APPENDIX H

Pertinent Historical Documentation

STATE OF CALIFORNIA

HEALTH AND WALFARE AGENCY

DEPARTMENT OF HEALTH SERVICES

In the matter of: Gardena Sumps Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, California County of Los Angeles	Docket No. HSA 87/88-037 REMEDIAL ACTION ORDER Health & Safety Code, Sections 25355.5 (a)(1)(B) and 205

To: Thomas W. Cooper, an individual, Clarence Haack, an individual, and Genevie Haack, an individual.

I. INTRODUCTION

1.1. The California Department of Health Services (DHS) issues this Remedial Action Order to the above named Respondent pursuant to California Health and Safety Code Sections 25355.5 (a)(1)(B) and 205. DHS has determined that there are releases or threatened releases of hazardous substances at the above named site and such releases constitute a Public Nuisance as Defined in Health and Safety Code Section 205 and Civil Code Sections 3479 and 3480.

1.2. Purpose. In issuing this Remedial Action Order it is the objective of DHS to require that any release or threatened release of a hazardous substance (also referred to as "contaminants" or "contamination") to air, soil, surface water and groundwater at or from the Gardena Sumps (Facility or Site) are throughtly investigated and appropriate remedial actions are taken.

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II. FINDINGS OF FACT

2.1. The Site which is the subject of this Remedial Action Order, is located at the southwest corner of Artesia Boulevard and Normandie Avenue, in the City of Gardena, County of Los Angeles, California. Maps of the Site are included which identify the regional location (Exhibit A) and exact parcel size and description (Exhibit B).

2.2. Mr. Dennis Goddard was the owner of the named Site from the mid-1920's to approximately 1957. Mr Goddard leased the property to presently unknown oil companies that utilized four existing pits for disposal of waste oil sludge, rinse waters, acids, and tank bottoms sludges. Two of the pits are still visible at the site and have apparently not been disturbed. The remaining two pits have been covered by soil and may have been excavated to some unknown degree.

2.3. A portion of the site was purchased by Mr. Russ Ward in approximately 1957.

2.4. Mr. Thomas Cooper purchased Mr. Ward's portion of the Site in 1982.

2.5. There are two sumps still visible on the Site, occupying approximately two acres. The entire site occupies approximately three acres. Historically the Site was excavated for its clay content. Estimates of the depth of the sumps vary from 8 to 30 feet. Based on historical photographs, two additional sumps extended from the west edge of Mr. Cooper's property onto the property immediately adjacent.

2.6. The portion of the site extending beyond Mr. Cooper's property is owned by Clarence and Genevie Haack and is leased to Aircraft Magnesium Company.

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2.7. In response to a citizen complaint, a field investigation was initiated to evaluate the sumps. On February 18, 1981, seven grab samples of liquids and sludges were obtained from the two visible sumps. The analytical results revealed that four of the seven samples had pH values below 2.0; three samples had lead concentrations of 61, 72, and 74 parts per million (ppm) and two samples had phenol concentrations of 6 and 11 ppm. Sample locations and analyses are on file with the DHS.

2.8. In January 1987, the Department obtained additional samples in the area west of the two visible sumps. The results of the analyses are as follows:

Contaminant	Highest Concentration (ppm)
Trimethyl Benzene	413
Tetramethyl Benzene	124
Decahydronaphthalene	51
Lead	240
Chromium	38
Copper	231
Nickel	55
Zinc	177
Phenanthrene	380
Pyrene	100
Fluoranthene	68
Chrysene	720
Anthracene	90
Benz (a) pyrene	27
pH	1.2 (lowest reading)

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Sample analyses and locations are on file with the DHS.

2.9. In August 1987, the DHS directed its regional contractor to take additional samples from two locations in each of the two visible sumps and three locations in the area of the adjacent historical sumps. The results of the analyses are as follows:

Contaminant	Visible Sumps (ppm) (highest concentration)	Historical Sumps (ppm) (highest concentration)
Lead	30	2500
Chromium	12	550
Zinc	34	720
Copper	7	250
Nickel	9	190
Antimony	ND (not detected)	49
Chrysene	1300	1100
Phenanthrene	2400	2400
Ethylbenzene	1	ND
Toluene	4	0.9
Benzene	ND	0.4
4,6 dinitro-2 methylphenol	ND	25
Aldrin	ND	0.0025
BHC(a)	ND	0.0025
Other compounds semi-quantitativly identified included: *		
Dimethylphenanthrene	1000	2000
Methyl Phenanthrene	ND	2000

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Methylanthracene isomers	3000	7000
Trimethylnapthalene isomers	400	700
Ethyl Methyl Benzene	ND	900
Methyl Acetate	60	20
Trimethyl Benzene	ND	7
Sulfur Dioxide	300	300
Acetone	ND	6
Xylene	3	10
Methyl Fluorene	ND	1000
Trimethylphenanthrene	10,000	10,000

Sample analyses and locations are on file with the DHS.

* Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.

2.10. During sampling, hydrogen sulfide (gas) was detected by direct reading instrumentation at concentrations as high as 100 ppm.

2.11. Based on these investigations, and the surfacing of several large seeps, DHS directed Mr. Clarence Hack to fence and post the unpaved portions of his property.

2.12. Lead compounds may be highly toxic, persistent, and they may accumulate in animal tissue. Lead compounds are hemotoxins and may cause central nervous system and neuromuscular effects. Some lead compounds are experimental carcinogens of the lungs and kidneys. Materials contaminated above 1,000 ppm total lead or 5 ppm soluble lead are hazardous wastes within the meaning Section 25117 of the Health and Safety Code. Lead compounds are listed hazardous materials (#406) in Section 66680 of Title 22 of the

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California Code of Regulations. Lead is a hazardous substance within the meaning of Health and Safety code Section 25316.

2.13. Trimethyl benzene isomers are rated as highly toxic. Acute exposure covering seconds or minutes can cause injury to the skin, mucous membranes, and eyes. Continuous or repeated exposures covering days, months or years can cause injury to the skin, mucous membranes, or eyes of sufficient severity to threaten life or produce permanent impairment, disfigurement or irreversible change. Repeated exposure by inhalation can produce death or serious physical impairment. Trimethyl benzene is a hazardous substance within the meaning of Health and Safety Code Section 25316.

2.14. Chrysene is one of a group of polynuclear aromatic hydrocarbons (PNAs), and is considered a human carcinogen by the Occupational Health & Safety Administration. Materials contaminated with chrysene are hazardous wastes within the meaning of the Health and Safety Code, Section 25117.

2.15. Chromium compounds have a corrosive action on the skin and mucus membrane. Lesions are confined to the exposed parts, affecting chiefly the skin of the hands and forearms and the mucus membranes of the nasal septum. Chromate salts can cause cancer of the lungs, nasal cavity and paranasal sinus. Chromium compounds are listed hazardous materials (#204) in Section 66680 of Title 22 of the California Code of Regulations. Chromium compounds are a hazardous substance within the meaning of Health and Safety Code Section 25316.

2.16. In its gaseous form, sulfur dioxide is dangerous to the eyes causing irritation and inflammation. In moist air it can combine to form sulfurous acid. Sulfur dioxide may also cause edema of the lungs and can cause respiratory paralysis. Excessive exposures can be fatal. Maximum permitted exposure for an 8 hour period is 5 parts per million. Materials contaminated

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with Sulfur dioxide are considered hazardous wastes within the meaning of the Health and Safety Code, Section 25117.

2.17. Hydrogen sulfide is both an irritant and an asphyxiant. Low concentrations (20 ppm to 100 ppm) cause irritation of the eyes and upper respiratory tract. If exposure is prolonged, pulmonary edema may result. Hydrogen sulfide is a listed hazardous material (#387) in Section 66680 of Title 22, California Code of Regulations. Hydrogen sulfide is a hazardous substance within the meaning of Health and Safety Code, Section 25316.

2.18. Analysis of oily waste material at the site indicated a pH below 2.0 (Reference Section 2.7 and 2.8). The oily waste material meets the criteria for a hazardous waste as identified in Section 66708 of Title 22 of the California Code of Regulations.

2.19. The following are potential routes of exposure:

a. Inhalation of airborne contaminants including wind blown contaminated soil released during site disturbances and hydrogen sulfide (gas) which was detected in boreholes during site sampling activities;

b. Direct contact with waste material or contaminated soils presents a hazard due to both the toxicity, and corrosivity of the material; and

c. Exposure to contaminated soils which have been transported off-site by surface water runoff is a concern because run on and run off is not controlled at the site.

2.20. The nearest residential area is within 500 feet of the site. The sidewalk immediately adjacent to the site is used by students going to and from Gardena High School, less than one-half mile away. The seeps have also surfaced in the Aircraft Magnesium parking lot.

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III. CONCLUSION OF LAW

3.1. The contaminants and substances, described above, are "hazardous substances" as defined by Health and Safety Code Section 25316.

3.2. Respondents are responsible persons or parties and liable persons as defined by Health and Safety Code Sections 25319, 25360, and 25385.1(g).

3.3. This Order complies with the requirements of Health and Safety Code Section 25355.5(a)(1).

3.4. The past, present and potential migration of hazardous substances from the Facility into the soil air and surface water constitutes an actual or threatened "release" as defined in Health and Safety Code Section 25320.

3.5. Conditions at the Site constitute a nuisance which is injurious to health or offensive to the senses. This nuisance is one which affects at the same time an entire community or neighborhood, or any considerable number of persons.

IV. DETERMINATION

4.1. Based on the foregoing Findings of Fact and Conclusions of Law, the Department has determined that:

a. Respondents are responsible parties who are required to take the actions ordered below to protect the public health and safety and environment;

b. The response actions set forth in this Order are necessary to respond to releases or threatened releases of hazardous substances from the Site; and

c. The response actions set forth in this Order are necessary to enjoin and abate a nuisance dangerous to health. Respondent's failure to

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perform these response actions shall result in the Department's commencing and maintaining all proper and necessary actions or proceedings to abate this public nuisance.

V. ORDER

IT IS HEREBY ORDERED:

5.1 INTERIM MEASURES Respondents shall continue to maintain the interim measures designed to reduce the potential for direct contact with the hazardous waste. These measures include:

a. Fencing and posting to restrict access to the site;

b. Construction of bulkheads to confine the waste material within the fenced area; and

c. Removal of any waste material surfacing outside the fenced area.

IV. REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

6.1. Workplan Submission. Within 45 calendar days of the effective date of this Order, Respondents shall submit to DHS for review and approval a detailed workplan and implementation schedule which covers all the activities necessary to conduct a complete remedial investigation and feasibility study of the Site and any areas where there is a release or threatened release of hazardous substances from the Site. The workplan and activities under it shall, at a minimum, conform to the National Contingency Plan (40 CFR Part 300), as amended, and the U. S. Environmental Protection Agency's "Guidance on Remedial Investigation under CERCLA" and "Guidance on Feasibility Studies under CERCLA" both dated June 1985, as amended, as well as state laws and regulations.

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6.2. Workplan Objectives. The objectives of the Workplan are to:

(a) Determine the nature and full extent of contamination of air, soil, surface water and ground water at the Site and adjacent areas;

(b) Identify all existing and potential migration pathways, including the direction, rate and dispersion of contaminant migration;

(c) Identify and evaluate appropriate remedial measures to prevent future releases and mitigate any releases which have already occurred; and

(d) Collect and evaluate the information necessary to prepare a remedial action plan in accordance with the requirements of Health and Safety Code Section 25356.1.

6.3. Workplan Contents. The Workplan shall cover each of the following elements: remedial investigation, remedial investigation report, feasibility study and feasibility study report and shall contain a schedule for implementation of each element.

6.3.1. The remedial investigation portion of the workplan shall include at least the following elements:

a. A history of the Site including a list of the hazardous materials used on-site and their estimated volumes and concentrations, a description of all manufacturing processes which are or were related to each hazardous material or produced any hazardous waste, and a Site map delineating each area where hazardous materials and/or hazardous wastes were disposed, treated, stored, transferred, transported, handled or used;

b. A summary of all air, soil, surface water and ground water assessment work completed to date, including data reduction and interpretation of the data;

c. A description of the activities which will be undertaken to develop a complete profile of on-site and off-site air, soil, surface

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water and ground water contamination attributable to operations at the Site;

d. Sampling protocols for air, surface water, standing liquid, ground water, sediment, surface soil and subsurface soil;

e. Analytic and quality control protocols for all sampling and analysis programs including:

(1) adequate sample identification;

(2) sample preservation techniques;

(3) chain of custody procedures;

(4) use of DHS approved analytical methods;

(5) identification of qualified person(s) conducting the sampling; and

(6) identification of a certified laboratory which will perform the analyses;

f. A description of locations where sampling will occur, and a list of chemical analyses to be performed;

g. Engineering specifications for all installations such as ground water monitoring wells and piezometers;

h. A description of provisions for gaining access to and obtaining samples from adjacent properties, where appropriate;

i. A description of how the data obtained pursuant to this Order will be managed and preserved by Respondents in accordance with paragraph 8.14;

j. A Site Health and Safety Plan which covers all measures including contingency plans which will be taken to protect persons on and off the Site from exposure to hazardous wastes, substances or materials during activities under the workplan; and

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k. A community relations plan (conforming to the Environmental Protection Agency's Community Relations in Superfund: A Handbook (1986)) for informing local residents about activities at the Site and responding to inquiries from concerned citizens.

6.3.2. The remedial investigation report portion of the workplan shall describe the steps necessary to submit this report in compliance with paragraph 6.4.

6.3.3. The feasibility study portion of the workplan shall include at least the following elements:

a. A summary of the existing and potential hazards for which corrective action is required;

b. A description of the alternative remedial actions which will be evaluated;

c. A list of the technologies which will be screened for each alternative remedial action described in (b) above;

d. A description of the factors which will be considered in screening and analyzing each alternative remedial action technology, including, but not limited to, effectiveness, reliability, timeliness of implementation, unit cost, availability, operation and maintenance costs and conformity with applicable laws and regulations;

e. A list of the criteria for screening and analyzing the alternative remedial action technologies; and

f. A description of all pilot studies, bench tests or other activities which will be performed to evaluate each alternative remedial action technology.

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6.3.4. The feasibility study report portion of the workplan shall describe the steps necessary to submit this report in compliance with paragraph 6.5.

6.4. Remedial Investigation Report. The remedial investigation report shall be submitted by Respondents to DHS for review and approval in accordance with the approved Workplan Schedule. The remedial investigation report shall summarize the results of the remedial investigation including reduction and interpretation of all data and information generated and/or compiled during the remedial investigation. The remedial investigation report shall cover the following subjects relating to the Site:

a. Introduction
    1. Overview of Report
    2. The Site Background Information
    3. Nature and Extent of Problem(s)
    4. Remedial Investigation Summary

b. The Site Features Investigation
    1. Demography
    2. Land Use
    3. Natural Resources
    4. Climatology

c. Hazardous Substance Investigation
    1. Waste Types
    2. Waste Component Characteristics and Behavior

d. Hydrogeologic Investigation
    1. Soils
    2. Geology
    3. Ground Water

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e. Surface Water Investigation

1. Surface Water

2. Sediments

3. Flood Potential

4. Drainage

f. Air Investigation

g. Biota Investigation

1. Flora

2. Fauna

h. Bench and Pilot Tests

i. Public Health and Environmental Concerns

1. Potential Receptors

2. Public Health Impacts

3. Environmental Impacts

j. Community Relations Plan.

6.5. Feasibility Study Report. The feasibility study report shall be submitted by Respondents to DHS for review and approval in accordance with the approved Workplan schedule. The feasibility study report shall summarize the results of the feasibility study including reduction and interpretation of all data and information generated and/or compiled during the feasibility study. The feasibility study shall cover the following subjects relating to the Site.

a. Description of Current Situation

1. The Site Background Information

2. Nature and Extent of Release

3. Objective of Remedial Action(s)

b. Screening of Remedial Action Technologies

1. Technical Criteria

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2. Remedial Action Alternatives Developed

3. Environmental and Public Health Criteria

4. Other Screening Criteria

5. Cost Criteria

c. Analysis of Remedial Action Alternatives

1. Technical Feasibility

2. Environmental Evaluation

3. Institutional Requirements

4. Public Health Evaluation

5. Cost Analysis

d. Recommended Remedial Action

6.6. Workplan Implementation. Respondents shall implement the Workplan as approved by DHS in accordance with the approved schedule.

VII. REMEDIAL ACTION PLAN

7.1. Draft Remedial Action Plan. Within 30 calendar days of DHS approval of the Feasibility Study Report Respondents shall prepare and submit to DHS for review and approval a draft Remedial Action Plan (RAP). The RAP shall set forth in detail appropriate steps to remedy air, soil, surface water and ground water contamination at the Facility and adjacent areas. The RAP shall be prepared in accordance with the standards and requirements set forth in California Health and Safety Code Section 25356.1. In addition the RAP shall contain a schedule for implementation of all removal and remedial actions proposed to be taken.

7.2. Implementation of Final Remedial Action Plan. Within 60 days after DHS approval of the final RAP in accordance with California Health and Safety

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Code Section 25356.1, the Respondents shall submit to DHS a detailed RAP workplan containing technical and operational plans and engineering designs for implementation of the approved remedial or removal action alternative(s), and a schedule for implementing the construction phase. The workplan shall also describe the nature and design of the construction or equipment to be employed, a Site specific hazardous waste transportation plan (if necessary), the identity of any contractors, transporters and other persons conducting the removal and remedial activities for the Site, post remedial sampling and monitoring procedures for air, soil, surface water and ground water and shall cover all of the subjects described in paragraph 5.3.1 subdivisions (d), (e), (f), (g), (h), (i), (j) and (k) as they pertain to the removal and remedial activities. The schedule submitted with the workplan shall provide that all approved removal or remedial actions excluding operation and maintenance shall be completed by June 30, 1988.

7.2.1. Upon DHS approval of the RAP workplan and schedule Respondents shall implement the final RAP as approved in accordance with the approved RAP workplan and schedule.

7.2.3. Respondents shall be responsible for all operation and maintenance requirements in accordance with the final RAP and RAP workplan.

7.2.4. During the implementation of the final RAP and RAP workplan DHS may specify such additions, modifications and revisions to the RAP workplan as it deems appropriate to implement the RAP.

7.2.5. Any remedial technology employed in implementation of the final RAP shall be left in place and operated by Respondents until and except to the extent that DHS determines and states in writing that Respondents may discontinue or modify some or all of such remedial technology because Respondents have met the criteria specified in the final RAP for discontinuance

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of such technology or because such modifications would better achieve the goals of the final RAP.

VIII. OTHER PROVISIONS

8.1. Project Coordinator. Within 15 calendar days of the effective date of this Order, Respondents shall submit to DHS in writing the name and address of a Project coordinator whose responsibilities will be to receive all notices, comments, approvals and other communications from DHS to Respondents.

8.2. Project Engineer/Geologist. The work performed pursuant to this Order shall be under the direction and supervision of a qualified professional engineer or a certified geologist with expertise in hazardous waste Site cleanup. The name and address of the project engineer or geologist chosen by Respondents shall be submitted to DHS within twenty calendar days of the effective date of this Order.

8.3. Monthly Summary Reports. Within 30 calendar days of the effective date of this Order and monthly thereafter, Respondents shall submit a Monthly Summary Report of their activities under the provisions of this Order. The report shall describe: 1) specific actions taken by or on behalf of Respondents during the previous calendar month, 2) actions expected to be undertaken during the current calendar month, and 3) all results of sample analyses, tests and other data generated or received by Respondents under this Order. The Monthly Summary Report shall be received by DHS by the 15th day of each month.

8.4. Incorporation of Documents. All plans, schedules, reports, specifications, and other documents required or submitted by Respondents pursuant to this Order are, upon written approval by DHS, incorporated in this

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Order and shall be implemented by Respondents as approved. Any noncompliance with such documents shall be a noncompliance with this Order.

8.5. Exhibits. All Exhibits attached hereto are incorporated herein by this reference.

8.6. Submittals and Approvals. All submittals and notifications from Respondents required by this Order shall be sent simultaneously to:

Mr. Angelo Bellomo, Chief
Southern California Section
Toxic Substances Control Division
107 S. Broadway, Room 7011
Los Angeles, CA 90012

Dr. Robert P. Ghirelli
Executive Officer
California Regional Water Quality
Control Board
Los Angeles Region
107 S. Broadway Room 4027
Los Angeles, CA 90012

Mr. Anastacio Medina, Chief
Hazardous Waste Control Program
Los Angeles County
Department of Health Services
2615 South Grand Ave., (Rm. 607)
Los Angeles, CA 90007

Mr. Jim Gregg
Senior Administrations Assistant
City Manager's Office
City of Gardena
1700 West 162nd Street
Gardena, CA 90247-3732

Ms. Lee Lockie, Director of Enforcement
South Coast Air Quality Management District
9150 Flair Drive
El Monte, CA 91731

All approvals and decisions of DHS made regarding such submittals and notifications shall be communicated to Respondents in writing by the Section Chief or his designee. No informal advice, guidance, suggestions or comments

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by DHS regarding reports, plans, specifications, schedules or any other writing prepared or submitted by or for Respondents shall be construed to relieve Respondents of their obligation to obtain such formal approvals as may be required herein.

8.7. DHS Review and Approval. If after review of any report, plan, schedule, remedial action plan or other document which Respondents submit for DHS approval pursuant to this Order, DHS determines that the document is not satisfactory and cannot be approved, DHS may take the following actions:

a. Make modifications to the submitted document as deemed necessary by DHS to protect public health and safety or the environment, and approve the document as modified; and/or

b. Return the submitted document to Respondents with recommended changes. Within a time period specified by DHS, Respondents shall submit a revised document incorporating the recommended changes to DHS for approval. All such approvals by DHS shall be in writing; and/or

c. Find the Respondents to be in noncompliance with this Order (Pursuant to Health and Safety Code Section 25355.5(a)(2)) and proceed with such actions that DHS deems necessary to mitigate any threat of release of hazardous substances from the site.

8.8. Modifications. Respondents may by written request seek modification, termination or revision of this Order or any portion of this Order or any program or plan submitted pursuant to this Order at any time. This Order and any applicable program, plan, or schedule may be modified, terminated or revised by mutual written agreement of the parties at any time. DHS reserves the right to unilaterally modify this Order. Any modification to this Order shall be effective upon issuance and deemed incorporated in this Order.

8.9. Time Periods. Unless otherwise specified, time periods begin from

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the effective date of this Order and "days" means calendar days. The effective date of this Order is the date of signature by DHS.

8.10. Extension Requests. If, for any reason, Respondents are unable to perform any activity or submit any document within the time required under this Order, Respondents may request, in writing an extension of the time specified. The extension request shall include a justification for the delay. All such requests shall be in advance of the date on which the activity or document is due.

8.11. Extension Approvals. If DHS is convinced that good cause exists for an extension as set forth in paragraph 7.10 it will grant the request and specify in writing a new schedule. Respondents shall comply with the new schedule.

8.12. Endangerment During Implementation. In the event that the Section Chief of the Southern California Section of the Toxic Substances Control Division of the Department (or his equivalent in any successor agency) determines that any activities or circumstances are creating an imminent or substantial endangerment to the health and welfare of people on the Site or in the surrounding area or to the environment, the Section Chief (or equivalent) may order Respondents to stop further implementation of this Order for such period of time as needed to abate the endangerment. Any deadline contained in this Order which is directly affected by a Stop Work Order under this section shall be extended for the term of such Stop Work Order.

8.13. Site Access. DHS and/or its authorized representatives shall have the authority to enter and move freely about all property at the Site at all reasonable times for the purposes of, inter alia: inspecting records, operations logs, sampling and analytic data, and contracts related to this Order; reviewing the progress of Respondents in carrying out the terms of this

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Order; conducting such tests as DHS may deem necessary; and verifying the data submitted to DHS by Respondents. Nothing in this paragraph is intended or shall be construed to limit in any way the right of entry or inspection that DHS or any other agency may otherwise have under law.

8.14. Sampling, Data and Document Availability. Respondents shall permit DHS and/or its authorized representatives to inspect and copy all sampling, testing, monitoring or other data generated Respondents or on Respondent's behalf in any way pertaining to work undertaken pursuant to this Order. Respondents shall allow duplicate samples to be taken by DHS and/or its authorized representatives, of any samples collected by Respondents pursuant to this Order. Respondents shall maintain a central depository of the data, reports, and other documents prepared pursuant to this Order. All data, reports and other documents shall be preserved by Respondents for a minimum of six years after the conclusion of all activities under this Order. If DHS requests that some or all of these documents be preserved for a longer period of time, Respondents shall either comply with that request or deliver the documents to DHS or permit DHS to copy the documents prior to destruction. Respondents shall notify DHS in writing at least six months prior to destroying any documents prepared pursuant to this Order.

8.15. Cost Recovery. Failure or refusal of Respondents to comply with this Order may make Respondents liable for any government costs incurred, including those payable from the Hazardous Substance Account or the Hazardous Substance Cleanup Fund for any remedial action at the Site, as provided in Section 25360 of the Health and Safety Code and other applicable provisions of law. These costs include DHS's direct costs and DHS's administrative overhead costs in an amount equal to 10 percent of the reasonable cost actually incurred, or five hundred dollars ($500), whichever is greater. In addition,

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Respondents may be liable for the costs of oversight by DHS of Respondents activities at the Site as provided in Section 25360 of the Health and Safety Code.

8.16. Additional Enforcement Actions. By issuance of this Order, DHS does not waive any further enforcement actions.

8.17. Compliance with Applicable Laws. Respondents shall carry out this Order in compliance with all applicable local, State, and Federal requirements, including, but not limited to, requirements to obtain permits and to assure worker safety.

8.18. Government Liabilities. The State of California shall not be liable for any injuries or damages to persons or property resulting from acts or omissions by Respondents, their officers, directors, employees, agents, receivers, trustees, successors, or of any persons, including but not limited to, firms, corporations, subsidiaries, contractors, or consultants in carrying out activities pursuant to this Order, nor shall the State of California be held as party to any contract entered into by Respondents or its agents in carrying out activities pursuant to this Order.

8.19. Reservation of Rights. Nothing in this Order is intended or shall be construed to limit the rights of any of the parties hereto with respect to claims arising out of or relating to the deposit or disposal at any other location of substances removed from the Site. Nothing in this Order is intended or shall be construed to limit or preclude DHS from taking any other action authorized by law to protect the public health and welfare or the environment and recovering the costs thereof.

8.20. Severability. The requirements of this Order are severable, and Respondents shall comply with each and every provision hereof notwithstanding the effectiveness of any other provision.

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8.21. Parties Bound. This Order applies to and is binding upon Respondents, and their successors and assigns.

IT IS SO ORDERED THIS 3 DAY OF March, 1988.

Angelo Bellomo, Chief
Southern California Section
Toxic Substances Control Division

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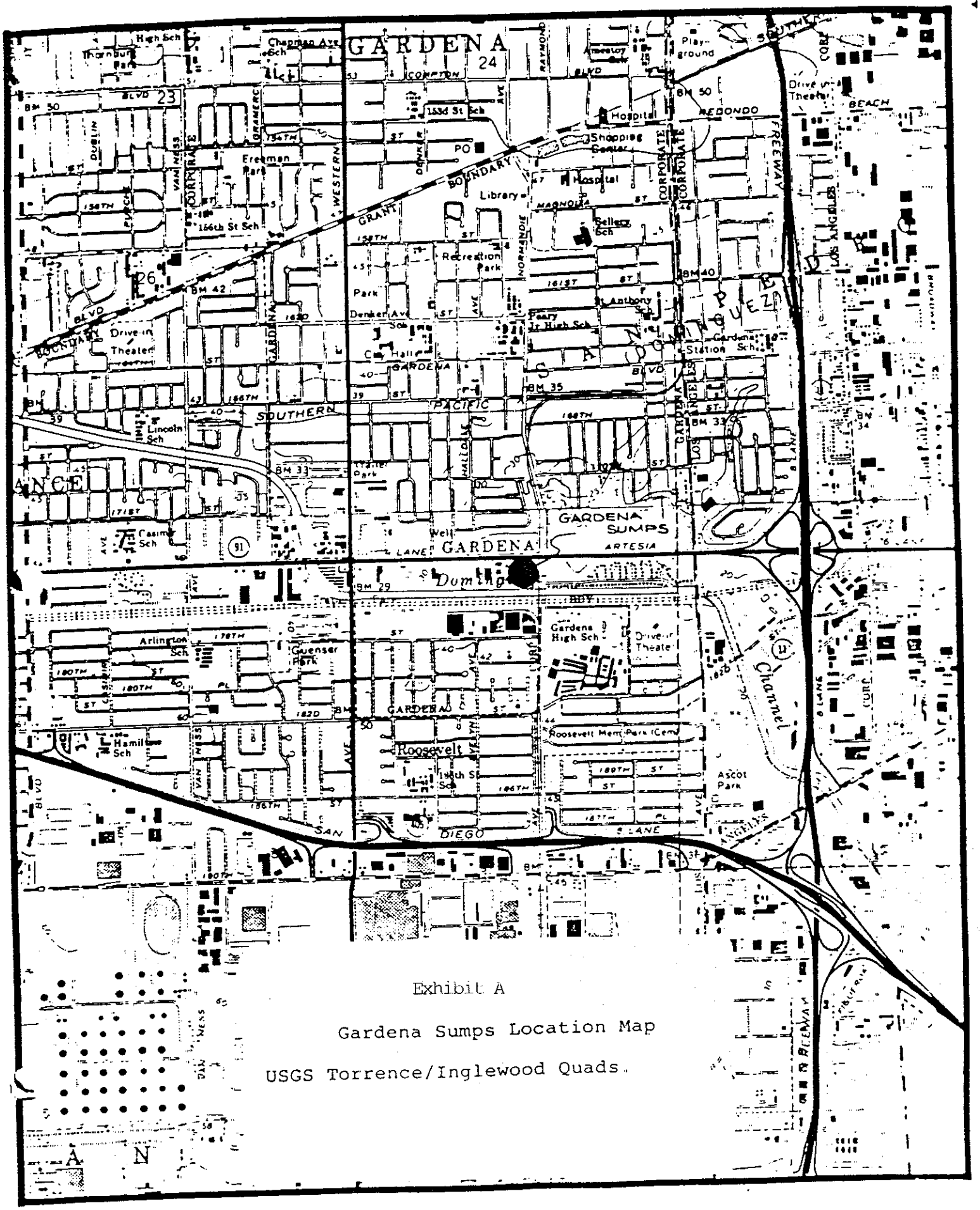
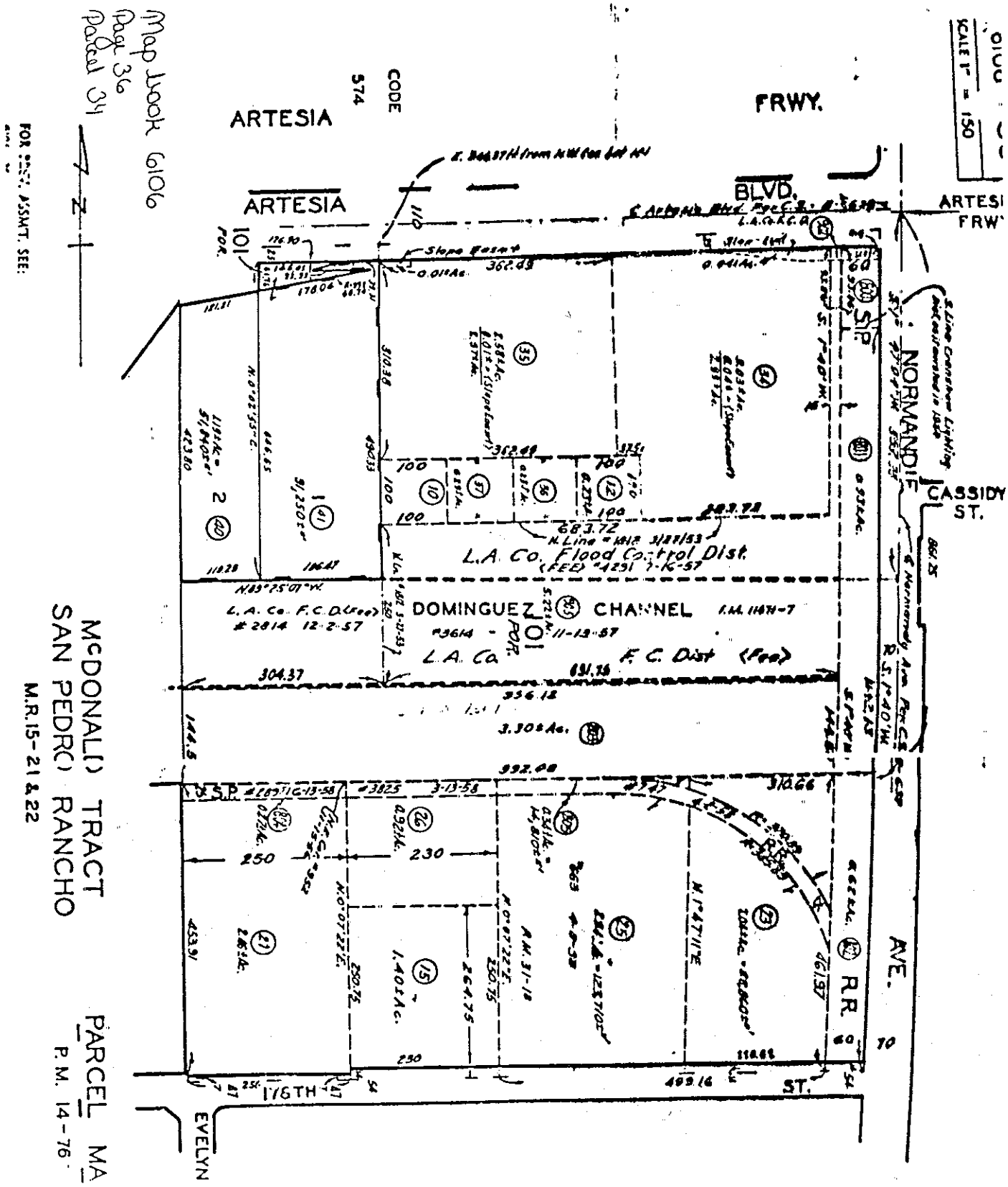


Exhibit A

Gardena Sumps Location Map

USGS Torrence/Inglewood Quads.

Exhibit B



Map Book 6106
Page 36
Parcel 34
ARTESIA
CODE 574
FRWY.
ARTESIA
BLVD.
ARTESIA FRWY
NORMANDIE
CASSIDY ST.
L.A. Co. Flood Control Dist.
DOMINGUEZ CHANNEL
L.A. Co. F.C. Dist (Fee)
R.R.
AVE.
176TH ST.
EVELYN
McDONALD TRACT
SAN PEDRO RANCHO
M.R. 15-21 & 22
PARCEL MA
P.M. 14-76

STATE OF CALIFORNIA

HEALTH AND WELFARE AGENCY

DEPARTMENT OF HEALTH SERVICES

In the Matter of: Gardena Sumps Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, California Respondents: Mr. Clarence Haack 6200 Perkins Road Oxnard, CA ~~90510~~ 93033 Mrs. Genevieve Haack 6200 Perkins Road Oxnard, CA ~~90510~~ 93033 Mr. Thomas Cooper 1210 West 198th Street Torrance, CA 90502 Southern Pacific Transportation Company Southern Pacific Building San Francisco, CA 94105 Los Angeles County Department of Public Works P.O. Box 1460 Alhambra, CA 91802-1460 Attn: Mapping and Property Management Division Right of Way Section	DETERMINATION OF IMMINENT AND/OR SUBSTANTIAL ENDANGERMENT AND ISSUANCE OF ORDER Health and Safety Code 25358.3; and 25359.5

I. INTRODUCTION

1.1. Parties: Mr. Clarence Haack, Mrs. Genevieve Haack, Mr. Thomas Cooper, Southern Pacific Transportation Company, and the County of Los

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Angeles, Flood Control District, are named Respondents at the Gardena Sumps Site.

I.2. Site Location: The site subject to this Order is located at the southwest corner of the intersection of Artersia Boulevard and Normandie Avenue in the City of Gardena, County of Los Angeles. The Site, which encompasses approximately three (3) acres, consists of 4 parcels. Attached as Appendix "A" and "B" are maps of the Site and the immediate surrounding area showing the location of facilities, buildings, and other relevant structures on or adjacent to the Site.

1.3. This administrative Order is issued pursuant to Section 25358.3 (a)(1) and 25359.5 of the California Health and Safety Code. The Respondents are subject to the provisions of Chapter 6.8 of Division 20 of the Health and Safety Code because there has been a release of a hazardous substance on, under, or into the land of the subject Site, and because the release or threatened release of hazardous substances at the Site may constitute an imminent and/or substantial endangerment to the public health or welfare or to the environment

1.3.1. The California Department of Health Services (hereinafter "DHS" or "Department") administers and enforces the provisions of the Hazardous Substances Account Act, as contained in Section 25300 et. seq. of the Health and Safety Code.

1.4. Effective Date: This Order is effective immediately upon receipt thereof by Mr. Clarence Haack, Mrs. Genevieve Haack, Mr. Thomas Cooper, the Southern Pacific Transportation Company and the County of Los Angeles, Flood Control District. All times for performance shall be calculated from the time and date of receipt.

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II. FINDINGS

2.1. Respondents are responsible persons or parties and liable persons as defined by Health and Safety Code Sections 25319, 25323.5, 25360 and 25385.1(g).

2.2. Clarence and Genevieve Haack own Parcels 3 and 4 which occupy the northwest portion of the site. They purchased this portion of the property in 1962. Currently, they are leasing this portion to the Aircraft Magnesium Company.

2.3. Mr. Thomas Cooper owns Parcels 1 and 2 which is the property immediately east of Parcels 3 and 4. He purchased his portion of the Site in 1982 from Mr. Russ Ward. Two sumps are visible and cover approximately the entire portion of Parcels 1 and 2.

2.4. Southern Pacific Transportation Company owns the land under and adjacent to the railroad tracks located along Normandie Avenue, adjacent to Parcels 1 and 2.

2.5. The Los Angeles County, Flood Control District, owns a parcel of land which borders Parcels 1 and 2 on the south and east sides.

2.6. The Department has determined that there are releases and/or threatened releases of hazardous substances at or from the Site to air, soil, surface water, and ground water. The substances found at the Site are "hazardous substances" as defined by health and Safety Code Section 25316 and the past, present or potential migration of these hazardous substances from Site into the air, soil, surface water, and ground water constitutes an actual or threatened "release" as defined in health and Safety Code Section 25320.

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2.7. Site History: Mr. Dennis Goddard was the owner of Parcels 1, 2, 3, and 4 from the mid-1920s to approximately 1957. Mr. Goddard leased the property to presently unknown oil companies that utilized four existing sumps for disposal of waste oil sludge, rinse water acids, and tank bottom sludges. Based on a review of historical photographs, two of the sumps, located on Parcels 1 and 2, occupy approximately 2 acres, are still visible at the Site, and have apparently not been disturbed. Based on a review of historical photographs, two additional sumps, extended from the western boundary of Mr. Cooper's property eastward onto Parcels 3 and 4, the Haacks's property. These two sumps are covered and are no longer visible; they may have been excavated to some unknown degree. However, seepage is occurring from these covered sumps and the material has been sampled and analyzed as per Section 2.8.1, 2.8.2, and 2.8.3.

Estimates of the depth of all four sumps vary from 8 to 30 feet (historically the Site was excavated for its clay content).

2.8. Site Investigation: In response to a citizen complaint, a field investigation was initiated by DHS to evaluate the Site. DHS collected and analyzed samples from the sumps, seeps, and soil at the Site on three separate occasions over a period of seven years. The results indicated that the sumps, seeps, and soil are contaminated with hazardous substances as described below.

2.8.1. On February 18, 1981, seven grab samples of liquid and sludge, (a black tar-like substance) were collected from the two visible sumps located in Parcels 1 and 2. The analytical results are shown below.

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Parameter	Value or Concentration (ppm)*
pH	<2
Lead	61, 72, 74
Phenol	6,11

* ppm - parts per million

Additional information on the sample analyses and location are on file with the DHS.

2.8.2. In January 1987, the Department collected and analyzed surface or subsurface soil samples from Parcels 3 and 4. The highest concentrations detected of selected hazardous substances are shown below.

Hazardous Substance	Concentration in (ppm)
Trimethyl benzene	413
Tetramethyl benzene	124
Decahydronaphthalene	51
Lead	240
Chromium	38
Copper	231
Nickel	55
Zinc	177
Phenanthrene	380
Pyrene	100
Fluoranthene	68
Chrysene	720
Anthracene	90
Benz (a) pyrene	27
pH	1.2 (lowest value)

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Additional information on the sample analyses and locations are on file with the DHS.

2.8.3. In August 1987, DHS directed its regional contractor to collect and analyze additional samples of the black tar-like substance from two locations in each of the two visible sumps, and soil samples from three locations in the area of the adjacent covered sumps. The highest concentrations detected of selected hazardous substances are shown below.

Hazardous Substance	Visible Sumps (ppm)	Covered Sumps (ppm)
Lead	30	2500
Chromium	12	550
Zinc	34	720
Copper	7	250
Nickel	9	190
Antimony	ND (not detected)	49
Chrysene	1300	1100
Phenantherene	2400	2400
Ethylbenzene	1	ND
Toluene	4	0.9
Benzene	ND	0.4
4,6 dinitro-2	ND	25
Dimethylphenanthrene	1000	2000
Methyl Phenanthrene	ND	2000
Methylanthracene isomers	3000	7000
Trimethylnapthalene isomers	400	700
Ethyl Methyl Benzene	ND	900
Methyl Acetate	60	20

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Hazardous Substance	Visible Sumps (ppm)	Covered Sumps (ppm)
Trimethyl benzene	ND	7
Sulfur Dioxide	300	300
Acetone	ND	6
Xylene	3	10
Methyl Fluorene	ND	1000
Trimethylphenanthrene	10,000	10,000

Sample analyses are on file with the DHS.

2.8.4. During sampling in January and August 1987, levels of hydrogen sulfide (gas) as high as 100 ppm were detected at the Site using direct reading instruments.

2.8.5. Site Inspection: On June 13, 1988, representatives of DHS inspected the Site. The following observations were made:

a. A black tar-like substance was seeping onto the sidewalk along Artesia Boulevard. This material was similar in appearance to the material which was tested in August 1987 and found to contain hazardous substances.

b. These seeps appeared only since the August 1987 inspection.

c. There were no signs posted around the periphery of Parcel 3.

d. Vehicles parked in the unpaved portion of Parcel 3 were sinking into material similar in appearance to the material which was tested in August 1987 and found to contain hazardous substances.

e. The signs which existed around the periphery of Parcels 1 and 2 were inadequate because they were difficult to read due to weathering.

f. The fence along the eastern boundary of Parcels 1 and 2 was broken in two places permitting unimpeded access to the open sumps.

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2.8.6. Site Inspection: On July 6, 1988, representatives of DHS, again inspected the Site and the following observations were made:

a. Seeps consisting of a black tar-like substance were observed on the sidewalk outside of the fence on Artesia Boulevard.

b. Seeps consisting of a black tar-like substance were observed on the ground outside of the fence on Normandie Avenue.

c. A pool consisting of a black tar-like substance was observed on the ground outside of the fence of Parcel 2 on the property of Southern Pacific Transportation Company.

d. Seeps consisting of a black tar-like substance were observed on the ground along the slopes of Normandie Avenue, approximately 5 feet from the Site.

e. The black tar-like substances notes in Items 2.8.6 a-d were similar in appearance to the material which was tested in August, 1987, and found to contain hazardous substances.

f. The fence along the eastern boundary of Parcels 1 and 2 had been repaired since DHS inspected it on June 13, 1988.

g. The gate which existed along Artesia Boulevard of Parcel 1 was not tightly secured, thus allowing unauthorized personnel access to the Site.

h. The gate which existed along the eastern boundary of Parcel 2 was not locked, thus allowing unauthorized personnel access to the Site.

2.8.7. The following actions were taken on July 6, 1988 by representatives of DHS based on the observations described above:

a. Seeps consisting of a black tar-like substance were removed from the sidewalk outside of the fence along Artesia Boulevard.

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b. Seeps consisting of a black tar-like substance were removed from the ground surface outside of the fence along Normandie Avenue.

2.9. Exposure pathways: Hazardous substances have been detected in the soil and sumps at the Site. These hazardous substances may migrate off-site and expose humans and/or the flora and fauna through four possible exposure pathways. These pathways are described below.

2.9.1. Ground Water: Hazardous substances may migrate into and contaminate ground water underlying the Site, and may have adverse impacts on beneficial uses of water of the State.

2.9.2. Air: Potential releases of hazardous substances from the Site to the air may occur. Human exposure to air contaminants could result from inhalation.

2.9.3. Soil: Dermal contact with, or ingestion of, the material in the sumps, the seeps, or contaminated surface soil may result in human exposure to hazardous substances.

2.9.4. Surface Water: Hazardous substances may migrate or may continue to migrate away from the Site via rainfall runoff and result in human exposure via dermal contact with or ingestion of soil or water contaminated by rainfall runoff.

2.10. Population at Risk: The sidewalk along Artesia Boulevard, where the seepage is occurring, is a public sidewalk which has a high volume of pedestrian traffic. Pedestrian traffic is generated by the residential area surrounding and immediately adjacent to the Site and from Gardena High School, which is located 1/4 mile south of the Site on Normandie Avenue and 177 th Street. The school has an enrolled student population of 2144.

2.10.1. Employees of Aircraft Magnesium Company work on the Site and may be exposed to the hazardous substances which are present at the Site.

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III. HEALTH EFFECTS

3.1. Health Risks of Hazardous Substances Found at the Site: Hydrogen sulfide is both an irritant and an asphyxiant. Low concentrations (20 ppm to 100 ppm) cause irritation of the eyes and upper respiratory tract. If exposure is prolonged, pulmonary edema may result. Hydrogen sulfide is a listed hazardous material (#387) in Section 66680 of Title 22, California Code of Regulations. Hydrogen Sulfide is a hazardous substance within the meaning of Health and Safety Code, Section 25316.

3.2. Lead compounds may be highly toxic, persistent, and they may accumulate in animal tissue. Lead compounds are hemotoxins and may cause central nervous system and neuromuscular effects. Some lead compounds are shown to be carcinogenic to the lungs and kidney in experiments. Materials contaminated above 1,000 ppm total lead or 5 ppm soluble lead are hazardous wastes within the meaning Section 25117 of the Health and Safety Code. Lead compounds are listed hazardous materials (#406) in Section 66680 of Title 22 of the California Code of regulations. Lead is a hazardous substance within the meaning of Health and Safety Code, Section 25316.

3.3. Trimethyl benzene isomers are rated as highly toxic. Acute exposure covering seconds or minutes can cause injury to the skin, mucous membranes, and eyes. Continuous or repeated exposures covering days, months or years can cause injury to the skin, mucous membranes, or eyes of sufficient severity to threaten life or produce permanent impairment or disfigurement. Repeated exposure by inhalation can produce death or serious physical impairment. Trimethyl benzene is a hazardous substance within the meaning of Health and Safety Code, Section 25316.

3.4. Chrysene is one of a group of polynuclear aromatic hydrocarbons (PNAs) and is considered a human carcinogen by the Occupational Health and

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Safety Administration. Materials contaminated with chrysene are hazardous wastes within the meaning of the Health and Safety Code, Section 25117 and are hazardous substances within the measure of Health and Safety Code, Section 25316.

3.5. Chromium compounds have a corrosive affect on the skin and mucous membrane. Lesions are confined to the exposed parts, affecting chiefly the skin of the hands and forearms and mucous membranes of the nasal septum. Chromate can cause cancer of the lungs, nasal cavity and paranasal sinus. Chromium compounds are listed hazardous materials (#204) in Section 66680 of Title 22 of the California Code of Regulations. Chromium compounds are a hazardous substance within the meaning of Health and Safety Code, Section 25316.

IV. DETERMINATIONS

4.0 Seeps of hazardous substances onto public thoroughfares have occurred at the Gardena Sumps Site since the August 1987 inspection.

4.1. Samples have been collected from the Site and analyzed by an analytical laboratory. The most noteworthy sample results are indicated on the analysis reports which are described in Sections 2.81. and 2.8.2 of this Order.

4.2. There has been a release of hazardous substance on, under, or into the land of this site, and this order is necessary to protect public health and the environment.

4.3. The release does not comply with the terms of a current permit or interim status document or regulation of the Department.

4.4. The Site poses a public health risk if human contact is made with the hazardous substance or the surrounding contaminated area.

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4.5. Based on the above findings, the Department has determined that there may be an imminent and/or substantial endangerment to the public health or welfare or to the environment because of a release and/or threatened release of a hazardous substance from the Site.

V. ORDER

5. Based on the foregoing Determination of Violations, it is hereby ordered tht:

5.1. Control and Removal of Seeps. Seepage of the black tar-like substance onto the public sidewalk along Artesia Boulevard, onto the ground along Normandie Avenue, and outside the perimeter fence must be removed and controlled to prevent direct contact with hazardous substances by workers or the public.

5.1.1. Within 72 hours of the receipt of this Order, the Respondents shall remove all seepages of the black tar-like substance outside the existing fence, as follows:

1. Inspect the entire perimeter of the Site outside the existing fence.
2. Identify all visible seeps outside the fence.
3. Remove all seeps and contaminated soil outside the fence and have this material disposed of at an approved hazardous waste disposal facility.
4. Control all seeps inside the fence so that the material will not continue to seep outside the fence.
5. Personnel engaged in these activities shall be trained in hazardous waste removal and disposal operations and shall follow appropriate health and safety procedures.

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6. All appropriate Federal, State and local regulations shall be complied with by the Respondents during this operation.

7. Respondents shall document the actions taken in response to items 1 through 5 above and submit the documentation in a written report to DHS within five (5) days of the completion of the actions.

5.1.2. Respondents shall submit a workplan for the removal and control of hazardous substances from the Site within 15 days from the date of this Order. The workplan shall describe: 1) the measures which shall be taken to monitor future seeps; 2) the measures which shall be taken to remove any seeps which occur in the future; 3) health and safety procedures which shall be followed in removing seeps in the future; and 4) the type and frequency of future reporting to DHS.

5.2. Fencing and Posting. The respondents shall install a fence on the Site property to secure, at a minimum, the area specified on the Site map (Appendix A). The fence and signs shall be installed within 15 days.

5.3. The fence and signs shall be constructed as follows:

1. The fence shall enclose the area at the Gardena Sumps Site and the vicinity shown on the site map and be continuously maintained so as to prevent unauthorized persons from gaining access to the Site.

2. The fence shall be a standard six (6) foot chain link fence topped with three (3) strands of barbed wire. The fence shall be constructed to the satisfaction of the Department.

3. The signs shall be bilingual, appropriate to the local areas.

4. The signs shall have lettering which is legible from a distance of at least twenty five (25) feet and shall read: "CAUTION: Hazardous Substances Area, Unauthorized Persons Keep Out" and shall have the name and phone number of the Department.

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5. Signs shall be visible from the area surrounding the contaminated area and posted at each route of entry into the Site, including those routes which are likely to be used by unauthorized persons, at access roads leading to the site, and facing navigable waterways where appropriate.

6. The signs shall be of materials able to withstand the elements.

5.4. Nothing in this Order is intended, or shall be construed, to relieve the respondents of any obligations under other Orders issued by DHS, including the Remedial Action Order, Docket No. HSA 87/88-037 issued on March 3, 1988 by the issuance of this Order, the Department does not waive the right to take further enforcement actions.

VI. PENALTIES FOR NON-COMPLIANCE

6.1. Failure to comply with this Order will result in the Department removing the subject seeps, as well as, securing, fencing, and posting the Site for the Respondents. After completion of this work project, the Department will seek recovery for all costs incurred by the Department (Health and Safety Code, Section 25360).

6.2. You are advised that refusal to comply with, or prevention of, this Order, or any portion thereof, may make you liable for a civil penalty not to exceed $25,000 for each separate violation or for continuing violations, for each day during which that violation continues pursuant to Health and Safety Code Section 25367(c). You are further advised that pursuant to Health and Safety Code, Section 25359(1), failure to take proper removal or remedial action may make you liable to the Department for punitive damages up to three times the amount of any costs incurred by the state account pursuant to Chapter 6.8 of the Health and Safety Code.

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6.3. Based on the foregoing, it is ordered this 29th day of July, 1988.

John J. Kearns, Acting Chief
Region 3 (Los Angeles)
Toxic Substances Control Division

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STATE OF CALIFORNIA
Environmental Protection Agency
DEPARTMENT OF TOXIC SUBSTANCES CONTROL

In the Matter of: Gardena Sumps Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, California Respondent(s): Mr. Clarence Haack 6200 Perkins Road Oxnard, CA 93033 Mrs. Genevieve Haack 6200 Perkins Road Oxnard, CA 93033 Mr. Thomas Cooper 1210 West 190th Street Torrance, CA 90502 Southern Pacific Transportation Company Southern Pacific Building San Francisco, CA 94105 Los Angeles County Department of Public Works P.O. Box 1460 Alhambra, CA 91802-1460 Aircraft Magnesium Company 1450 West Artesia Boulevard Gardena, CA 90247 Atlantic Richfield Company 515 South Flower Street Los Angeles, CA 90071	Docket No. 91/92-012 IMMINENT AND SUBSTANTIAL ENDANGERMENT ORDER AND REMEDIAL ACTION ORDER Health and Safety Code Sections 25358.3(a)(1), 25355.5(b)(3)

INTRODUCTION

1.1 Parties. The State Department of Toxic Substances Control (DTSC) issues this Imminent and Substantial Endangerment

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Order and Remedial Action Order (Order) to Mr. Clarence Haack, Mrs. Genevieve Haack, Mr. Thomas Cooper, Southern Pacific Transportation Company, the County of Los Angeles Department of Public Works, Aircraft Magnesium Company, and Atlantic Richfield Company, hereinafter referred to as Respondents.

1.2 Site. The Site which is the subject of this Order is known as Gardena Sumps, and is located on the southwest corner of Artesia Boulevard and Normandie Avenue in Los Angeles County, California. The Site consists of Parcels 34,35,36,37,10, and 12 of the Los Angeles County Assessors mapbook 6106, page 36. A map of the Site is attached as Exhibit 1.

1.3 Jurisdiction. Section 25358.3(a) of the Health and Safety Code authorizes the Department to issue an Order when the Department determines that there may be an imminent or substantial endangerment to the public health or welfare or to the environment, because of a release or a threatened release of a hazardous substance.

Section 25355.5(a)(1)(B) of the Health and Safety Code authorizes the Department to issue an Order establishing a schedule for removing or remedying a release of a hazardous substance at a site, or for correcting the conditions that threaten the release of a hazardous substance. The Order may include, but is not limited to, requiring specific dates by which the nature and extent of a release shall be determined and the site adequately characterized, a remedial action plan prepared and submitted to the Department for approval, and a removal or remedial action completed.

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FINDINGS OF FACT

The Department hereby finds:

2.1 Liability of Responsible Parties. Mr. Clarence Haack, Mrs. Genevieve Haack, Mr. Thomas Cooper, Southern Pacific Transportation Company, and the County of Los Angeles Department of Public Works are owners of parcels/easements which comprise the Site. Aircraft Magnesium Company is an owner/operator doing business on the Site. Atlantic Richfield Company is a generator, and arranged for disposal of hazardous substances at the Site. All of the above named are responsible parties, and have incurred the liability for cleaning up the Site.

2.2 Physical Description of Site. The Site subject to this Order is located at the southwest corner of Artesia Boulevard and Normandie Avenue in the City of Gardena, County of Los Angeles, California. The Site is approximately 6.48 acres and is divided into nine parcels. The Site is zoned "M-2," manufacturing, "legal non-conforming."

The western half of the Site contains three buildings, an asphalt covered parking lot, horse stables, and residential properties. This half also contains visible evidence of sludge seepage to the surface up through both the parking lot, and a fenced-off area at the eastern portion of the Haack property (Parcel 35), which was developed over two oily waste sludge sumps.

The eastern half of the Site contains two large oily waste sludge sumps. The Site is entirely fenced and posted with warning signs in both English and Spanish. Residences are located within 100 feet of the visible sludge sumps. Sludge has seeped from this

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portion of the Site onto the public sidewalk along Artesia Boulevard.

Parcel 35, which encompasses a large amount of the western portion of the Site, is currently owned by Mr. and Mrs. Genevieve Haack and leased to Aircraft Magnesium Corporation/Grico Corporation for manufacturing and horse stables.

Parcels 10,37,36, and 12, are residential properties owned by James La Pointe (parcel 10), Sabina Knight (parcels 37 and 12), and Marion and Kiyono Newman (parcel 36).

Parcel 34 is owned by Mr. Thomas Cooper. This parcel encompasses the majority of the eastern portion of the Site and contains the visible sludge sumps.

2.3 Site History.

History of Site Ownership:

November 1925 to October 1930 - A.H. and Florence Vaughn
(Parcels 34,35,36,37,10, and 12)

October 1930 to May 1939 - Florence Vaughn
(Parcels 34,35,36,37,10, and 12)

May 1939 to March 1947 - Denys Goddard
(Parcels 34,35,36,37,10, and 12)

March 1947 to January 1948 - Wendell and Golda Hopkins
(Parcels 34 and 35)

May 1953 to June 1981 - Jane Moore Goddard
(Parcels 10,12,36, and 37)

January 1948 to April 1958 - S and L Manufacturing
(Parcels 34 and 35)

April 1958 to January 1959 - Charles Warfel

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(Parcels 34 and 35)

January 1959 to December 1977 - William Ward

(Parcel 34)

May 1960 to Present - Clarence and Genevieve Haack

(Parcel 35)

December 1977 to Present - Thomas Cooper

(Parcel 34)

February 1955 to April 1960 - James and Jane Robbins

(Parcel 10)

August 1959 to August 1969 - Harold and Jane Wolf

(Parcel 10)

August 1969 to December 1987 - Jane Wolf

(Parcel 10)

December 1987 to Present - James La Point

(Parcel 10)

August 1955 to August 1964 - Kenneth and Sabina Knight

(Parcel 12)

August 1964 to Present - Sabina Knight

(Parcel 12)

June 1969 to February 1975 - Francis Sledzinski

(Parcel 37)

February 1975 to Present - Sabina Knight

(Parcel 37)

June 1981 to Present - Marion and Kiyono Newman

History of Site Operators:

March 1926 to May 1939 - Moneta Brick company

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A.H. and Florence Vaughn leased the Site to George McGhee/Moneta Brick Company to excavate clay for brick manufacturing. During this period there is no evidence of sludge disposal.

May 1939 to March 1947 - Denys Goddard

Mr. Goddard had a poultry farm and a dog breeding facility on a portion of the site. During the time of Mr. Goddard's ownership, oil refinery wastes were discharged into the pits created from clay excavation.

May 1960 to Present - Clarence and Genevieve Haack/Aircraft Magnesium (a.k.a. Grico Corporation)

Clarence and Genevieve Haack lease the Site (Parcel 35) to Aircraft Magnesium, a manufacturer of magnesium and aluminum aircraft parts. Aircraft Magnesium sublets a portion of the Site for horse stables.

2.3.1 History of On-Site Waste Disposal Activities

In February 1937 a business known as Nigger Slough Mud Company (NSMC) filed a $25,000.00 damage suit against three oil companies because runoff from the Site had contaminated mud used for rotary drilling. The suit was brought against Union Oil, Richfield Oil, and Shell Oil. The contamination resulted from the discharging of sludge, acids, emulsions, and other foreign substances from the Site to what was known as the Nigger Slough (a.k.a Laguna Dominguez and Dominguez Channel).

In March 1940 an oil sludge fire occurred at 174th Street (a.k.a. Artesia Boulevard) west of Normandie Avenue. The Gardena

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Valley News Reported that the Dump was used for disposal of oil sludge from refineries.

Development of the sludge sumps first became visible in aerial photographs (The Fairchild Collection) in 1941. In February 1943 it was reported that the Gardena Sumps overflowed for the second time in three years, and the Dominguez Slough was polluted for two or three miles with an oily residue, driving away or killing most birds.

On March 5, 1942, the Gardena Valley Chamber of Commerce filed a complaint regarding a sludge dump at 174th and Normandie, with the Los Angeles County Health Department. In a letter summarizing the complaint investigation to the Los Angeles County Board of Supervisors, the Director of the Bureau of Sanitation reported that the sludge was a lubricating oil sludge coming from the Richfield Oil Company. The oily sludge is believed to have been dumped from 1939 to 1947.

2.3.2 National Priorities List (NPL) Status This Site is not on the National Priorities List.

2.3.3 Site Investigations In response to a citizen complaint, a field investigation was initiated by the California Department of Health Services (DHS) to evaluate the site. DHS collected and analyzed samples from the sumps, seeps, and soil at the site on three separate occasions over a period of seven years. The results indicated that the sumps, seeps, and soil are contaminated with hazardous substances as described below. On February 18, 1981, seven grab samples of liquid and sludge were

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collected from the two visible sumps located in parcels 1, and 2. The analytical results are shown in section 2.4.1.

In January 1987, DHS collected and analyzed surface and subsurface soil samples from Parcels 3 and 4. The highest detected concentrations of selected hazardous substances are shown in section 2.4.2

In August 1987, DHS directed its regional contractor to collect and analyze additional samples of sludge material from two locations in each of the two visible sumps, and soil samples from three locations in the area of the adjacent covered sumps. The highest detected concentrations of selected hazardous substances are shown in section 2.4.3

On June 13, 1988, representatives of DHS inspected the Site. The following observations were made:

a. A black tar-like substance was seeping onto the sidewalk along Artesia Boulevard. This material was similar in appearance to the material which was tested in August 1987 and found to contain hazardous substances.

b. These seeps appeared after the 1987 inspection.

c. There were no signs posted around the periphery of Parcel 35.

d. Vehicles parked in the unpaved portion of Parcel 35 were sinking into material similar in appearance to that which was tested in August 1987 and found to contain hazardous substances.

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e. The signs which existed around the periphery of Parcel 34 were inadequate because they were difficult to read due to weathering.

f. The fence along the eastern boundary of Parcel 34 was broken in two places, permitting unimpeded access to the exposed sumps.

On July 6, 1988, representatives of DHS again inspected the site and the following observations were made:

a. Seeps consisting of a black tar-like substance were observed on the sidewalk outside of the fence on Artesia Boulevard.

b. Seeps consisting of a black tar-like substance were observed on the ground outside of the fence on Normandie Avenue.

c. A pool consisting of a black tar-like substance was observed on the ground outside of the fence of Parcel 34 on the property of Southern Pacific Transportation Company.

d. Seeps consisting of a black tar-like substance were observed on the ground along the slopes of Normandie Avenue, approximately 5 feet from the site.

e. The black tar-like substances were similar in appearance to the material which was tested in August 1987, and found to contain hazardous substances.

f. The fence along the eastern boundary of Parcel 34, had been repaired since DHS inspected it on June 13, 1988.

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g. The gate which was located along Artesia Boulevard and Parcel 34 was not tightly secured, thus allowing unauthorized personnel access to the site.

h. The gate which was located along the eastern boundary of Parcel 34 was not locked, thus allowing unauthorized persons access to the site.

The following actions were taken on July 6, 1988 by representatives of DHS based on the observations described above:

a. Seeps consisting of a black tar-like substance were removed from the sidewalk outside the fence along Artesia Boulevard.

b. Seeps consisting of a black tar-like substance were removed from the ground surface outside of the fence along Normandie Avenue.

In September and October of 1991, a Focused Remedial Investigation was performed at the Gardena Sumps by state contractors Metcalf & Eddy, Inc. The results of this investigation are presented in a report entitled "Results From Focused Remedial Investigation At Gardena Sumps" dated January 30, 1992. This investigation confirmed what preliminary investigations had shown: that hazardous substances (see analytical results "Results from Focused Remedial Investigation at Gardena Sumps") are contained in the sump material, the sump material has an extremely low pH, and that disturbed sump material produces emissions of hydrogen sulfide gas.

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The report also noted areas in which the walls of the visible sumps were breached, and areas in which sump material was seeping up from underneath the asphalt-covered sumps in Parcel 35.

2.4.1 Substances Found at the Site.

All results presented herein are the maximum values of hazardous substances found at the site during each respective investigation. As a result of the February 18, 1981 site investigation and liquid and sludge sampling performed by DHS the following hazardous substances were identified:

Hazardous Substance	Concentration
Lead	61, 72, 74 (mg/Kg)
Phenol	6, 11 (ppm)

The pH of the samples collected was less than 2.

2.4.2 As a result of the January 1987 surface and subsurface soil sampling from Parcel 35 conducted by DHS, the following sample analysis results were generated:

Hazardous Substance	Concentration (ppm)
Trimethyl benzene	413
Tetramethyl benzene	124
Decahydronapthalene	51
Phenanthrene	380
Pyrene	100
Fluoranthene	68
Chrysene	720
Anthracene	90
Benzo(a)Pyrene	27

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Hazardous Substance	Concentration (mg/Kg)
Lead	240
Chromium	38
Copper	231
Nickel	55
Zinc	177

The pH was also tested; the lowest pH value was 1.2.

2.4.3 In August 1987, as a result of DHS's regional contractor's sampling activities, the following data was generated:

Hazardous Substance	Visible Sumps (Mg/Kg)	Covered Sumps (mg/Kg)
Lead	30	2500
Chromium	12	550
Zinc	34	720
Copper	7	250
Nickel	9	190
Antimony	ND	49
Chrysene	1300	1100
Phenanthrene	2400	2400
Ethylbenzene	1	ND
Toluene	4	0.9
Benzene	ND	0.4
4,6 dinitro-2	ND	25
Dimethylphenanthrene	1000	2000
Methylphenanthrene	ND	2000
Methylanthracene	3000	7000
Trimethylnapthalene	400	700
Ethyl Methyl Benzene	ND	900

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Methyl Acetate	60	20
Trimethyl benzene	ND	7
Sulfur Dioxide	300	300
Acetone	ND	6
Xylene	3	10
Methyl Flourene	ND	1000
Trimethylphenanthrene	10,000	10,000

2.4.4 In September and October of 1991, a greater variety of hazardous substances was detected. Presented here are the additional hazardous substances found by investigations conducted by the Department's contractor, Metcalf and Eddy, Inc.

Hazardous Substance	Concentration (ppm)
Benzo(A)Anthracene	50
Benzo(K)Fluoranthene	130
Benzo(G,H,I)Perylene	30
Dibenzo(A,H)Anthracene	37
Fluorene	38
Hydrogen Sulfide	91 (ppb)

8. Health Effects.

The following are health effects of substances found at the site, as described in standard reference sources.

Chromium Human poison by ingestion with gastrointestinal effects. Chromium (VI) is a known carcinogen. Chromium is also known to damage the lungs when inhaled.

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Copper Human systemic effects by ingestion are nausea and vomiting. An experimental tumorigen and teratogen. Copper is an upper respiratory tract, skin, and eye irritant.

Lead In children, ingestion of small amounts of lead can cause damage to neural tissue, muscles and formed elements of the blood. Lead is a poison by ingestion and moderately toxic by the intraperitoneal route. Lead is listed as a class B2 carcinogen via the inhalation and oral routes. It is suspected to attack the lungs and kidneys. Human systemic effects by ingestion and inhalation: loss of appetite, anemia, malaise, insomnia, headache, irritability, muscle and joint pains, tremors, flaccid paralysis without anesthesia, hallucinations and distorted perceptions, muscle weakness, gastritis and liver changes. The major organ system affected are the nervous system, blood system, and kidneys.

Nickel Poison by ingestion, intratracheal, intraperitoneal, subcutaneous and intravenous routes. Nickel is a class A2 carcinogen via the inhalation route. It is an experimental carcinogen, neoplastigen, tumorigen, and teratogen. Ingestion of soluble salts causes nausea, vomiting, diarrhea. Hypersensitivity to nickel is common and can cause allergic contact dermatitis, pulmonary asthma, conjunctivitis, and inflammatory reactions around nickel-containing medical implants and prostheses.

Zinc Adverse health effects in humans may occur from ingestion of zinc at levels that exceed the Recommended Dietary Allowance. High level ingestion of zinc presents a potential for gastrointestinal disorders, primarily stomach cramps, nausea and vomiting. Excessive oral exposure to zinc may also induce

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pancreatitis and impair immune and inflammatory responses in humans. Other systemic effects in humans by ingestion are cough, dyspnea and sweating. A human skin irritant.

Antimony Antimony is acutely toxic through oral ingestion of contaminated food or drink, and may result in vomiting, severe gastrointestinal cramps and diarrhea. Effects of acute inhalation include inflammation of the nasal passages and pulmonary edema. Effects of chronic exposure to antimony-laden dusts are inflammation of the upper respiratory tract which may progress to bronchitis, pneumoconiosis, obstructive lung disease and possibly emphysema.

Acetone Acetone is an irritant of eyes and mucous membranes. Human systemic effects by inhalation: changes in electro-encephalogram, changes in carbohydrate metabolism, nasal effects, conjunctiva irritation, respiratory system effects, nausea and vomiting, and muscle weakness. Human systemic effects by ingestion: coma, kidney damage, and metabolic changes.

Benzene Benzene is a class A human carcinogen via the inhalation and oral routes. Benzene is a cause of leukemia. It is also an irritant of eyes and a depressant to the central nervous system. A human poison by inhalation. Human systemic effects by inhalation and ingestion: euphoria, somnolence, changes in REM sleep, changes in motor activity, nausea or vomiting, reduced number of blood platelets, other unspecified blood effects, dermatitis, and fever. A human carcinogen which produces myeloid leukemia and lymphomas by inhalation. Poisoning occurs most commonly via inhalation of the vapor, although benzene can penetrate the skin and cause poisoning.

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Chloroform Chloroform is a class B2 carcinogen via the oral and inhalation routes. It is also a kidney and liver toxin, and a depressant to the central nervous system. Human systemic effect by inhalation: hallucinations and distorted perceptions, nausea, vomiting, and other unspecified gastrointestinal effects. Prolonged inhalation will bring on paralysis accompanied by cardiac respiratory failure and finally death.

Ethylbenzene Ethylbenzene is an eye irritant, and a depressant to the central nervous system. Human systemic effects by inhalation: eye, sleep and pulmonary changes. An eye and skin irritant. The liquid is an irritant to the skin and mucous membranes.

Toluene Toluene is a depressant to the central nervous system. Poison by intraperitoneal route. Moderately toxic by intravenous, subcutaneous and possibly other routes. Mildly toxic by inhalation. Human systemic effects by inhalation: central nerve system recording changes, hallucinations or distorted perceptions, motor activity changes, antipsychotic, psychophysiological test changes and bone marrow changes.

Xylene Xylene is a known liver toxin, and a depressant to the central nervous system. Human systemic effects by inhalation: olfactory changes, conjunctiva irritation and pulmonary changes. A human eye irritant.

Pyrene Pyrene is a Poison by Inhalation. It is an irritant of the skin. It is also an experimental tumorigen.

2-Butanone Moderately toxic by ingestion, and dermal and intraperitoneal routes. 2-Butanone is an experimental teratogen. It

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is a strong irritant to the human eye, and affects the peripheral and central nervous systems.

Carbon Disulfide This substance is a human poison by ingestion and possibly other routes. It is mildly toxic to humans via inhalation. The main toxic effect is respiratory failure through the depression of the central nervous system. Carbon disulfide is an experimental teratogen.

Benzo(A)Anthracene This substance is a poison by the intravenous route. It is a class B2 carcinogen by the inhalation and oral routes. It is also an experimental neoplastigen and tumorigen by dermal and other routes.

Benzo(K)Fluoranthene Benzo(K)Fluoranthene is a class B2 carcinogen by the inhalation and oral routes. It is an experimental tumorigen.

Benzo(A)Pyrene Benzo(A)Pyrene is a poison via subcutaneous, intraperitoneal and intrarenal routes. It is a class B2 carcinogen via the oral and inhalation routes. It is also an experimental tumorigen, neoplastigen, and teratogen.

Benzo(GHI)Perylene Studies of this substance have generated mutagenic data.

Chrysene Chrysene is a class B2 carcinogen via the oral and inhalation routes. It is also an experimental neoplastigen and tumorigen by dermal contact.

Dibenzo(A,H)Anthracene This substance is a poison by the intravenous route. It is a class B2 carcinogen via the oral and inhalation routes. It is also an experimental tumorigen and neoplastigen by most routes.

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Fluoranthene This substance is moderately toxic via ingestion and skin contact. Fluoranthene is a poison by the intravenous route. It is an experimental tumorigen.

Phenanthrene This substance is a poison by the intravenous route. It is moderately toxic by ingestion. Phenanthrene is an experimental neoplastigen and tumorigen by skin contact. It is a human skin photosensitizer.

Sulfur Dioxide Sulfur Dioxide is a poison gas that is moderately toxic experimentally through inhalation. It is an experimental tumorigen and teratogen. It chiefly effects the upper respiratory tract including the bronchi. It can cause respiratory paralysis. This substance will react with water or steam to produce toxic and corrosive fumes.

Hydrogen Sulfide Hydrogen sulfide is a human poison by inhalation. It is a severe irritant to the eyes and mucous membranes, at low concentrations (20-150 ppm). Hydrogen sulfide is an insidious poison because of its olfactory de-sensitization. Hydrogen sulfide is an asphyxiant.

2.6 Routes of Exposure.

2.6.1 Ground water Hazardous substances may migrate into and contaminate ground water underlying the Site, having an adverse impact on regional water use. Six freshwater aquifers are identified in the area of Gardena Sumps. Four of the aquifers run directly beneath the site. The first aquifer below ground surface is referred to as the Semi-perched Aquifer and is of relatively poor quality and not generally used. Studies indicate, however,

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that there are interconnections between the abovementioned aquifers, and that the possibility for cross contamination exists.

2.6.2 Surface Water The Gardena Sumps are located in an area that represents a low topographic point (a depressed surface area). Surface runoff is most likely to flow towards, and accumulate in the Gardena Sumps area rather than flow away from them. The Dominguez Channel, which runs adjacent to the Site, was built to eliminate the potential for localized flooding. The overall threat to surface waters from the Gardena Sumps site appears to be low. If however, the Site should become flooded, it is likely that the overflow could be discharged into the Dominguez Channel.

2.6.3 Air When the sump material is disturbed, potential releases of hazardous substances from the site to the air may occur resulting in human exposure through the inhalation route. Emissions from disturbed areas on the Site were relatively higher than undisturbed areas, and contained amounts of hydrogen sulfide gas.

2.6.4 Dermal Contact Contact with the sump sludge is the most likely route of exposure. The sump sludge is unstable and has been known to migrate and seep up near public sidewalks and a local business. The pH of the sludge is extremely low and could cause burns upon contact. Hazardous substances known to be toxic via the dermal pathway are contained in the sludge. Exposure through dermal contact is a threat to employees of the affected business (Aircraft Magnesium Inc.) and pedestrians walking on the sidewalk along Artesia Boulevard.

Population at Risk The sidewalk along Artesia Boulevard, where seepage has occurred, is a public sidewalk which has a high volume

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of pedestrian traffic. Pedestrian traffic includes nearby residents, and school children who attend Gardena High School located 1/4 mile south of the Site, on Normandie Avenue and 177th Street. The school has an enrollment of approximately 2,800 students.

Bicycle tracks have been observed along the perimeter of the Site fence. Bicyclists riding near the Site fence are at risk of crossing over seeps and thus coming into contact with hazardous substances.

2.7.1 Aircraft Magnesium Company's employees have the greatest risk of exposure to hazardous substances from the Site. Evidence shows Aircraft Magnesium's employee parking lot to be located on top of a portion of the site. There is also a possibility that employees may work on top of portions of the site. Sludge seeps are evident in the employee parking lot and there is a possibility of employee contact with the seeps.

2.7.2 Located at the northwest corner of the Site are four residences. The actual number of residents occupying the three homes is unknown. Through the superimposition of past aerial photographs it appears that two of the residences may be located directly on top of a portion of the sumps that was covered with a fill material. The residences are situated on what appears to be an elevated base of fill material, and are approximately 7-10 feet above the ground surface of the sumps. Residents are at risk of coming into contact with the sump material, and becoming exposed to hazardous substances through seeps that may surface on or near their property.

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2.7.3 Located directly adjacent to the three residences are horse stables. In examining past aerial photography of the Gardena Sumps site, it appears that the horse stables are almost entirely located on a portion of the sumps that has been covered. The horse stables are also situated on what appears to be an elevated base of fill material, and are approximately 7-10 feet above the ground surface of the sumps. Horses are at risk of exposure to hazardous substances through contact with seeps that may surface in or near the stables.

CONCLUSIONS OF LAW

2.8 Each of the persons listed in paragraph 1.1 is a "responsible party" or "liable person," as defined by Health and Safety Code sections 25319, 25323.5 and 25385.1(g).

2.9 Each of the substances listed in paragraph 2.4 is a "hazardous substance," as defined by Health and Safety Code section 25316, and has been found at the Site.

2.10 A "release" or threatened release of the hazardous substances listed in paragraph 2.4 has occurred at or from the Site, as defined by Health and Safety Code section 25320.

2.11 The actual and/or threatened release of hazardous substances at the Site may present endangerment to the public health or welfare or to the environment.

ORDER

3.0 ALL WORK PERFORMED UNDER THIS ORDER SHALL BE CONSISTENT WITH AND BASED ON the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (42 U.S.C. 9601 et seq., as

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amended, the National Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Part 300), as amended, and the U.S. Environmental Protection Agency's "Guidance for Conducting Remedial Investigations and Feasibility Studies" under CERCLA, as amended, as well as state laws and regulations, as amended.

Based on the foregoing FINDINGS AND DETERMINATIONS, IT IS HEREBY ORDERED THAT Respondents conduct the following response activities in the manner specified herein, and in accordance with a schedule approved by the Department as follows:

3.1 Immediate Action Respondents shall immediately carry out the following activities:

3.1.1 Groundwater Monitoring Respondents shall immediately begin interim groundwater monitoring in accordance with 3.2.2, RI/FS Workplan contents.

3.1.2 Temporary Cover Construction Respondents shall immediately construct a temporary cover for all exposed areas of the Gardena Sumps Site that contain sludges/seeps containing hazardous substances. The cover shall be constructed to the specifications set forth by the Department.

Respondents shall prepare and deliver the following:

A. A workplan detailing how all required work for the construction of the cover will be performed. The workplan shall include a site specific health and safety plan prepared in accordance with all applicable regulations. The workplan shall be submitted in draft form to the Department for review, comments, and approval. The final workplan shall be submitted to the Department in

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duplicate fifteen (15) days after receiving approval. Work shall not begin at the Site unless approval is received from the Department. The workplan shall be submitted in the following format:

1. Introduction/Objectives
2. Work Description
3. Required Permits
4. Site Preparatory Work
5. Cover Installation
6. Project QA/QC Procedures
7. Health and Safety Plan
8. Gantt Chart Showing Phase, Activity, and Task Completion Timelines

B. A final report detailing quality assurance/quality control procedures utilized during cover construction. The report shall be submitted in draft form for Department review, comment, and approval. The final report shall incorporate Department comments. The report shall be submitted to the Department in duplicate, in the following format:

1. Introduction
2. Site Preparatory Work QA/QC
3. Cover Installation QA/QC
4. QA/QC Data

C. Monthly project status reports submitted on the first day of each month. These reports are to be submitted to the

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Department throughout the length of the project. The reports shall be submitted in the following format:

1. Activities Completed as of Last Report
2. Activities to be Completed this Month
3. Anticipated Problems in Meeting Scheduled Events

Respondents shall comply with the following implementation schedule:

1. Draft Workplan - submit within 30 days of the effective date of this Order.
2. Final Workplan - submit within 15 days of Department approval of workplan.
3. Cover Construction - complete by November 30, 1992.
4. Draft Report - submit within 30 days of the completion of cover construction.
5. Final Report - submit within 15 days of Department approval of report.
6. Monthly Status Reports - submit on the first day of each month throughout the life of the project.

3.1.3 Seep Removal Respondents shall immediately remove and legally dispose of all seepage from the Gardena Sumps Site. Respondents shall continue to remove and legally dispose of all seeps from the Site until such time as the Department declares the threat of seeps to have been abated.

3.2 Remedial Investigation and Feasibility Study (RI/FS)

3.2.1 RI/FS Objectives The objectives of the RI/FS are to:

(a) Determine the nature and full extent of hazardous substance contamination of air, soil, surface water, and

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groundwater at the Site and contamination from the Site, including offsite areas affected by the Site;

(b) Identify all existing and potential migration pathways, including the direction, rate, and dispersion of contaminant migration;

(c) Determine the magnitude and probability of actual or potential harm to public health, safety, or welfare or to the environment posed by the threatened or actual release of hazardous substances at or from the Site;

(d) Identify and evaluate appropriate response measures to prevent or minimize future releases and mitigate any releases which have already occurred; and

(e) Collect and evaluate the information necessary to prepare a Remedial Action Plan (RAP), in accordance with the requirements of Health and Safety Code Section 25356.1.

3.2.2 RI/FS Workplan Submission Within 45 days of the effective date of this Order, Respondents shall prepare and submit to the Department for review and approval a detailed RI/FS Workplan and implementation schedule which covers all the activities necessary to conduct a complete remedial investigation and feasibility study of the Site and any offsite areas where there is a release or threatened release of hazardous substances from the Site. The RI/FS Workplan shall be designed to meet the objectives of paragraph 3.2.1 and shall, at a minimum, cover all the elements described in 3.2.3, RI/FS Workplan Contents.

The RI/FS workplan includes a detailed description of the tasks to be performed, information or data needed for each task,

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and the deliverables which will be submitted to the Department. These deliverables are discussed in the remainder of this Section, with a schedule for implementation, and monthly reports.

Because of the unknown nature of the Site and the iterative nature of the RI/FS, additional data requirements and analysis may be identified throughout the process. Either Respondents or the Department may identify the need for additional work.

3.2.3 RI/FS Workplan Contents The RI/FS Workplan shall be designed to meet the objectives in paragraph 3.2.2 of the Order and shall cover, at a minimum, each of the following elements:

a. Project Management Plan A Project Management Plan which describes how the project will be managed by Respondents and their contractors, subcontractors, and consultants including an organization chart with the names and titles of key personnel and a description of their individual responsibilities;

b. Scoping Document A Scoping Document which consists of an evaluation of existing data and identification of the data needs and investigation tasks for the RI/FS including, at a minimum, the following information:

(1) A map and description of known site characteristics, including topography, hydrogeology, buildings and structures, and all other characteristics relevant to an evaluation of hazardous substance sources, pathways, and receptors, and potential impacts on health and the environment;

(2) A description of hazardous substance characteristics including:

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(A) A list of all hazardous substances, materials or wastes which were disposed, discharged, spilled, treated, stored, transferred, transported, handled or used at the Site, and a description of their estimated volumes, concentrations, and characteristics;

(B) A description of all manufacturing processes which are or were related to each hazardous substance, material or waste, or which produced any hazardous waste; and

(C) Past disposal practices;

(3) A summary of all existing data including air, soil, surface water, and groundwater data that has been previously generated, and the Quality Assurance/Quality Control (QA/QC) procedures which were followed;

(4) A description of the nature and extent of the release and/or threatened release, including a summary of actual and potential onsite and offsite health and environmental effects;

(5) A description of any previous response actions;

(6) An identification of the general types of response actions which will be evaluated in the feasibility study;

(7) An identification of all data gaps;

(8) Recommendations for all additional work needed to eliminate any data gaps.

(9) If remedial actions involving treatment can be identified during scoping and planning phases, treatability studies will be required unless the Respondents

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and the Department agree that such studies are unnecessary. where treatability studies are identified and required, initial research and design studies should be conducted concurrently with the site characterization.

(c) Sampling Plan A Sampling Plan which describes the activities which will be undertaken to develop a complete profile of onsite and offsite air, soil, surface water, and groundwater contamination attributable to operations at the Site including, at a minimum, the following information:

(1) The objectives of the investigation;

(2) Identification of all chemical parameters which will be analyzed or tested;

(3) A description of the types of samples which will be taken;

(4) A map showing all locations which will be sampled;

(5) A description of the depth and frequency of sampling at each location;

(6) The engineering specifications for all sampling installations, such as groundwater monitoring wells, soil borings and piezometers;

(7) Identification of all analytical procedures to be used; and

(8) Provisions for obtaining access to and obtaining samples from adjacent properties, where appropriate;

(d) Quality Control/Quality Assurance (QA/QC) Plan A QA/QC Plan which describes the procedures for the collection, identification, preservation and transport of samples, the

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calibration and maintenance of instruments, and the processing, verification, storage, and reporting of data, and including chain of custody procedures, identification of qualified person(s) conducting the sampling, and of a laboratory certified or approved by the Department, pursuant to Health and Safety Code (H&SC) Section 25198;

(e) Data Management Plan A Data Management Plan which describes how the data obtained pursuant to this Order will be managed and preserved by Respondents in accordance with paragraph 3.16;

(f) Health and Safety Plan A Site Health and Safety Plan which describes the specific personnel, procedures and equipment, and covers all measures including contingency plans which will be taken during field activities to protect the health and safety of the workers at the Site, authorized representatives of the Department, and the general public from exposure to hazardous wastes, substances, or materials.

(g) Public Health and Environmental Evaluation Plan A Public Health and Environmental Evaluation Plan (PHEEP) which describes how the magnitude and probability of actual or potential harm to public health and welfare and the environment by the threatened and/or actual release of a hazardous substance will be determined. A PHEEP describes the activities necessary to accomplish this task including:

(1) An evaluation of the results of the site investigation showing the actual and potential amounts and concentrations of hazardous substances in all relevant

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environmental media (air, water, soil, sediment, and biota) at the conclusion of the remedial investigation and projected in the future;

(2) An assessment of the environmental fate and transport mechanisms for each hazardous substance within the relevant environmental media;

(3) Identification of the hazardous and toxicological properties and relevant human health and environmental standards and criteria for the hazardous substance(s) found in the site investigation;

(4) Identification of all exposure pathways and the extent of actual and/or potential exposure;

(5) Identification of the population(s) at risk; and

(6) An evaluation of the extent of expected harm and the likelihood of such harm occurring.

(h) Feasibility Study Plan A Feasibility Study Plan describing how the Feasibility Study will identify, develop, and evaluate remedial action alternatives with respect to technical, public health, environmental, institutional, and cost considerations, which includes at a minimum, the following information:

(1) A summary of the existing and potential hazards for which corrective action may be required;

(2) A description of the alternative remedial actions which will be evaluated;

(3) A list of the technologies which will be screened and which will be subsequently evaluated in the detailed

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analysis section of the FS report for each alternative remedial action described in (2) above;

(4) A description of the public health, environmental cost factors, and criteria which will be considered in screening and analyzing each alternative remedial action technology, including, but not limited to: effectiveness, reliability, timeliness of implementation, unit cost, availability, operation and maintenance costs, and conformity with applicable laws and regulations; and

(5) A description of all pilot studies, bench tests or other activities which will be performed to evaluate each alternative remedial action technology;

(6) A description of the federal and state environmental and public health requirements to be considered in developing the remedy.

(i) Other Activities A description of any other significant activities not already addressed in the RI/FS Workplan and necessary to perform the RI/FS, and submit the Remedial Investigation Report and Feasibility Study Report in compliance with paragraphs 3.2.4 and 3.2.5 of this Exhibit;

(j) Treatability Studies Treatability testing shall be performed by Respondents to address data for the detailed analysis of the alternatives. Treatability testing will be required to demonstrate the implementability and effectiveness of technologies unless the Respondents can show similar data or can document the existence and availability of this information to the Department. The deliverables are required for all treatability studies

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include a workplan, a sampling and analysis plan and a treatability evaluation report. To the extent practicable, treatability studies will be proposed and implemented during the latter half of site characterization.

(k) Schedule A schedule shall be submitted which provides specific time frames and dates for completion of each activity and report conducted or submitted under the RI/FS Workplan.

3.2.4 Remedial Investigation (RI) Report The RI Report shall be prepared and submitted by the Respondents to the Department for review and approval, in accordance with the approved RI/FS workplan schedule. The RI Report shall summarize the results of the remedial investigation, including: reduction, presentation and interpretation of all data and information generated and/or compiled during the remedial investigation. The RI Report shall cover the following subjects relating to the Site:

1. Introduction
    - 1.1 Purpose of Report
    - 1.2 Site Background
        - 1.2.1 Site Description
        - 1.2.2 Site History
        - 1.2.3 Previous Investigation
    - 1.3 Report Organization
2. Study Area Investigation
    - 2.1 Surface Features (topographic mapping, etc.) (natural and man-made features)
    - 2.2 Contaminant Source Investigations
    - 2.3 Meteorological Investigations

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2.4 Surface-Water and Sediment Investigations

2.5 Geological Investigations

2.6 Soil and Vadose Zone Investigations

2.7 Ground Water Investigations

2.8 Human Population Surveys

2.9 Ecological Investigations

3. Physical Characteristics of the Study Area

3.1 Surface Features

3.2 Meteorology

3.3 Surface Water Hydrology

3.4 Geology

3.5 Soils

3.6 Hydrogeology

3.7 Demography and Land Use

3.8 Ecology

4. Nature and Extent of Contamination

4.1 Sources

4.2 Soils and Vadose Zone

4.3 Ground Water

4.4 Surface Water and Sediments

4.5 Air

5. Contaminant Fate and Transport

5.1 Potential Routes of Migration

5.2 Contaminant Persistence

5.3 Contaminant Migration

6. Baseline Risk Assessment (submit as a separate document)

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6.1 Human Health Evaluation

6.1.1 Exposure Assessment

6.1.2 Toxicity Assessment

6.1.3 Risk Characterization

6.2 Environmental Evaluation

7. Summary and Conclusions

3.2.5 Baseline Risk Assessment Respondent shall submit within 30 days from the submittal of the RI Report, a Baseline Risk Assessment Report. The report shall be prepared consistent with EPA guidance: Risk Assessment Guidance for Superfund, Volume 1; Human Health Evaluation Manual, December 1989; and Risk Assessment Guidance for Superfund, Volume 2, Environmental Evaluation Manual, March 1989. The Baseline Risk Assessment Report shall include the following components:

(a) Human Health Evaluation consisting of;

(1) Identification of nature and extent of contaminated area.

(2) Identification of sensitive environments and rare, threatened, or endangered species and their habitats.

(3) As appropriate, ecological investigations to assess the actual or potential effects on the environment and/or develop remediation criteria.

3.2.6 Draft Feasibility Study Report The Draft Feasibility Study (FS) Report shall be prepared and submitted by Respondents to the Department for review and approval, in accordance with the approved RI/FS workplan schedule. The Draft FS Report shall

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summarize the results of the FS including reduction, presentation and interpretation of all data and information generated and/or compiled during the feasibility study. Respondents shall identify and screen technologies in order to develop a range of site remediation options which can meet the remedial action objectives and which will subsequently be evaluated in the detailed analysis section of the FS report. The deliverable shall include refining the remedial action objectives, identification of areas and/or volumes of media using applicable or relevant and appropriate standards (ARARs) and risk based numbers as these become available, identification and screening of technologies by media.

Respondents may prepare a treatability study report for the Department review and approval. The purpose of the treatability study is to describe and evaluate the options for site remediation for each operable unit for comprehensive remedy. The FS Report shall include the prior deliverables, identification and screening of technologies and new chapters containing the detailed analysis of alternatives and appropriate standards. The FS should serve as a basis for remedy selection. Respondents may prepare a memorandum of their preferred alternative including the rational for this selection over each of the other alternatives in the FS. The Department will comment upon this memorandum, but will not approve it.

The FS shall cover the following subjects relating to the Site:

a. Description of Current Situation

1. The Site Background Information

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2. Nature and Extent of Release

3. Objective of Remedial Action(s)

b. Description of Remedial Action Technologies

1. Pilot Studies

2. Bench Tests

c. Documentation of all necessary treatability studies conducted.

d. Development of medium specific or operable unit specific remedial action objectives including ARARs.

e. Identification and screening of general response actions, remedial technologies, and process options on a medium and/or operable unit specific basis.

f. Evaluation of alternatives based on the criteria contained in the NCP and Health and Safety Code Section 25356.1 including

(1) Overall protection of human health and the environment.

(2) Compliance with ARARs.

(3) Long term effectiveness and performance.

(4) Reduction of toxicity, mobility, or volume through treatment.

(5) Short term effectiveness.

(6) Implementability based on technical and administrative feasibility.

(7) Community acceptance.

State acceptance.

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g. Proposed remedial actions, i.e. the recommended remedial action.

Final Feasibility Study Report Respondents shall modify the draft feasibility study as required by the Department.

3.2.7 RI/FS Workplan Implementation Respondents shall implement the RI/FS Workplan as approved by the Department in accordance with the approved schedule. If the Department identifies other activities necessary to complete the RI/FS, the Department shall provide written notice to Respondents of such additional activities and the basis for such additional activities.

3.3 Public Participation Plan (Community Relations) Respondents shall prepare a proposed list of interviewees for Department review and approval within 15 days after the date this Order is issued. After the list of interviewees has been approved, submit within 45 days for Department review and approval, a Public Participation Plan (PPP) which describes how, under the Order, the public and the adjoining community will be kept informed of activities conducted at the Site and how Respondents will be responding to inquiries from concerned citizens. The PPP shall be developed in accordance with the Department's Public Participation Policy and Guidance Manual, 1990.

3.4 Remedial Action Plan.

3.4.1 Draft Remedial Action Plan No later than 30 days after Department approval of the FS Report, Respondents shall prepare and submit to the Department for review and approval, a draft Remedial Action Plan (RAP) which summarizes the approved RI/FS Report and the proposed remedial action. The draft RAP shall

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set forth appropriate steps to remedy air, soil, surface water and groundwater contamination at the Site and adjacent areas. The RAP shall contain prior deliverables and the following: (1) a summary and conclusions of the RI (2) a summary of the FS (3) detailed evaluation chapter of the FS and (4) prior chapter of the FS. In addition, the RAP shall contain a schedule for implementation of all proposed removal and remedial actions. Before the RAP is approved a determination pursuant to the California Environmental Quality Act (CEQA) is required. Respondents will be required to prepare either a Negative Declaration or an Environmental Impact Report, as determined by the Department.

3.4.2 Final RAP Modify draft RAP as required by the Department.

3.4.3 Preparation of Remedial Design (RD) and Implementation Plan Within 45 days after Department approval of the final RAP, in accordance with H&SC Section 25356.1, Respondents shall submit to the Department for review and approval a detailed Remedial Design (RD) and Implementation Plan containing technical and operational plans and engineering designs for implementation of the approved remedial or removal action alternative(s), and a schedule for implementing the construction phase. The Plan shall also describe the nature and design of the construction equipment to be employed, a site specific hazardous waste transportation plan (if necessary), the identity of any contractors, transporters, and other persons conducting the removal and remedial activities for the Site, post remedial sampling and monitoring procedures for air, soil, surface water and groundwater, operation and maintenance

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procedures and schedules, and shall cover all the subjects described in paragraphs 3.2.3 (a), (c), (d), (e), and (f) as they pertain to the removal, remedial, and operation and maintenance activities. The schedule submitted with the workplan shall provide that all approved removal or remedial actions, excluding operation and maintenance shall be completed by the date determined by the Department.

3.4.4 Implementation of Final Remedial Action Upon Department approval of the RD and schedule, Respondents shall implement the final RAP as approved.

3.4.5 Operation and Maintenance Respondents shall be responsible for all operation and maintenance requirements in accordance with the final RAP and approved RD. An O&M plan must be submitted within 30 days of approval of RD.

3.4.6 Changes During Implementation of the Final RAP During the implementation of the final RAP and RD , the Department may specify such additions, modifications, and revisions to the RD and schedule as deemed necessary to protect public health and safety or the environmental or to implement the RAP.

3.4.7 Discontinuation of Remedial Technology Any remedial technology employed in implementation of the final RAP shall be left in place and operated by Respondents until and except to the extent that the Department authorizes Respondents in writing to discontinue, move or modify some or all of the remedial technology because Respondents have met the specific criteria in the final RAP

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for its discontinuance or because the modifications would better achieve the goals of the final RAP.

Administrative Requirements

3.5 Project Coordinator Within 10 days of the effective date of this Order, Respondents shall submit to the Department in writing the name, address, and telephone number of a Project Coordinator whose responsibilities will be to receive all notices, comments, approvals, and other communications from the Department to Respondents.

3.6 Project Engineer/Geologist The work performed pursuant to this Order shall be under the direction and supervision of a qualified professional engineer or a registered geologist in the State of California, with expertise in hazardous waste site cleanup. Within 20 calendar days of the effective date of this Order, Respondents shall submit: a) The name and address of the project engineer or geologist chosen by Respondents; and b) in order to demonstrate expertise in hazardous waste cleanup, the resume of the engineer or geologist, and the statement of qualifications of the consulting firm responsible for the work.

3.7 Monthly Summary Reports Within 30 days of the effective date of this Order, and on a monthly basis thereafter, Respondents shall submit a Monthly Summary Report of its activities under the provisions of this Order. The report shall describe: a) specific actions taken by or on behalf of Respondents during the previous calendar month; b) actions expected to be undertaken during the current calendar month; c) all planned activities for the next month, any requirements under this Order that were not completed,

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and any problems or anticipated problems in complying with this Order; and d) Summaries of all results of sample analyses, tests, and other data generated or received by Respondents under this Order. The report shall be received by the Department by the 15th day of each month.

3.8 Quality Control/Quality Assurance (QC/QA) All sampling and analysis conducted by Respondents under this Order shall be performed in accordance with QC/QA procedures submitted by Respondents and approved by the Department pursuant to this Order.

3.9 Submittals All submittals and notifications from Respondents required by this Order shall be sent simultaneously to:

John Scandura, Chief
Site Mitigation Branch
Attention: Peter A. Garcia
Department of Toxic Substances Control
Region 4
245 West Broadway, Suite 350
Long Beach, California 90802-4444

Robert P. Ghirelli
Executive Officer
California Regional Water Quality
Control Board
Los Angeles Region
101 Centre Plaza Drive
Monterey Park, California 91754-2156

Anastacio Medina, Director
Los Angeles County Fire Department
Hazardous Materials Control Program
2615 South Grand Street, 6th Floor
Los Angeles, California 90007

3.10 Communications All approvals and decisions of the Department made regarding submittals and notifications will be communicated to Respondents in writing by the Regional Administrator, Department of Toxic Substances Control, or his/her

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designee. No informal advice, guidance, suggestions or comments by the Department regarding reports, plans, specifications, schedules or any other writings by Respondents shall be construed to relieve Respondents of the obligation to obtain such formal approvals as may be required.

3.11 Department Review and Approval If the Department determines that any report, plan, schedule or other document submitted for approval pursuant to this Order fails to comply with this Order or fails to protect public health or safety or the environment, the Department may:

(a) Modify the document as deemed necessary and approve the document as modified or;

(b) Return the document to Respondents with recommended changes and a date by which Respondents must submit to the Department a revised document incorporating the recommended changes or;

(c) In cases where the document fails to comply with this Order, make a determination of noncompliance, pursuant to H&SC Section 25355.5(a) (2).

3.12 Compliance with Applicable Laws Respondents shall carry out this Order in compliance with all applicable State and Federal requirements, including but not limited to, requirements to obtain permits and to assure worker safety.

3.13 Endangerment During Implementation In the event that the Department determines that any circumstances or activities (whether or not pursued in compliance with this Order) are creating an imminent or substantial endangerment to the health or safety of

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people on the Site or in the surrounding area or to the environment, the Department may order Respondents to stop further implementation of this Order for such period of time as needed to abate the endangerment. Any deadline in this Order directly affected by a Stop Work Order, under this section, shall be extended for the term of the Stop Work Order.

3.14 Liability Nothing in this Order shall constitute or be construed as a satisfaction or release from liability for any conditions or claims arising as a result of past, current or future operations of Respondents. Nothing in this Order is intended or shall be construed to limit the rights of any of the parties with respect to claims arising out of or relating to the deposit or disposal at any other location of substances removed from the Site. Nothing in this Order is intended or shall be construed to limit or preclude the Department from taking any action authorized by law to protect public health or safety or the environment and recovering the cost thereof. Notwithstanding compliance with the terms of this Order, Respondents may be required to take further actions as are necessary to protect public health and the environment.

3.15 Site Access Access to the Site and laboratories used for analyses of samples under this Order shall be provided at all reasonable times to employees, contractors, and consultants of the Department. Nothing in this paragraph is intended or shall be construed to limit in any way the right of entry or inspection that the Department or any other agency may otherwise have by operation of any law. The Department and its authorized representatives shall have the authority to enter and move freely about all

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property at the Site at all reasonable times for purposes including, but not limited to: inspecting records, operating logs, sampling and analytic data, and contracts relating to this Site; reviewing the progress of Respondents in carrying out the terms of this Order; conducting such tests as the Department may deem necessary; and verifying the data to the Department by Respondents.

3.16 Sampling, Data and Document Availability Respondents shall permit the Department and its authorized representatives to inspect and copy all sampling, testing, monitoring or other data generated by Respondents or on their behalf in any way pertaining to work undertaken pursuant to this Order. Respondents shall inform the Department at least 5 days in advance of all field sampling under this Order, and shall allow the Department and its authorized representatives to take duplicates of any samples collected by Respondents pursuant to this Order. Respondents shall maintain a central depository of the data, reports, and other documents prepared pursuant to this Order. All such data, reports and other documents shall be preserved by Respondents for a minimum of six years after the conclusion of all activities under this Order. If the Department requests that some or all of these documents be preserved for a longer period of time, Respondents shall either comply with that request or deliver the documents to the Department, or permit the Department to copy the documents prior to destruction. Respondents shall notify the Department in writing, at least six months prior to destroying any documents prepared pursuant to this Order.

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3.17 Government Liabilities The State of California shall not be liable for any injuries or damages to persons or property resulting from acts or omissions by Respondents, or related parties specified in paragraph 3.26 in carrying out activities pursuant to this Order, nor shall the State of California be held as party to any contract entered into by Respondents or its agents in carrying out activities pursuant to this Order.

3.18 Additional Enforcement Actions By issuance of this Order, the Department does not waive the right to take any further enforcement actions.

3.19 Incorporation of Plans and Reports All plans, schedules, reports, specifications and other documents that require Department approval and are submitted by Respondents pursuant to this Order are incorporated in this Order upon approval by the Department, and shall be implemented by Respondents as approved. Any noncompliance with the documents incorporated in this Order, shall be deemed a failure or refusal to comply with this Order.

3.20 Extension Requests If Respondents are unable to perform any activity or submit any document within the time required under this Order, Respondents may, prior to expiration of the time, request an extension of the time in writing. The extension request shall include a justification for the delay. All such requests shall be in advance of the date on which the activity or document is due.

3.21 Extension Approvals If the Department determines that good cause exists for an extension, it will grant the request and

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specify a new schedule in writing. Respondents shall comply with the new schedule.

3.22 Statutory Fees Respondents shall be liable for all costs incurred by the Department in connection with the oversight of any removal or remedial action occurring at the Site, pursuant to California Health and Safety Code Section 25343, upon billing by the Board of Equalization. The Department's oversight costs are in addition to the costs incurred for removal or remedial actions, and shall be recovered pursuant to Section 25360.

These statutory fees shall be paid prior to the commencement of the work phase for which the Department's oversight occurs, unless such work phase has been wholly or partially completed prior to the execution of an agreement, in which case, the fees will be billed pursuant to the agreement.

3.23 Cost Recovery Respondents are liable for any and all of the Department's costs, as provided in section 25360 of the Health and Safety Code, and other applicable provisions of law. Cost recovery may also be pursued by the Department under CERCLA.

3.24 Severability The requirements of this Order are severable, and Respondents shall comply with each and every provision hereof, notwithstanding the effectiveness of any other provision.

3.25 Modifications The Department reserves the right to unilaterally modify this Order. Any modification to this Order shall be effective upon issuance and deemed incorporated in this Order.

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3.26 Time Periods Unless otherwise specified, time periods begin from the effective date of this Order and "days" means calendar days. The effective date of this Order is the date of issuance by the Department.

3.27 Parties Bound This Order applies to and is binding upon Respondents, and their officers, directors, agents, employees, contractors, consultants, receivers, trustees, successors and assignees, including but not limited to, individuals, partners, and subsidiary and parent corporations, and upon any successor agency of the State of California that may have responsibility for and jurisdiction over the subject matter of this Order.

PENALTIES AND PUNITIVE DAMAGES

FOR NONCOMPLIANCE

4. You may be liable for penalties of up to $25,000 for each day you refuse to comply with this Order and for punitive damages up to three times the amount of any costs incurred by the Department as a result of your failure to comply, pursuant to Health and Safety Code sections 25359 and 25367(c).

6/24/92
Date of Issuance

John Scandura, Chief
Site Mitigation Branch
Department of Toxic Substances Control
Region 4 - Long Beach

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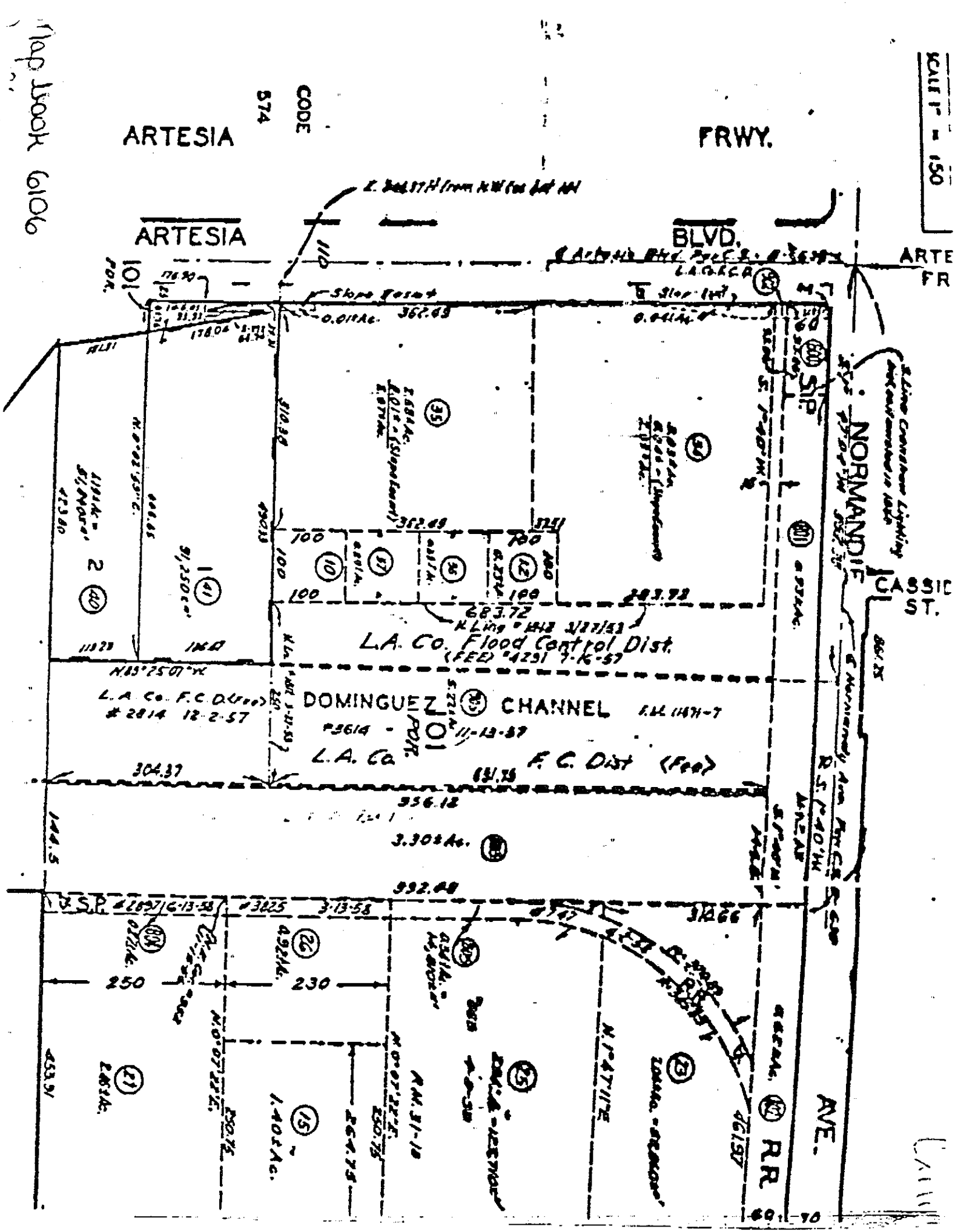
EXHIBIT 1


Map Book 6106
CODE 574
ARTESIA FRWY.
ARTESIA BLVD.
ARTE FR
SCALE 1" = 150
NORMANDIE AVE.
ASSID ST.
SLIP
L.A. Co. Flood Control Dist.
DOMINGUEZ CHANNEL
L.A. Co. F.C. Dist (Fee)
R.R.
AVE.

APPENDIX 1A

IMMINENT AND/OR SUBSTANTIAL ENDANGERMENT
SIGN-OFF SHEET
(FOR REGIONAL OFFICE)

Gardena Sumps
Site Name

Peter A. Garcia — 6-18-92
Project Manager — Date

Gregory A. Holmes — 6/18/92
Regional Senior Specialist/Engineer — Date

John E. Scandura — 6/22/92
Regional Site Mitigation Branch Chief — Date

Orchid Kwei by Dennis H. Mahon — 6-24-92
Toxics Legal Office — Date

Remarks: _____

March 1990

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
Region 4
245 West Broadway, Suite 350
Long Beach, CA 90802-4444

RECEIVED
AUG 18 1993
By

Report of Completion of Removal Action

1. Site Name: Gardena Sumps

2. Site Address: Southwest corner of Artesia Boulevard and Normandie Avenue, Gardena, California

3. Type of Site: Department of Toxic Substances Control - Lead

4. Size of Site: Large

5. Names of Responsible Parties: Thomas W. Cooper, Clarence Haack, Genevieve Haack, Southern Pacific Transportation Company, Los Angeles Flood Control District.

6. Role of DTSC in Removal Action: DTSC implemented removal action directly.

7. Description of Removal Action: An interim cover was constructed to prevent dermal contact with hazardous substance contaminated oily sludge. The cover was constructed over an area approximately 114,000 square feet.

8. Cost of Removal Action: $236,954.00

9. Date of Removal Action: The removal action was initiated on June 14, 1993, and was completed on August 6, 1993.

10. Work Remaining to be Completed: A report containing as built drawings and data from the QA/QC program remains to be completed. The report is scheduled to be finalized in September 1993.

    The Site should now be further investigated to determine what, if any, impact it has caused to the underlying groundwater aquifer.

11. Confirmation of Report by Regional Site Mitigation Operations Branch Chief.

The following signatures acknowledged that the information contained in this report is true and correct.

Peter A. Garcia — 8-10-93
Date
Project Manager
Site Mitigation Operations Branch

for Greg Holmes — 8/11/93
Date
Greg Holmes
Unit Chief
Site Mitigation Operations Branch

8/11/93
Date
John E. Scandura, Chief
Site Mitigation Operations Branch

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
Region 4
245 West Broadway, Suite 350
Long Beach, CA 90802-4444

RECEIVED
MAR 1 5 1994
BY

REPORT OF COMPLETION OF REMOVAL ACTION

1. Site Name: Gardena Sumps

2. Site Address: Southwest corner of Artesia Boulevard and Normandie Avenue, Gardena, California

3. Type of Site: Department of Toxic Substances Control (DTSC) Lead

4. Size of Site: Large

5. Responsible Parties: Thomas W. Cooper, Clarence Haack, Genevieve Haack, Southern Pacific Lines, Aircraft Magnesium Corporation, Los Angeles County Department of Public Works.

6. DTSC Role in Removal Action (RA): DTSC provided oversight and guidance to responsible parties for implementing RA.

7. Description of RA: Exposed areas of hazardous substance contaminated black oily sludge which was seeping to the surface of the Southern Pacific Line's (SPL) property was covered with a layer of clean fill dirt. In addition, a fence was installed around this portion of the SPL property which borders the Gardena Sumps. The fence encloses approximately 12,000 square feet of the SPL property.

8. Cost of RA: Approximately $25,000.00

9. Date of RA: The RA was initiated on January 10, 1994 and completed on January 24, 1994.

10. Work Remaining to be done at Site: Remedial Investigation work is ongoing at the Site. Sampling of DTSC newly installed groundwater monitoring wells remains to be performed. A Risk Assessment for the Site is also underway and remains to be completed.

recycled paper

11. Confirmation Report by Regional Site Mitigation Branch Chief: The information contained in this report is true and correct to the best of my knowledge.

Peter A. Garcia — 3-2-94
Date
Associate Hazardous Materials Specialist
Site Mitigation Operations Branch

Greg Holmes — 3/3/94
Date
Unit Chief
Site Mitigation Operations Branch

John E. Scandura — 3/3/94
Date
Chief
Site Mitigation Operations Branch

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LOS ANGELES COUNTY
CALIFORNIA
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L E A D S H E E T

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D.T.T

CODE
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CODE
19

CODE
9____

Assessor's Identification Number (AIN)
To be completed by Examiner OR Title Company in black ink.

Number of AIN's Shown

THIS FORM NOT TO BE DUPLICATED

04 1468522

RECORDING REQUESTED BY

California Department of Toxic Substances Control

WHEN RECORDED MAIL TO

Mr. Thomas Cota
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630

2

SPACE ABOVE THIS LINE RESERVED FOR RECORDER'S USE

LIEN

The State of California Department of Toxic Substances Control, hereby records this lien in the amount of $1,838,588.03 on the real property in the County of Los Angeles, State of California, located at the Southwest corner of Artesia Boulevard and Normandie Avenue in the City of Gardena, and identified as Assessor Parcel Number 6106-063-034 by the Los Angeles County Assessor. This property is the site of a hazardous substance release. A legal description of the property described on the deed found in Book 6106, Page 36, of the official records in the Los Angeles County Recorder's office is as follows:

> In the McDonald Tract of the San Pedro Rancho. 3.03 acres, less a 0.04 acre slope easement, for a net lot size of 2.99 acres. Commencing 666.86 feet east from the northwest corner of Lot 101, going east for 345.76 feet, with an approximate 0.04 acre slope easement for approximately the last half of this distance. At the end of that easement, going south and 1° 40' to the west for 412.68 feet, west 283.72 feet, north 100 feet, west 37.51 feet, and north 310.38 feet.

Owner of Record as shown on the latest equalized assessment roll: Thomas Cooper.

This lien is recorded pursuant to, and its enforceability is governed by, section 25365.6 of the California Health and Safety Code.

The amount secured by this lien, pursuant to section 25365.6, is equal to the costs or damages incurred and payable from the California Hazardous Substances Account, Hazardous Waste Control Account and the Hazardous Substance Cleanup Fund by the Department of Toxic Substances Control and its predecessor agency, the Department of Health Services, with respect to the property described herein. The lien continues until the liability for these costs or damages is satisfied.

The lien has the force, effect, and priority of a judgment lien.

Date: May 13, 2004

Thomas M. Cota, Chief
Southern California Cleanup Operations Branch
Cypress Office

Site Mitigation and Brownfields Reuse Program
Lien Reporting Form

04 1468522

3

When the lien is finalized, complete top half of this form and forward a copy marked "Confidential" to Shannon Similai, HQ 11-4. (Leave bottom section of form blank.)

Lien Imposed

Date Completed: 5/13/2004

Site Name: Gardena Sumps

Project Code: 400067 Lien amount: $ $1,838,588.03

CalSites ID #: 19490135 Was activity entered in CalSites: ☒ YES/ NO☐

(CalSites activity COST with description LIEN)

Lien Completion Form

Once the above lien has been satisfied, please complete the information below and forward form (with both top and bottom filled out) marked "Confidential" to Shannon Similai, HQ 11-4.

Date Lien Satisfied: _____ Amount Satisfied: $ _____

Was activity entered in CalSites: ☐ YES/ NO ☐

(CalSites activity COST with description STLMT, NFCRA, SALE, or OTHER)

How was Lien satisfied: ☐ Settlement Payment ☐ NFCRA

☐ Sale of property ☐ Other (explain below)

If applicable, please be sure to complete and submit other related documentation (e.i, Settlement form, NFCRA form, etc.)

Comments: _____

BILL LOCKYER
Attorney General of the State of California
RICHARD M. FRANK
Chief Assistant Attorney General
THEODORA BERGER
Senior Assistant Attorney General
DENNIS A. RAGEN
Telephone: (619) 645-2016
PEARL LATTAKER
Telephone: (213) 897-2614
Deputy Attorney General
110 West A St., Suite 1100
San Diego, CA 92101
Fax: (619) 645-2012
Attorneys for Plaintiffs

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CENTRAL DIST. OF CALIF.
LOS ANGELES

IN THE UNITED STATES DISTRICT COURT

FOR THE CENTRAL DISTRICT OF CALIFORNIA

THE CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL; THE HAZARDOUS WASTE CONTROL ACCOUNT; THE HAZARDOUS SUBSTANCE ACCOUNT; THE TOXIC SUBSTANCES CONTROL ACCOUNT; and THE SITE REMEDIATION ACCOUNT,

Plaintiffs,

v.

ATLANTIC RICHFIELD COMPANY,

Defendant.

Case No. CV04-7882 AHM (JTLx)

CONSENT DECREE

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BY

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IN THE UNITED STATES DISTRICT COURT

FOR THE CENTRAL DISTRICT OF CALIFORNIA

THE CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL; THE HAZARDOUS WASTE CONTROL ACCOUNT; THE HAZARDOUS SUBSTANCE ACCOUNT; THE TOXIC SUBSTANCES CONTROL ACCOUNT; and THE SITE REMEDIATION ACCOUNT,

Plaintiffs,

v.

ATLANTIC RICHFIELD COMPANY,

Defendant.

CASE NO. CV04-7882 AHM (JTLx)

CONSENT DECREE

INTRODUCTION

The General Purpose of the Decree.

The Parties to this Consent Decree are ATLANTIC RICHFIELD COMPANY (referred to as "ARC" or "Defendant") and the CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL (the "Department" or "DTSC"), the CALIFORNIA HAZARDOUS WASTE CONTROL ACCOUNT, the CALIFORNIA HAZARDOUS SUBSTANCE ACCOUNT, the CALIFORNIA TOXIC SUBSTANCES CONTROL ACCOUNT and the CALIFORNIA SITE REMEDIATION ACCOUNT (collectively referred to as the "Plaintiffs"). The Parties enter into this Consent Decree ("Decree" or "Consent Decree") in order to (1) provide for certain response actions at the Gardena Sumps Site, located at the southwest corner of Artesia Boulevard and Normandie Avenue in Gardena, California (the "Site"); (2) resolve certain alleged ARC liabilities with respect to the Site; and (3) provide ARC, including its parents, subsidiaries and current affiliates, including, without limitation, BP America, Inc., with contribution protection and a covenant not to sue in connection with certain claims relating to the Site.

Concurrently with the lodging of this Decree, Plaintiffs have filed a complaint in this matter (the "Complaint") against Defendant pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §9601, et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986, Pub. L. No. 99-499, 100 Stat. 1613 (1986) ("CERCLA"). In the Complaint, the Plaintiffs assert that Defendant "arranged for the disposal" of "hazardous substances" at the Site, as those terms are defined under CERCLA, and that Defendant is therefore liable for the costs that have been, or will be, incurred in response to releases and threatened releases of hazardous substances at and from the Site.

This Decree resolves portions of the claims asserted in the Complaint, and requires the Defendant to do the following:

Defendant will (1) implement those response actions set forth below; (2) prepare studies and planning documents, including a Remedial Action Plan ("RAP"), for the Site; and (3) pay certain costs that Plaintiffs have incurred or will incur with respect to the Site.

This Decree does not address the remedial work for the Site that will be required in order to implement the RAP and, under this Decree, the Defendant is neither required to, nor released from any obligation to, undertake such remedial work.

The Defendant denies that it is a liable party under CERCLA, the HSAA or any other state or federal law, and denies that it has any liability to Plaintiffs or to any other person. The Parties agree that the actions undertaken by the Defendant in accordance with this Consent Decree do not constitute an admission of liability on the part of Defendant. For the purposes of this Decree, the Defendant does not admit either (1) any of the facts set forth in the Statement of Facts contained in Section III of this Consent Decree (Site Background), or (2) any other allegations of fact or law set forth in this Consent Decree and/or in the Complaint. The Defendant reserves its rights to controvert any such allegations in any subsequent proceeding (other than a proceeding to implement or enforce the terms of this Consent Decree).

This Consent Decree is entered into by Plaintiffs pursuant to their authority under Sections 107 and 113 of CERCLA, 42 U.S.C. §§ 9607 and 9613, 42 U.S.C. 9621, et seq., Section 7003 of RCRA, 42 U.S.C. §§ 6973 and California Health & Safety Code ("H&SC") §§ 25100 et seq, 25187, 25355.5, 25358.3, 25360, 58009 and 58010.

Pursuant to the aforementioned authority and pursuant to CERCLA § 113(f)(2), 42 U.S.C. § 9613(f)(2), Plaintiffs and the Defendant each have

stipulated and agreed to the making and entry of this Consent Decree prior to the taking of any testimony.

Plaintiffs and the Defendant agree that this settlement and entry of this Consent Decree are made in good faith in an effort to avoid expensive and protracted litigation and to benefit the environment and the community without any admission or finding of liability or fault as to any allegation or matter.

NOW THEREFORE, it is ORDERED, ADJUDGED, AND DECREED, as follows:

I. JURISDICTION

The Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. § 1331 and CERCLA, 42 U.S.C. § 9601 et seq. Solely for the purposes of this Consent Decree and the underlying Complaint, the Defendant waives service of summons and agrees to submit to the jurisdiction of this Court and to venue in this District. The Defendant agrees not to challenge or object to entry of this Decree by the Court unless Plaintiffs have notified ARC in writing that Plaintiffs no longer support entry of the Decree or that Plaintiffs seek to modify the Decree. The Defendant and Plaintiffs agree not to challenge this Court's jurisdiction to enforce the terms of this Decree once it has been entered.

II. PARTIES BOUND

A. The "Parties" to this Consent Decree are ARC, DTSC, the California Hazardous Waste Control Account, the California Hazardous Substance Account, the California Toxic Substances Control Account and the California Site Remediation Account.

B. The Defendant has agreed to pay the amounts specified under Section VIII of this Decree (Payment of Plaintiffs' Costs) and to undertake the Work and certain other obligations set forth in this Decree.

C. This Consent Decree applies to and is binding upon the Plaintiffs and the Defendant. Any change in ownership, partnership status or corporate status of ARC, including, but not limited to, any transfer of assets or real or personal property, shall in no way alter ARC's rights or responsibilities under this Consent Decree.

D. The Defendant shall be responsible and shall remain responsible for carrying out all activities required of it under this Consent Decree. DTSC is acting as the lead agency with respect to the Site pursuant to H&SC § 25300, et seq. The Covenants Not to Sue provided by DTSC pursuant to this Decree are those of the DTSC only and do not affect the rights of any other agency of the State of California or the United States.

E. ARC shall be responsible for ensuring that its contractors and subcontractors perform the Work contemplated herein in accordance with this Consent Decree.

III. SITE BACKGROUND

The following is a summary of the Site background as alleged by Plaintiffs:

A. The Facility.

The facility ("Facility") which is the subject of this Decree is located at the southwest corner of Artesia Boulevard and Normandie Avenue in the City of Gardena. A legal description of the Facility is attached to this Decree as Exhibit "A." The Facility occupies approximately 6.48 acres, in an industrial/ commercial/residential area of Gardena, California.

B. Facility History and Operations

From 1925 until 1931, the Moneta Brick Company ("Moneta") operated a brick manufacturing business on the Facility property. Moneta mined clay out of large pits that it dug at that property, and it used this clay for the manufacture of bricks. Sometime after Moneta ceased operations at the Site,

John Morrison commenced operating a hazardous waste disposal facility at the Facility. Sometime between 1940 and 1944, certain wastes were disposed of into the pits left over from the brickyard operation.

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C. Richfield Oil Company's Involvement with the Facility.

During the period that certain wastes were being dumped at the Site, ARC's predecessor, Richfield Oil Corporation ("Richfield"), operated a refinery (the "Richfield Refinery") approximately seven miles away, in what is today Carson, California, at which Richfield produced an acid sludge waste. Richfield arranged to have certain waste from the Richfield Refinery disposed of at the Facility.

D. Contamination.

As a result of the operation of the Facility, the Site is now contaminated with hazardous substances, including benzene, ethyl benzene, toluene, trichloroethene, low pH (acid) sludges and substances, anthracene, chromium, chrysene, copper, hydrogen sulfide, lead, methyl anthracene isomers, methyl ethyl benzene, methyl fluorene, nickel, phenanthrene, pyrene, sulfur dioxide, trimethyl benzene, and trimethylnapthalene isomers; acetone, barium, benzo(a)anthracene, benzo(k)fluoranthene, benzo(g,h)perylene, benzo-(a)pyrene, 2-butanone, cadmium, carbon disulfide, chrysene, cobalt, dibenzo-(a,h)anthracene, fluoranthene, fluorene, phenanthrene, phenols, sulfide, vanadium, and xylenes.

E. Regulatory History.

In responding to the pollution from the Facility, Plaintiffs have taken significant and time-consuming efforts toward a cleanup of the Site. In 1988 and 1992, the Department determined that the presence of hazardous substances in the soil at the Site posed an imminent and substantial endangerment to public health and the environment. In 1992, the Department issued an *Imminent and Substantial Endangerment Order and Remedial Action*

Order ("I&SE Order"), which ordered the respondents named therein, including ARC and the owners of the Site, to undertake certain cleanup measures at the Site. ARC and the other respondents declined to comply with the I&SE Order. ARC contended that it was not a liable party with respect to the Site, because it had not arranged for the disposal of hazardous waste at the Site.

The Plaintiffs thereupon expended taxpayer and bond funds on removal and response actions that have been designed to minimize the threat that the Site poses to human health and the environment. Specifically, the Department installed an interim cover over the eastern portion of the Site which was designed to (1) reduce human contact with the wastes in the disposal pits; (2) prevent these wastes from migrating away from the Site, and (3) prevent rainwater from percolating and migrating through the wastes and driving contamination further into the earth. In addition, the Department entered into an agreement with Clarence and Genevieve Haack, who owned a parcel located on the western portion of the Site; this agreement required the Haacks to take certain response actions. The response actions taken to date at the Site do not constitute the final remedy for the hazardous substance contamination at the Site.

F. Hazardous Substances.

The contaminants found at the Site include hazardous substances as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14), and H&SC §§ 25316 and 25317 and hazardous wastes as defined in H&SC § 25117.

G. Releases.

There have been releases and threatened releases of hazardous substances at the Site.

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H. Facility.

The property located at the southwest corner of Artesia Boulevard and Normandie Avenue in the City of Gardena, California is a "facility" as that term is defined by Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

I. Person/Arranger.

~~ARC~~ is a "person" as that term is defined by Section 101(21) of CERCLA, 42 U.S.C. § 9601(21) and H&SC § 25319 who arranged for the disposal of hazardous substances at the Site.

J. Response Activities.

DTSC has identified the following response actions which Defendant has agreed to undertake at the Site: (1) Repair and maintenance of the existing Site fencing; (2) Repair and maintenance of the interim cover system that DTSC has installed at the Site; and (3) Preparation of a Remedial Investigation/Feasibility Study ("RI/FS") and RAP for the Site.

IV. DEFINITIONS

Unless otherwise expressly provided herein, terms used in this Consent Decree which are defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them therein. Whenever terms listed below are used anywhere in this Consent Decree or its exhibits, the following definitions shall apply:

1. "CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, Pub. L. No. 99-499, 100 Stat. 1613 (1986), 42 U.S.C. §§ 9601, et seq., as amended.

2. "Consent Decree" or "Decree" shall mean this Consent Decree and its attachments and exhibits.

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3. "Contractor" shall mean the individual, company or companies retained by or on behalf of Defendant to undertake and complete the Work.

4. "Day" shall mean a calendar day. In computing any period of time under this Consent Decree, where the last day would fall on a Saturday, Sunday, or State or Federal holiday, the period shall run until the close of business of the next working day.

5. "Facility" is defined at Section 101(9) of CERCLA, 42 U.S.C. § 9601(9), and shall mean the property of approximately 6.48 acres in size located at southwest corner of Artesia Boulevard and Normandie Avenue in the City of Gardena, California, including, without limitation, any waste disposal pits located in whole or in part at that property. A legal description of the Facility property is attached hereto as Exhibit "A."

6. "Matters Addressed" in this Consent Decree shall mean: (1) the Work, (2) the Past Response Costs, paid and unpaid; (3) Work Oversight Costs; and (4) any response costs, incurred by any person, prior to the timely completion of the Work required by this Decree or during the time that Defendant is timely completing such Work, with respect to any hazardous substances, pollutants or contaminants on, under, or migrating to or from the Facility, and (5) response actions performed by any person at the Site prior to the Effective Date of this Decree. "Matters Addressed," however, shall not include those matters reserved in Section XII (Reservation of Rights) of this Decree.

7. "National Contingency Plan" or "NCP" shall refer to the National Oil and Hazardous Substances Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300.

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8. "Oversight" shall mean inspection, review, advice, direction and comments performed or provided by DTSC, its contractors, or its representatives, with respect to any of the following actions taken by Defendant pursuant to this Decree: (1) any investigatory, removal or remedial activities; (2) any plans, assessments or reports; and (3) the performance of the Work. "Oversight" shall also include any actions, including but not limited to, sampling, testing or analysis taken by DTSC, its contractors or its representatives that are necessary to verify or ensure the adequacy of the Work or of any other activity undertaken, or proposed to be undertaken, by ARC pursuant to this Decree.

9. "Parties" shall mean:

a. Plaintiffs: (1) DTSC, and (2) the California Hazardous Waste Control Account, the California Hazardous Substances Account, the Toxic Substances Control Account and the Site Remediation Account (the "State Accounts"), to the extent that moneys from those accounts have been expended at DTSC's direction.

b. Defendant: ARC.

10. "Past Response Costs" shall mean all costs, including, but not limited to, interest, that DTSC has incurred on behalf of Plaintiffs with regard to the Site up until December 31, 2003.

11. "Plan(s)" or "Workplan(s)" shall mean the plans and designs developed by or on behalf of ARC which detail the elements of the Work to be conducted pursuant to this Consent Decree.

12. "RCRA" shall mean the Solid Waste Disposal Act, as amended, 42 U.S.C. § 6901, et seq. (also known as the Resource Conservation and Recovery Act).

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13. "Report(s)" shall mean the reports developed by ARC in compliance with this Decree, detailing the Work and the results of its implementation.

14. "Site" shall mean the (i) Facility and (ii) the vertical and areal extent of hazardous substance contamination at and from the Facility.

15. "Waste Material" shall mean (1) any "hazardous substance" as defined under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14) that is in, or threatens to migrate to or from, soil or groundwater at the Site, (2) any "hazardous substance" as defined under California H&SC §§ 25316 and 25317 that is in, or threatens to migrate to or from, soil or groundwater at the Site or (3) any "hazardous waste" as defined under H&SC § 25117.

16. "Work" shall mean the implementation, in accordance with this Decree, of the tasks and activities defined herein, including but not limited to: Section VI (General Obligations Respecting the Work to be Performed); Section VII (Specific Work to Be Performed); and such work as may be modified or performed pursuant to the provisions of this Consent Decree; and any schedules or plans required to be submitted pursuant to this Decree. "Work" does not include the activities necessary for the implementation of the RAP for the Site.

17. "Work Oversight Costs" shall mean all costs incurred by the Plaintiffs and their contractors with respect to this Decree after the date that this Decree is entered. Work Oversight Costs shall include: payroll costs, overhead costs, contractor costs, laboratory costs, the costs incurred pursuant to Subsection VI.J (Site Access), and the costs of reviewing or developing plans, reports and other items pursuant to this Consent Decree, verifying the Work, or costs incurred to implement or enforce this Consent Decree, from the date upon which this Decree is entered. Work Oversight Costs include any such costs incurred by DTSC or its contractors or either of them with respect to this

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Decree, including but not limited to any costs incurred in oversight of the preparation of the RI/FS and RAP. Work Oversight Costs shall also include costs DTSC incurs in oversight of any Work that ARC may perform during the period after this Decree is signed by the parties and before it is entered by the Court. Work Oversight Costs do not include any costs incurred by DTSC in oversight of activities that are beyond the scope of this Decree. Activities that fall within the scope of this Decree include the Work and any other activities necessary for the implementation of this Decree.

V. GENERAL PROVISIONS

A. Purposes.

The purposes of this Consent Decree are:

1. Work.

To protect public health and welfare and the environment from releases or threatened releases of Waste Material at or from the Site by the completion of the following work:

(a) Implementation and operation of removal action(s) necessary to minimize the spread of contaminants from the Site; these removal actions will include the repair and maintenance of the existing Site fencing and cover systems;

(b) Preparation of an RI/FS for the Site; and

(c) Preparation of a RAP for the Site.

2. Resolution of Certain Claims.

To settle certain portions of the claims that the Plaintiffs have asserted against the Defendant in this matter.

3 Contribution Protection and Covenant Not to Sue

To provide ARC, including its parents, subsidiaries and current affiliates, including without limitation BP America, Inc., with contribution

protection for Matters Addressed in this Consent Decree and a covenant not to sue in connection with the Matters Addressed in this Consent Decree, pursuant to the terms specified in Sections XI (Covenants Not to Sue) and XIII (Contribution Protection) of this Decree. The Contribution Protection and Covenants Not to Sue set forth in this Decree are not intended to absolve ARC's future parents, subsidiaries or affiliates from any liability they may have for Matters Addressed in this Consent Decree, unless that liability arises from the acts or omissions of ARC or Richfield that are alleged in the Complaint. For the purposes of this Paragraph A.3, the term "ARC's future parents, subsidiaries and affiliates" shall mean those companies and entities who are not parents, subsidiaries or affiliates of ARC as of the Effective Date of this Decree, but who later become parents, subsidiaries or affiliates of ARC through merger or acquisition.

B. Final Remedy.

The Parties agree that completion of the work required by this Decree may not constitute the final remedial action for the Site. DTSC reserves all of its rights to (i) compel ARC, and its parents, subsidiaries and affiliates, or any liable person, to implement any final remedial action for the Site and (ii) seek recovery of any costs it incurs with respect to any final remedial action from Defendant or any liable party.

C. Compliance With Applicable Law.

All activities undertaken by ARC pursuant to this Consent Decree shall be performed in accordance with the requirements of all applicable federal, state and local laws and regulations, including the NCP. All parties agree that the Work, if performed in accordance with the requirements of this Decree, is consistent with the NCP.

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D. **No Findings By DTSC.**

This Decree in no way constitutes a finding by DTSC as to the risks to human health or the environment which may be posed by contamination at the Site. This Decree does not constitute a representation by DTSC that the Site, or any part thereof, is fit for any particular purpose.

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VI. GENERAL OBLIGATIONS RESPECTING WORK TO BE PERFORMED

A. **Project Coordinator.**

Within fifteen (15) days from the Effective Date of this Decree, ARC shall submit to DTSC in writing the name, address, and telephone number of a Project Coordinator whose responsibilities will be to receive all notices, comments, approvals, and other communications from DTSC. ARC shall promptly notify DTSC of any change in the identity of the Project Coordinator.

B. **Communication and Coordination Plan (CCP)**

Within forty-five (45) days of the Effective Date of this Decree, ARC shall submit to DTSC for approval a Communication and Coordination Plan ("CCP") which specifies the requirements and procedures by which ARC will communicate and coordinate with the owner(s) of the Facility premises in carrying out the requirements of this Decree.

C. **Project Engineer/Geologist.**

The Work performed pursuant to this Decree shall be under the direction and supervision of a qualified professional engineer and/or a registered geologist in the State of California. Within fifteen (15) days from the Effective Date of the Decree ARC will submit for DTSC review and approval: (a) the name(s) and address(es) of the project engineer and/or geologist chosen by ARC; and (b) in order to demonstrate their expertise in hazardous substance cleanup, the resume(s) of the engineer and/or geologist, and the statement of qualifications of the consulting firm responsible for the work. ARC shall

promptly notify DTSC of any change in the identity of the Project Engineer and/or Geologist.

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D. Monthly Summary Reports.

Within forty-five (45) days from the Effective Date of the Decree, and every month thereafter, ARC shall submit a Monthly Progress Report of its activities under the provisions of this Decree. ARC shall submit the report to DTSC by the fourth day of the month due, and the report shall describe:

(1) Specific actions taken by or on behalf of ARC during the previous month;

(2) Actions expected to be undertaken during the current month;

(3) All planned activities for the next month;

(4) Any requirements under this Decree that were not completed;

(5) Any problems or anticipated problems in complying with this Decree; and

(6) All results of sample analyses, tests, and other data generated under the Decree during the previous month, and any significant findings from these data.

After ARC has established a satisfactory history of submission of Monthly Progress Reports for a period of six months, it may begin to submit such reports on a quarterly basis; DTSC, however, may at any time instruct ARC to resume submission of such reports on a monthly basis where the submission of monthly reports is necessary and appropriate under the circumstances.

E. Quality Control/Quality Assurance ("QC/QA").

All sampling and analysis conducted by ARC under this Decree shall be performed in accordance with QC/QA procedures submitted by ARC and approved by DTSC pursuant to this Decree.

F. Submittals.

All submittals and notifications from ARC required by this Decree shall be sent to:

Mr. Thomas Cota, Chief
Southern California Cleanup Operations Branch
Cypress Office
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630

and to other DTSC personnel, as determined by DTSC.

G. Communications.

All approvals and decisions of DTSC made regarding submittals and notifications will be communicated to ARC in writing by the Southern California Cleanup Operations Branch Chief, Department of Toxic Substances Control, or his/her designee. No informal advice, guidance, suggestions or comments by DTSC regarding reports, plans, specifications, schedules or any other writings by ARC shall relieve ARC of the obligation to obtain such formal approvals as may be required.

H. DTSC Review and Approval.

If DTSC determines that any report, plan, schedule or other document submitted for approval pursuant to this Decree fails to comply with this Decree or with applicable laws or regulations, or fails to protect public health or safety or the environment, DTSC may:

(1) Return written comments to ARC with recommended changes and a reasonable date by which ARC is to submit to DTSC a revised document incorporating the recommended changes; or

(2) Modify the document as deemed reasonably necessary in light of ARC's responses to DTSC's written comments and approve the document as modified.

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Any modifications, final comments or other directives that DTSC issues pursuant to this Subsection VI.H shall be become binding unless disputed by ARC in accordance with the dispute resolution provisions set forth in Section IX of this Decree (Dispute Resolution).

I. Compliance With Applicable Laws.

ARC shall carry out this Decree in compliance with all applicable state, local, and federal requirements including, but not limited to, requirements to obtain permits and to assure worker safety.

J. Site Access.

To the extent access to the Site or laboratories used for analyses of samples under this Decree is within the control of the Defendant, the Defendant shall provide access at all reasonable times to employees, contractors, and consultants of DTSC. Nothing in this Section is intended or shall be construed to limit in any way the right of entry or inspection that DTSC or any other agency may otherwise have by operation of any law.

K. Sampling, Data and Document Availability.

ARC shall permit DTSC and its authorized representatives to inspect and copy all sampling, testing, monitoring or other data generated by ARC or on ARC's behalf in any way pertaining to Work undertaken pursuant to this Decree. ARC shall submit all such data upon the request of DTSC. Copies shall be provided within seven (7) days of receipt of DTSC's written request. ARC shall inform DTSC at least seven (7) days in advance of all field sampling under this Decree, and shall allow DTSC and its authorized representatives to take duplicates of any samples collected by ARC pursuant to this Decree. ARC shall maintain a central repository of the data, reports, and other documents prepared pursuant to this Decree. DTSC shall make its public records file of Site reports, workplans, comments, technical information and all related information concerning the Site available to ARC for its review and

consideration, pursuant to DTSC Public Records Act procedures or pursuant to any expedited procedures that may be agreed upon by the ARC and DTSC. DTSC understands that complete access to its public files for the Site is essential for ARC to initiate compliance with the conditions and requirements of this Decree.

L. Record Retention.

All data, final reports and other documents prepared pursuant to this Decree shall be preserved by ARC for a minimum of six (6) years after the conclusion of all activities under this Decree. If DTSC requests that some or all of these documents be preserved for a longer period of time, ARC shall either comply with that request or deliver the documents to DTSC, or permit DTSC to copy the documents prior to destruction.

M. Government Liabilities.

The State of California shall not be liable for any injuries or damages to persons or property resulting from acts or omissions by ARC in carrying out activities pursuant to this Decree, nor shall the State of California be held as party to any contract entered into by ARC or its agents in carrying out activities pursuant to this Decree.

N. Additional Actions.

Except as expressly provided herein, by entering into this Decree, DTSC does not waive the right to take any further actions authorized by law.

O. Stop Work Order.

In the event that DTSC determines that any activity (whether or not pursued in compliance with this Decree) may pose an imminent or substantial endangerment to the health or safety of people on the Site or in the surrounding area or to the environment, DTSC may order ARC to stop further implementation of such activity for such period of time needed to abate the endangerment (hereafter "Stop Work Order"). In the event that DTSC

determines that any Site activities (whether or not pursued in compliance with this Decree) are proceeding without DTSC authorization, DTSC may order ARC to stop further implementation of such Site activity for such period of time needed to obtain DTSC authorization, if such authorization is appropriate. Any deadline in this Decree directly affected by a Stop Work Order, under this Subsection, shall be extended for the term of the Stop Work Order.

P. Emergency Response Action/Notification.

In the event of any action or occurrence, such as a fire, earthquake, explosion, or human exposure to hazardous substances caused by the release or threatened release of a hazardous substance at the Site, during the course of this Decree, ARC shall immediately take all appropriate action to prevent, abate, or minimize such emergency, release, or immediate threat of release and shall immediately notify the Project Manager. ARC shall take such action in consultation with the Project Manager and in accordance with all applicable provisions of this Decree. Within seven (7) days of the onset of such an event, ARC shall furnish a report to DTSC, signed by ARC's Project Coordinator, setting forth the events which occurred and the measures taken in the response thereto. In the event that ARC fails to take appropriate response action and DTSC takes the action instead, DTSC may seek to recover the costs of its response action from ARC. Nothing in this Section shall be deemed to limit any other notification requirement to which ARC may otherwise be subject by operation of law.

Q. Extension Requests.

If ARC is unable to perform any activity or submit any document within the time required under this Decree, ARC may, prior to expiration of the time, request an extension of the time in writing. The extension request shall include a justification for the delay. All such requests shall be in advance of the date on which the activity or document is due, and all reasonable requests for

extensions shall be granted, if DTSC determines that good cause exists for the extension.

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R. Extension Approvals.

If DTSC determines that good cause exists for an extension, it will grant the request and specify a new schedule in writing. ARC shall comply with the new schedule incorporated in this Decree.

VII. SPECIFIC WORK TO BE PERFORMED

A. Removal Actions.

ARC shall undertake the following removal actions. Prior to the implementation of these removal actions, ARC shall submit a removal action workplan, including an implementation schedule for DTSC's review and approval. Implementation of the removal actions shall be completed by the specified dates.

1. Fence and Post.

Within thirty (30) days from the Effective Date of this Decree, ARC shall commence any necessary repair or maintenance to the perimeter fencing and warning signs that have been installed at the easterly portion of the Site.

2. Maintenance of Interim Cover.

ARC shall repair and maintain the interim cover system that DTSC has installed on the easterly portion of the Site. Within forty-five (45) days of the Effective Date of this Decree, ARC shall provide DTSC with a plan for the repair and maintenance of the cover system.

3. Additional Removal Actions.

DTSC and ARC may agree on the need for removal actions in addition to the removal action specified in Subsection V.A.1(a). Any requirement that ARC perform such additional removal actions shall be subject to the dispute resolution procedures of Section IX (Dispute Resolution).

B. Public Participation Plan ("PPP") (Community Relations).

ARC shall work cooperatively with DTSC in ensuring that the public, the affected community, and the owners of the Site are involved in DTSC's decision-making process. Any such public participation activities shall be conducted in accordance with H&SC Section 25356.1(d), DTSC's Public Participation Policy and Guidance Manual, and with DTSC's review and prior approval. Within ninety (90) days after the Effective Date of this Decree, ARC shall submit a Public Participation Plan for DTSC's review and approval.

C. Remedial Investigation/Feasibility Study (RI/FS).

ARC shall complete an RI/FS for the Site. The RI/FS shall be consistent with the U.S. EPA's "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA," October 1988, and "Data Quality Objectives for Remedial Response Activities," March 1987 and any updated guidance documents. The purpose of the RI/FS is to assess Site conditions, to fully characterize the nature and extent of the Site's hazardous substance contamination, and to evaluate alternatives to the extent necessary to select a remedy appropriate for the Site. RI and FS activities shall be conducted concurrently and interactively so that the investigation and permanent remedy, respectively, can be completed and selected expeditiously. Because of the iterative nature of the RI/FS, additional data requirements and analyses may be identified throughout the process. Site characterization may be conducted in one or more phases to focus sampling efforts and increase the efficiency of the investigation. ARC shall fulfill additional data and analysis needs identified by DTSC as necessary to complete the RI/FS; these additional data and analysis requests will be consistent with the general scope and objectives of the Decree.

As part of the RI, ARC shall begin interim local groundwater monitoring, including groundwater level measurements using the existing wells,

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within thirty (30) days after DTSC's approval of the RI/FS Workplan (see, paragraph VII.C.1, below). Groundwater level measurements and groundwater sampling shall be conducted on a quarterly basis. A groundwater sampling report shall be submitted to DTSC by the 15th of the month following the end of the quarter. As data is gathered, DTSC may require the need for additional groundwater wells on or off the Property. Any dispute as to the need for such wells shall be subject to the dispute resolution procedures of Section IX of this Decree (Dispute Resolution).

The required Treatability Studies and FS shall evaluate and address the proposal made by Mr. Thomas Cooper, who owns the eastern portion of the Facility, for recycling the waste materials present at the Site. Mr. Cooper's proposal shall be included as one of the alternatives discussed in the FS.

The following RI/FS components shall be prepared, implemented and performed:

1. **RI/FS Workplan.**

Within sixty (60) days from the Effective Date of this Decree, ARC shall prepare and submit to DTSC for review and approval a detailed RI/FS Workplan and implementation schedule which covers all activities necessary to conduct a complete RI/FS of the Site. DTSC may, at its option, grant ARC a thirty (30) day extension for submitting the RI/FS Workplan.

2. **RI/FS Workplan Implementation.**

ARC shall implement the DTSC approved RI/FS Workplan.

3. **RI/FS Workplan Revisions.**

If ARC proposes to modify any methods or initiate new activities for which a Field Sampling Plan, Health and Safety Plan, Quality Assurance Project Plan or other necessary procedures/plans have been

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established, ARC shall prepare an addendum to the approved plan(s) for DTSC review and approval prior to modifying the method or initiating new activities.

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D. Interim Screening & Evaluation of Remedial Technologies.

At the request of DTSC, ARC shall submit an interim screening and evaluation document which identifies and evaluates potentially suitable remedial technologies and recommendations for treatability studies.

E. Treatability Studies.

Treatability testing shall be performed by ARC to develop data for the detailed remedial alternatives set forth in the RI/FS. Treatability testing is required to demonstrate the implementability and effectiveness of technologies, unless ARC can show DTSC that similar data or documentation or information exists. The required deliverables are: a workplan, a sampling and analysis plan, and a treatability evaluation report. To the extent practicable, treatability studies will be proposed and implemented during the latter part of Site characterization.

F. Remedial Investigation (RI) Report.

ARC shall submit an RI Report to DTSC for review and approval in accordance with the approved RI/FS Workplan Schedule. The purpose of the RI is to collect data necessary to adequately characterize the Site for the purpose of defining risks to public health and the environment and developing and evaluating effective remedial alternatives. Site characterization may be conducted in one or more phases to focus sampling efforts and increase the efficiency of the investigation. As part of the preparation of the RI Report, ARC will (i) evaluate the Focused Remedial Investigation Report (Focused RI Report) for the Site that was completed on January 31, 1992 and (ii) collect such additional data as is necessary to evaluate current site conditions.

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G. Baseline Risk Assessment.

ARC shall submit a Baseline Risk Assessment Report within sixty (60) days from the approval of the Revised RI Report. The report shall be prepared consistently with U.S. EPA and DTSC regulations and guidance documents, including at a minimum: "Risk Assessment Guidance for Superfund (RAGS) Part A" (1989); "Soil Screening Guidance Technical Background Document" (1996); "Exposure Factors Handbook" (1997); "Johnson and Ettinger Model, Users Guide for Evaluating Subsurface Vapor Intrusion into Buildings" (2003); "Ecological Risk Assessment Guidance for Superfund" (1997) and "State of California Preliminary Endangerment Assessment Guidance Manual" (1999) and any updates to those documents.

H. Feasibility Study ("FS") Report

ARC shall prepare the FS Report and submit it to DTSC for review and approval no later than sixty (60) days from the date DTSC approves the Revised RI Report. DTSC, at its option, may grant a thirty (30) day extension for submitting this report.

I. California Environmental Quality Act ("CEQA").

DTSC must comply with CEQA insofar as activities required by this Decree are "projects" requiring CEQA compliance. To the extent that relevant documents, information or data are in ARC's possession or control, ARC shall assist DTSC in preparing the documents required by CEQA.

J. Remedial Action Plan ("RAP").

No later than sixty (60) days after DTSC's approval of the FS Report, ARC shall prepare a final Draft RAP and submit it to DTSC for approval. The final Draft RAP shall be consistent with the NCP and H&SC Section 25356.1, et seq. The Draft RAP public review process may be combined with that of any other documents required by CEQA. The Draft RAP shall be based on and summarize the approved RI/FS Report.

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VIII. PAYMENT OF PLAINTIFFS' COSTS

A. Past Response Costs.

With respect to Plaintiffs' Past Response Costs, the Defendant shall pay DTSC $800,000. Such payment shall be made within sixty (60) days of the Effective Date of this Decree by check payable to the California Department of Toxic Substances Control and referring to the "Gardena Sumps Site." The check should be sent to:

California Department of Toxic Substances Control
Attention: Accounting Unit
Gardena Sumps Site, Project No. 400067
P.O. Box 806
Sacramento, California 95812-0806

Copies of the transmittal letters and the check shall be sent to

(1) DTSC's Cypress Office, as specified in Paragraph VI.F of this Decree (Submittals); and

(2) Deputy Attorney General Dennis A. Ragen
110 West A Street, Suite 1100,
San Diego, California 92101

This payment shall be credited toward the earliest outstanding costs that the Plaintiffs have incurred with regard to the Site.

B. Work Oversight Costs.

DTSC will provide ARC with an accounting of all Work Oversight Costs as they accrue. DTSC will provide quarterly bills for those Work Oversight Costs incurred in a manner that is not inconsistent with the NCP. DTSC estimates that the Work Oversight Costs will be $144,000. A copy of DTSC's estimate is attached hereto as Exhibit "B." This is only an estimate; the actual amount of these costs may be more or less, depending on the circumstances surrounding the implementation of the Work.

ARC may provide notice of any challenge to the quarterly bill for Work Oversight Costs by letter mailed to DTSC within thirty (30) days after

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ARC receives the quarterly bill. The challenge will then be subject to the dispute resolution provisions of this Decree.

Unless challenged by ARC, ARC shall pay the Work Oversight Costs that are not inconsistent with the NCP by check within thirty (30) days after receipt of the Bill. The check shall be disbursed to:

California Department of Toxic Substances Control
Attention: Accounting Unit
Gardena Sumps Site, Project No. 400067
P.O. Box 806
Sacramento, California 95812-0806

Copies of the transmittal letter and the check shall be sent to:

(1) DTSC's Cypress Office, as specified in Paragraph VI. F of this Decree (Submittals); and

(2) Deputy Attorney General Dennis A. Ragen
110 West A Street, Suite 1100
San Diego, California 92101

IX. DISPUTE RESOLUTION

A. Informal Dispute Resolution.

Should ARC object to any decision that DTSC makes pursuant to this Decree, ARC shall notify DTSC pursuant to Subsection VI. F of this Decree (Submittals) of its objections, in writing, within thirty (30) days after receipt of the decision. Within fifteen (15) days from ARC's submission of such written objections, DTSC and ARC shall meet and confer in an attempt to reach agreement. Within 30 days after meeting or conferring with ARC, or within such other reasonable time period set by DTSC, DTSC shall provide a written statement of its decision to ARC. That statement shall be considered the final and binding decision of DTSC, unless ARC seeks review under the Formal Dispute Resolution procedures, set forth in the following Subsections.

B. Scope of Formal Dispute Resolution.

Formal Dispute resolution under this Decree is exclusively limited to disputes regarding the provisions described in Sections VII (Specific Work to

be Performed); VIII (Payment of DTSC Costs); XIV (Force Majeure); Subsection VI.H (DTSC Review and Approval); and Subsection X.A (Satisfaction by ARC). Formal Dispute resolution does not apply to DTSC decisions with respect to deadlines for submission of documents pursuant to this Decree. Formal dispute resolution shall proceed as described in the following Subsection (IX.C).

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C. Formal Dispute Resolution.

For matters that are within the scope of Formal Dispute Resolution, if ARC disagrees with any final decision that DTSC issues pursuant to Subsection IX.A (Informal Dispute Resolution), ARC may, within thirty (30) days after receipt of that decision, submit such action for review by the Deputy Director of Site Mitigation, Department of Toxic Substances Control, (the "Arbiter") or, in the Deputy Director's extended absence, the Deputy Director's designee. ARC's submission shall be made pursuant to Subsection VI.F (Submittals) of this Decree. The Arbiter shall receive written evidence and testimony concerning the relevant action or omission by DTSC, and shall determine whether such action is reasonably necessary or appropriate in light of the overall objectives of this Decree. The Arbiter shall issue a written decision affirming the action of DTSC, setting aside the action of DTSC, or amending the action of DTSC, as appropriate. The Arbiter's written decision shall set forth the reasons for the ruling. The Arbiter shall render all decisions in accordance with applicable state and federal laws. The Arbiter's decision shall be the final decision of DTSC and shall become binding unless ARC seeks review by this Court as provided in the following Subsection.

D. Review by This Court.

Any administrative decision by the Arbiter respecting administrative dispute resolution, as described above, shall be reviewable by this Court, provided that ARC files a notice of judicial appeal with the Court

and serves it on DTSC within thirty (30) days of receipt of the decision of the Arbiter. Judicial review shall be limited to the administrative record as a whole. The notice of judicial appeal shall include a description of the matter in dispute, the efforts made by the parties thereto to resolve it, and the relief requested. Within thirty (30) days of DTSC's receipt of such notice or within the schedule set forth by the Court, DTSC may file a response to ARC's notice of judicial appeal. ARC will have the burden of proving based on the weight of the evidence in the administrative record as a whole (1) that the Arbiter's decision was not supported by the weight of the evidence in the entire administrative record or was otherwise not consistent with state or federal law, or (2) when the Arbiter's decision involves DTSC's response or oversight costs, that the costs incurred by DTSC were not consistent with the NCP or were otherwise not in accordance with State or Federal law.

E. ARC's Work Obligations During Dispute Resolution.

Notwithstanding the invocation of the procedures stated in this Section, ARC shall continue to perform its undisputed obligations under this Consent Decree, including those that are not disputed or not substantially affected by the disputed issue.

F. Obligations After Resolution of Dispute.

If the Court finds that ARC has not satisfied its burden as described in Subsection IX.B.3 (Review by This Court), ARC shall then fulfill its obligation to pay costs or implement the disputed matter as resolved and perform the work which was the subject of the dispute in accordance with the Court's decision. The appropriate plans should be amended to reflect the resolution of the dispute. In any dispute in which ARC prevails, the deadlines for any affected deliverables shall be extended to account fully for any delays attributable to the dispute resolution procedures and ARC need only comply with any disputed obligations as finally determined by the Court.

X. SATISFACTION AND CERTIFICATION

A. Satisfaction by ARC.

If ARC fulfills its obligations by performing the activities required under this Decree, ARC's obligations for the Work required under this Decree shall be deemed to be satisfied. Within sixty (60) days after DTSC determines that ARC has fulfilled its obligations under this Decree, DTSC will issue ARC a statement that ARC's obligations pursuant to this Decree have been completed (Statement of Completion) and that no further action or work is required of ARC pursuant to this Consent Decree. Upon the Effective date of this Consent Decree, and for so long as ARC is in full compliance with the terms of this Decree, and then after the issuance of the Statement of Completion, ARC, including its parents, subsidiaries and current affiliates, including without limitation BP America, Inc., shall be protected by the covenants not to sue in Section XI (Covenants Not to Sue), subject to the reservations of rights set forth in Section XII (Reservation of Rights).

B. Preparation of New RAP.

Notwithstanding the other provisions of this Decree, if, after the completion of the RAP, new facts are discovered which, either by themselves or in combination with other facts, indicate that the remedy selected in the RAP is no longer protective of human health and the environment, then DTSC may seek to compel the Defendant to prepare a new RAP; the Defendant, however, reserves the right to contest the need for a new RAP and to present any other defenses it may have including, without limitation, the right to deny liability or responsibility for the preparation or implementation of the new RAP.

XI. COVENANTS NOT TO SUE

A. Covenants Not to Sue. In consideration of the actions that will be performed and the payments that will be made by the Defendant under the terms of this Consent Decree, and except as specifically provided for in this

Section and in Section XII (Reservation of Rights), the Plaintiffs covenant not to sue or to take administrative action against the Defendant, pursuant to Sections 106 and 107(a) of CERCLA, 42 U.S.C. §§ 9606 and 9607, Sections 3008(h), 3013 or 7003 of RCRA, 43 U.S.C. §§ 6928(b), 6934 or 6973, or H&SC §§ 25100, et seq, 25300, et seq., or any other federal or state statute or common law relating to:

(1) the Work,

(2) Work Oversight Costs, and/or

(3) Past Response Costs.

These covenants not to sue are conditioned upon the performance by ARC of all its obligations under this Consent Decree but shall take effect on the effective date of this Consent Decree, and shall continue so long as ARC complies with the terms of this Decree. These covenants not to sue shall become permanently binding upon the issuance of the Statement of Completion described in Subsection X.A (Satisfaction by ARC).

B. Defendant's Covenant Not to Sue. Defendant hereby covenants not to sue or assert any claims, causes of action or claims for reimbursement against the Plaintiffs arising out of any matters relating to the Site or this Consent Decree. Nothing in this Decree shall be construed to limit, impair, or prejudice any tort or governmental immunities available to Plaintiffs under applicable law for their oversight activities at the Site under this Decree.

XII. RESERVATIONS OF RIGHTS

A. Except as otherwise provided in this Consent Decree, the Defendant expressly reserves any and all rights, including, but not limited to, rights of contribution or indemnification for all costs, losses, liabilities and damages incurred in connection with the Site, or for complying with the requirements of this Consent Decree.

B. In the event DTSC initiates any legal proceedings against the Defendant for non-compliance with this Consent Decree, the Defendant shall not contest its obligation to comply with this Consent Decree in any motion brought by DTSC solely to enforce this Consent Decree; the Defendant, however, expressly reserves all other rights and defenses with respect to any such proceeding or any other cause of action or proceeding.

C. Nothing in this Consent Decree is intended or shall be construed to limit the rights of Plaintiffs or Defendant with respect to claims arising out of or relating to the deposit, release or disposal of hazardous substances at any location other than the Site subject to this Decree.

D. Nothing in this Consent Decree shall constitute or be construed as a release or covenant not to sue regarding any claim or cause of action against any person as defined in Section 101(21) of CERCLA or H&SC § 25319, other than Plaintiffs, and ARC and its parents, subsidiaries and current affiliates, including without limitation BP America, Inc., for any liability it may have arising out of or relating to the Site. DTSC retains all of its legal and equitable rights against all persons, except as otherwise provided in this Decree. The legal and equitable rights retained by DTSC include, but are not limited to, the right to compel any person, other than the Defendant, to take response actions for hazardous substance contamination at the Site and to seek reimbursement against such persons for any past, present or future costs incurred by DTSC with respect to the Site.

E. Limitations on Covenants Not to Sue. Notwithstanding any other provision of this Decree, DTSC reserves the right to assert, and any covenants not to sue in this Decree shall not apply with respect to, the following:

1. Any claim based on a failure by ARC to meet the obligations of this Consent Decree.

2. Claims based on the liability of ARC arising from the past, present, or future disposal of Waste Materials at disposal sites other than the Site.

3. Claims based on Defendant's disposal of any hazardous substances, pollutant, or contaminant at the Site in the future;

4. Claims based on liability for Waste Materials removed from the Site.

5. Claims based on future overt acts by Defendant that cause the exacerbation of the hazardous conditions existing at the Site.

6. Claims based on liability for any violations of federal or state law which occur during implementation of the Work.

7. Claims based on Defendant's acquisition of an ownership interest in the Site in the future.

8. Claims based on response, remedial or cleanup measures that are undertaken or costs that are incurred at the Site after the approval of the RAP, unless Defendant has completed such measures or incurred such costs with the approval of DTSC within the scope of this Consent Decree.

10. Claims based on the response actions undertaken or costs incurred in order to implement the RAP or any other legally appropriate future response or remedial action for the Site, unless Defendant has completed such actions or incurred such costs within the scope of this Consent Decree.

11. Claims based on damages to Natural Resources.

F. This Decree does not address any liability that the Defendant may have to implement any unperformed element of the remedy that is identified for the Site in the RAP. Notwithstanding any other provision of this Decree, DTSC expressly retains and reserves the right to institute proceedings

in this action or in a new action, or to take other administrative or judicial action, necessary to compel the Defendant and its parents, subsidiaries and affiliates, to:

1. implement any remedial, response or cleanup activity that is identified for the Site in the final RAP and that ARC has not implemented pursuant to this Decree;
2. implement any remedial or response action, other than the Work, where such action is necessary to protect human health or the environment.
3. implement any portion of the final remedy for the Site that ARC has not implemented pursuant to the terms of this Decree; or
4. pay any unrecovered costs that are not inconsistent with the NCP which are associated with (i) the implementation of the RAP or the final remedy for the Site or (ii) activities or costs that are beyond the scope of this Decree.

G. The parties recognize and acknowledge that the settlement embodied in this Decree is only a partial resolution of the claims raised in the Complaint. The Defendant hereby waives any defenses of res judicata, collateral estoppel, equitable estoppel, laches and claim-splitting based on the existence of this Decree, only with respect to DTSC's rights to pursue subsequent litigation regarding the alleged responsibility of the Defendant for any Site work and costs not covered by this Decree.

H. Except as provided in the Covenants Not to Sue set forth above, nothing in this Decree shall be deemed to limit the response authority of the Plaintiffs under H&SC § 25358.3 or under any other response authority.

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J. Except as otherwise provided in this Decree, Plaintiffs and Defendant expressly reserve all rights and defenses that they may have.

XIII. CONTRIBUTION PROTECTION

With regard to claims for contribution against Defendant for matters addressed in this Consent Decree, the Parties agree, and the Court finds as follows:

A. This Consent Decree constitutes a judicially approved settlement within the meaning of CERCLA § 113(f)(2) 42 U.S.C.§ 9613(f)(2).

B. This Consent Decree requires that Defendant pay certain costs and undertake certain response actions at the Site. Accordingly, except as provided in Section XII (Reservation of Rights), upon fulfillment of the obligations imposed upon them by this Decree, the Defendant will have resolved its liability to Plaintiffs for the following matters, as they are defined in this Decree:

1. Plaintiffs' Past Response Costs, paid and unpaid, pursuant to the terms specified in this Decree,
2. Plaintiffs' Work Oversight Costs, and
3. The Work.

C. The Defendant is entitled to the Contribution Protection provided by CERCLA § 113(f)(2), 42. U.S.C. Section 9613(f)(2), for the Matters Addressed in this Consent Decree.

D. Nothing in this Section shall limit the Plaintiffs' rights to seek cost recovery from, or take enforcement or other legal or administrative action against, any person or entity other than ARC, its parents, subsidiaries and current affiliates.

XIV. FORCE MAJEURE

ARC shall cause all Work to be performed within the time limits set forth in this Decree unless an extension is approved or performance is

delayed by events that constitute an event of force majeure. For purposes of this Decree, an event of force majeure is an event arising from circumstances beyond the control of ARC that delays performance of any obligation under this Decree, provided that ARC has undertaken all appropriate planning and prevention measures to avoid any foreseeable circumstances. Increases in cost of performing the Work specified in this Decree shall not be considered circumstances beyond the control of ARC. For purposes of this Decree, events which constitute a force majeure shall include, without limitation, events such as acts of God, war, civil commotion, unusually severe weather, labor difficulties, shortages of labor, materials or equipment, government moratorium, delays in obtaining necessary permits due to action or inaction by third parties, earthquake, fire, flood or other casualty. In addition, any unavoidable delay in obtaining the right of access for ARC to the Site or any off-Site area shall also constitute an event of force majeure. Delay caused by an event of force majeure shall be deemed not to be a violation of this Decree, and this delay shall not be counted in determining the time during which such work shall be completed, or such act performed, whether such time be designated by a fixed date, a fixed time or a reasonable time, and such time shall be deemed to be extended for the effective period of delay equal to the actual days lost attributable to the effect of the event of force majeure. ARC shall notify DTSC in writing immediately after the occurrence of the force majeure event. Such notification shall describe the anticipated length of the delay, the cause or causes of the delay, the measures taken and to be taken by ARC to minimize the delay and the timetable by which these measures will be implemented. If DTSC does not agree that the delay is attributable to a force majeure, then the matter may be subject to the dispute resolution procedures set forth in Section IX of this Decree (Dispute Resolution).

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XV. NO ADMISSION OF LIABILITY

The actions undertaken by ARC in accordance with this Consent Decree do not constitute an admission of liability for any purpose by Defendant, nor do they constitute a waiver of any rights or claims that ARC may have against any other party or person, except as otherwise provided in this Consent Decree with respect to claims against the Plaintiffs.

XVI. CLAIMS AGAINST OTHER PERSONS

Nothing in this Consent Decree shall in any way constitute a waiver or release of any claims and rights that Plaintiffs or the Defendant have or may have against any potentially responsible party for the Site, and Plaintiffs and Defendant reserve any and all rights they have or may have against any prior owner and/or operators of the Site, and/or any other potentially responsible parties.

XV. FUTURE SETTLEMENTS

DTSC agrees that it will notify ARC of negotiations with any other party that is potentially liable for the cleanup of the contamination at the Site and that it will permit ARC to participate in such negotiations to the extent that the negotiations may lead to a proposed consent decree or settlement agreement that may adversely affect the rights of ARC to recover response costs or obtain contribution for costs that ARC incurs pursuant to this Decree. As part of this process, DTSC nonetheless reserves the right to meet and negotiate in confidence with any other potentially responsible party.

Plaintiffs and ARC agree that any funds received by Plaintiffs from any other persons as a result of any administrative consent order, consent decree, or similar settlement with respect to the Site, shall be used, at DTSC's discretion, only for the following purposes: (1) to pay for any past or future costs that DTSC has incurred or will incur with respect to the Site, including, without limitation, any response, removal, remedial or oversight costs; (2) to

pay for attorneys fees and costs of litigation that DTSC has incurred or may incur with respect to the Site; (3) to fund cleanup work needed at the Site that has not been successfully undertaken by ARC, and/or (4) to fund, to the extent permitted by law, an interest-bearing, site-specific account, which shall be used to pay for cleanup work at the Site that is not inconsistent with the NCP, including, without limitation, the implementation of the final remedy for the Site. Without limiting DTSC's discretion to determine the allocation of future settlement proceeds, it is expressly understood that DTSC retains the right to give priority to the payment of its own unpaid Past Response Costs when allocating any such settlement proceeds.

XVIII. FULL AND COMPLETE DECREE

This Consent Decree supersedes any and all prior agreements, either oral or in writing, between Plaintiffs, on the one hand, and the Defendant, on the other hand, with respect to the Site. This Decree contains all of the covenants and agreements between Plaintiffs on the one hand and the Defendant on the other, with respect to the Site, and Plaintiffs and the Defendant acknowledge that no representation, inducement, promise or agreement has been made by or on behalf of any of the Parties except those covenants and agreements embodied in this Decree. No agreement, statement or promise not contained in this Decree shall be valid or binding as between Plaintiffs on the one hand, and Defendant on the other, unless the agreement is in writing, signed by the party to be bound and, where appropriate, approved by the Court.

XIX. PUBLIC COMMENT

This Decree shall be subject to a public comment period of not less than 30 days. Notice of the proposed Decree shall be published in the California Regulatory Notice Register. If DTSC receives comments that disclose facts or considerations indicating that this Decree is inappropriate,

improper or inadequate, then DTSC may (i) withdraw its consent to this Decree, or (ii) seek to modify this Decree with the consent of the Defendants.

SCANNED

XX. NOTICE TO THE UNITED STATES AND US E.P.A.

Within 10 days of the day that this Decree is signed by the Parties, DTSC will serve copies of this Decree and the Complaint on the Administrator of U.S. EPA, the Attorney General of the United States and the offices of U.S.EPA, Region IX.

XXI. EFFECTIVE DATE

The Effective Date of this Decree is the date upon which the Court enters an order approving this Decree.

XXII. RETENTION OF JURISDICTION

Notwithstanding any dismissal of this action, this Court retains jurisdiction over both the subject matter of and the parties to this Decree for the purposes of enabling any of the Parties to apply to this Court at any time for such further order or relief as may be necessary or appropriate for (1) Dispute Resolution in accordance with Section IX of this Decree; (2) to effectuate the terms of this Decree or (3) to enforce compliance with this Decree. In the event this action is dismissed, the Court may reopen this matter in order to effectuate any of the terms of this Decree.

XXIII. MISCELLANEOUS

A. Each undersigned representative of DTSC and the Defendant certifies that he or she is fully authorized to enter into the terms and conditions of this Decree and to execute and legally bind such Party to this Decree.

B. This Decree shall be binding upon, and inure to the benefit of (1) ARC and its corporate predecessors, successors, current affiliates and assignees, and (2) DTSC and any successor agencies of the State of California, including any agencies that succeed to (i) DTSC's authority pursuant to the

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HSAA, or (ii) DTSC's authority as lead agency of the State of California with respect to the Site.

C. This Decree is entered into and shall be construed and interpreted in accordance with the laws of the State of California.

D. ARC shall identify, on the attached signature page, the name and address of an agent who is authorized to receive notice on behalf of the ARC with respect to all matters arising under or relating to this Decree. ARC hereby agrees to receive notice in that manner.

DATED: November 2, 2004

United States District Judge

SCANNED

FOR PLAINTIFFS, THE CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCE CONTROL AND THE STATE ACCOUNTS:

SCANNED

Dated June 21, 2004

Thomas Cota
Chief, Southern California Cleanup Operations Branch
Cypress Office
Department of Toxic Substances Control

FOR DEFENDANT, ATLANTIC RICHFIELD COMPANY:

Dated: June 16, 2004

By: Mark E. Bollard

Its: MANAGER - U.S. WEST COAST Region

Name and Address of person authorized to receive notice on behalf of ARC pursuant to this Decree:

Mike McAnulty / Deborah Felt
6 Centerpointe Dr.
La Palma, CA 90623

Exhibit "A"

SCANNED

Legal Description

Legal Description
Gardena Sumps Facility Property

SCANNED

1. Cooper Property: Los Angeles County Parcel Number 6106-036-034. In the McDonald Tract of the San Pedro Rancho. 3.03 acres, less a 0.04 acre slope easement, for a net lot size of 2.99 acres. Commencing 666.86 feet east from the northwest corner of Lot 101, going east for 345.76 feet, with an approximate 0.04 acre slope easement for approximately the last half of this distance. At the end of that easement, going south and 1° 40' to the west for 412.68 feet, west 283.72 feet, north 100 feet, west 37.51 feet, and north 310.38 feet.

2. Haack Property: Los Angeles County Parcel Number 6106-036-035. 1450 West Artesia Boulevard, Gardena, California. McDonald Tract of the San Pedro Rancho. 2.58 more or less acres. Commencing east 304.37 feet and south 25 feet from the northwest corner of Lot 101, then south 310.38 feet, then east 362.49 feet, then north to southern line of Artesia Boulevard, then west thereon 362.49 feet to the beginning part of Lot 101.

Exhibit "B"

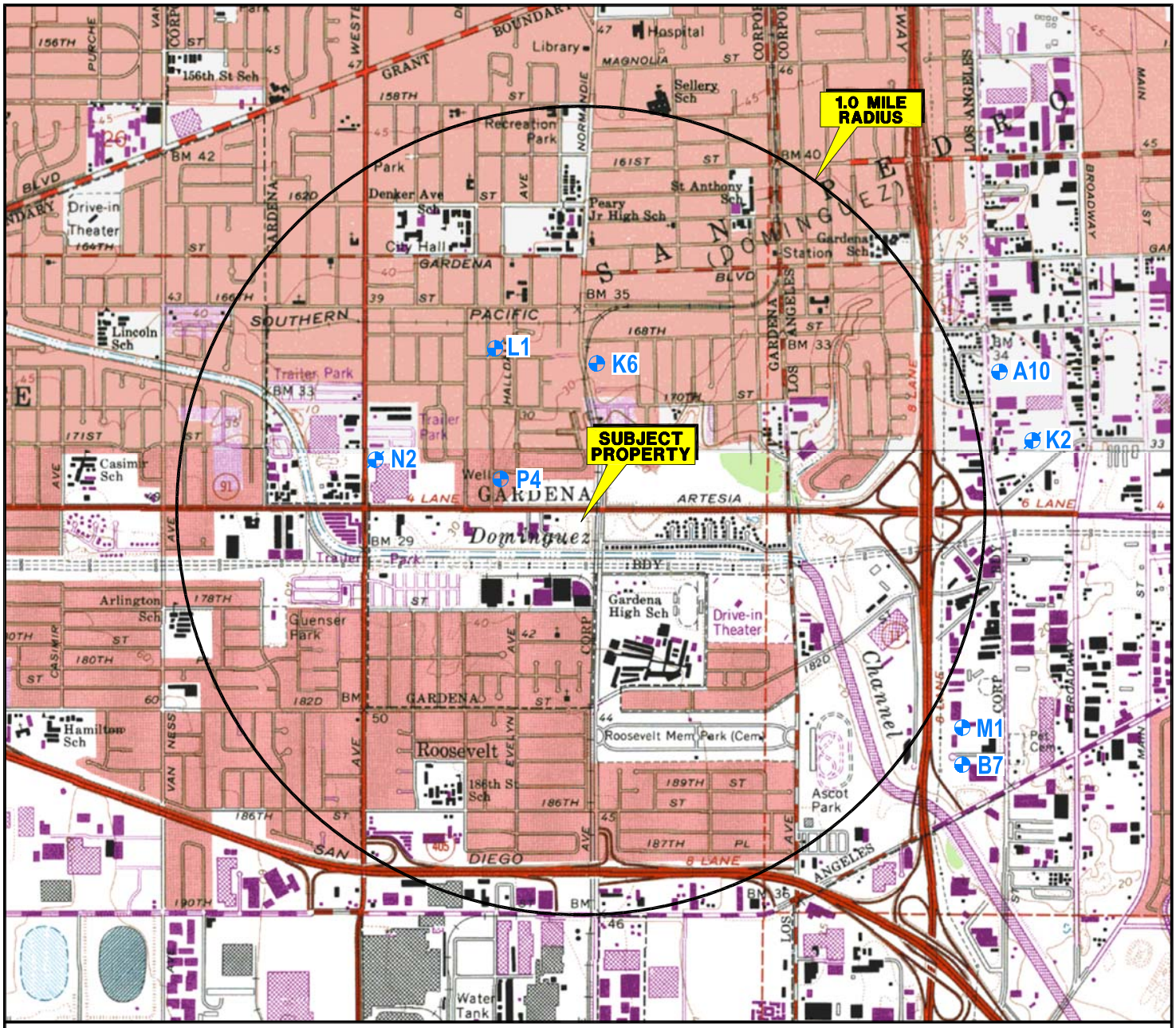
SCANNED

Summary of Estimated Work Oversight Costs

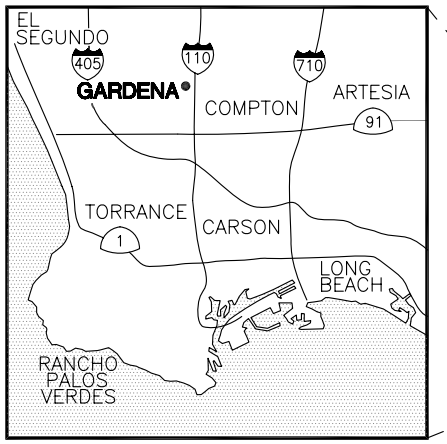
Exhibit "B"
Estimate of Work Oversight Costs

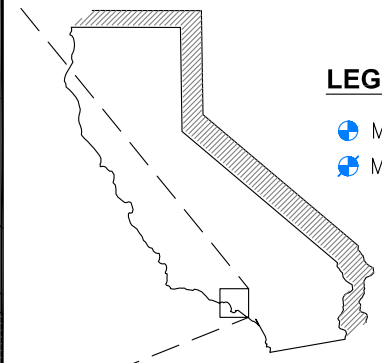
Title	Branch Chief	Project Manager	Supervisor	Toxicology	Geology	Industrial Hygiene	HQ Engring	Public Particip	HQ CEQA	Legal	Clerical
Classification	Sup HSS II	HSS	HSSI	Staff Toxicologist	Eng Geol.	Assoc IH	HSE	PPS	AEP	Staff Counsel	WPT
TASK: Consent Order Prep./Negotiation	40	40	40							40	
Scoping Documents: HSP/SAP/QAP		20	10	20	20						
Review and comment on existing data and Preliminary Endangerment Assessment (PEA) equivalent documents and provide general project oversight.		40	10								10
Remedial Investigation/ Feasibility Study (RI/FS)											
Workplan	4	40	16	10	50	10					
Implementation/Treat. Study		60	20		60		40				
Report	4	60	16	10	80		20				
Risk Assessment		12	6	60							
Public Participation								60			
CEQA	4	40	16						40		
Removal Action Workplan											
Implement Removal Action											
Design											
Remedial Action Plan (RAP)	16	40	30	20	36		8	40		10	10
Certification											
Deed Restriction											
Operation & Maint											
Total No. Hours/Class	68	352	164	120	246	10	68	100	40	50	20
Hourly Rate/Class	144	108	125	140	114	104	111	101	101	144	56
Cost/Class	$9,792	$38,016	$20,500	$16,800	$28,044	$1,040	$7,548	$10,100	$4,040	$7,200	$1,120
Grand Total Cost	$144,200										

FIGURES



SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC MAP, TORRANCE QUADRANGLE, 1964
PHOTOREVISED 1981
INGLEWOOD QUADRANGLE, 1964
PHOTOREVISED 1981





LEGEND

- MUNICIPAL SUPPLY WELL–ACTIVE
- MUNICIPAL SUPPLY WELL–INACTIVE

N

0 2000 4000

APPROXIMATE SCALE (FEET)

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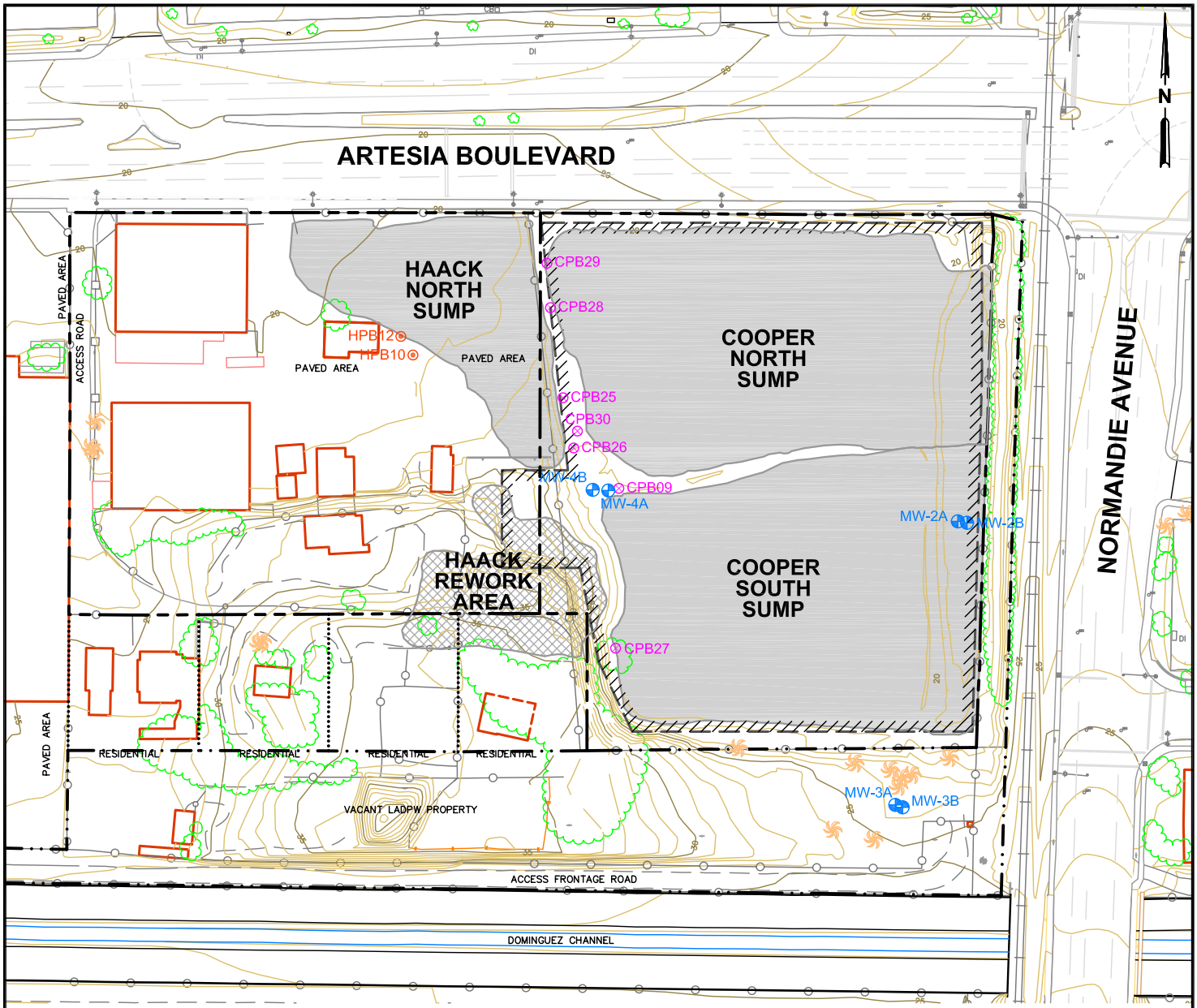
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

SITE LOCATION MAP WITH WELLS IDENTIFED WITHIN A ONE-MILE RADIUS

FIGURE: 1

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16.3236	R. Roman	S. Montrose	P. Kinney	05/08/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS-RIB_SLMR.dwg|troman|Jul 23, 2008 at 13:55|Layout: SLMR_FIG1



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION OF HAACK REWORK AREA
- MW-4B — CLUSTER WELLS (A&B)
- CPB29 — COOPER PROPERTY SOIL/SLUDGE BORINGS
- HPB12 — HACK PROPERTY SOIL/SLUDGE BORINGS

GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.

0 120 240

APPROXIMATE SCALE (FEET)

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GARDENA SUMPS
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Gardena, CA

LOCATIONS OF SELECTED SITE FEATURES, BORINGS AND MONITORING WELLS

FIGURE: **2A**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.06.3236	R. Roman	G. Maurath	P. Kinney	11/26/07

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\GS-RI_FIG2A.dwg|troman|Aug 20, 2008 at 7:16|Layout: FIG2A

ARTESIA BOULEVARD

NORMANDIE AVENUE

PAVED AREA

PAVED AREA

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

VACANT LADPW PROPERTY

ACCESS FRONTAGE ROAD

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- CHAIN–LINK FENCE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY

0 40 80

APPROXIMATE SCALE (FEET)

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SITE MAP WITH AERIAL PHOTOGRAPHY AND TOPOGRAPHY

FIGURE: **2B**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	06/20/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\GS-RI_FIG2BC.dwg|troman|Aug 01, 2008 at 8:20|Layout: FIG2B

ARTESIA BOULEVARD

NORMANDIE AVENUE

W. CASSIDY ST

ACCESS FRONTAGE ROAD

DOMINGUEZ CHANNEL

PAVED AREA

ACCESS ROAD

VACANT LADPW PROPERTY

RESIDENTIAL

SS-4 ⊠ S3 ⊖ SS-3 ⊠ S2 ⊖ SS-2 ⊠ S1 ⊖ SS-1 ⊠

GS-A3 GS-A4 GS-A1 GS-A2 GS-D1 GS-D2 GS-D3 GS-D4 GS-B1 GS-B2 GS-B3 GS-B4 GS-C1 GS-C2 GS-C3 GS-C4

GS1 GS2 GS3 GS4

JH01 JH02 JH03 JH04 JH05 JH06 JH07

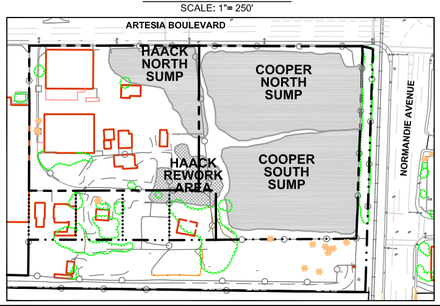
SUR-1 ⊠

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION OF HAACK REWORK AREA
- GS-B3 ◑ SURFACE SOIL SAMPLES (DTSC, 11/94 REPORT)
- SUR-1 ⊠ SURFACE SUMP SAMPLE (METCALF & EDDY, 1/92 REPORT)
- SS-2 ⊠ SURFACE SAMPLES (METCALF & EDDY, 1/92 REPORT)
- S2 ⊖ SOIL SAMPLE (ECOLOGY & ENVIRONMENT, 12/87 REPORT)
- GS-2 ◑ SURFACE SOIL SAMPLES (ECOLOGY & ENVIRONMENT, 07/82 REPORT)
- JH06 ◑ SURFACE SOIL SAMPLES (ECOLOGY & ENVIRONMENT, 07/82 REPORT)

SUMP LOCATIONS

SCALE: 1"= 250'



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE WERE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.

0 80 160

APPROXIMATE SCALE (FEET)

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PRE-RI SURFACE SAMPLE LOCATIONS (APPROXIMATE)

FIGURE: **3A**

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37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	04/28/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_PreRI.dwg|troman|Aug 18, 2008 at 9:12|Layout: FIG3A

DALTON
(APPROXIMATE LOCATION OF MUNICIPAL SUPPLY WELL)

MW-1A
MW-1B

CP-01
CP-02
CP-03
G-1
G-2
G-3

ARTESIA BOULEVARD

NORMANDIE AVENUE

W. CASSIDY ST

PAVED AREA
ACCESS ROAD
PAVED AREA
PAVED AREA
PAVED AREA
PAVED AREA

B-2
B-1
B-3A
B-3 [2.5]
B-4 [4.5]
HA-1 [2.0]
B-5
B-10 [12]
[3.0] EE-1
EE-2 [3.3]
B-11 [6.5]
EE-5 [>3.3]
S-1 [>7.5]
[>7.5] S-2
EE-6 [>0.7]
CP-04
B-9 [4.5]
CP-11
B-8 [2]
[2.5] HA-2
B-7
MW-4B
MW-4A
EE-4 [>3.0]
MW-2A
MW-2B
CP-05
CP-12
B-14
B-13
B-12 [1]
B-15 B-16 [1.5]
[3] B-6
B-17 [4.5]
EE-3 [>3.0]
S-3 [3.5]
S-4 [4.0]
S-5 [>3.0]
CP-06

RESIDENTIAL
RESIDENTIAL
RESIDENTIAL
RESIDENTIAL

VACANT LADPW PROPERTY

G-4
MW-3A
MW-3B
CP-07

ACCESS FRONTAGE ROAD
CP-10
ACCESS FRONTAGE ROAD
CP-09
CP-08

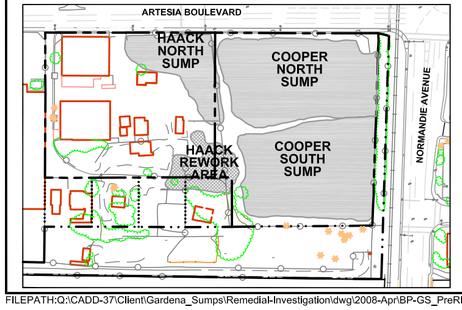
DOMINGUEZ CHANNEL
DOMINGUEZ CHANNEL

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 EPA GROUNDWATER MONITORING WELL
- MW-2A,B CLUSTER WELLS (A&B)
- G-2 ABANDONED EPA GROUNDWATER MONITORING WELL (ECOLOGY & ENVIRONMENT, 10/86 REPORT)
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION OF HAACK REWORK AREA
- B-8 SOIL BORING (DTSC, 11/94 REPORT)
- CP-07 CONE PENETROMETER BORING (URS, 11/94 REPORT)
- HA-1 HAND AUGER BORINGS (METCALF & EDDY 1/92 REPORT)
- S-3 SUMP SAMPLES (METCALF & EDDY, 1/92 REPORT)
- EE-4 SOIL BORING (ECOLOGY & ENVIRONMENT, 12/87 REPORT)
- [#.#] ESTIMATED TOTAL SLUDGE THICKNESS IN FEET

SUMP LOCATIONS

SCALE: 1"= 250'



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE WERE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.

0 80 160
APPROXIMATE SCALE (FEET)

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PRE-RI SOIL BORING LOCATIONS (APPROXIMATE) AND LOCATIONS OF USEPA MONITORING WELLS

FIGURE: **3B**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.06.3236	R. Roman	G. Maurath	P. Kinney	04/29/08

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SOUTH DALTON AVENUE

ARTESIA BOULEVARD

NORMANDIE AVENUE

W. CASSI

PAVED AREA

ACCESS ROAD

PAVED AREA

PAVED AREA

PAVED AREA

PAVED AREA

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

VACANT LADPW PROPERTY

ACCESS FRONTAGE ROAD

ACCESS FRONTAGE ROAD

DOMINGUEZ CHANNEL

CB

CB

DI

DI

DI

DI

2.00 3.00 4.00 5.00 6.00 7.00 8.00 9.00 10.00

10.00 8.00 9.00 8.00 7.00 6.00 5.00 4.00

4.00 5.00 6.00 5.00 4.00 3.00 8.00 9.00 10.00 11.00 9.00 7.00 6.00 7.00 5.00 4.00 4.00 4.00 5.00 6.00 7.00 6.00 5.00 4.00

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION OF HAACK REWORK AREA
- CONTOUR (FEET) DEPTH TO BOTTOM OF SLUDGE ESTIMATED FROM GPR SURVEY

GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.

0 80 160

APPROXIMATE SCALE (FEET)

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GPR SURVEY OF COOPER PROPERTY

FIGURE: **4**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	06/20/08

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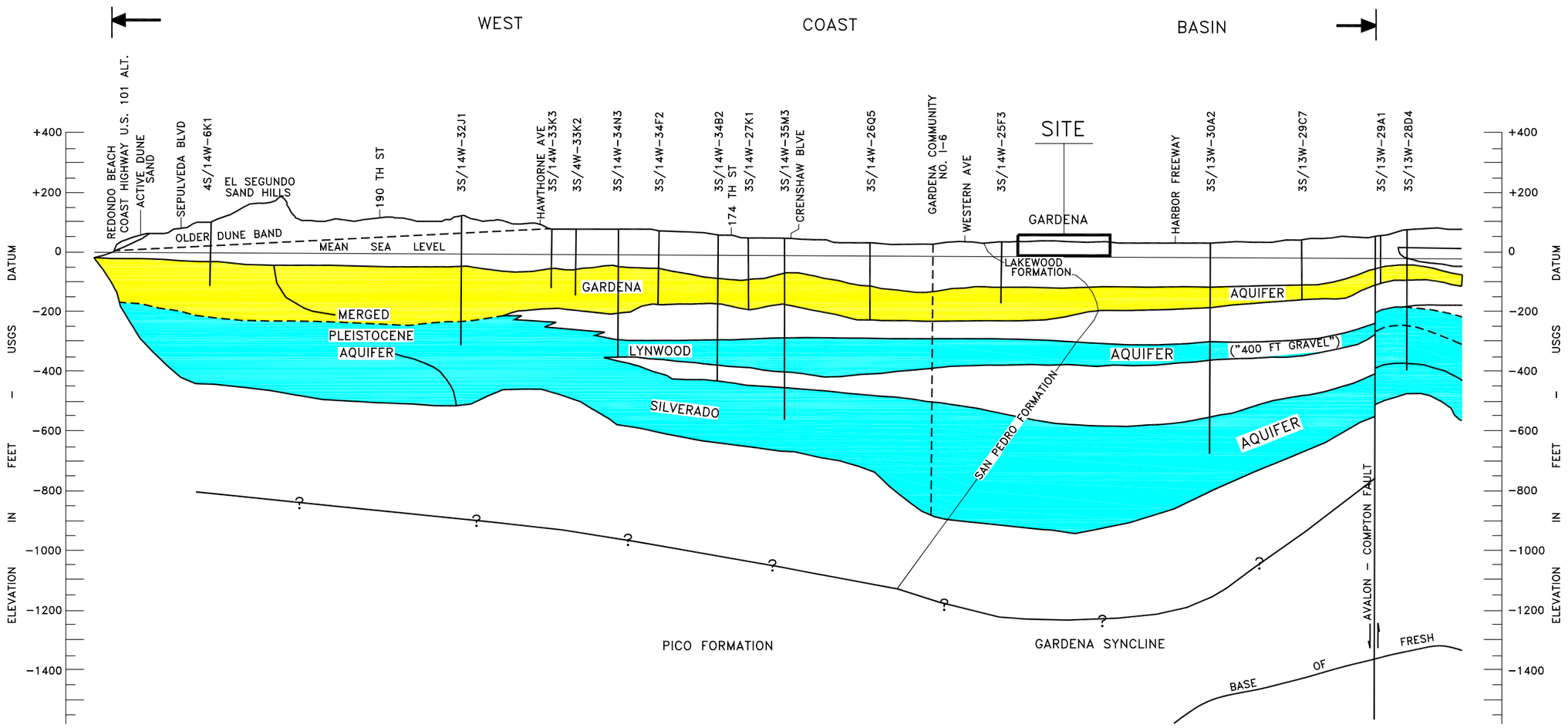
WEST **EAST**



EXPLANATION

Stipled areas represent water-bearing zones

Non-stipled areas represent zones with low groundwater production potential or deeper undifferentiated formations.

Source: California Department of Water Resources, 1961, Bulletin 104 Appendix A
Plate 6B – Idealized Geologic Sections C-C'C" and D-D'D" (Portions of Section D-D')

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REGIONAL HYDROGEOLOGY CROSS SECTION

FIGURE: **5**

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37BP.XB006.06.3236	R. Roman	G. Maurath	P. Kinney	01/25/07

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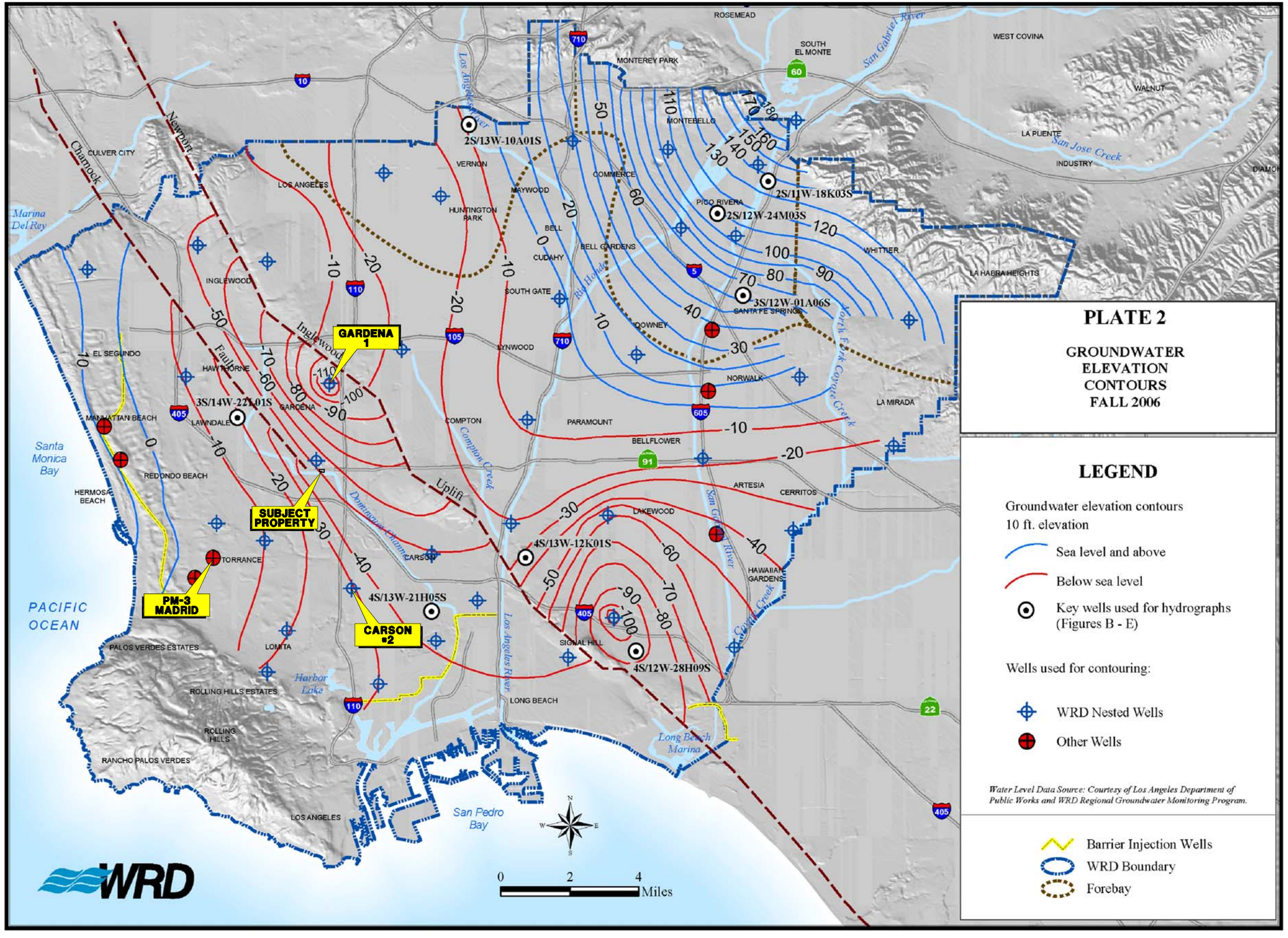

NOTE: CONTOURS REFLECT GROUNDWATER ELEVATIONS OF THE SILVERADO AQUIFER.

REFERENCE: REGIONAL GROUNDWATER MONITORING REPORT, WATER YEAR 2005-2006 WATER REPLENISHMENT DISTRICT, APRIL 2007.

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REGIONAL DEEP AQUIFER GROUNDWATER ELEVATION CONTOUR MAP (FALL 2006)

FIGURE: **6**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.06.3236	R. Roman	G. Maurath	P. Kinney	07/29/08

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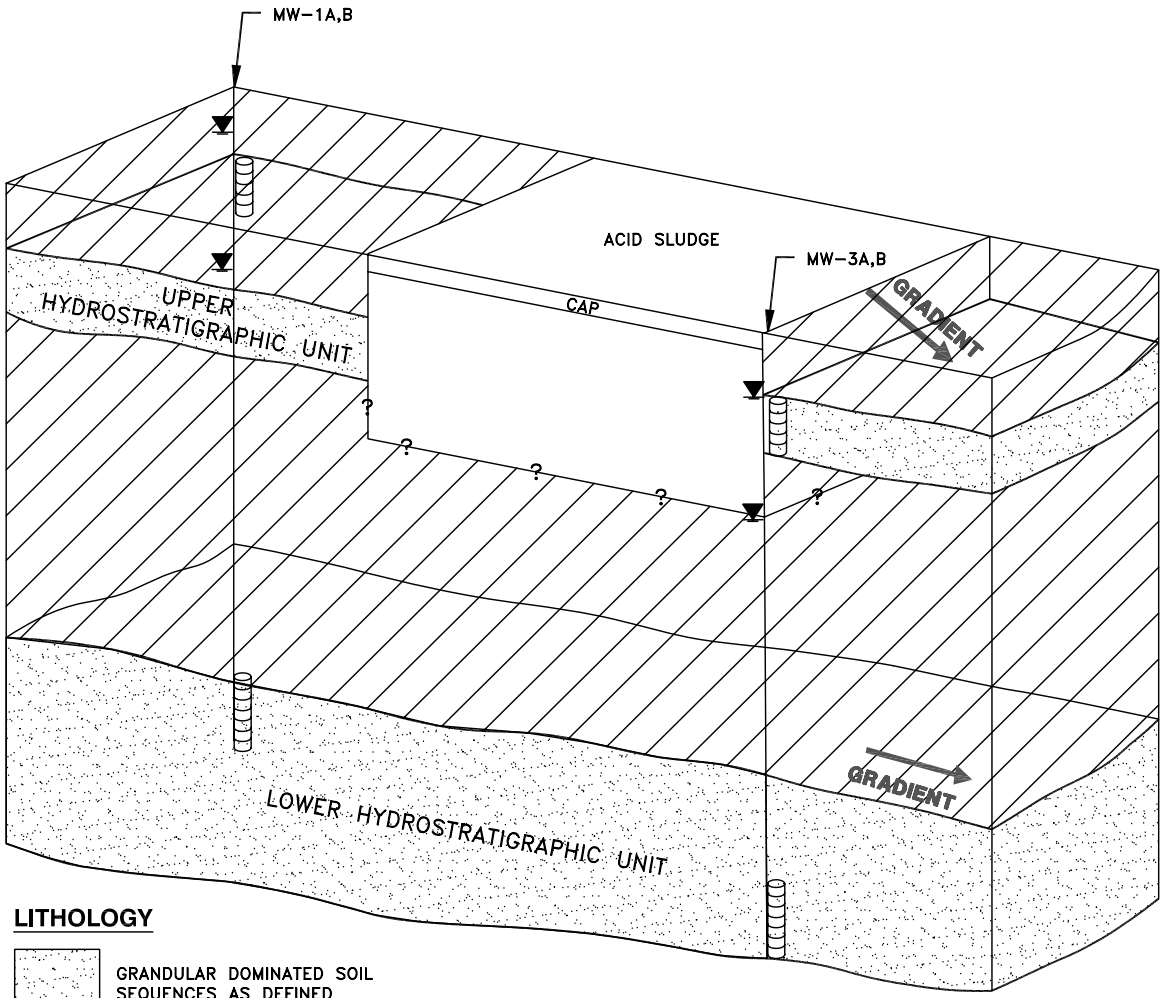

LITHOLOGY

GRANDULAR DOMINATED SOIL SEQUENCES AS DEFINED BY USCS

FINE GRAINED DOMINATED SOIL SEQUENCES AS DEFINED BY USCS

NOT TO SCALE

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PRELIMINARY CONCEPTUAL SITE MODEL BLOCK DIAGRAM

FIGURE: **7**

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37BP.XB006.06.3236	RLE/RAR	G. Maurath	P. Kinney	01/26/07

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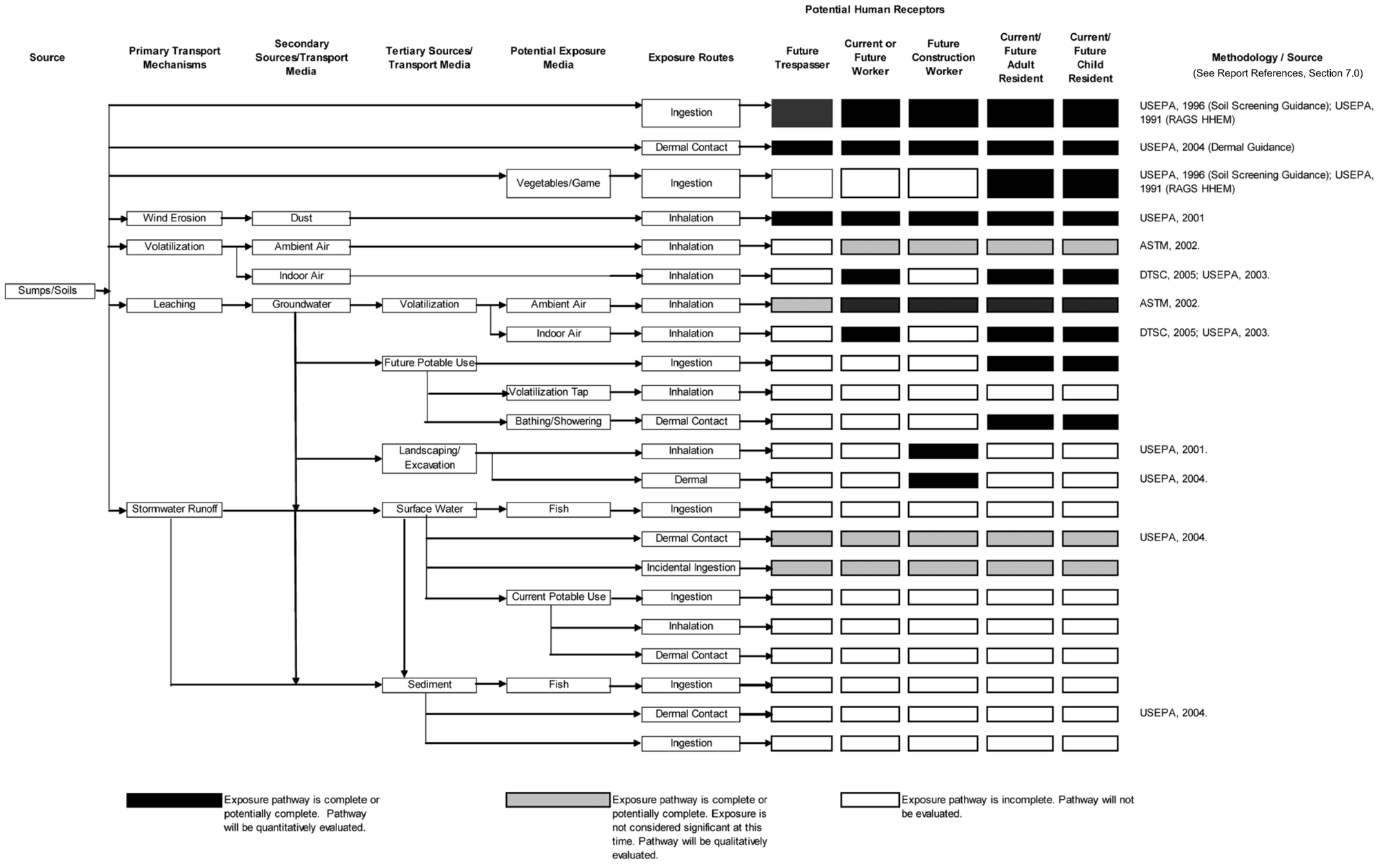

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CONCEPTUAL SITE MODEL FLOW DIAGRAM

FIGURE: **8**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
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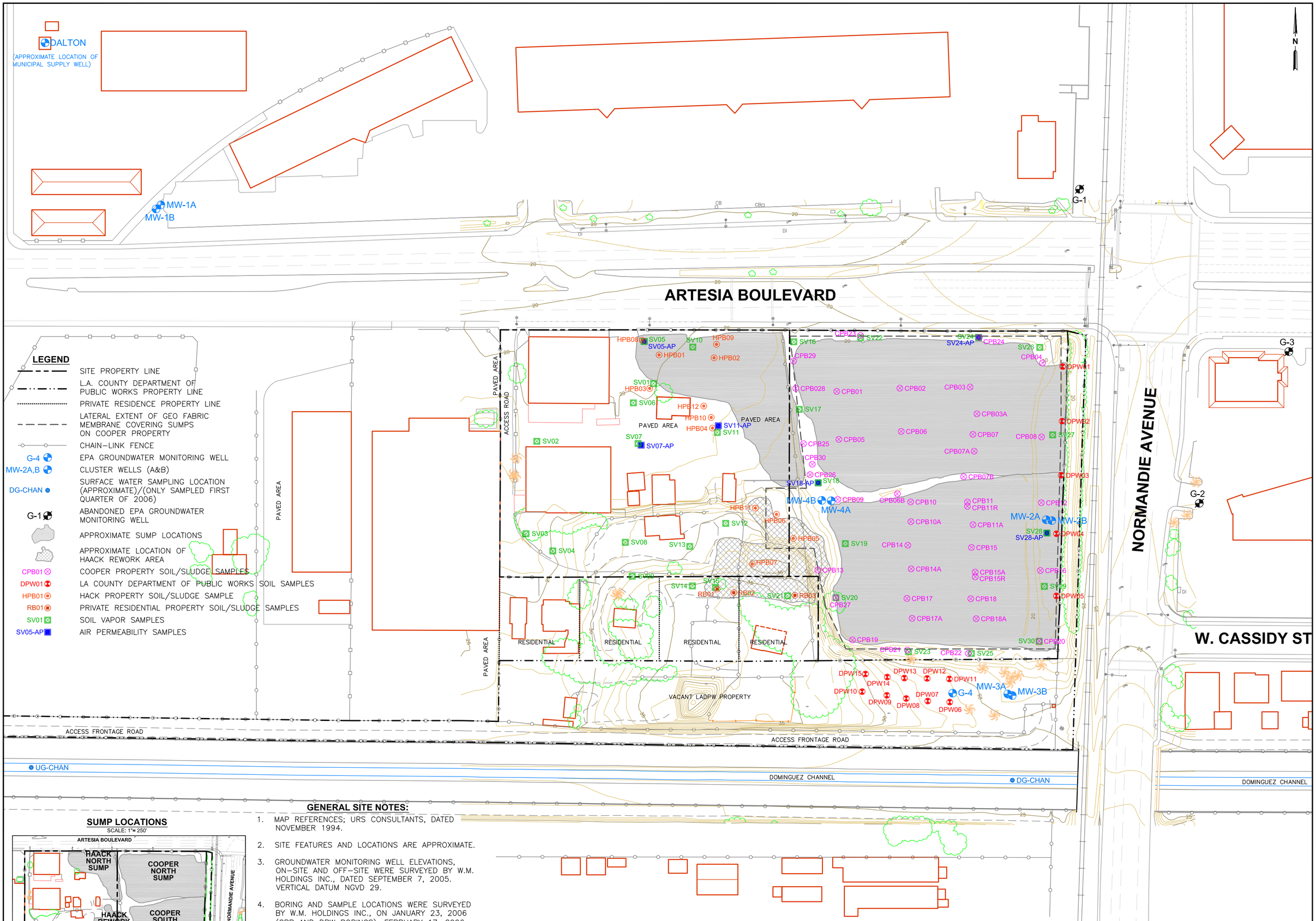
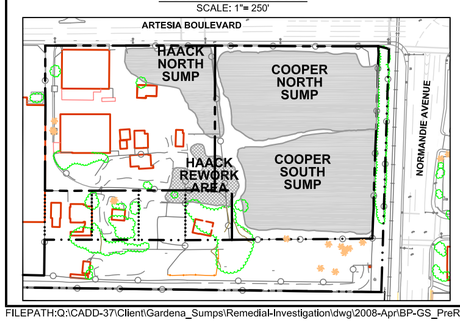
FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_CSMFD.dwg|troman|Aug 04, 2008 at 8:30|Layout: FIG8



SUMP LOCATIONS

SCALE: 1"= 250'



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON-SITE AND OFF-SITE WERE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.
4. BORING AND SAMPLE LOCATIONS WERE SURVEYED BY W.M. HOLDINGS INC., ON JANUARY 23, 2006 (CPB AND DPW BORINGS), FEBRUARY 17, 2006 (HPB AND RB BORINGS), AND MARCH 30, 2006 (SV BORINGS).
5. SUPPLIMENTAL BORING AND SAMPLE LOCATIONS; AND GROUND WATER MONITORING WELL LOCATIONS AND ELEVATIONS (MW-04A/B) WERE SURVEYED BY W.M. HOLDING INC. ON MARCH 1, 2007

0 80 160
APPROXIMATE SCALE (FEET)

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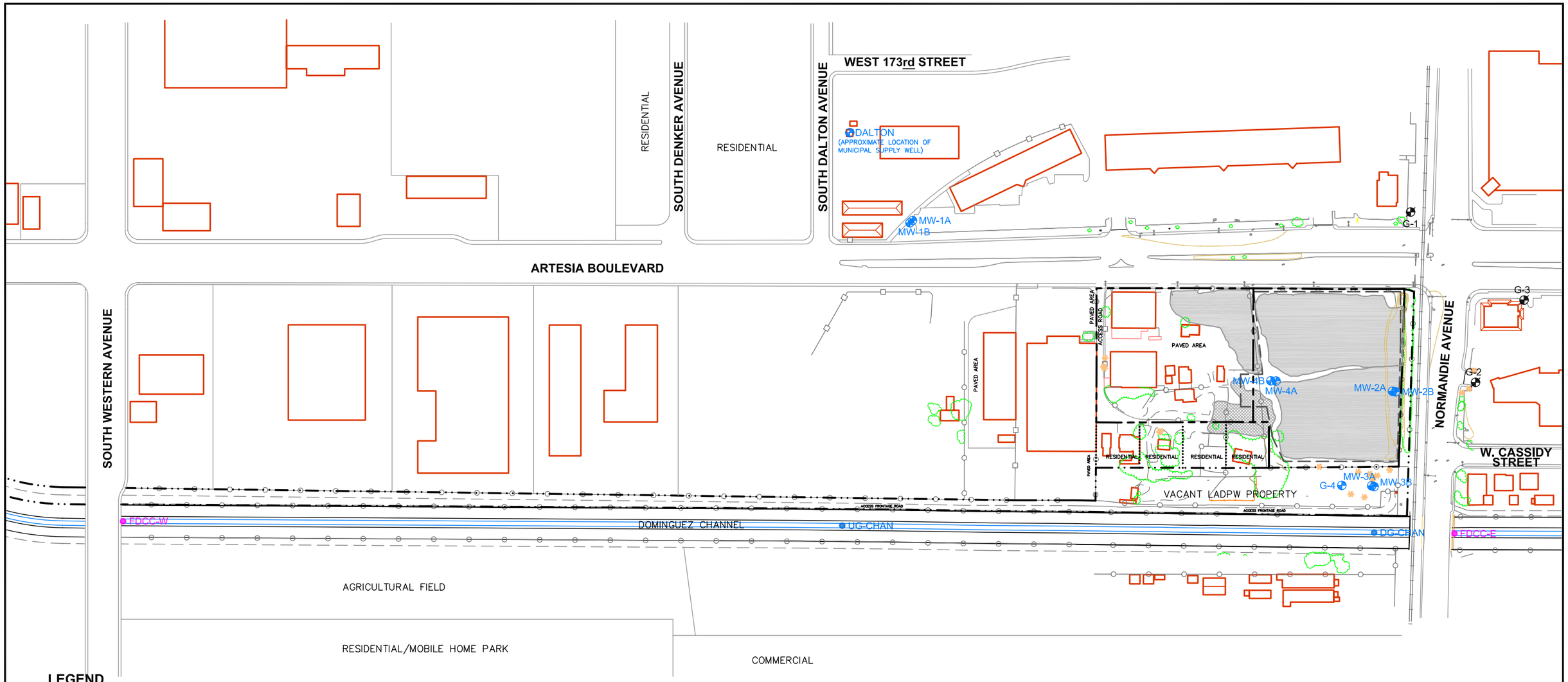
Gardena, CA

SITE MAP SHOWING LOCATIONS OF CURRENT INVESTIGATIVE CPT LOCATIONS, SOIL AND SUMP BORINGS, AND SOIL VAPOR TEST LOCATIONS

FIGURE: 9A

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	12/22/06

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_PreRI.dwg|troman|Aug 22, 2008 at 7:12|Layout: FIG9A



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-1A,B — CLUSTER WELLS (A&B)
- DG-CHAN — 2006 SURFACE WATER SAMPLING LOCATION
- FDCC-W — 2008 SURFACE WATER SAMPLING LOCATION
- G-1 — ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION OF HAACK REWORK AREA

N

0 225 450

APPROXIMATE SCALE (FEET)

GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE ARE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.

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FOR: Revised Draft - Report on 2006 Remedial Investigation GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA

SITE VICINITY MAP SHOWING GROUNDWATER MONITORING WELLS AND SURFACE WATER SAMPLE LOCATIONS

FIGURE: **9B**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.06.3236	R. Roman	G. Maurath	P. Kinney	06/19/08

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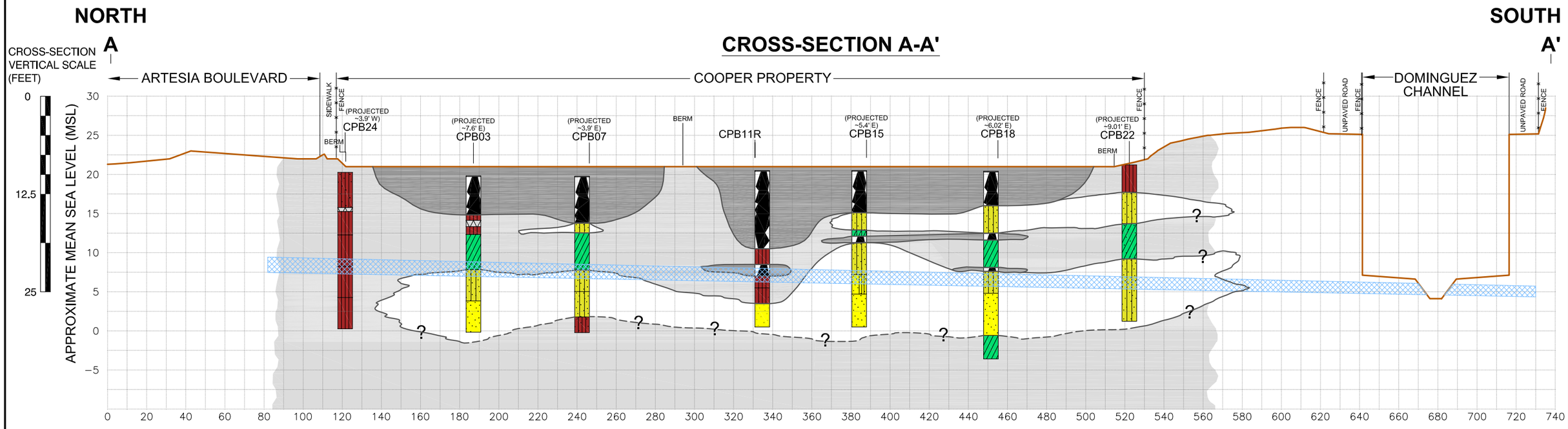
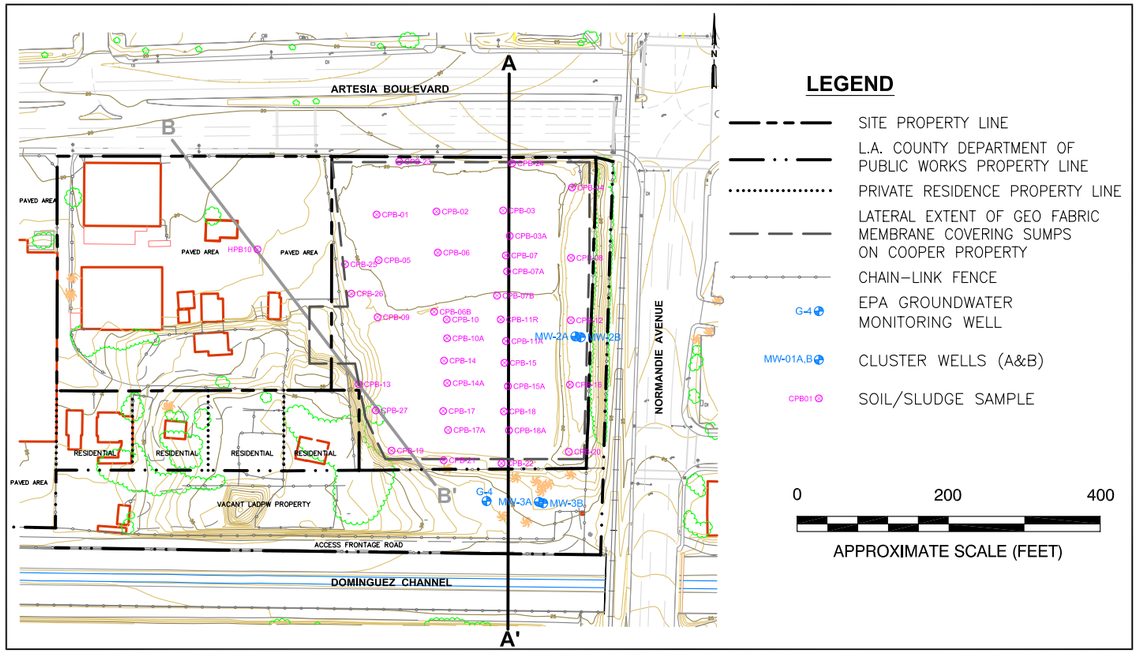
CROSS-SECTION A-A'



CROSS-SECTION INDEX MAP



LEGEND

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- CHAIN–LINK FENCE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-01A,B — CLUSTER WELLS (A&B)
- CPB01 — SOIL/SLUDGE SAMPLE

0 200 400

APPROXIMATE SCALE (FEET)

0 50 100

CROSS-SECTION HORIZONTAL SCALE (FEET)

CROSS-SECTION LEGEND

—— ? —— APPROXIMATE LITHOLOGIC CONTACT, QUERIED (?) WHERE UNCERTAIN

RANGE OF GROUNDWATER ELEVATION FROM JANUARY 2006 TO MARCH 2008

UPPER SATURATED ZONE

GENERALIZED HYDROSTRATIGRAPHY

- SLUDGE DEPOSITS
- LOW PERMEABILITY, VERY FINE TO FINE GRAINED CLAYEY SILT, LOCALIZED INTERFINGERING OF SILTY SAND LENSES
- VERY LOW PERMEABILITY, SILTY CLAY TO CLAY

LITHOLOGY GRAPHICS

- SLUDGE
- SAND
- SAND WITH SILT
- SILTY SAND
- SILT
- LOW PLASTICITY CLAY

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GEOLOGIC CROSS-SECTION A-A' (NORTH-SOUTH COOPER PROPERTY)

FIGURE: **10A**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	06/16/08

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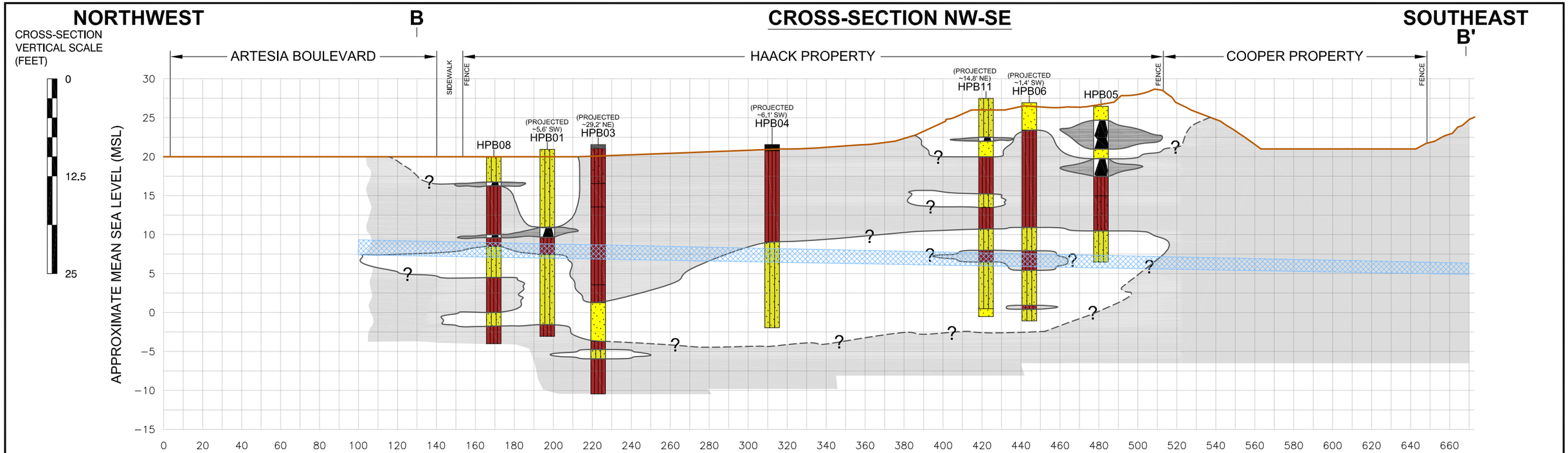
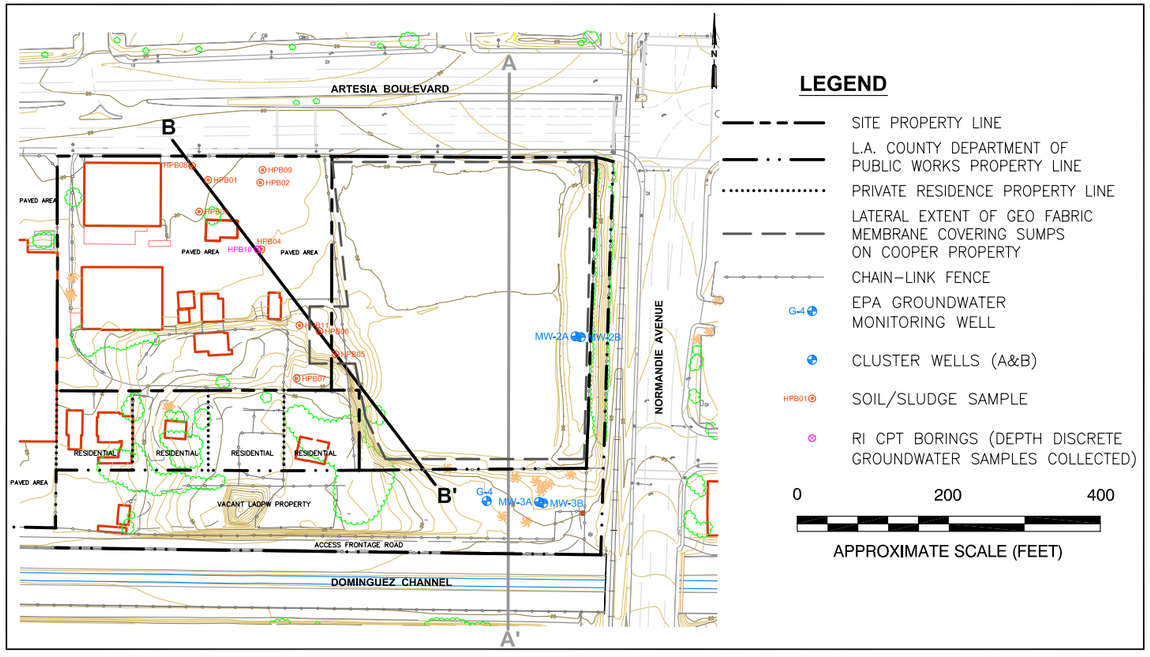


CROSS-SECTION INDEX MAP



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 EPA GROUNDWATER MONITORING WELL
- CLUSTER WELLS (A&B)
- HPB01 SOIL/SLUDGE SAMPLE
- RI CPT BORINGS (DEPTH DISCRETE GROUNDWATER SAMPLES COLLECTED)

0 200 400

APPROXIMATE SCALE (FEET)

0 50 100

CROSS-SECTION HORIZONTAL SCALE (FEET)

CROSS-SECTION LEGEND

? APPROXIMATE LITHOLOGIC CONTACT, QUERIED (?) WHERE UNCERTAIN

SEASONAL FLUCTUATION OF POTENTIOMETRIC SURFACE JANUARY 2006 TO MARCH 2008

UPPER SATURATED ZONE

GENERALIZED HYDROSTRATIGRAPHY

- SLUDGE DEPOSITS
- LOW PERMEABILITY, VERY FINE TO FINE GRAINED CLAYEY SILT, LOCALIZED INTERFINGERING OF SILTY SAND LENSES
- VERY LOW PERMEABILITY, SILTY CLAY TO CLAY

LITHOLOGY GRAPHICS

- SLUDGE
- SAND
- SAND WITH SILT
- SILTY SAND
- SILT
- LOW PLASTICITY CLAY

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GEOLOGIC CROSS-SECTION B-B' (NORTHWEST-SOUTHWEST HAACK PROPERTY)

FIGURE: **10B**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	06/16/08

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NORTH
C

SOUTH
C'

CROSS-SECTION VERTICAL SCALE (FEET)
0
25
50

APPROXIMATE MEAN SEA LEVEL (MSL)
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80

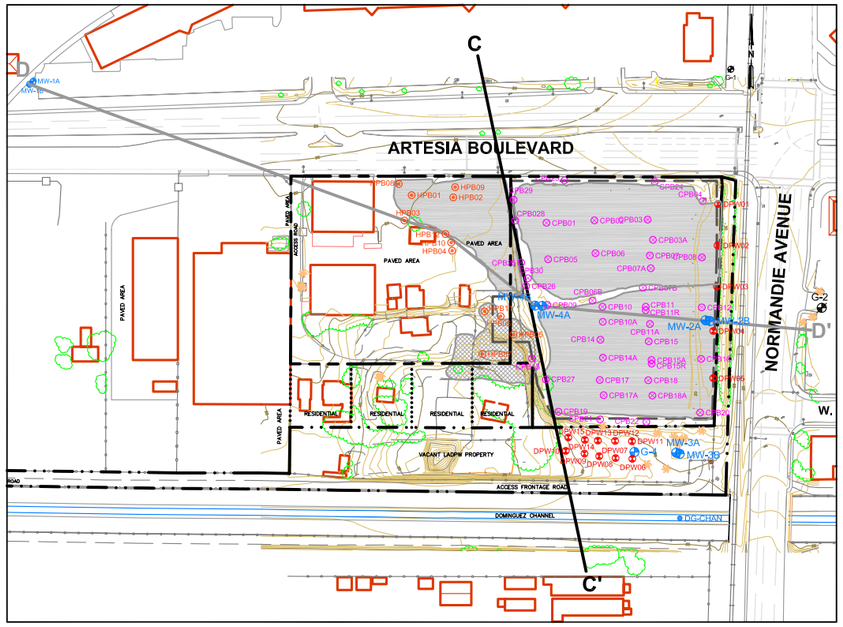
ARTESIA BOULEVARD
SIDEWALK
FENCE
COOPER PROPERTY
LADPW
FENCE
ACCESS FRONTAGE ROAD
DOMINGUEZ CHANNEL

(PROJECTED ~9.2' NE) CPB29
(PROJECTED ~4.8' NE) CPB28
CPB25
CONE PENETRATION TEST SOUNDINGS 0 SBT 12
(PROJECTED ~5.6' NE) CPB30
CPB26
CONE PENETRATION TEST SOUNDINGS 0 SBT 12
(PROJECTED ~7.8' NE) MW-4B
(PROJECTED ~19.4' NE) MW-04A
NOT LOGGED
(PROJECTED ~15' SW) CPB13
CPB27
CONE PENETRATION TEST SOUNDINGS 0 SBT 12
(PROJECTED ~9.5' NE) CPB19
(PROJECTED ~16.7' NE) DPW115
(PROJECTED ~8.0' NE) DPW10

UPPER HYDRAULIC ZONE A
LOWER HYDRAULIC ZONE B

0 50 100
CROSS-SECTION HORIZONTAL SCALE (FEET)

CROSS-SECTION INDEX MAP



0 250 500
INDEX MAP SCALE (FEET)

INDEX MAP LEGEND

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- CHAIN–LINK FENCE
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- MW-2A,B — CLUSTER WELLS (A&B)
- DG-CHAN — SURFACE WATER SAMPLING LOCATION (APPROXIMATE)/(ONLY SAMPLED FIRST QUARTER OF 2006)
- G-1 — ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION OF HAACK REWORK AREA
- CPB01 — COOPER PROPERTY SOIL/SLUDGE SAMPLES
- DPW01 — LA COUNTY DEPARTMENT OF PUBLIC WORKS SOIL SAMPLES
- HPB01 — HACK PROPERTY SOIL/SLUDGE SAMPLE

CROSS-SECTION LEGEND

- ? — APPROXIMATE LITHOLOGIC CONTACT, QUERIED (?) WHERE UNCERTAIN

RANGE OF GROUNDWATER ELEVATION FROM JANUARY 2006 TO MARCH 2008

- UPPER SATURATED ZONE
- LOWER SATURATED ZONE

GENERALIZED CPT SOIL BEHAVIOR TYPES (SBT)

- SLUDGE DEPOSITS
- SAND
- SILT
- CLAY
- STIFF FINE GRAINED

GENERALIZED HYDROSTRATIGRAPHY

- LOW PERMEABILITY, VERY FINE TO FINE GRAINED SAND TO SILTY SAND, LOCALIZED INTERFINGERING OF SILTY SAND LENSES
- VERY LOW PERMEABILITY, SILTY CLAY TO CLAY

LITHOLOGY GRAPHICS

- SLUDGE
- SAND
- SAND WITH SILT
- SILTY SAND
- SANDY SILT
- SILT
- ELASTIC SILT
- LOW PLASTICITY SILTY CLAY
- LOW PLASTICITY CLAY
- HIGH PLASTICITY CLAY
- LOW TO HIGH PLASTICITY CLAY

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GEOLOGIC CROSS-SECTION C - C'

FIGURE: **10C**

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CROSS-SECTION VERTICAL SCALE (FEET)

0 25 50

APPROXIMATE MEAN SEA LEVEL (MSL)

30 20 10 0 −10 −20 −30 −40 −50 −60 −70 −80

WEST
D

EAST
D'

ARTESIA BOULEVARD

SIDEWALK

HAACK PROPERTY

COOPER PROPERTY

NORMANDIE AVENUE

FENCE

LADPW PROPERTY

MW-1B

NOT LOGGED

HPB03

HPB12

(PROJECTED ~14.7' NE) HPB04

(PROJECTED ~0.6' SW) MW-04A

MW-04B

(PROJECTED ~2.9' SW) CPB09

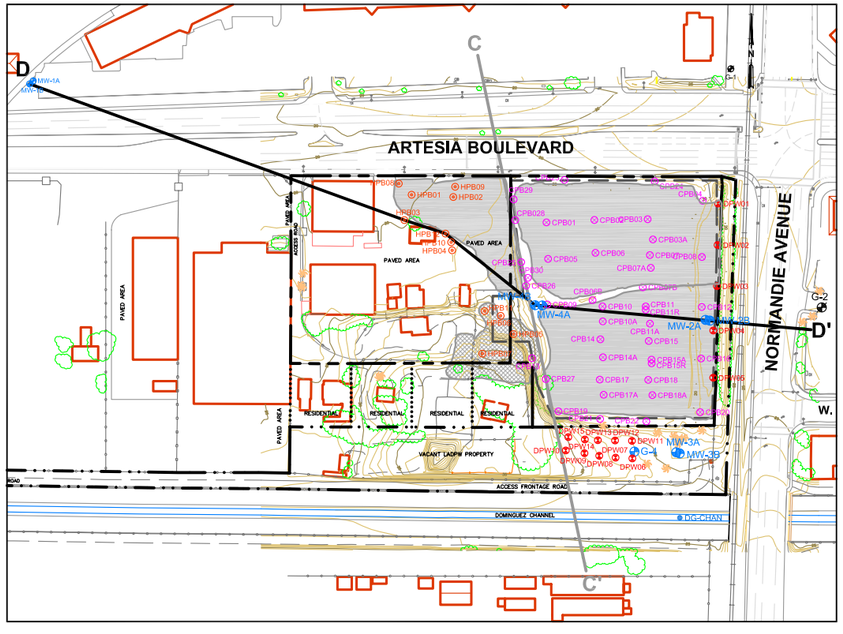
CONE PENETRATION TEST SOUNDINGS 0 SBT 12

(PROJECTED ~7.8' SW) CPB10

(PROJECTED ~8.6' SW) CPB11R

MW-2B

CROSS-SECTION INDEX MAP



0 250 500

INDEX MAP SCALE (FEET)

INDEX MAP LEGEND

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- CHAIN–LINK FENCE
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- MW-2A,B — CLUSTER WELLS (A&B)
- DG-CHAN — SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- G-1 — ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION OF HAACK REWORK AREA
- CPB01 — COOPER PROPERTY SOIL/SLUDGE SAMPLES
- DPW01 — LA COUNTY DEPARTMENT OF PUBLIC WORKS SOIL SAMPLES
- HPB01 — HACK PROPERTY SOIL/SLUDGE SAMPLE

0 100 200

CROSS-SECTION HORIZONTAL SCALE (FEET)

CROSS-SECTION LEGEND

? — APPROXIMATE LITHOLOGIC CONTACT, QUERIED (?) WHERE UNCERTAIN

GENERALIZED CPT SOIL BEHAVIOR TYPES (SBT)

- SLUDGE DEPOSITS
- SAND
- SILT
- CLAY
- STIFF FINE GRAINED

GENERALIZED HYDROSTRATIGRAPHY

- LOW PERMEABILITY, VERY FINE TO FINE GRAINED SAND TO SILTY SAND, LOCALIZED INTERFINGERING OF SILTY SAND LENSES
- VERY LOW PERMEABILITY, SILTY CLAY TO CLAY

LITHOLOGY GRAPHICS

- SLUDGE
- SAND
- SAND WITH SILT
- SILTY SAND
- SANDY SILT
- SILT
- ELASTIC SILT
- LOW PLASTICITY SILTY CLAY
- LOW PLASTICITY CLAY
- HIGH PLASTICITY CLAY
- LOW TO HIGH PLASTICITY CLAY

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GEOLOGIC CROSS-SECTION D - D'

FIGURE: **10D**

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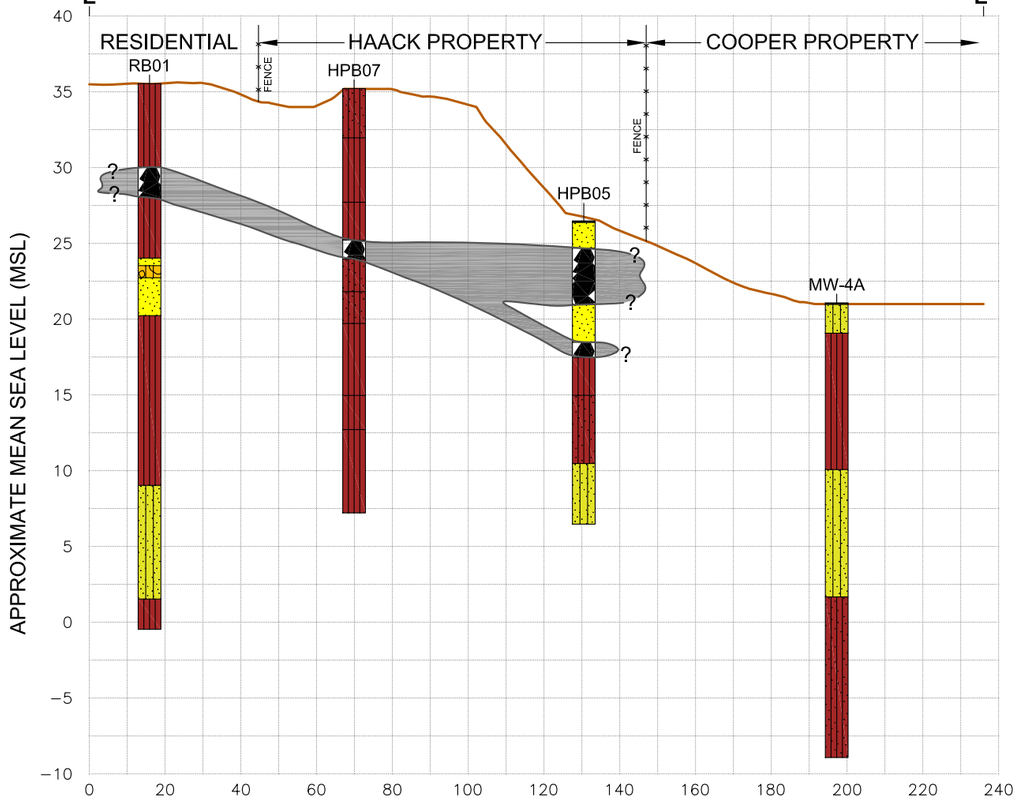
CROSS-SECTION E-E'

SOUTHWEST E — NORTHEAST E'



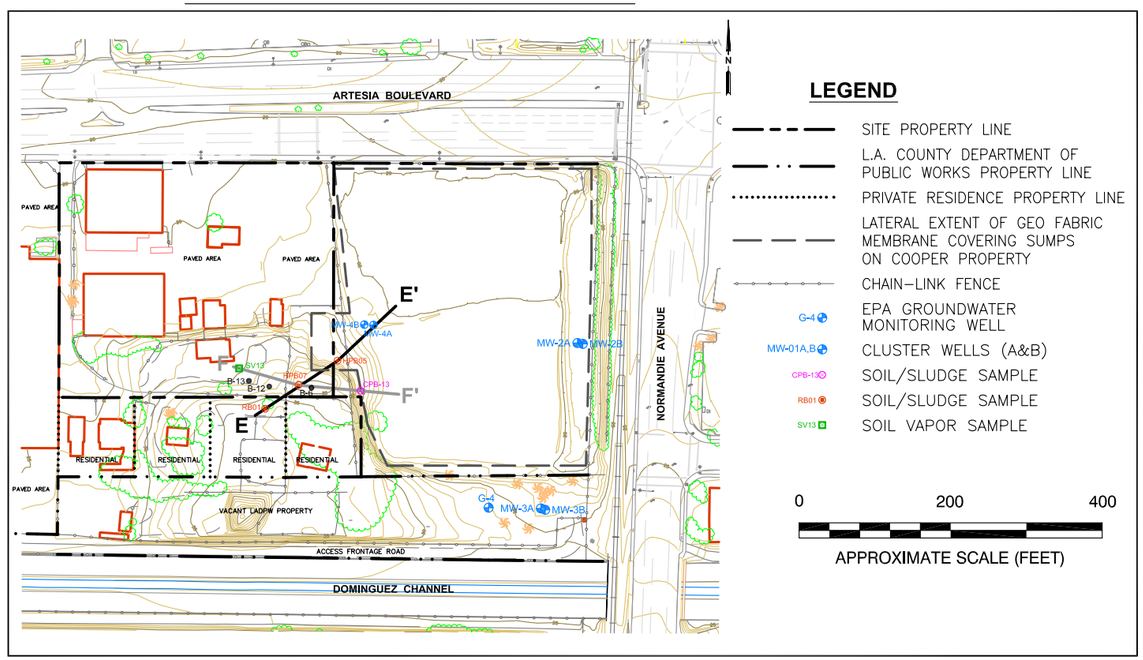
CROSS-SECTION VERTICAL SCALE (FEET)

0 — 10 — 20

0 — 40 — 80

CROSS-SECTION HORIZONTAL SCALE (FEET)

CROSS-SECTION INDEX MAP



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- MW-01A,B — CLUSTER WELLS (A&B)
- CPB-13 — SOIL/SLUDGE SAMPLE
- RB01 — SOIL/SLUDGE SAMPLE
- SV13 — SOIL VAPOR SAMPLE

0 — 200 — 400

APPROXIMATE SCALE (FEET)

CROSS-SECTION LEGEND

——?—— APPROXIMATE LITHOLOGIC CONTACT, QUERIED (?) WHERE UNCERTAIN

GENERALIZED HYDROSTRATIGRAPHY

- SLUDGE DEPOSITS
- LOW PERMEABILITY, VERY FINE TO FINE GRAINED CLAYEY SILT, LOCALIZED INTERFINGERING OF SILTY SAND LENSES
- VERY LOW PERMEABILITY, SILTY CLAY TO CLAY

LITHOLOGY GRAPHICS

- SLUDGE
- SILTY GRAVEL
- SAND
- SAND WITH SILT
- SILTY SAND
- SILT
- LOW PLASTICITY CLAY

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SLUDGE/GEOLOGIC CROSS-SECTION E-E' (SOUTHWEST-NORTHEAST) HAACK REWORK AREA

FIGURE: **10E**

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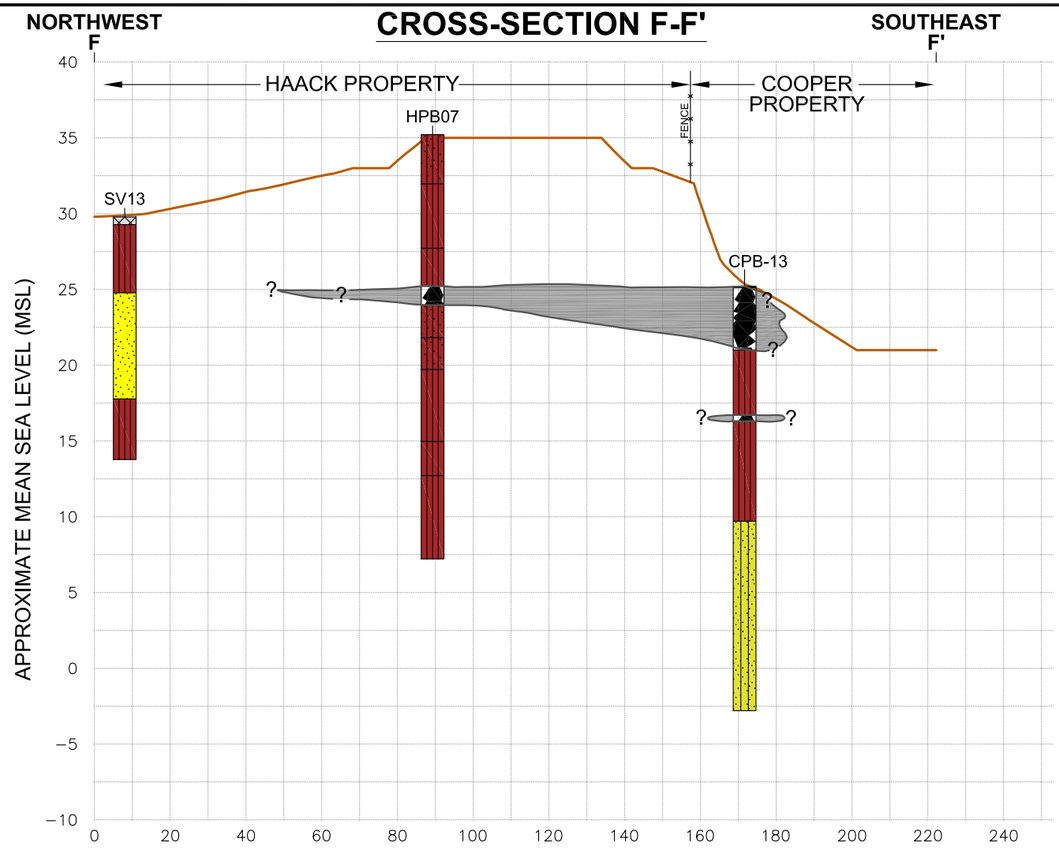
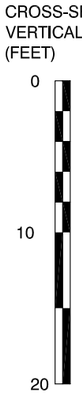
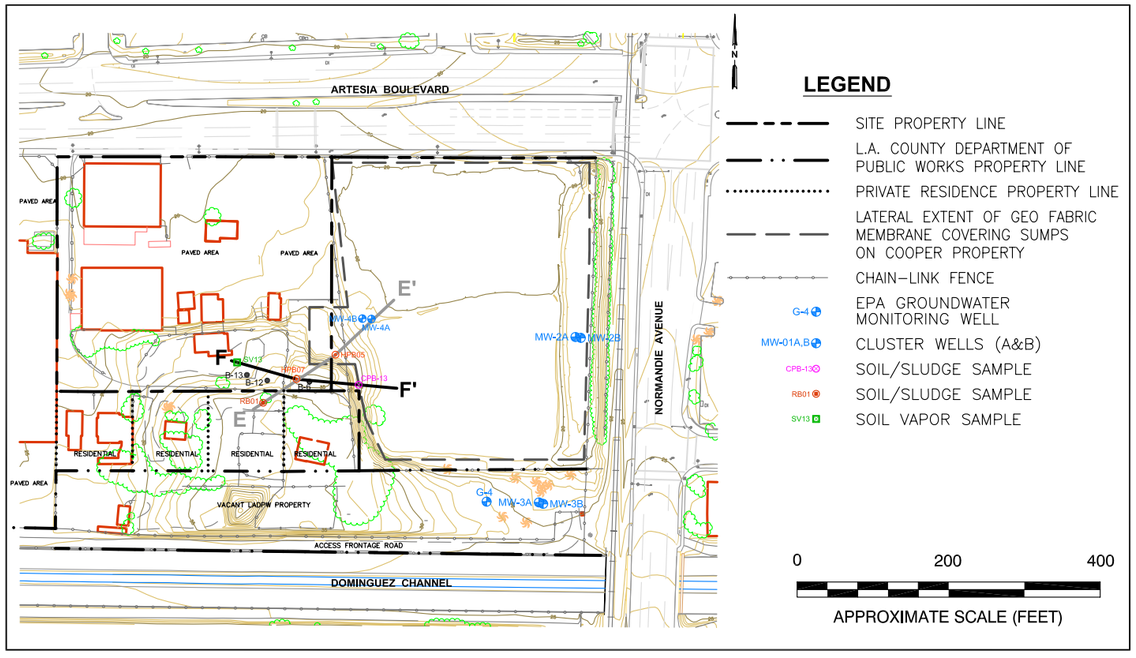
CROSS-SECTION F-F'



CROSS-SECTION VERTICAL SCALE (FEET)



CROSS-SECTION INDEX MAP



0 40 80

CROSS-SECTION HORIZONTAL SCALE (FEET)

CROSS-SECTION LEGEND

——?—— APPROXIMATE LITHOLOGIC CONTACT, QUERIED (?) WHERE UNCERTAIN

GENERALIZED HYDROSTRATIGRAPHY

- SLUDGE DEPOSITS
- LOW PERMEABILITY, VERY FINE TO FINE GRAINED CLAYEY SILT, LOCALIZED INTERFINGERING OF SILTY SAND LENSES
- VERY LOW PERMEABILITY, SILTY CLAY TO CLAY

LITHOLOGY GRAPHICS

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- SILTY GRAVEL
- SAND
- SAND WITH SILT
- SILTY SAND
- SILT
- LOW PLASTICITY CLAY

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SLUDGE/GEOLOGIC CROSS-SECTION F-F' (WEST-EAST) HAACK REWORK AREA

FIGURE: **10F**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	07/28/08

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Figure 11 – OMITTED

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Figure 12 – OMITTED

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DALTON
(APPROXIMATE LOCATION OF MUNICIPAL SUPPLY WELL)

MW-1A
MW-1B

G-1

G-3

G-2

N

ARTESIA BOULEVARD

NORMANDIE AVENUE

W. CASSIDY ST

PAVED AREA

ACCESS ROAD

RESIDENTIAL

VACANT LADPW PROPERTY

ACCESS FRONTAGE ROAD

UG-CHAN

DOMINGUEZ CHANNEL

DG-CHAN

MW-4B
MW-4A
MW-2A
MW-2B
MW-3A
MW-3B
G-4

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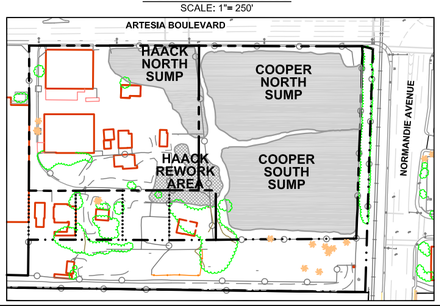
- CPB01 — COOPER PROPERTY SOIL/SLUDGE SAMPLES
- DPW01 — LA COUNTY DEPARTMENT OF PUBLIC WORKS SOIL SAMPLES
- HPB01 — HACK PROPERTY SOIL/SLUDGE SAMPLE
- RB01 — PRIVATE RESIDENTIAL PROPERTY SOIL/SLUDGE SAMPLES
- SV01 — SOIL VAPOR SAMPLES
- SV05-AP — AIR PERMEABILITY SAMPLES
- B-3 — SOIL BORING (PREVIOUS CONSULTANT INVESTIGATION)
- 2 — CONTOUR–DEPTH TO TOP OF SLUDGE (Ft–BGS)
- 15.4 — DEPTH TO TOP OF SLUDGE (Ft–BGS)
- *SV05 — NOT USED IN CONTOURING

SUMP LOCATIONS

SCALE: 1"= 250'



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE WERE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.
4. BORING AND SAMPLE LOCATIONS WERE SURVEYED BY W.M. HOLDINGS INC., ON JANUARY 23, 2006 (CPB AND DPW BORINGS), FEBRUARY 17, 2006 (HPB AND RB BORINGS), AND MARCH 30, 2006 (SV BORINGS).
5. SUPPLIMENTAL BORING AND SAMPLE LOCATIONS; AND GROUND WATER MONITORING WELL LOCATIONS AND ELEVATIONS (MW–04A/B) WERE SURVEYED BY W.M. HOLDINGS INC. ON MARCH 1, 2007

0 80 160

APPROXIMATE SCALE (FEET)

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DEPTH TO TOP OF SLUDGE

FIGURE: **13**

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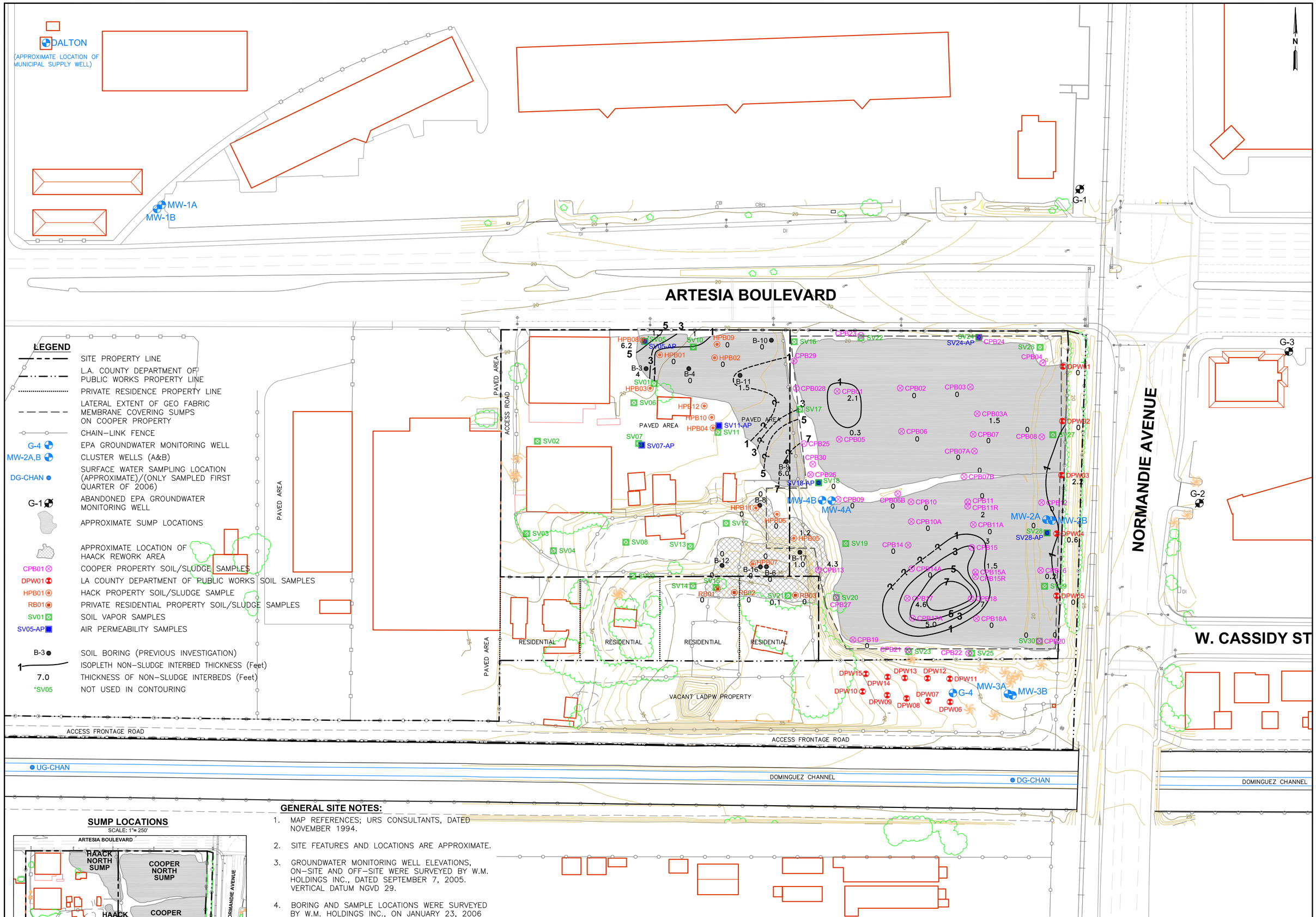
37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	05/22/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_PreRI.dwg|troman|Aug 18, 2008 at 9:15|Layout: FIG13



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON-SITE AND OFF-SITE WERE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.
4. BORING AND SAMPLE LOCATIONS WERE SURVEYED BY W.M. HOLDINGS INC., ON JANUARY 23, 2006 (CPB AND DPW BORINGS), FEBRUARY 17, 2006 (HPB AND RB BORINGS), AND MARCH 30, 2006 (SV BORINGS).
5. SUPPLIMENTAL BORING AND SAMPLE LOCATIONS; AND GROUND WATER MONITORING WELL LOCATIONS AND ELEVATIONS (MW-04A/B) WERE SURVEYED BY W.M. HOLDINGS INC. ON MARCH 1, 2007

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FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

SITE MAP SHOWING THICKNESS OF NON-SLUDGE INTERBEDS

FIGURE: 14

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	05/22/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_PreRI.dwg|troman|Aug 21, 2008 at 13:44|Layout: FIG14

DALTON
(APPROXIMATE LOCATION OF MUNICIPAL SUPPLY WELL)

MW-1A
MW-1B

ARTESIA BOULEVARD

G-1

G-3

G-2

NORMANDIE AVENUE

W. CASSIDY ST

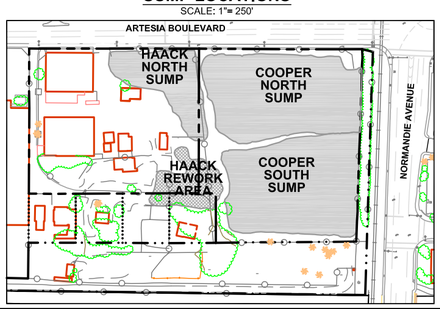
N

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-2A,B — CLUSTER WELLS (A&B)
- DG-CHAN — SURFACE WATER SAMPLING LOCATION (APPROXIMATE)/(ONLY SAMPLED FIRST QUARTER OF 2006)
- G-1 — ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION HAACK REWORK AREA
- CPB01 — COOPER PROPERTY SOIL/SLUDGE SAMPLES
- DPW01 — LA COUNTY DEPARTMENT OF PUBLIC WORKS SOIL SAMPLES
- HPB01 — HACK PROPERTY SOIL/SLUDGE SAMPLE
- RB01 — PRIVATE RESIDENTIAL PROPERTY SOIL/SLUDGE SAMPLES
- SV01 — SOIL VAPOR SAMPLES
- SV05-AP — AIR PERMEABILITY SAMPLES
- B-1 — SOIL BORING (PREVIOUS CONSULTANT INVESTIGATION)
- 2 — ISOPLETH–TOTAL SLUDGE THICKNESS (Feet) AT SAMPLING LOCATION
- 15.4 — TOTAL THICKNESS OF SLUDGE (Feet) AT SAMPLING LOCATION
- *SV05 — NOT USED IN CONTOURING

PAVED AREA
ACCESS ROAD
PAVED AREA
PAVED AREA
PAVED AREA
RESIDENTIAL
RESIDENTIAL
RESIDENTIAL
RESIDENTIAL
VACANT LADPW PROPERTY
ACCESS FRONTAGE ROAD
ACCESS FRONTAGE ROAD
UG-CHAN
DOMINGUEZ CHANNEL
DG-CHAN
DOMINGUEZ CHANNEL

SUMP LOCATIONS
SCALE: 1"= 250'



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0 80 160
APPROXIMATE SCALE (FEET)

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SITE MAP SHOWING TOTAL SLUDGE THICKNESS

FIGURE: **15**

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37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	05/22/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_PreRI.dwg|troman|Aug 18, 2008 at 9:17|Layout: FIG15

ISOPLETH - 1 FOOT TOTAL SLUDGE THICKNESS

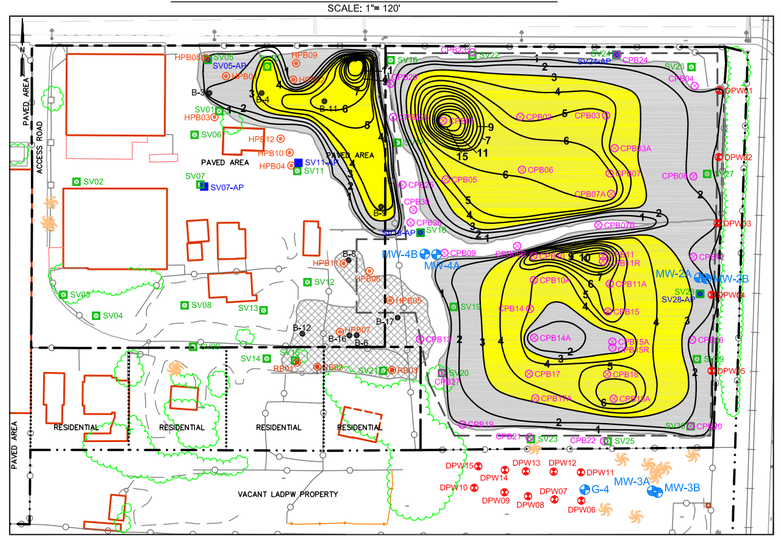
SCALE: 1"= 120'

ISOPLETH - 2 FOOT TOTAL SLUDGE THICKNESS

SCALE: 1"= 120'

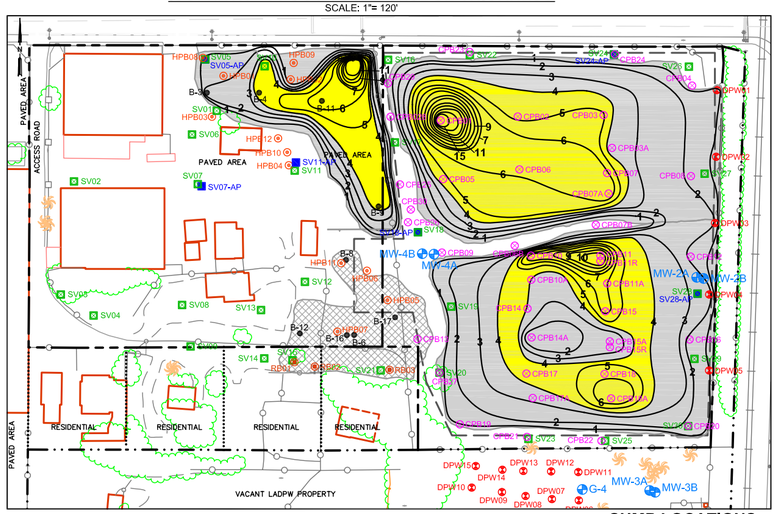
ISOPLETH - 3 FOOT TOTAL SLUDGE THICKNESS

SCALE: 1"= 120'



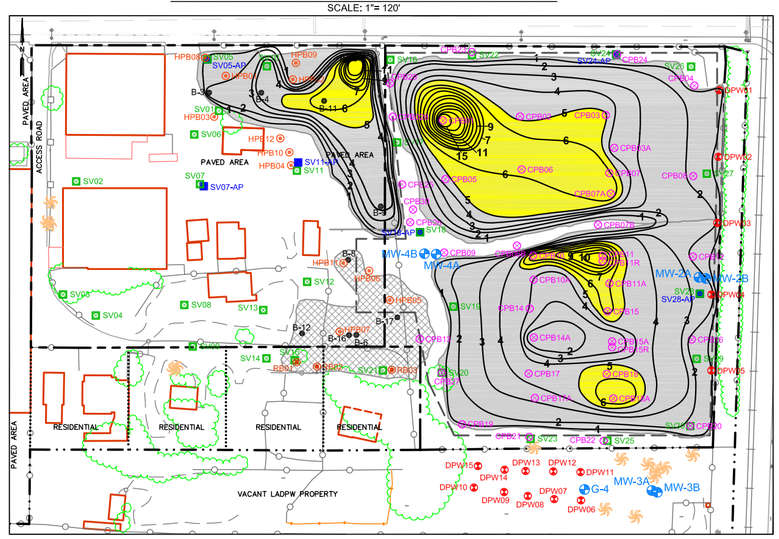
ISOPLETH - 4 FOOT TOTAL SLUDGE THICKNESS

SCALE: 1"= 120'



ISOPLETH - 5 FOOT TOTAL SLUDGE THICKNESS

SCALE: 1"= 120'

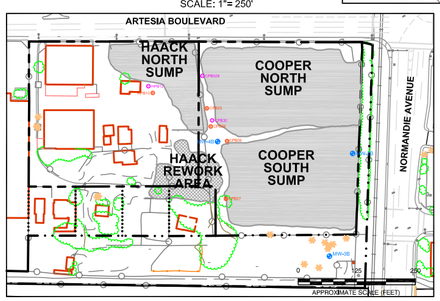


ISOPLETH - 6 FOOT TOTAL SLUDGE THICKNESS

SCALE: 1"= 120'

SUMP LOCATIONS

SCALE: 1"= 250'



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-2A,B — CLUSTER WELLS (A&B)
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION OF HAACK REWORK AREA
- CPB01 — COOPER PROPERTY SOIL/SLUDGE SAMPLES
- DPW01 — LA COUNTY DEPARTMENT OF PUBLIC WORKS SOIL SAMPLES
- HPB01 — HACK PROPERTY SOIL/SLUDGE SAMPLE
- RB01 — PRIVATE RESIDENTIAL PROPERTY SOIL/ SLUDGE SAMPLES
- SV01 — SOIL VAPOR SAMPLES
- SV05-AP — AIR PERMEABILITY SAMPLES
- B-1 — SOIL BORING (PREVIOUS INVESTIGATION)
- 2 — ISOPLETH–TOTAL SLUDGE THICKNESS (Feet)
- AREA ENCOMPASSED BY INDICATED ISOPLETHS THICKNESS

0 120 240

APPROXIMATE SCALE (FEET)

GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
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APROXIMATE SURFACE AREAS

SURFACE AREA	ACRE	SQ. FEET
COOPER PROPERTY	3.13	136,416
HAACK PROPERTY	2.67	116,241
RESIDENCES	1.07	46,479
COOPER NORTH SUMP	1.26	54,909
COOPER SOUTH SUMP	1.28	55,845
HAACK NORTH SUMP	0.48	20,831
HAACK REWORK AREA	0.29	13,043
GEOSYNTHETIC COVER	2.91	126,588

COOPER PROPERTY'S SUMP ISOPLETH-TOTAL SLUDGE THICKNESS APPROXIMATE AREAS

SLUDGE THICKNESS (FT.)	ACRES	SQ. FEET
1 FT.–COOPER NORTH SUMP	1.17	51,099
2 FT.–COOPER NORTH SUMP	1.00	43,822
3 FT.–COOPER NORTH SUMP	0.74	32,500
4 FT.–COOPER NORTH SUMP	0.59	25,767
5 FT.–COOPER NORTH SUMP	0.45	19,781
6 FT.–COOPER NORTH SUMP	0.25	10,848
7 FT.–COOPER NORTH SUMP	0.073	3,214
1 FT.–COOPER SOUTH SUMP	1.22	53,163
2 FT.–COOPER SOUTH SUMP	1.039	45,262
3 FT.–COOPER SOUTH SUMP	0.696	30,361
4 FT.–COOPER SOUTH SUMP	0.392	17,077
5 FT.–COOPER SOUTH SUMP	0.16	6,901
6 FT.–COOPER SOUTH SUMP	0.081	3,535
7 FT.–COOPER SOUTH SUMP	0.034	1,488

HAACK PROPERTY'S SUMP ISOPLETH-TOTAL SLUDGE THICKNESS APPROXIMATE AREAS

SLUDGE THICKNESS (FT.)	ACRES	SQ. FEET
1 FT.–HAACK NORTH SUMP	0.404	17,578
2 FT.–HAACK NORTH SUMP	0.319	13,892
3 FT.–HAACK NORTH SUMP	0.251	10,933
4 FT.–HAACK NORTH SUMP	0.199	8,668
5 FT.–HAACK NORTH SUMP	0.090	3,940
6 FT.–HAACK NORTH SUMP	0.048	2,073
7 FT.–HAACK NORTH SUMP	0.018	801
1 FT.–HAACK REWORK AREA	0.254	11,054
2 FT.–HAACK REWORK AREA	0.183	7,986
3 FT.–HAACK REWORK AREA	0.096	4,163
4 FT.–HAACK REWORK AREA	0.0456	1,986
5 FT.–HAACK REWORK AREA	0.00704	307
6 FT.–HAACK REWORK AREA	0.00257	112

ISOPLETH - 7 FOOT TOTAL SLUDGE THICKNESS

SCALE: 1"= 120'

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AREAS ENCOMPASSED BY SELECTED ISOPLETHS

FIGURE: **16**

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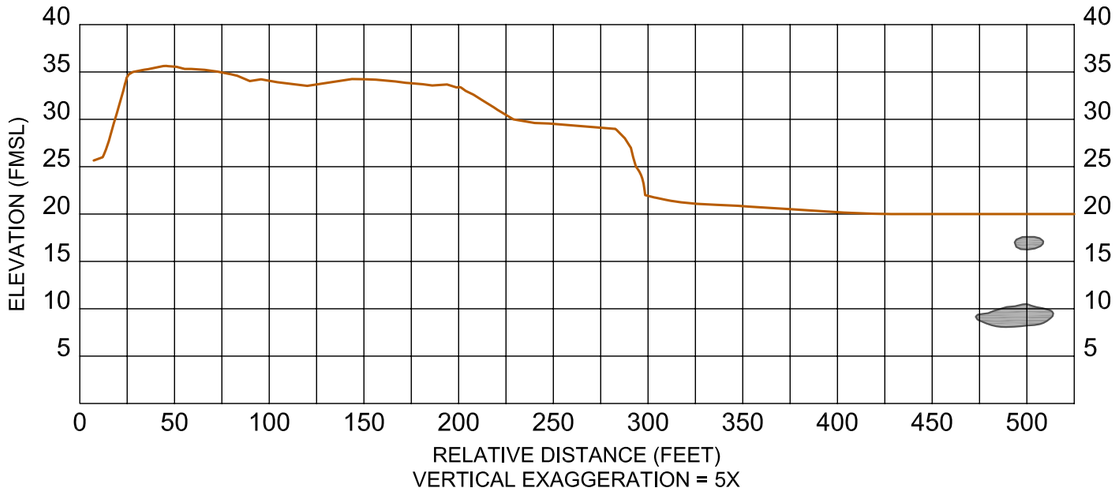
FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_PreRI.dwg|lroman|Aug 18, 2008 at 9:19|Layout: FIG16

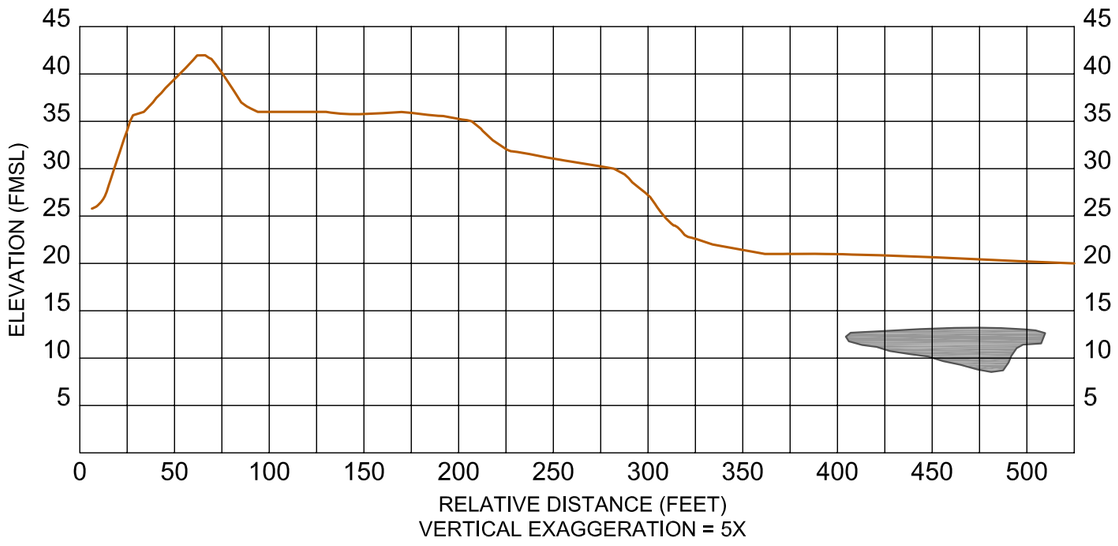
SECTION A

SOUTH — NORTH



SECTION B

SOUTH — NORTH



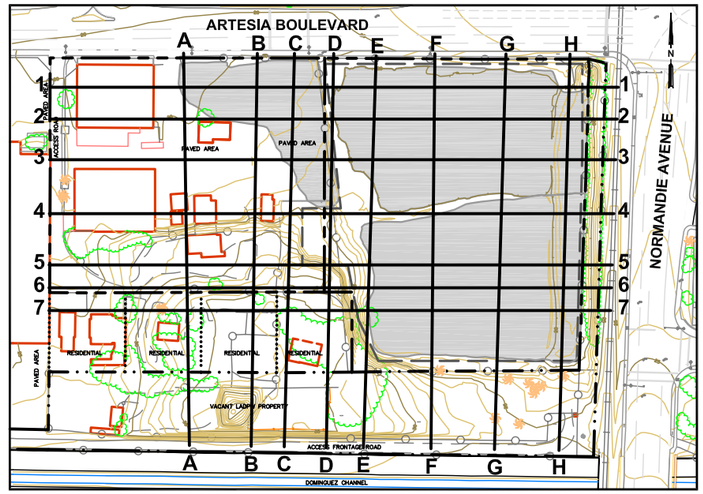
CROSS-SECTION LEGEND

- EXISTING SURFACE
- SLUDGE

CROSS-SECTION INDEX MAP LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- APPROXIMATE SUMP LOCATIONS

CROSS-SECTION INDEX MAP



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. SEE FIGURES 10E AND 10F FOR CROSS SECTIONS ACROSS HAACK REWORK AREA.

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FOR: Revised Draft - Report on 2006 Remedial Investigation
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NORTH-SOUTH CROSS-SECTIONS OF SLUDGE SECTIONS A AND B

FIGURE: **17A**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
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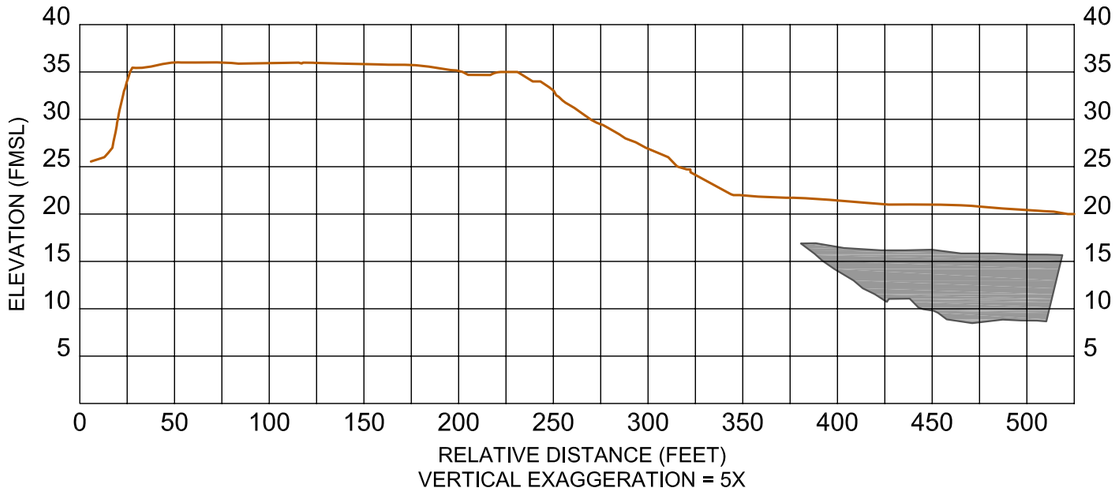
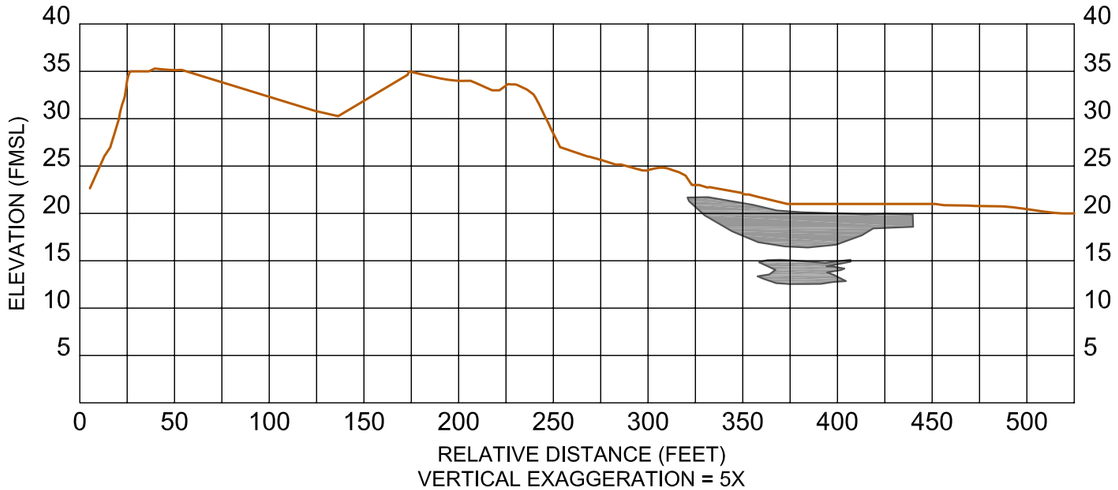
SECTION C

SOUTH — NORTH



SECTION D

SOUTH — NORTH



CROSS-SECTION LEGEND

- EXISTING SURFACE
- SLUDGE

CROSS-SECTION INDEX MAP LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
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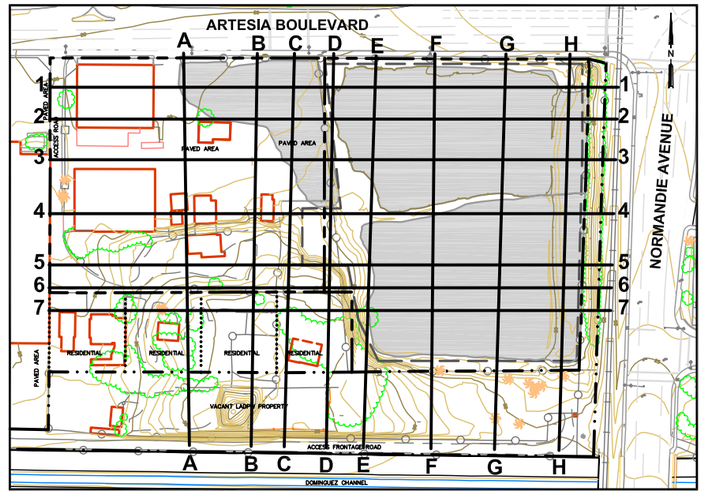
- CHAIN–LINK FENCE
- APPROXIMATE SUMP LOCATIONS

CROSS-SECTION INDEX MAP



GENERAL SITE NOTES:

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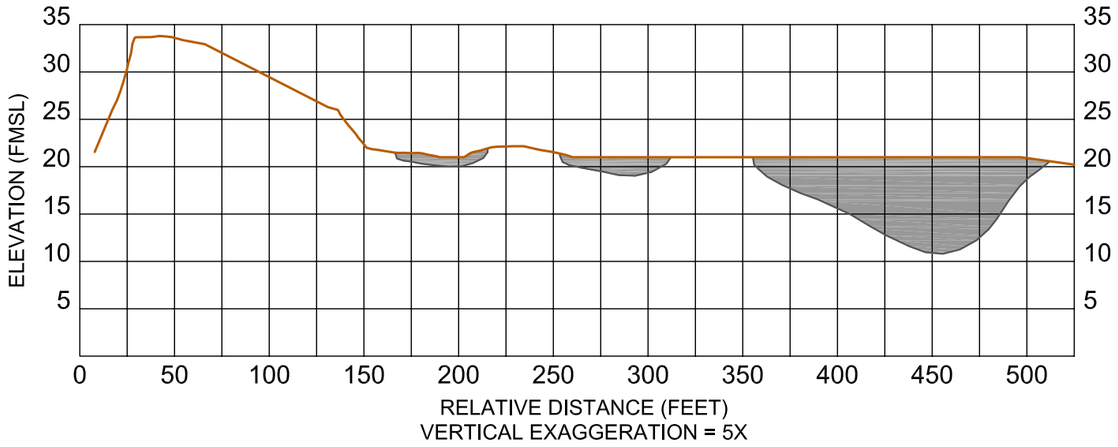
FOR: Revised Draft - Report on 2006 Remedial Investigation GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA		NORTH-SOUTH CROSS-SECTIONS OF SLUDGE SECTIONS C AND D		FIGURE: 17B
JOB NUMBER: 37BP.XB006.16	DRAWN BY: R. Roman	CHECKED BY: G. Maurath	APPROVED BY: P. Kinney	DATE: 06/10/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_Cross-Section (N-S&E-W).dwg|troman|Aug 18, 2008 at 8:42|Layout: FIG17B

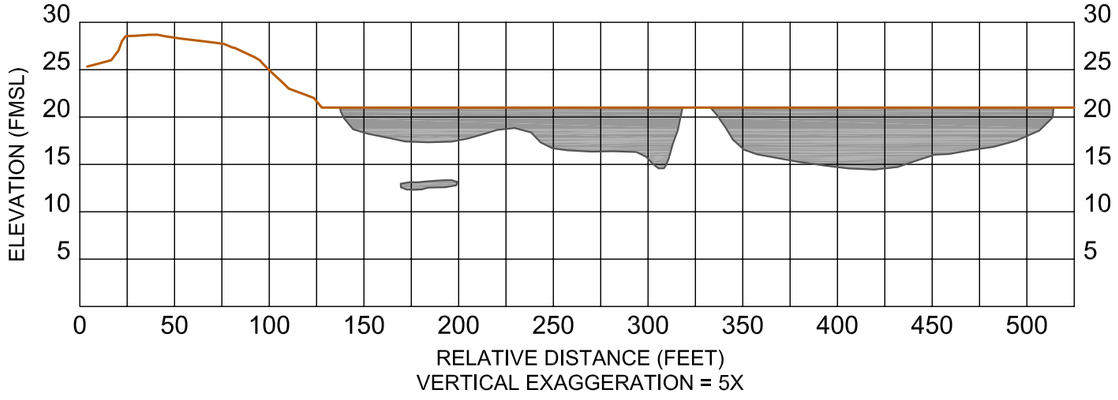
SECTION E

SOUTH NORTH



SECTION F

SOUTH NORTH



CROSS-SECTION LEGEND

- EXISTING SURFACE
- SLUDGE

CROSS-SECTION INDEX MAP LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
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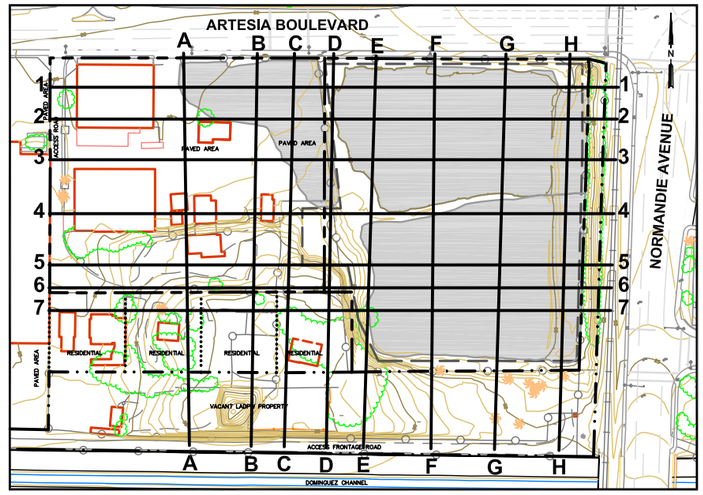
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- APPROXIMATE SUMP LOCATIONS

CROSS-SECTION INDEX MAP



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NORTH-SOUTH CROSS-SECTIONS OF SLUDGE SECTIONS E AND F

FIGURE: **17C**

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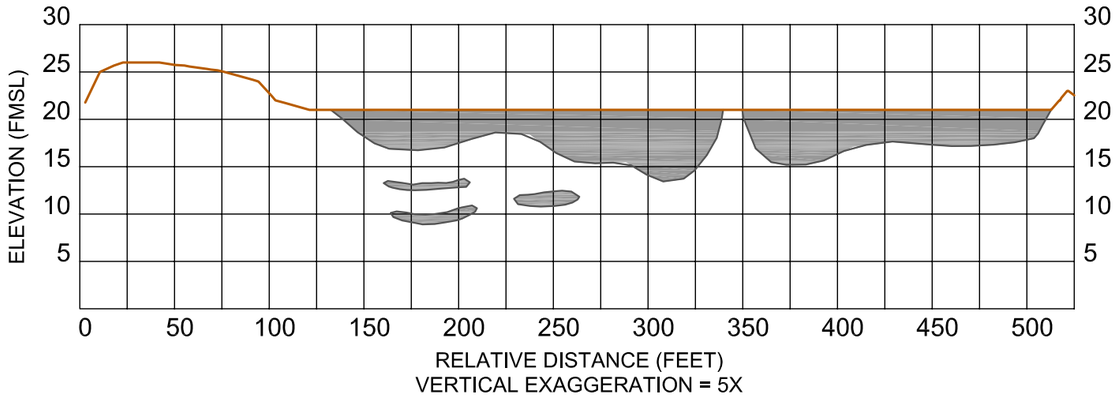
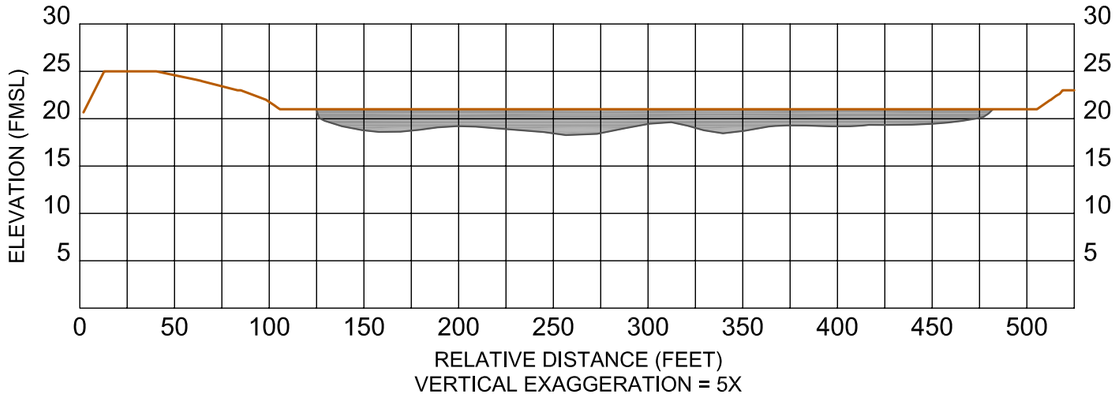
SECTION G

SOUTH — NORTH



SECTION H

SOUTH — NORTH



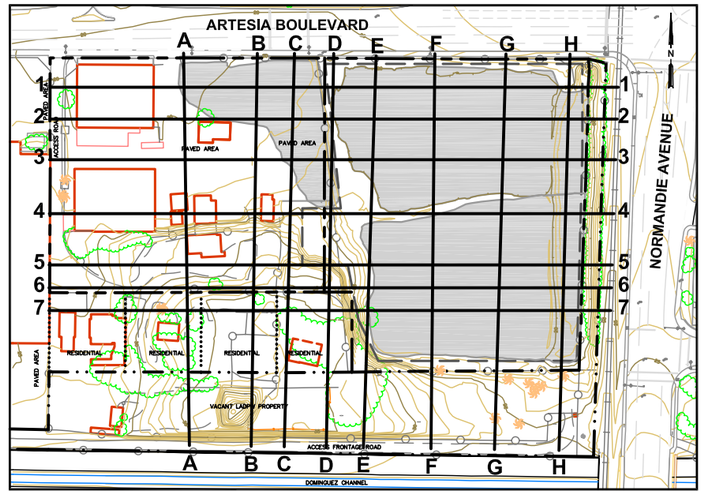
CROSS-SECTION LEGEND

- EXISTING SURFACE
- SLUDGE

CROSS-SECTION INDEX MAP LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- APPROXIMATE SUMP LOCATIONS

CROSS-SECTION INDEX MAP



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FOR: Revised Draft - Report on 2006 Remedial Investigation GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA		NORTH-SOUTH CROSS-SECTIONS OF SLUDGE SECTIONS G AND H		FIGURE: 17D
JOB NUMBER: 37BP.XB006.16	DRAWN BY: R. Roman	CHECKED BY: G. Maurath	APPROVED BY: P. Kinney	DATE: 06/10/08

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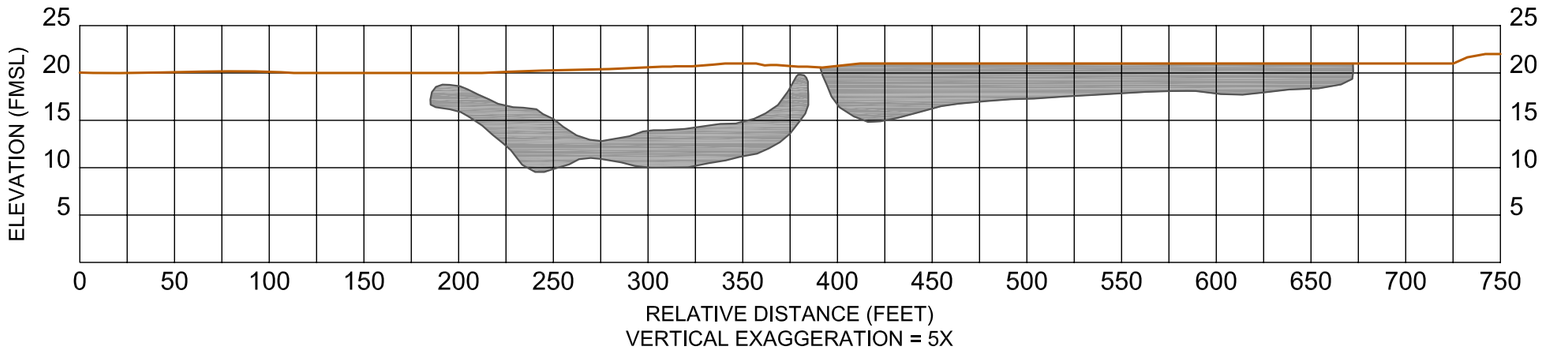
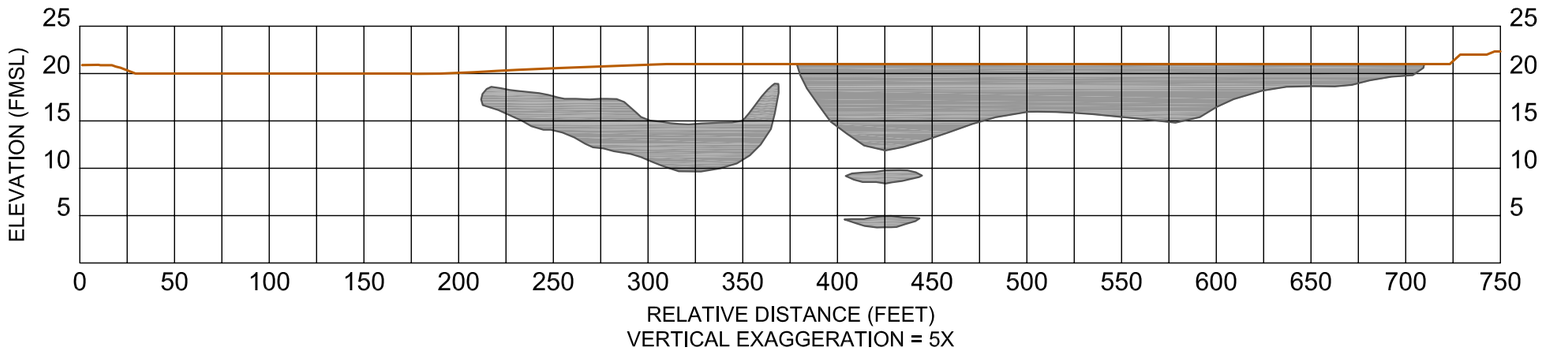
SECTION 1



SECTION 2



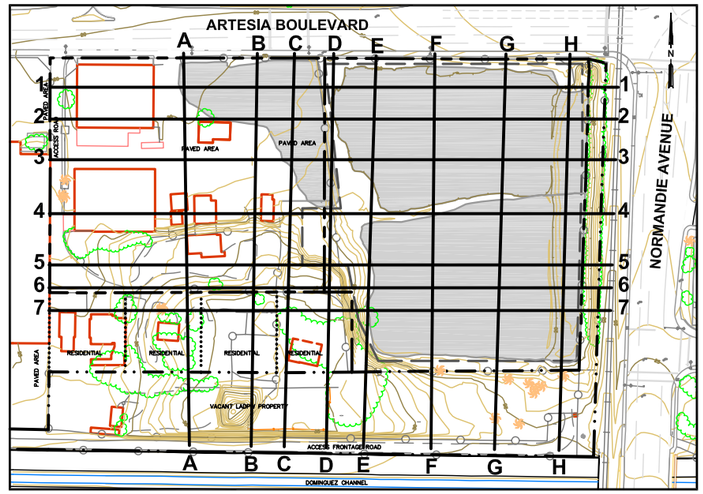
CROSS-SECTION LEGEND

- EXISTING SURFACE
- SLUDGE

CROSS-SECTION INDEX MAP LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- APPROXIMATE SUMP LOCATIONS

CROSS-SECTION INDEX MAP



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. SEE FIGURES 10E AND 10F FOR CROSS SECTIONS ACROSS HAACK REWORK AREA.

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FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

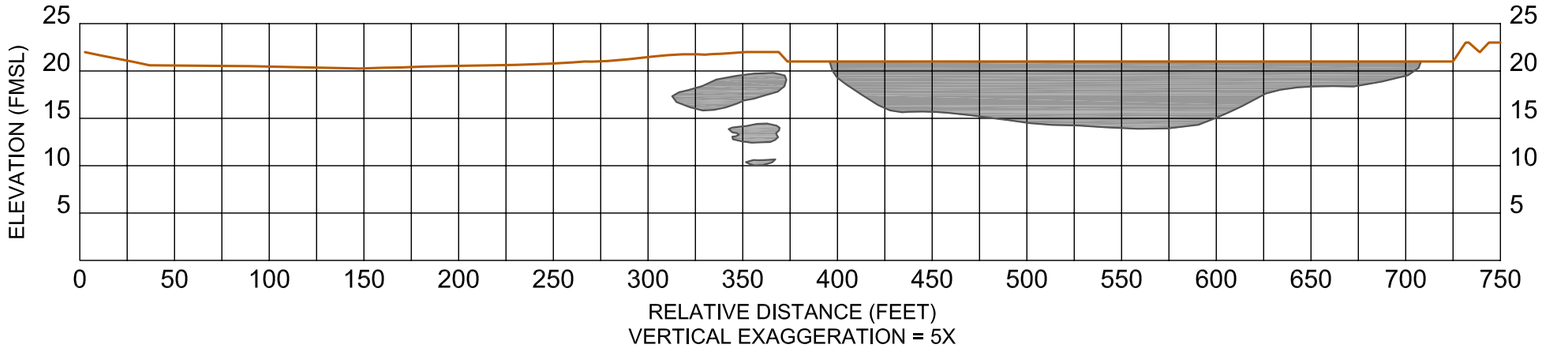
EAST-WEST CROSS-SECTIONS OF SLUDGE SECTIONS 1 AND 2

FIGURE: **17E**

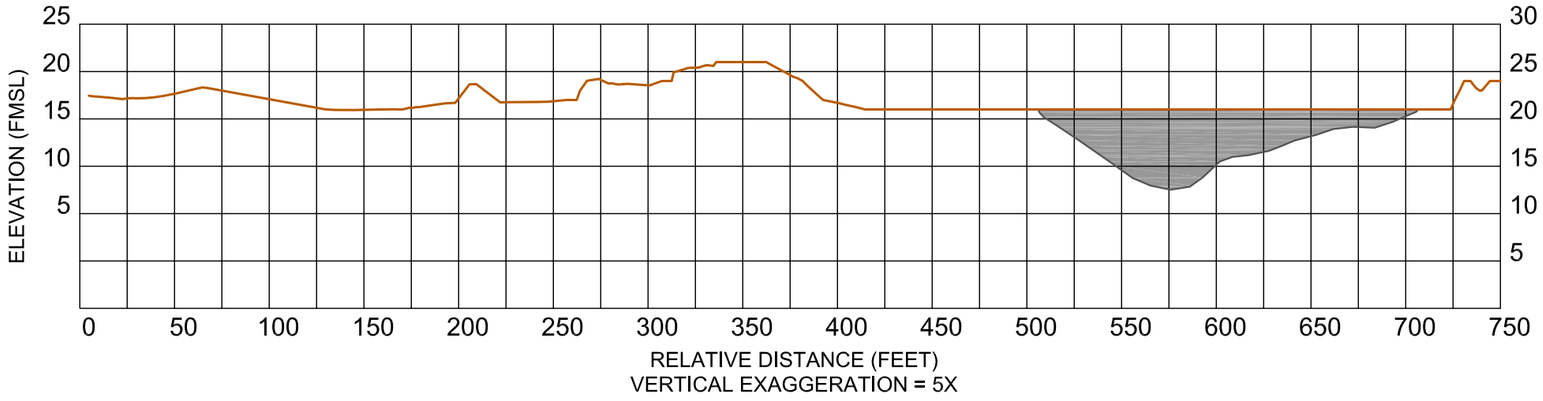
JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	06/10/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_Cross-Section (N-S&E-W).dwg|troman|Aug 18, 2008 at 8:56|Layout: FIG17E

SECTION 3



SECTION 4



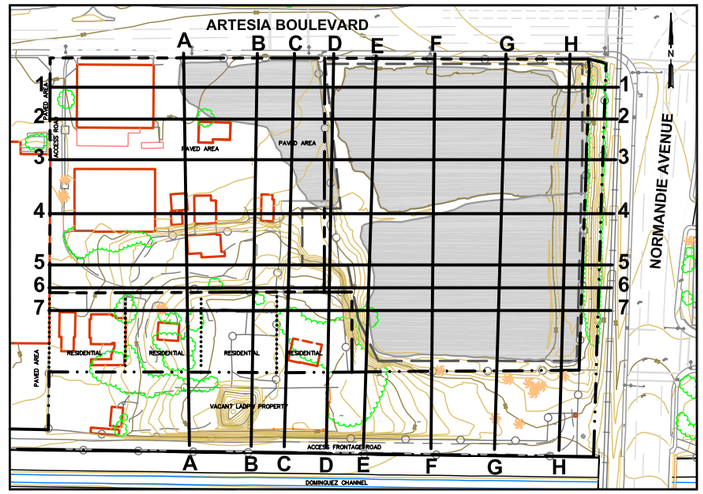
CROSS-SECTION LEGEND

- EXISTING SURFACE
- SLUDGE

CROSS-SECTION INDEX MAP LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- APPROXIMATE SUMP LOCATIONS

CROSS-SECTION INDEX MAP



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. SEE FIGURES 10E AND 10F FOR CROSS SECTIONS ACROSS HAACK REWORK AREA.

Stantec
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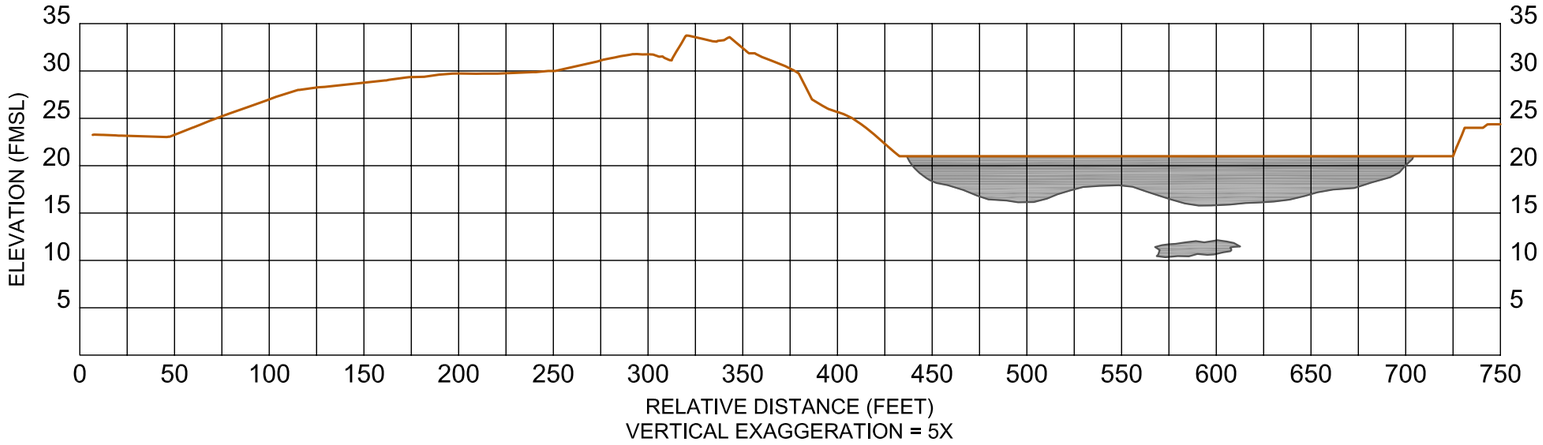
(805) 230-1266/230-1277 (Fax)

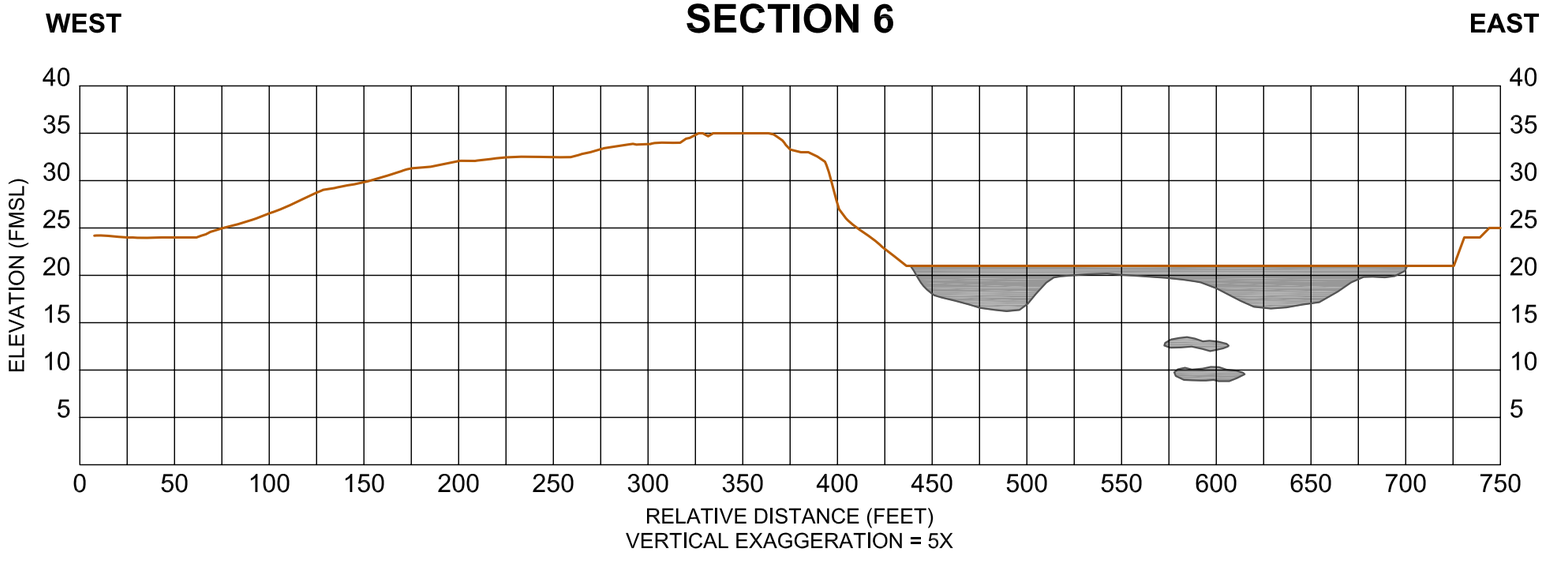
FOR: Revised Draft - Report on 2006 Remedial Investigation GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA		**EAST-WEST CROSS-SECTIONS OF SLUDGE SECTIONS 3 AND 4**		FIGURE: **17F**
JOB NUMBER: 37BP.XB006.16	DRAWN BY: R. Roman	CHECKED BY: G. Maurath	APPROVED BY: P. Kinney	DATE: 06/10/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_Cross-Section (N-S&E-W).dwg|troman|Aug 18, 2008 at 8:57|Layout: FIG17F

SECTION 5



SECTION 6



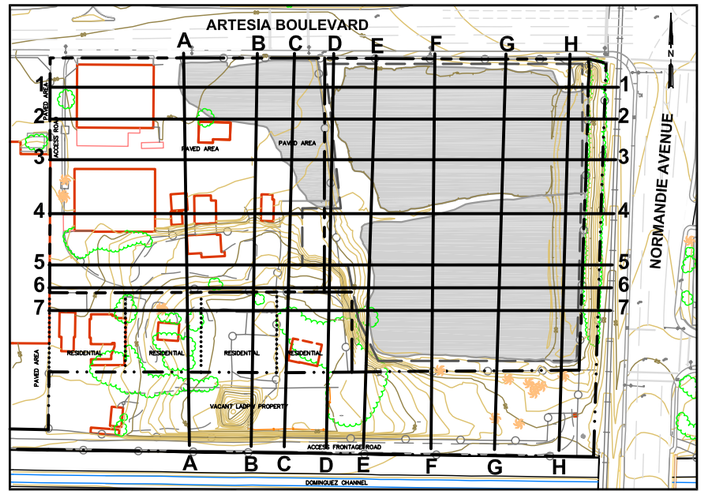
CROSS-SECTION LEGEND

- EXISTING SURFACE
- SLUDGE

CROSS-SECTION INDEX MAP LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- APPROXIMATE SUMP LOCATIONS

CROSS-SECTION INDEX MAP



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. SEE FIGURES 10E AND 10F FOR CROSS SECTIONS ACROSS HAACK REWORK AREA.

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EAST-WEST CROSS-SECTIONS OF SLUDGE SECTIONS 5 AND 6

FIGURE: **17G**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	06/10/08

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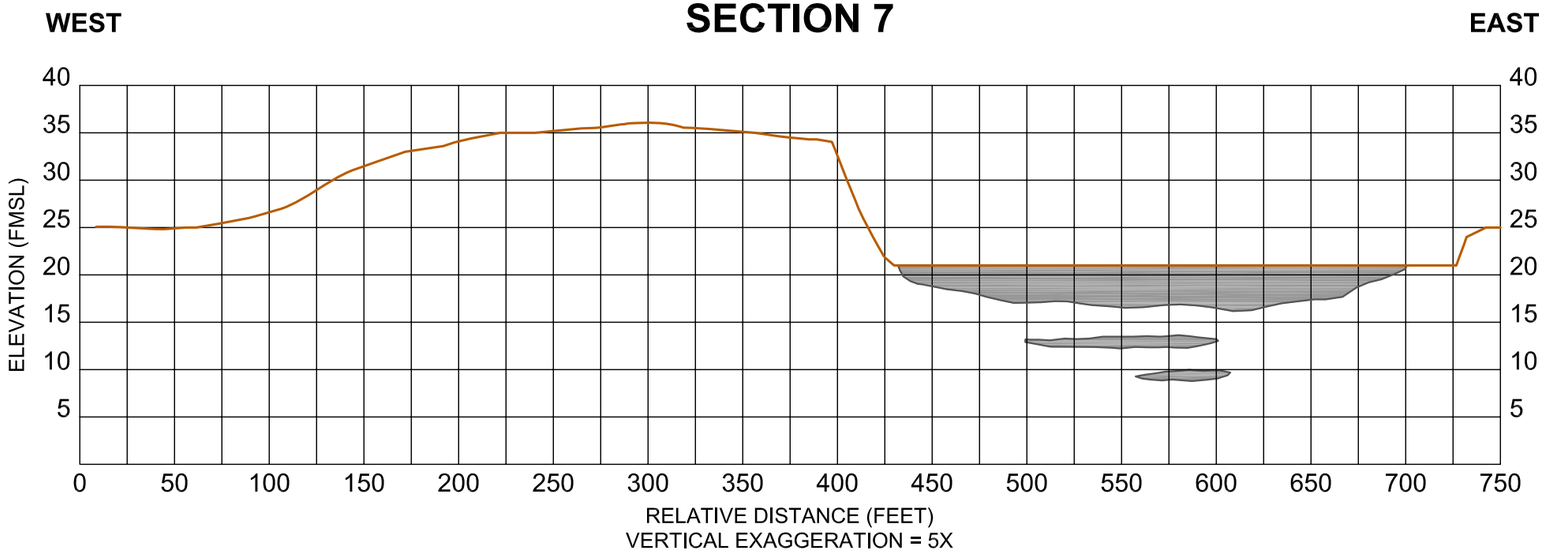
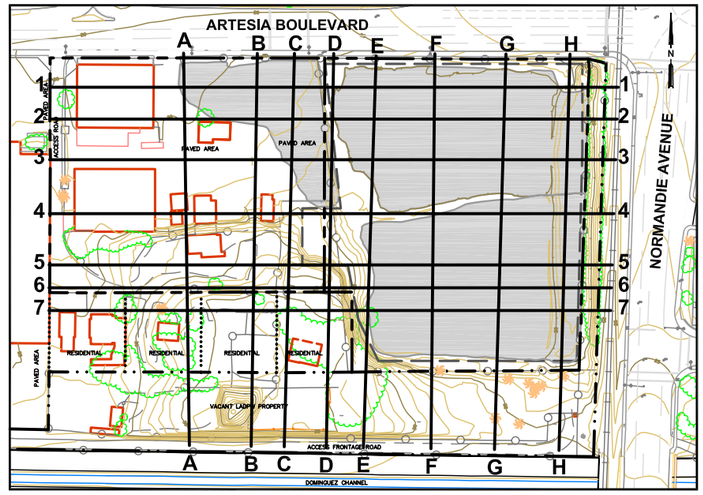
CROSS-SECTION INDEX MAP LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- APPROXIMATE SUMP LOCATIONS

SECTION 7



CROSS-SECTION INDEX MAP



CROSS-SECTION LEGEND

- EXISTING SURFACE
- SLUDGE

GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. SEE FIGURES 10E AND 10F FOR CROSS SECTIONS ACROSS HAACK REWORK AREA.

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EAST-WEST CROSS-SECTIONS OF SLUDGE SECTION 7

FIGURE: **17H**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	06/10/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_Cross-Section (N-S&E-W).dwg|troman|Aug 18, 2008 at 8:58|Layout: FIG17H

SOUTH DALTON AVENUE

DALTON
(APPROXIMATE LOCATION OF MUNICIPAL SUPPLY WELL)

MW-1A
(10.81 FT MSL)

GRO	<50
VOC	ND
SVOC	<47
LAB pH	7.53
FIELD pH	6.68
PAH	<9.4
TSULF	20 J

(6.55 FT MSL)

GRO	<50
VOC	ND
SVOC	<47
LAB pH	7.29
FIELD pH	6.80
PAH	<9.4
TSULF	57 J

G-1

ARTESIA BOULEVARD

7.5

7.0

6.5

6.0

5.5

PAVED AREA

ACCESS ROAD

PAVED AREA

PAVED AREA

PAVED AREA

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

VACANT LADPW PROPERTY

MW-4A

MW-2A

G-4

MW-3A

G-3

G-2

NORMANDIE AVENUE

W. CASSIDY STREET

ACCESS FRONTAGE ROAD

ACCESS FRONTAGE ROAD

UG-CHAN

DOMINGUEZ CHANNEL

FDCC-E

(5.54 FT MSL)

GRO	<50
VOC	ND
SVOC	<47
LAB pH	7.34
FIELD pH	6.57
PAH	<9.4
TSULF	83. J

(6.47 FT MSL)

GRO	<50
VOC	ND
SVOC	<4.7
LAB pH	7.45
FIELD pH	6.82
PAH	<9.4
TSULF	63 J

N

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-2A,B — CLUSTER WELLS (A&B)
- DG-CHAN — 2006 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- FDCC-E — 2008 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- G-1 — ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION OF HAACK REWORK AREA
- GROUNDWATER ELEVATION CONTOUR LINE, DASHED WHERE INFERRED (Feet above mean sea level)
- GROUNDWATER GRADIENT (0.0042) BENEATH COOPER SUMP–BEARING –A 180
- SELECTED VOLATILE ORGANIC, SEMIVOLATILE ORGANIC, AND METAL CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L) AND pH IN GROUNDWATER, SAMPLED ON MAY 19 & 20, 2008.

(6.37 FT MSL) GROUNDWATER ELEVATION FEET ABOVE MSL

GRO	= GASOLINE RANGE ORGANICS (C_4–C_{12}) BY 8015B
VOC	= VOLATILE ORGANIC COMPOUNDS BY 8260B
SVOC	= SEMI–VOLATILE ORGANIC COMPOUNDS BY 8270C BIS(2–ETYLHEXYL) PHTHALATE
LAB pH	= pH MEASURED IN THE LAB BY 9040B
FIELD pH	= pH MEASURED IN THE FIELD PRIOR TO SAMPLING
PAH	= POLYNUCLEAR AROMATIC HYDROCARBON BY 8270C CHRYSENE, PYRENE
TSULF	= TOTAL SULFIDES BY 376.2
ND	NON–DETECT
J	ANALYTE WAS DETECTED BETWEEN THE MDL AND THE RL
G–4	GROUNDWATER ELEVATION DATA FROM G–4 & MW–1 NOT USED FOR CONTOURING

GENERAL SITE NOTES:

1. REFERENCES; BASEMAP BY W.M. HOLDINGS INC., FLOWN SEPTEMBER 2005.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE ARE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005 AND MARCH 1, 2007. VERTICAL DATUM NGVD 29.

0 140 280

APPROXIMATE SCALE (FEET)

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FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

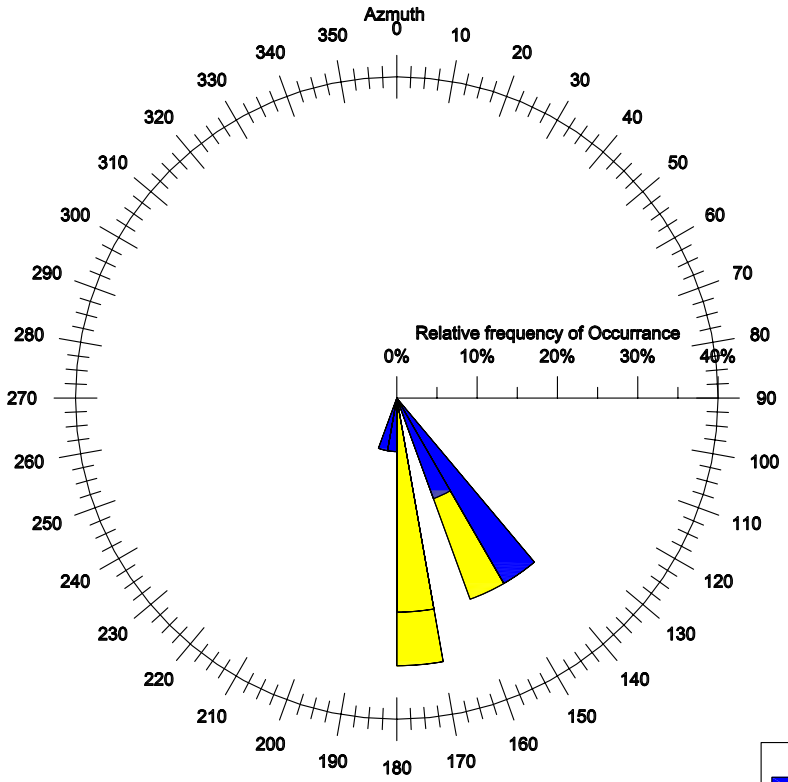
GROUNDWATER ELEVATIONS AND SELECTED ANALYTICAL RESULTS FOR UPPER HYDRAULIC ZONE (A) SECOND QUARTER 2008

FIGURE: **18**

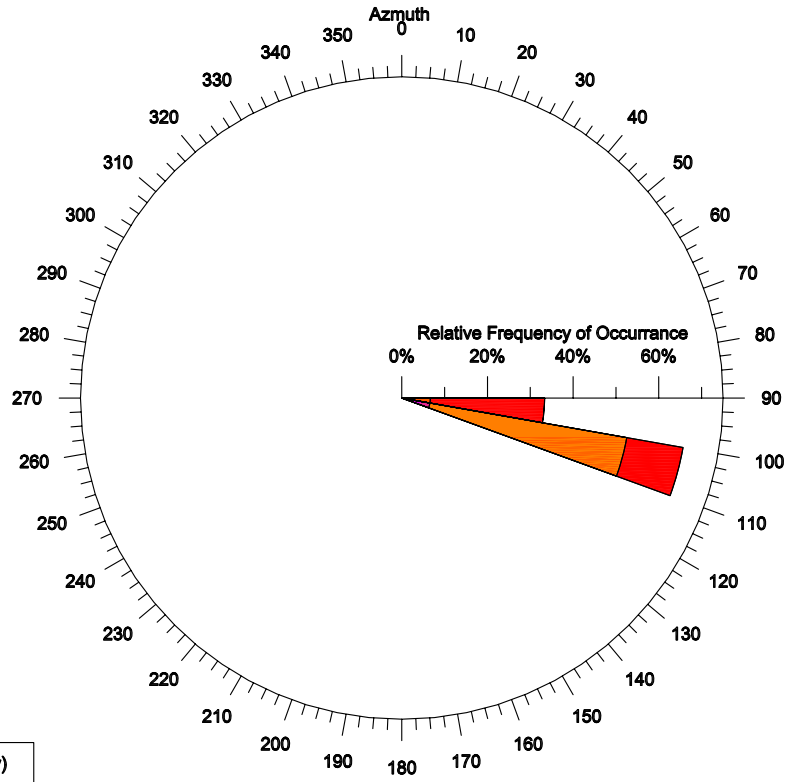
JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.14.3236	J.Barboza	M.Mason	G.Maurath	7/15/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_Q2GW08.dwg|troman|Aug 04, 2008 at 10:23|Layout: GWA_FIG18

Groundwater Velocity and Direction
Upper Monitored Zone - Cooper Property



Groundwater Velocity and Direction
Lower Monitored Zone - Cooper Property



Groundwater Velocity (ft/day)
- <=0.04
- >0.04 - 0.08
- >0.08 - 0.12
- >0.12 - 0.16
- >0.16 - 0.2
- >0.2

NOTES:

1. OBSERVATION PERIOD OF ESTIMATED GROUNDWATER GRADIENT, VELOCITY, AND DIRECTION FOR VELOCITY POLAR DIAGRAMS, FOR FEBRUARY 15, 1994 TO PRESENT.

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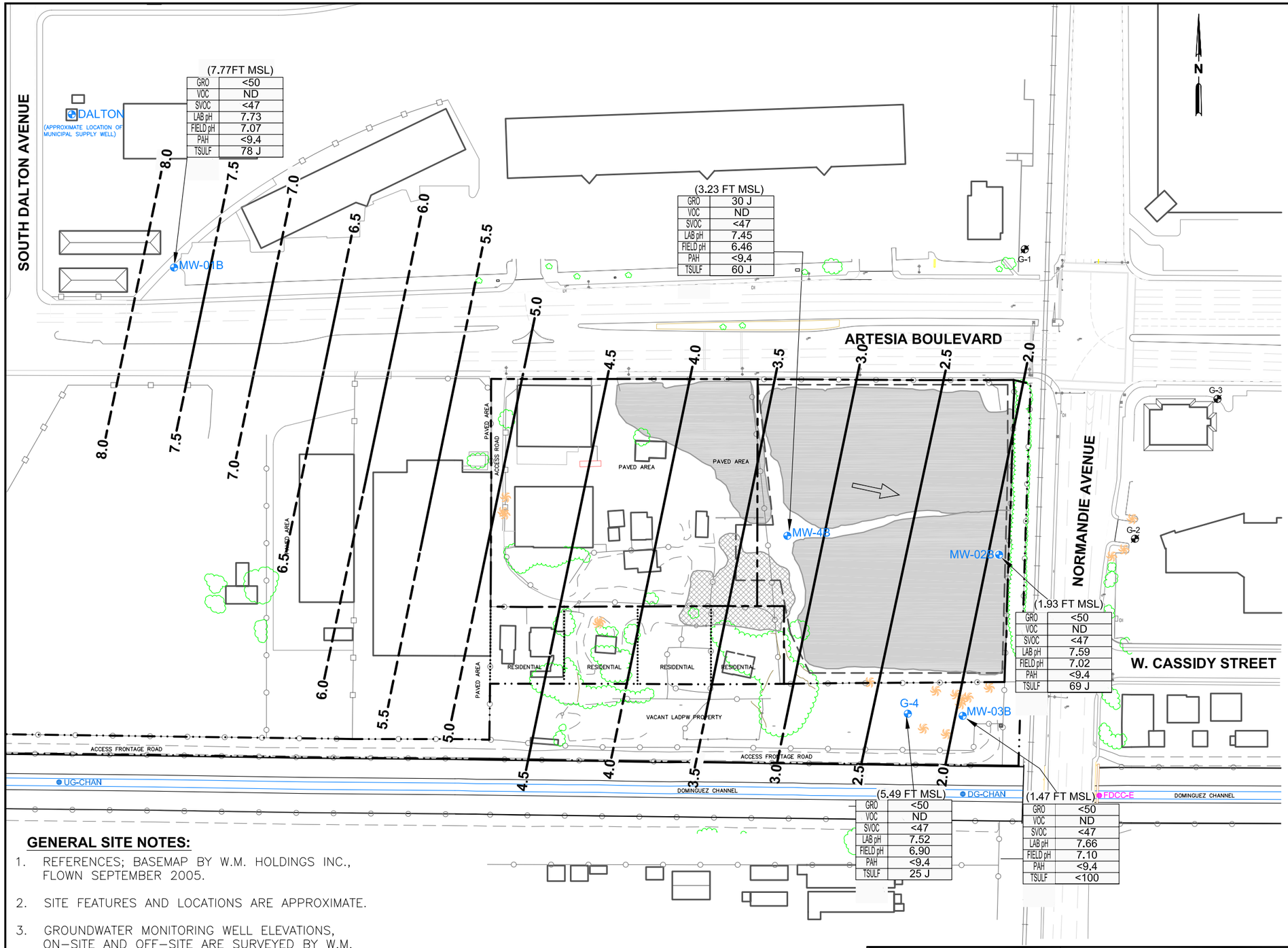
GROUNDWATER ROSE DIAGRAMS

FIGURE: **19**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	07/15/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\GS-Hydrograph.dwg|troman|Aug 04, 2008 at 10:27|Layout: FIG19



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-2A,B — CLUSTER WELLS (A&B)
- DG-CHAN — 2006 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- FDCC-E — 2008 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- G-1 — ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION OF HAACK REWORK AREA
- GROUNDWATER ELEVATION CONTOUR LINE, DASHED WHERE INFERRED (Feet above mean sea level)
- GROUNDWATER GRADIENT (0.0045) BENEATH COOPER SUMP–BEARING–A 102

SELECTED VOLATILE ORGANIC, SEMIVOLATILE ORGANIC, AND METAL CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L) AND pH IN GROUNDWATER, SAMPLED ON MAY 19 & 20, 2008.

(7.23 FT MSL) GROUNDWATER ELEVATION FEET ABOVE MSL

GRO	= GASOLINE RANGE ORGANICS (C_4–C_{12}) BY 8015B
VOC	= VOLATILE ORGANIC COMPOUNDS BY 8260B
SVOC	= SEMI–VOLATILE ORGANIC COMPOUNDS BY 8270C BIS(2–ETYLHEXYL) PHTHALATE
LAB pH	= pH MEASURED IN THE LAB BY 9040B
FIELD pH	= pH MEASURED IN THE FIELD PRIOR TO SAMPLING
PAH	= POLYNUCLEAR AROMATIC HYDROCARBON BY 8270C CHRYSENE, PYRENE
TSULF	= TOTAL SULFIDES BY 376.2
ND	NON–DETECT
J	ANALYTE WAS DETECTED BETWEEN THE MDL AND THE RL
G-4	GROUNDWATER ELEVATION DATA FROM G–4 NOT USED FOR CONTOURING

GENERAL SITE NOTES:

1. REFERENCES; BASEMAP BY W.M. HOLDINGS INC., FLOWN SEPTEMBER 2005.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE ARE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005 AND MARCH 1, 2007. VERTICAL DATUM NGVD 29.

0 140 280
APPROXIMATE SCALE (FEET)

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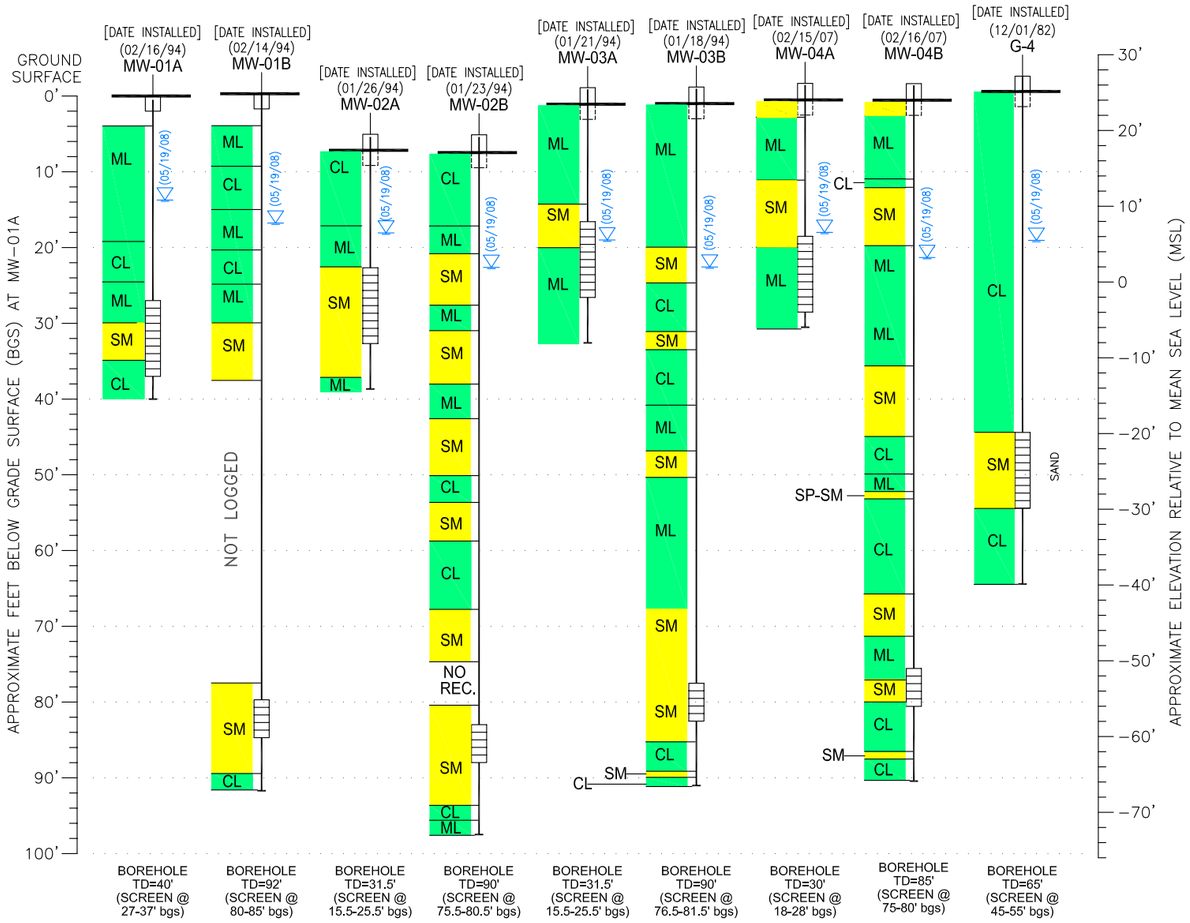
Gardena, CA

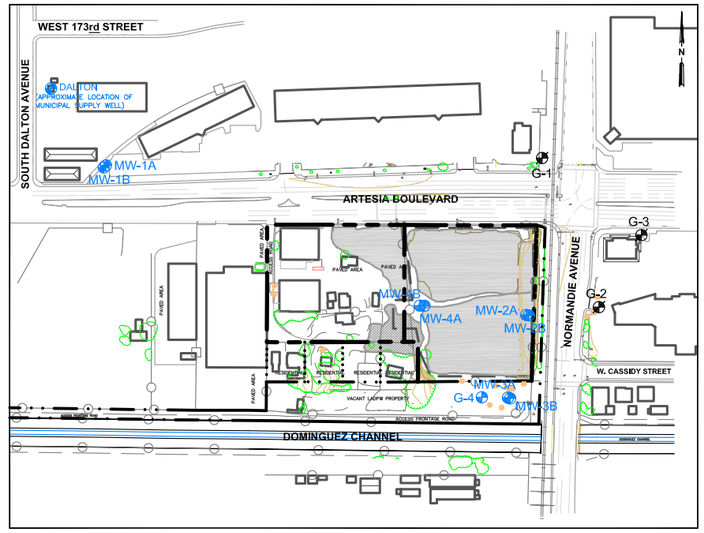
GROUNDWATER ELEVATIONS AND SELECTED ANALYTICAL RESULTS FOR LOWER HYDRAULIC ZONE (B) SECOND QUARTER 2008

FIGURE: **20**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.14.3236	J.Barboza	M.Mason	G.Maurath	7/15/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_Q2GW08.dwg|troman|Aug 04, 2008 at 10:23|Layout: GWB_FIG20





SITE MAP

1 INCH = 400 FEET

0 400 800

APPROXIMATE SITE MAP SCALE (FEET)

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- FENCE
- G-4 — EPA GROUNDWATER MONITORING WELL
- G-1 — ABANDONED EPA GROUNDWATER MONITORING WELL
- MW-1A/B — GROUNDWATER MONITORING WELL (A/B)
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION OF HAACK REWORK AREA
- GROUNDWATER ELEVATION (DATE)

GENERAL SITE MAP NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON-SITE AND OFF-SITE ARE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005, AND MARCH 1, 2007. VERTICAL DATUM NGVD 29.

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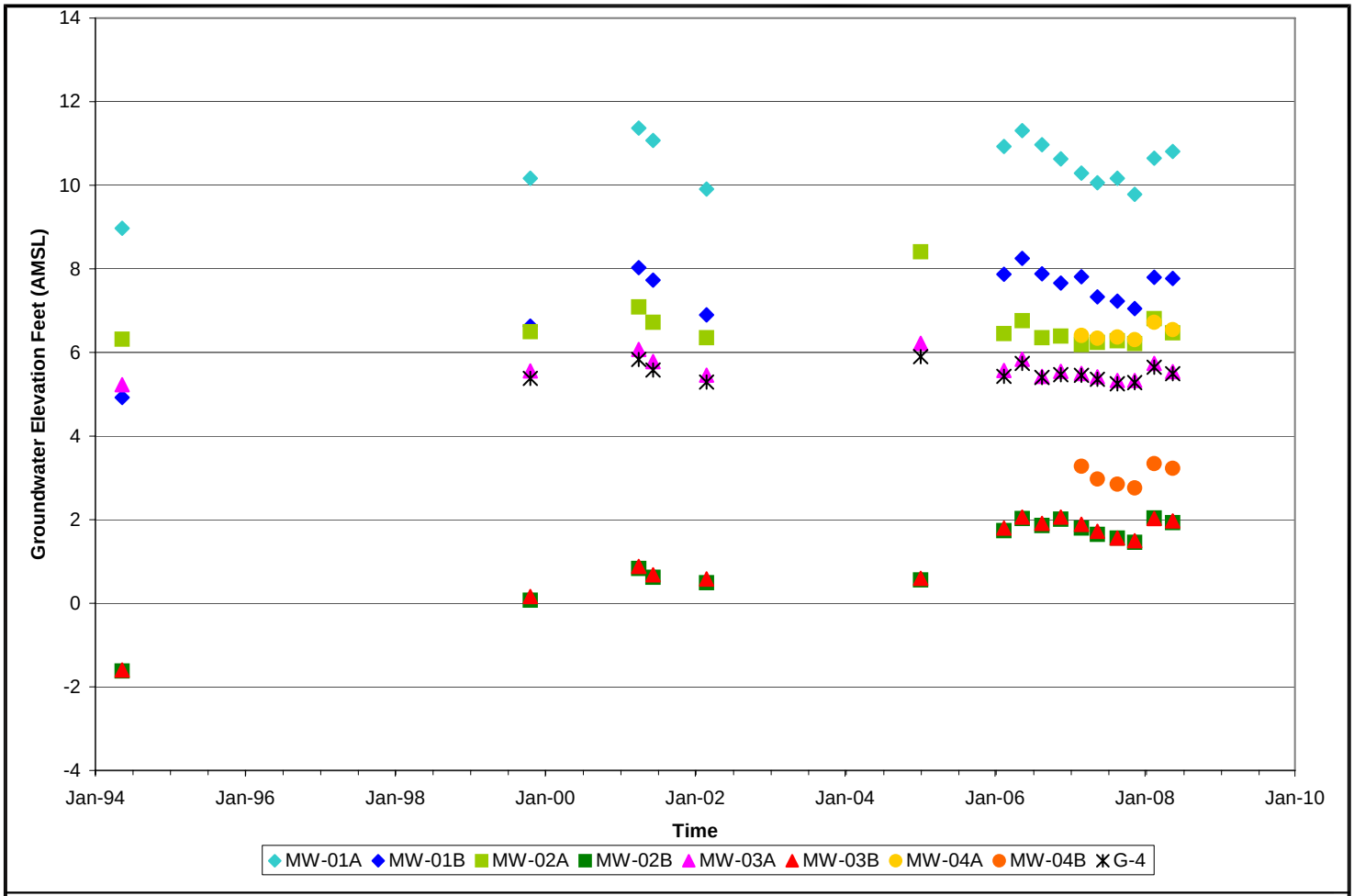
Gardena, CA

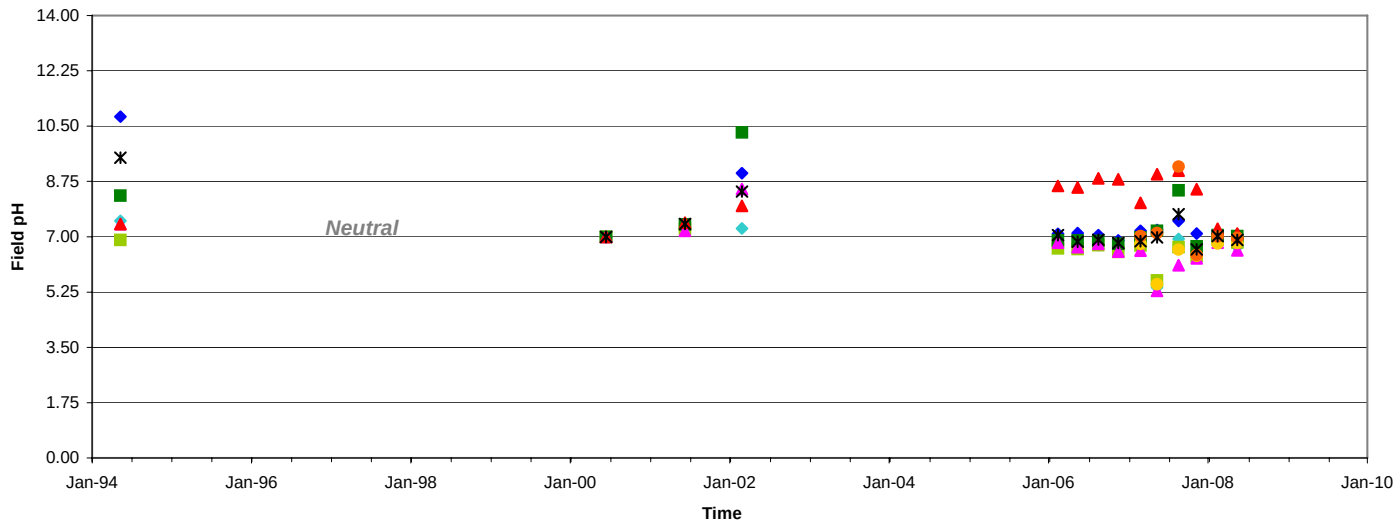
GROUNDWATER ELEVATION

FIGURE: **21**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	07/15/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\GS-Hydrograph.dwg|troman|Aug 04, 2008 at 10:34|Layout: FIG21





GRAPH NOTES:

1. ALL pH MEASUREMENTS TAKEN JUNE 15, 2000 WERE OBTAINED USING pH PAPER INSTEAD OF A pH METER. THUS, DATA RESOLUTION WAS LIMITED TO WHOLE pH UNITS.

2. DURING THE SECOND QUARTER 2007 THE INSTRUMENT USED TO MEASURE pH IN WELLS COMPLETED IN THE UPPER SATURATED ZONE HAD CALIBRATION ISSUES THAT RESULTED IN SLIGHTLY LOWER pH VALUES. DURING THE THIRD QUARTER 2007 A CALIBRATION ISSUE DEVELOPED IN THE INSTRUMENT USED TO MEASURE pH VALUES IN WELLS WITHIN THE LOWER SATURATED ZONE RESULTING IN SLIGHTLY ELEVATED pH VALUES.

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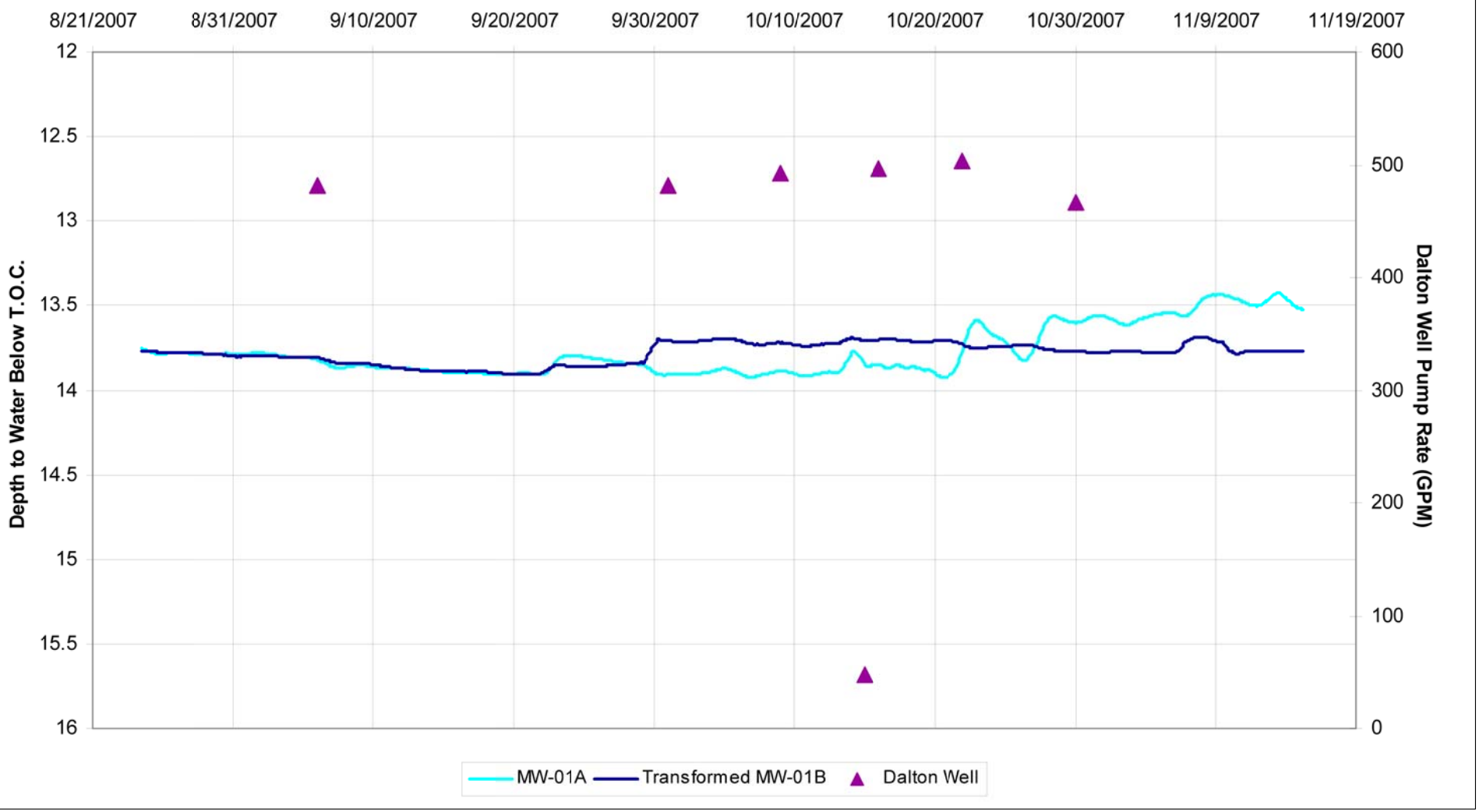
Gardena, CA

HYDROGRAPH AND FIELD pH

FIGURE: **22**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16	R. Roman	G. Maurath	P. Kinney	07/15/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\GS-Hydrograph.dwg|troman|Aug 04, 2008 at 10:31|Layout: FIG22



NOTES:

DALTON WELL MEASURED PRODUCTION GOLDEN STATE WATER REPORTED THAT THE DALTON WELL OPERATES CONTINUOUSLY EXCEPT FOR INFREQUENT 15 MINUTE SHUT DOWNS TO MONITOR WATER LEVELS.

THE DATA FOR MW-01B HAVE BEEN ADJUSTED UPWARDS BY 2.61 FEET FOR EASE OF COMPARISON WITH MW-01A DATA.

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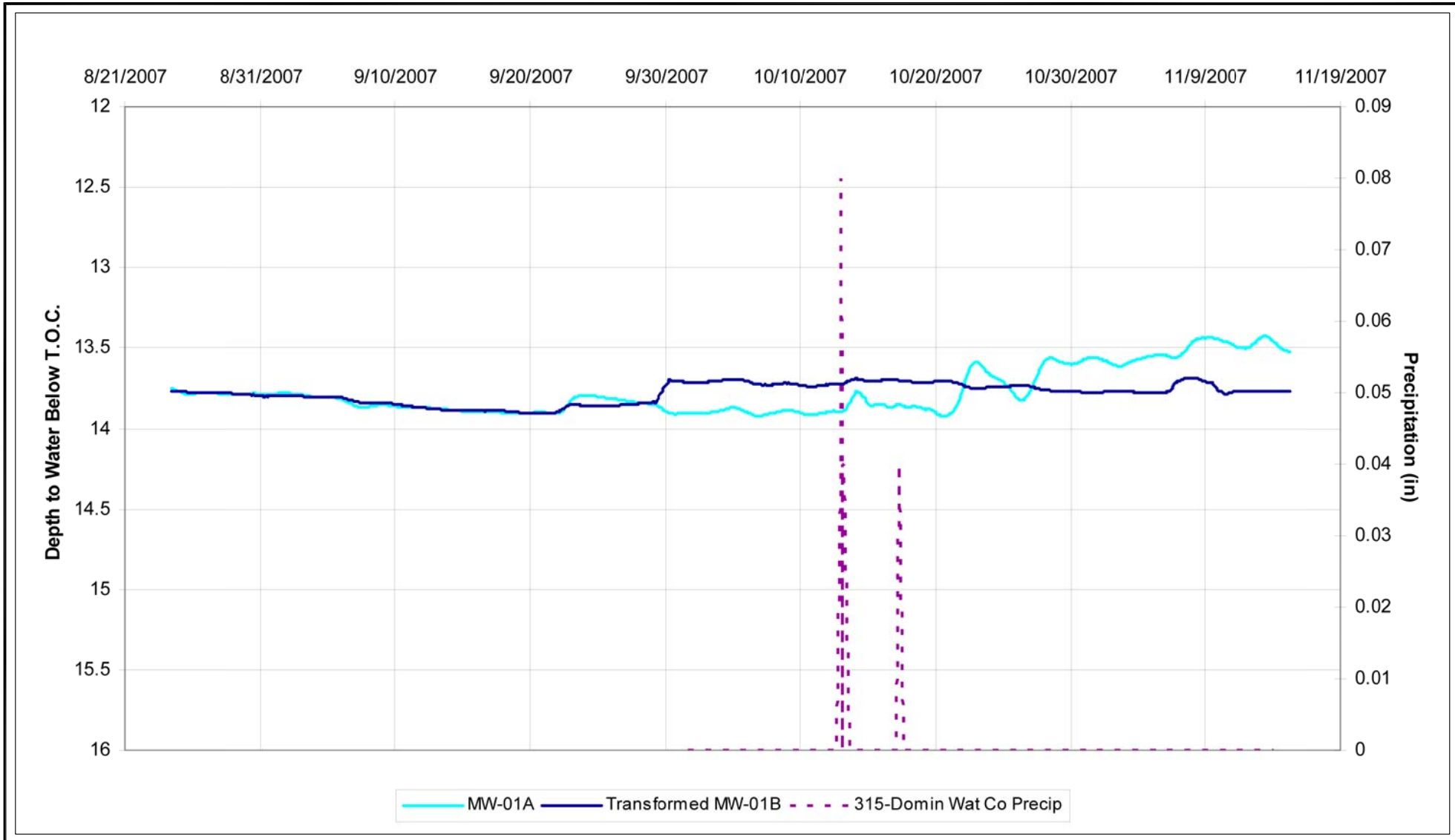
FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

MW-01A AND MW-01B TRANSDUCER DATE AUGUST 23, 2007 TO NOVEMBER 15, 2007 WITH DALTON WELL PUMPING DATA, SEPTEMBER 6, 2007 TO OCTOBER 30, 2007

FIGURE: **23A**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.10.3236	H. Firouzian	G. Maurath	P. Kinney	1/15/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_Graphs2.dwg|troman|Aug 04, 2008 at 11:19|Layout: FIG23A



NOTES:

LOCAL AREA PRECIPITATION DATA OBTAINED FROM LA COUNTY DEPARTMENT OF PUBLIC WORKS WEBSITE.

THE DATA FOR MW-01B HAVE BEEN ADJUSTED UPWARDS BY 2.61 FEET FOR EASE OF COMPARISON WITH MW-01A DATA.

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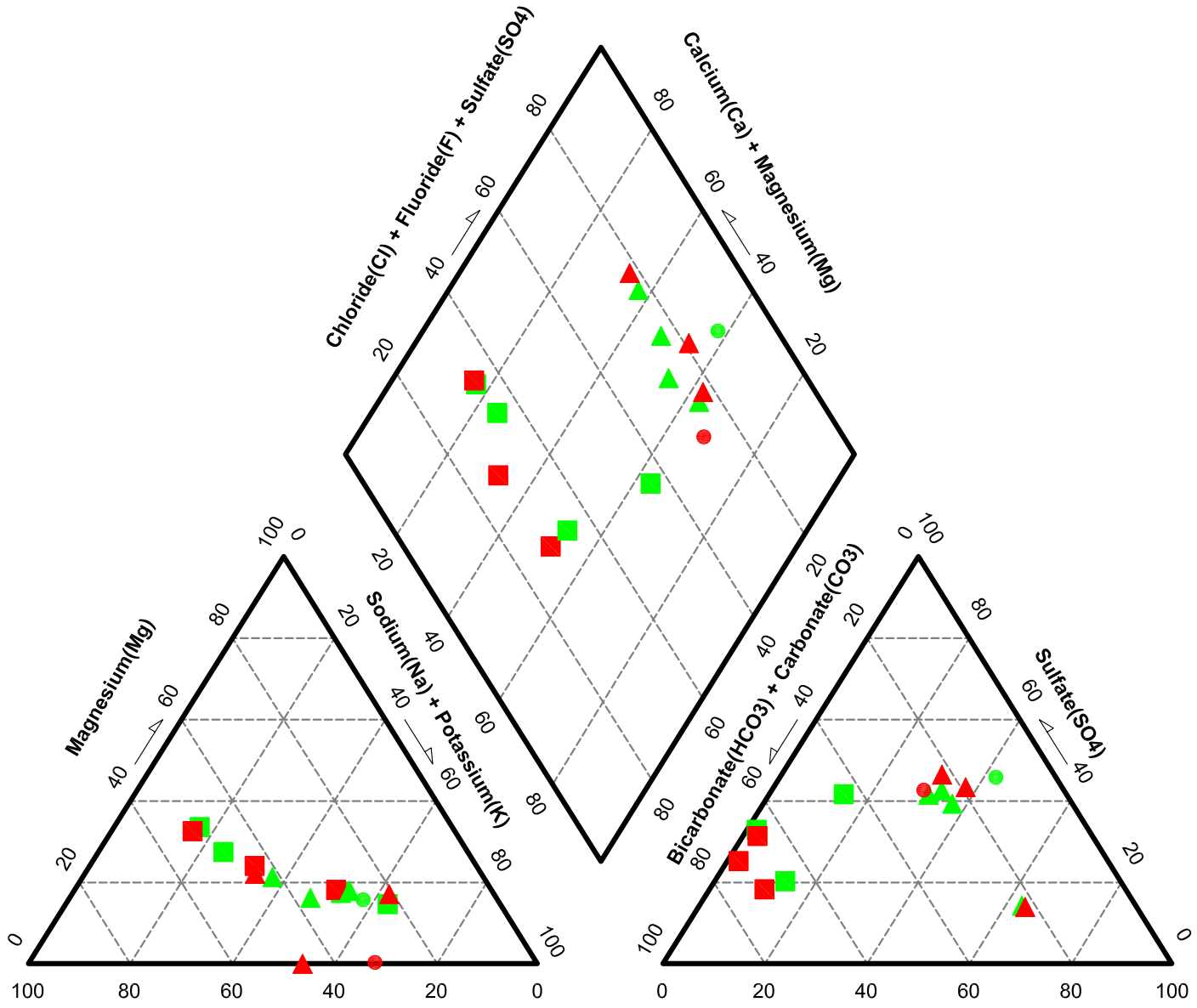
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

MW-01A AND MW-01B TRANSDUCER DATE AUGUST 23, 2007 TO NOVEMBER 15, 2007 WITH LOCAL PRECIPITATION DATA, OCTOBER 1, 2007 TO DECEMBER 31, 2007

FIGURE: **23B**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.10.3236	H. Firouzian	G. Maurath	P. Kinney	1/15/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_Graphs2.dwg|troman|Aug 04, 2008 at 11:20|Layout: FIG23B



Stantec 290 Conejo Ridge Avenue Thousand Oaks, CA 91361 (805) 230-1266/230-1277 (Fax)	FOR: Revised Draft - Report on 2006 Remedial Investigation GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA	**GROUNDWATER CHEMISTRY PIPER DIAGRAM 4Q 2006 AND 2Q 2008**		FIGURE: **24**
	JOB NUMBER: 37BP.XB006.06	DRAWN BY: R. Roman	CHECKED BY: G. Maurath	APPROVED BY: P. Kinney	DATE: 07/07/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\GS-ChemPiperDiag.dwg|troman|Aug 04, 2008 at 11:22|Layout: FIG24

ARTESIA BOULEVARD

NORMANDIE AVENUE

W. CASSIDY ST

ACCESS FRONTAGE ROAD

ACCESS FRONTAGE ROAD

DOMINGUEZ CHANNEL

DOMINGUEZ CHANNEL

PAVED AREA

ACCESS ROAD

PAVED AREA

PAVED AREA

PAVED AREA

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

VACANT LADPW PROPERTY

ID: SV01	
Depth	
7'	B=0.1
	T=0.3
	H=0.047

ID: SV02	
Depth	
13'	T=0.4
	M=12
	m,p,-X=0.2

ID: SV03	
Depth	
5'	M=160
15'	B=0.1
	T=0.7
	M=77

ID: SV04	
Depth	
15'	B=0.1
	M=48

ID: SV06	
Depth	
5'	T=0.4
13'	T=0.4

ID: SV07	
Depth	
15'	M=26

ID: SV11	
Depth	
5'	B=0.2*
	T=0.5*
	M=53

ID: SV12	
Depth	
15'	B=0.1

ID: SV13	
Depth	
5'	T=0.4

ID: SV15	
Depth	
5'	M=10
15'	H=0.37

ID: SV16	
Depth	
13'	M=14
	Freon=0.4

ID: SV17	
Depth	
5'	M=10
	Freon=0.3
10'	T=0.4
	E=0.2

ID: SV18	
Depth	
5'	B=0.1
	T=0.4
	m,p,-X=0.2
	H=2.1
13'	Freon=0.4

ID: SV19	
Depth	
5'	B=0.3
	T=2.2
	E=0.3
	o-x=0.2
	m,p,-X=0.7*
	1,3,5,Tr=0.1*
	H=5.1
10'	B=0.1
	T=0.8
	m,p,-X=0.2
	H=0.21

ID: SV21	
Depth	
15'	M=14

ID: SV22	
Depth	
5'	M=28
13'	M=38

ID: SV23	
Depth	
15'	T=0.3

ID: SV24	
Depth	
13'	M=92

ID: SV25	
Depth	
13'	M=23
15'	T=0.3**

ID: SV26	
Depth	
13'	M=26
	Freon=0.3

ID: SV28	
Depth	
5'	T=0.3
	M=220
	H=0.32
10'	M=99
	H=>50

ID: SV29	
Depth	
5'	M=16
	H=0.054

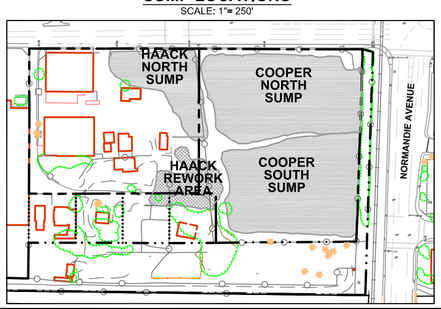
LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN-LINK FENCE
- SV01 SOIL VAPOR SAMPLES

Sample ID:		
Depth		
5'	B	= Benzene
	T	= Toluene
	E	= Ethylbenzene
	o-x	= o-Xylene
	m,p,-X	= m,p, -Xylene
	1,3,5, Tr	= 1,3,5 Trimethylbenzene
	M	= Methane
	H	= Hydrogen Sulfide
	*	= Duplicate Sample Analytical Data
	**	= Second Event Analytical Data

SUMP LOCATIONS

SCALE: 1"= 250'



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON-SITE AND OFF-SITE WERE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.
4. BORING AND SAMPLE LOCATIONS WERE SURVEYED BY W.M. HOLDINGS INC., ON JANUARY 23, 2006 (CPB AND DPW BORINGS), FEBRUARY 17, 2006 (HPB AND RB BORINGS), AND MARCH 30, 2006 (SV BORINGS).
5. SUPPLIMENTAL BORING AND SAMPLE LOCATIONS; AND GROUND WATER MONITORING WELL LOCATIONS AND ELEVATIONS (MW-04A/B) WERE SURVEYED BY W.M. HOLDING INC. ON MARCH 1, 2007

0 80 160

APPROXIMATE SCALE (FEET)

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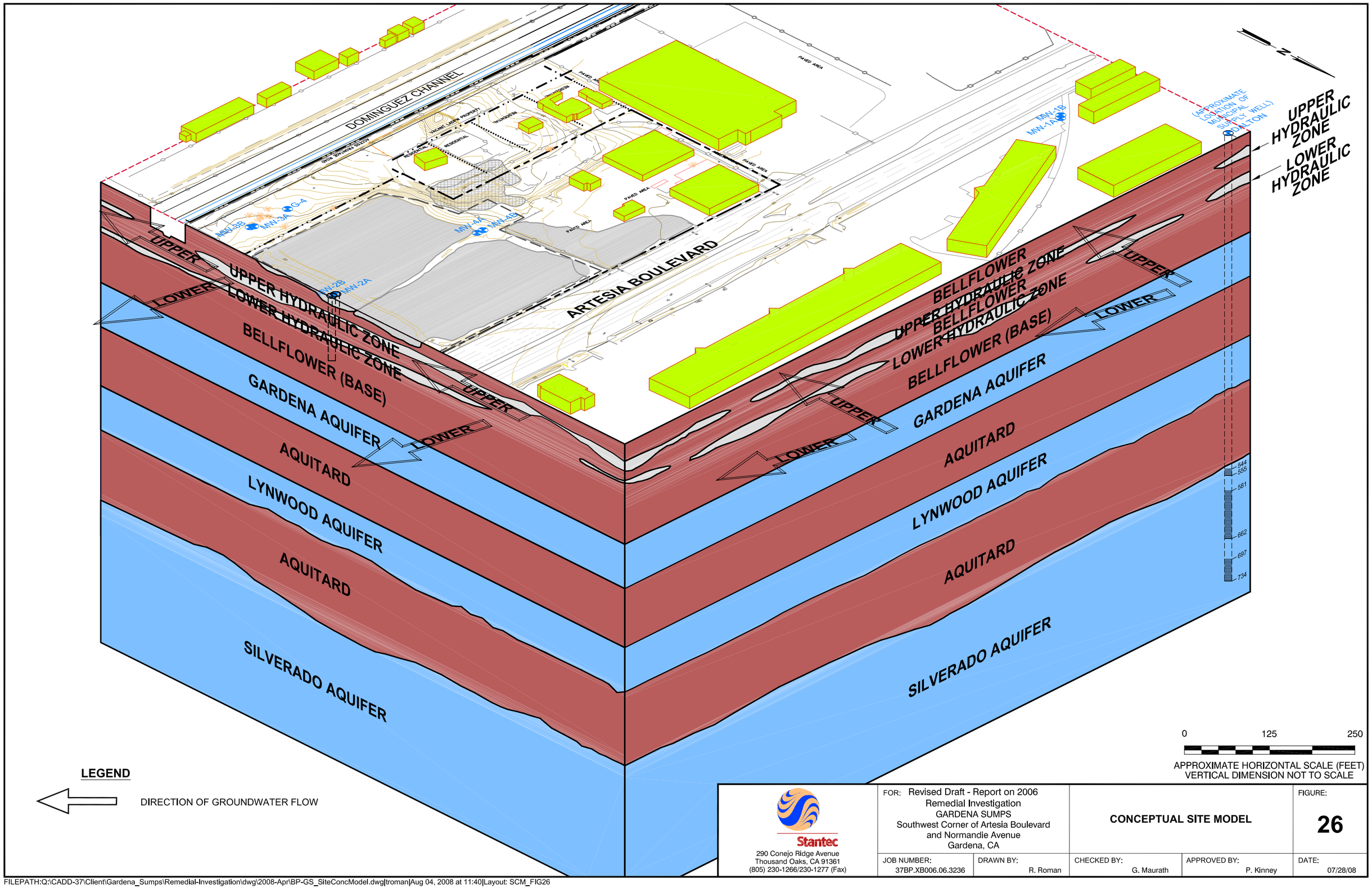
FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

TEMPORARY SOIL VAPOR PROBE LOCATIONS WITH DETECTED VOC (8260B), H2S, AND METHANE ANALYTICAL RESULTS

FIGURE: **25**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16	R. Roman	M. Richards	P. Kinney	06/13/08

FILEPATH:O:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_ActiveSoilGas.dwg|troman|Aug 18, 2008 at 9:07|Layout: FIG25



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Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

CONCEPTUAL SITE MODEL

FIGURE: **26**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.06.3236	R. Roman	G. Maurath	P. Kinney	07/28/08

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2008-Apr\BP-GS_SiteConcModel.dwg|troman|Aug 04, 2008 at 11:40|Layout: SCM_FIG26

TABLES

Table 1
Summary of Main Investigation Reports Completed Prior to 2005
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Report Date	Completed By	Title	Report Type	Description
05/24/2002	Joe Cully (DTSC)	2002 Groundwater Sampling Reports for Gardena Sumps	GW	Sampling of 2 off-site, 5 on-site wells supervised by Joe Cully
11/20/2001	Joe Cully (DTSC)	2000 and 2001 Groundwater Sampling Reports for Gardena Sumps	GW	Redevelopment, purge, sampling of 2 off-site, 5 on-site wells supervised by Joe Cully
07/06/1995	Tetra Tech	Baseline Human Health Risk Assessment		
07/01/1995	Tetra Tech	Groundwater Monitor & Liner Damage Report	GW	7 wells - 2nd phase of monitor/TT vehicle sank in sump causing damage
11/1/1994	DTSC	Soils/Waste Sludge Remedial Investigation Report	Soil	October and November 1993 soil /waste sludge investigation of Haack property. February 1994 surface soil sampling
11/14/1994	URS	Groundwater Remedial Investigation	GW	--
04/06/1994	OHM	Final Report for Temporary Covering of Gardena Sumps		Barrier - Polypropylene Geo membrane
03/09/1994	OHM	Site Specific Health and Safety Plan for Temporary Covering of Gardena Sumps		--
12/08/1993	DTSC	Gardena Sumps - Environmental Investigation		Industrial Hygenist Review of stress to workers
12/01/1992	OHM	Health and Safety Procedures Manual		1st printing 08/89

Table 1
Summary of Main Investigation Reports Completed Prior to 2005
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Report Date	Completed By	Title	Report Type	Description
11/12/1992	HazMat West '92, Long Beach, CA	Environmental Forensic Geochemistry: Global Geochemistry Corporation, Authors: Kaplan, Alimi, Dunuohou, and Lee		--
07/07/1992	Karl Morthole, Esq., for Southern Pacific	Gardena Sumps		Response to Order
06/22/1992	California Fish & Game	Division of Fish and Game Case Reports		Regarding John Morrison and Compartment Delivery citations, received from PHR Environmental Consultants, Inc.
06/15/1992	Metcalf & Eddy, Inc.	Gardena Sumps Temporary Cover D-Size, Surveyed Site Plan		Cover Plan for Cooper property - shows 4 residences, 2 of 3
01/30/1992	Metcalf & Eddy, Inc.	Results from Focused Remedial Investigation at Gardena Sumps		Sampling 10/91 - characterize wastes & information for health hazards
10/08/1991	Cooper, Thomas	T. Cooper Monthly Report #43 September 1991		
08/14/1990	Cooper, Thomas	Letter regarding results of analysis by Petroleum Testing Service, including the letter to T. Cooper from Petroleum Testing Co.		
04/13/1990	Cooper, Thomas	T. Cooper Monthly Report #25 March 1990		
01/01/1989	--	The 1989 Bond Expenditure Plan, Detailed Site Expenditure Plan, Gardena Sumps		
08/08/1988	Cooper, Thomas	Monthly Report #5, July 1988		

Table 1
Summary of Main Investigation Reports Completed Prior to 2005
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Report Date	Completed By	Title	Report Type	Description
08/03/1988	DTSC, R. Notini	Letter discussing PH test method		--
08/02/1988	DTSC, R. Notini	Letter discusses Gardena Sumps Remedial Investigation and Feasibility Study Report		DTSC says report "grossly deficient" with regard to 03/03/1988 Remedial Action Order
07/29/1988	DHS	Determination of Imminent and/or Substantial Endangerment and Issuance of Order		Atlantic Richfield not included as Respondent
07/08/1988	DHS	DHS Internal Draft of Determination of Imminent and Substantial Endangerment and Issuance of Order. Respondents: Haacks (2) and T. Cooper		
06/24/1988	--	Remedial Investigation and Feasibility Study Report		
03/03/1988	DHS	DHS Amendment to Remedial Action Order, Docket No. HSA 87/88-037		
01/01/1988	DTSC	Public Information Fact Sheet		Discussed Gardena Sumps investigation
01/01/1988	DHS	DHS Fact Sheet on Gardena Sumps: "DHS Investigates Petroleum Disposal Site"		
12/01/1987	Ecology & Environment, Inc.	Site Inspection Report, Gardena Sumps		Task Order No. 3-4-1.0-P31016
11/01/1987	DHS	DHS Site Inspection Report, Gardena Sumps		

Table 1
Summary of Main Investigation Reports Completed Prior to 2005
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Report Date	Completed By	Title	Report Type	Description
06/10/1987	Ecology & Environment, Inc.	Site Health and Safety Plan (revised)		--
06/10/1987	Ecology & Environment, Inc.	Letter and updated Health and Safety Plan		
10/28/1986	Ecology & Environment, Inc.	Preliminary Site Assessment, Gardena Sumps		Task Order No. 3-4-1.0-P31016
10/31/1983	U.S. EPA	U.S. EPA Memo on Gardena Sumps		Site Background
07/01/1982	Ecology & Environment, Inc.	FIT Project - Field Investigation of Uncontrolled Hazardous Waste Sites		Site Investigation / Work Plan Determine Hazard Ranking System and work plan for field data collection.
07/01/1982	U.S. EPA	U.S. EPA Potential Hazardous Waste Site, Site Inspection Report		
03/23/1982	U.S. EPA	U.S. EPA Memo on Site Inspection Report, Cooper Site Investigation		
08/26/1981	U.S. EPA	U.S. EPA Notification of Hazardous Waste Site, "Sump Site, City of Gardena"		
03/04/1943	California Fish & Game	Case Report: John Morrison, 1715 Cressey Street, Compton 03/04/1943 to 05/28/1943		Record of arrest trial conviction fine for waste discharge
01/25/1943	California Fish & Game	Case Report: Compartment Del, Inc. 1715 Cressey St., Compton 01/25/1943 to 02/15/1943		Recovery of arrest, trial, conviction, and fine, after heavy rains breached containment causing waste discharge to nearby slough (prior violation 03/15/1941 referred to)

Table 2
Pre-SECOR RI - Results of the pH Analysis -
Surface Soil Samples

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

SAMPLE ID	SAMPLE DEPTH (ft)	SAMPLE pH
GS-A1	1	6.1
GS-A2	2	6.3
GS-A3	1	5.9
GS-A4	2	6.4
GS-B1	1	4.5
GS-B2	2	5.8
GS-B3	1	5.7
GS-B4	2	5.2
GS-C1	1	6.9
GS-C2	2	7.2
GS-C3	1	6.9
GS-C4	2	7.2
GS-D1	1	3.3
GS-D2	2	2.1
GS-D3	1	2.3
GS-D4	2	3.2
JH01	"Grab Sample"	3.7
JH02	"Grab Sample"	2.6
JH03	"Grab Sample"	1.8
JH04	"Grab Sample"	1.9
JH05	"Grab Sample"	1.9
JH06	"Grab Sample"	1.3
JH07	"Grab Sample"	2.5

References:

DTSC, 1994. Soils/Sludge Remedial Investigation Report, Gardena Sumps, 1440 West Artesia Boulevard, Gardena, California, November.

EEI, 1982. Site Investigation Report / Work Plan, Gardena Sumps, Gardena, CA, July.

Table 3
Pre-SECOR RI - Results of the Metals Analysis and Selected Organic Constituents - Surface Soil Samples

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

ANALYTE	MAXIMUM OBSERVED CONCENTRATION (mg/kg)	BORING ID
Arsenic	11.7	B-2
Antimony	49	B-2
Barium	192	GS-A1
Beryllium	0.94	GS-A2
Cadmium	2.90	GS-D4
Cobalt	10.8	GS-A4
Chromium	550	S-3
Copper	2,240	GS-D2
Molybdenum	11.8	GS-D4
Nickel	190	B-1
Lead	2500	B-2
Selenium	<7.50	NA
Thallium	<15.0	NA
Vanadium	53.9	GS-A2
Zinc	1620	GS-D2
1-3-5-Trimethylbenzene	17	B3GS-SS2
C_4-C_{40}	<MDL	NA

Notes:
mg/kg = milligrams per kilogram
NA = not applicable
MDL = method detection limit

Reference:
DTSC, 1994. Soils/Sludge Remedial Investigation Report, Gardena Sumps, 1440 West Artesia Boulevard, Gardena, California, November.
EEI, 1987. Site Inspection Report, Gardena Sumps, Gardena, CA, December.

Table 4
Pre-SECOR RI - Results of the Semi-Volatile Analysis - Surface Soil Samples

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

ANALYTE	MAXIMUM OBSERVED CONCENTRATION (mg/kg)	BORING ID
Chrysene	81	GS-D2
Benzo (b) Fluoranthene	*8.3	GS-D3
Phenanthrene	1500	B-1
Fluoranthene	*7.3	GS-D2
Pyrene	*19	GS-D2

Notes:

* = quantitated below the established linear calibration range. The amount reported is an estimate.
mg/kg = milligrams per kilogram

Reference:

DTSC, 1994. Soils/Sludge RemedialInvestigation Report, Gardena Sumps, 1440 West Artesia Boulevard, Gardena, California, November.

EEI, 1987. Site Inspection Report, Gardena Sumps, Gardena, CA, December.

Table 5
Pre-SECOR RI - Summary of Laboratory Analytical Results for Soil at Monitoring Well Locations
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:		8260	8270	6010/7000			9040
Sample ID	Date Sampled	Volatiles (mg/kg)	Semi-Volatiles (mg/kg)	Title 22 Metals [1]			pH (mg/kg)
				Barium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	
SMW-02A-06	01/26/94	ND	ND	190	<50	55	8.4
SMW-02A-11	01/26/94	ND	ND	140	<50	<50	9.0
SMW-02A-16	01/26/94	ND	ND	76	<50	<50	8.2
SMW-02A-21	01/26/94	ND	ND	90	<50	<50	7.8
SMW-12A-21	01/26/94	ND	ND	120	<50	<50	7.7
SMW-02A-26	01/26/94	ND	ND	65	<50	<50	8.4
SMW-02A-31	01/26/94	ND	ND	94	<50	<50	7.7
SMW-03A-05	01/21/94	ND	ND	--	--	--	--
SMW-03A-05	01/21/94	ND	ND	95	69	<50	7.1
SMW-03A-10	01/21/94	ND	ND	160	85	69	7.9
SMW-03A-16	01/21/94	ND	ND	87	73	58	7.4
SMW-03A-21	01/21/94	ND	ND	140	89	71	7.1
SMW-03A-26	01/21/94	ND	ND	400	75	61	7.7
SMW-03A-31	01/21/94	ND	ND	190	<50	55	7.4
SMW-13A-31	01/21/94	ND	ND	150	96	76	7.4
SMW-03A-31 [2]	01/21/94	ND	ND	--	--	--	--

Notes:

(1) = Silver, Arsenic, Cobalt, Chromium, Copper, Molybdenum, Nickel, Lead, Antimony and Thallium were not detected in concentrations greater than 50 mg/kg. Beryllium and Cadmium were not found in concentrations greater than 5.0 mg/kg. Selenium was not detected in concentrations greater than 10 mg/kg

(2) = Duplicate sample

ND = Non-detect

mg/kg = milligrams per kilogram

-- = Not applicable / Not analyzed

Sample Number Definition:

SMW = Soil sample collected during Monitoring Well Boring

OXA = Boring number (1XA indicates duplicate sample)

-XX = Depth (bgs) in feet

Reference:

URS, 1994. *Groundwater Remedial Investigation Technical Memorandum*, Gardena Sumps, 1440 West Artesia Boulevard, Gardena, California, November 14.

Table 6

Pre-SECOR RI - Location and Depth of Waste Sludge -
Haack Property Soil Borings

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

BORING ID	DEPTH OF SLUDGE (ft. bgs)	TOTAL THICKNESS OF SLUDGE (ft. bgs)
B-3	2.5 to 3.0 8.8 to 9.0	0.7
B-4	7.0 to 11.5	4.5
B-6	5.0 to 8.0	3
B-8	4.0 to 6.0	2
B-9	1.0 to 3.0 7.5 to 9.5 11.0 to 11.5	4.5
B-10	1.0 to 13.0	12
B-11	1.0 to 5.0 6.5 to 9.0	6.5
B-12	2.0 to 3.0	1
B-16	5.5 to 7.0	1.5
B-17	2.0 to 2.5 3.5 to 7.5	4.5

Reference:

DTSC, 1994. Soils/Sludge RemedialInvestigation Report, Gardena Sumps, 1440 West Artesia Boulevard, Gardena, California, November.

Table 7
Pre-SECOR RI - Volatile Organic Analysis - Haack Property Soil Borings

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8260								
Sample ID	Depth (ft)	Type	2-Butanone (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	m, p-Xylenes (mg/kg)	o-Xylenes (mg/kg)	n-propyl-benzene (mg/kg)	1,2,4 trimethyl-benzene (mg/kg)	1,3,5 trimethyl-benzene (mg/kg)	Naphthalene (mg/kg)
B3AGS-SS1	5	soil	ND	ND	ND	ND	ND	ND	ND	*3.8	ND
B3GS-SS1	13	soil	ND	ND	ND	ND	ND	ND	ND	*2.5	ND
B3GS-SS2	15	soil	ND	ND	ND	ND	ND	ND	ND	17	ND
B4GS-SS2	9.5	waste	ND	ND	ND	*7	ND	ND	21	-140	*4.5
B17GS-SS1	5	waste	ND	17	*5.5	35	12	*1.4	17	*4.6	7.3
B12GS-VOA1	--	water	*31	ND	ND	ND	ND	ND	ND	ND	ND
B14GS-VOA1	--	water	*39	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

* = quantitated below linear calibration range
- =quantitated above the linear calibration range
mg/kg = milligrams per kilogram
ND = Non-detect

Reference:

DTSC, 1994. Soils/Sludge RemedialInvestigation Report, Gardena Sumps, 1440 West Artesia Boulevard, Gardena, California, November.

Table 8
Pre-SECOR RI - Semi-Volatile Organic Analysis - Haack Property Soil Borings

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:				8270														
Sample ID	Depth (ft)	Type	pH	Diethyl Phthalate (mg/kg)	Bis (2-ethylhexyl) Phthalate (mg/kg)	Naph-thalene (mg/kg)	Fluorene (mg/kg)	Phenan-threne (mg/kg)	Fluoran-thene (mg/kg)	Pyrene (mg/kg)	Chrysene (mg/kg)	Benzo (b) Fluoran-thene (mg/kg)	Benzo (a) Pyrene (mg/kg)	Dibenz (a,h) Anthracene (mg/kg)	Benzo (g,h,i) Perylene (mg/kg)	Phenol (mg/kg)	2-Methylnaph-thalene (mg/kg)	2-Methylnaph-thalene Isomers (mg/kg)
B3GS-CC3	8	waste	<1.0	ND	ND	ND	ND	*120	ND	*42	*60	*38	ND	ND	ND	ND	ND	*59
B3GS-CC4	10	soil	6.6	ND	ND	ND	ND	*1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B4GS-CC3	10	waste	<1.0	ND	ND	*18	*20	190	*16	*44	*100	*35	ND	ND	ND	*120	*59	*120
B4GS-CC4	13	soil	1.5	ND	ND	ND	ND	11	ND	*2.2	*5.2	*1.8	ND	ND	ND	ND	*2.7	*5.4
B4GS-CC5	19	soil	3.3	ND	ND	ND	ND	*4.9	ND	*1.8	*2.6	*1.9	ND	ND	ND	ND	*1.6	*2.6
B5GS-CC3	6	soil	3.6	ND	ND	ND	ND	ND	ND	ND	*2.6	ND	ND	ND	ND	ND	ND	ND
B6GS-CC1	5.5	waste	2.4	ND	ND	ND	*11	155	ND	70	157	*46	ND	ND	ND	ND	ND	ND
B7GS-CC2	8	soil	6.3	ND	ND	ND	ND	*2.8	ND	*2.4	*2.7	ND	ND	ND	ND	ND	ND	ND
B8GS-CC1	5	soil	3.1	ND	ND	ND	ND	28	11	15	29	*4.8	ND	ND	ND	ND	ND	ND
B9GS-CC1	1.5	waste	1.9	ND	ND	ND	ND	116	*13	*31	64	*18	ND	ND	ND	ND	ND	ND
B9GS-CC2	8	waste	1.8	ND	ND	ND	*19	238	*18	*49	82	*25	ND	ND	ND	ND	*21	*15
B9GS-CC3	9	waste	1.9	ND	ND	ND	*23	229	*12	*20	43	*10	ND	ND	ND	ND	*15	*10
B10GS-CC2	12	waste	2.8	ND	ND	59	ND	13	*1.7	*3.4	10	*4.6	ND	ND	ND	ND	191	302
B11GS-CC1	2	soil	1.3	ND	ND	ND	*4.2	55	*4.2	*15	35	*8.7	ND	ND	ND	ND	*8.4	*13.4
B11GS-CC2	8	waste	1.6	ND	ND	*2.1	*5.5	56	*6.6	18	38	11	ND	ND	ND	ND	*8.9	*11
B12GS-CC1	2.2	waste	2.5	ND	ND	ND	*18	366	36	65	157	28	ND	ND	ND	ND	*12	*7
B12GS-CC2	4	soil	2.4	ND	ND	ND	ND	*1.6	ND	ND	*1.8	ND	ND	ND	ND	ND	ND	ND
B14GS-RS2	--	water	--	240	*73	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B16GS-CC1	7	waste	2.7	ND	ND	ND	ND	*15	*6.7	22	59	25	ND	ND	ND	ND	ND	ND
B17GS-CC1	2.5	waste	1.6	ND	ND	ND	*17	205	*22	65	126	53	*14	*15	*12	ND	*13	*10
B17GS-CC2	4	waste	1.0	ND	ND	ND	*19	188	*23	72	119	55	*15	*17	*10	ND	*18	*11
B17GS-CC3	6.5	waste	<1.0	ND	ND	*6.6	*9.6	169	*11	22	51	*13	ND	ND	ND	ND	*7.9	*5.5

Notes:
* = quantitated below linear calibration range
mg/kg = milligrams per kilogram
ND = Non-detect

Reference:
DTSC, 1994. Soils/Sludge RemedialInvestigation Report, Gardena Sumps, 1440 West Artesia Boulevard, Gardena, California, November.

Table 9
Pre-SECOR RI - Inorganic Analysis - Haack Property Soil Borings

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

				EPA Method:								
				6010								
Sample ID	Depth (ft)	Type	pH	Barium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)
B1GS-CC1	2	soil	7.1	110	<50	<50	<50	<50	<5	<5	<10	--
B1GS-CC5	10.5	soil	5.1	180	<50	<50	<50	<50	<5	<5	<10	--
B1GS-CC7	15	soil	5.2	110	<50	<50	69	57	<5	<5	<10	--
B2GS-CC1	4	soil	7.6	120	<50	<50	70	61	<5	<5	<10	--
B2GS-CC2	8.5	soil	7.3	140	<50	<50	67	55	<5	<5	<10	--
B2GS-CC3	12.5	soil	6.9	110	<50	<50	70	59	<5	<5	<10	--
B3GS-CC2	2	soil	5.4	130	<50	<50	65	94	<5	<5	<10	--
B3GS-CC2	4.5	soil	5.8	89	<50	<50	71	60	<5	<5	<10	--
B3GS-CC3	8	waste	<1.0	<50	210	<50	<50	77	<5	<5	<10	--
B3GS-CC4	10	soil	6.6	520	190	995	68	2,000	<5	7	<10	--
B4GS-CC1	4.5	soil	5.8	86	<50	<50	<50	<50	<5	<5	<10	--
B4GS-CC2	8	soil	3.4	100	<50	<50	57	<50	<5	<5	<10	--
B4GS-CC3	10	waste	<1	<50	54	<50	<50	<50	<5	<5	<10	--
B4GS-CC4	13	soil	1.5	75	100	<50	<50	250	<5	<5	<10	--
B4GS-CC5	19	soil	3.3	100	<50	<50	58	110	<5	<5	<10	--
B5GS	see notes											
B6GS	see notes											
B7GS-CC1	6	soil	5.5	130	<50	<50	82	82	<10	<10	<10	--
B7GS-CC2	8	soil	6.3	120	<50	<50	79	65	<10	<10	<10	--
B7GS-CC3	14	soil	6.2	140	<50	<50	81	66	<10	<10	<10	--
B7GS-CC4	19	soil	6.3	86	<50	<50	70	<50	<10	<10	<10	--
B8GS-CC1	5	waste	3.1	180	<50	<50	<50	<50	<10	<10	<10	--
B8GS-CC1	8	soil	3.3	100	<50	<50	67	<50	<10	<10	<10	--
B8GS-CC2	12	soil	3.4	110	<50	<50	84	<50	<10	<10	<10	--
B8GS-CC3	19	soil	3.5	79	<50	<50	64	<50	<10	<10	<10	--
B9GS-CC4	1.5	waste	1.9	<50	51	110	<50	97	<10	<10	<10	--
B9GS-CC1	8	waste	1.8	<50	<50	78	<50	<50	<10	<10	<10	--
B9GS-CC3	9	waste	1.9	57	68	3,500	<50	225	<10	<10	<10	--
B9GS-CC4	13	soil	3.4	94	<50	<50	65	50	<10	<10	<10	--
B10GS-CC1	8	waste	3.5	95	<50	<50	<50	66	<5	<5	<5	--
B10GS-CC2	12	waste	2.8	120	<50	<50	<50	<50	<5	<5	<5	--
B10GS-CC3	15	soil	3.3	120	<50	<50	<50	<50	<5	<5	9	--
B10GS-CC4	18	soil	3.7	100	<50	<50	<50	<50	<5	<5	10	--
B11GS-CC1	2	waste	1.3	59	<50	<50	<50	<50	<5	<5	<5	--
B11GS-CC2	8	waste	1.6	65	<50	70	<50	<50	<5	<5	<5	--

Table 9
Pre-SECOR RI - Inorganic Analysis - Haack Property Soil Borings

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:				6010								
Sample ID	Depth (ft)	Type	pH	Barium (mg/L)	Copper (mg/L)	Lead (mg/L)	Vanadium (mg/L)	Zinc (mg/L)	Beryllium (mg/L)	Cadmium (mg/L)	Selenium (mg/L)	Silver (mg/L)
B11GS-CC3	10	soil	2.6	170	<50	<50	<50	100	<5	<5	<5	--
B12GS-CC1	2.2	waste	2.5	66	<50	<50	<50	<50	<5	<5	<5	--
B12GS-CC2	4	waste	2.4	150	<50	<50	<50	<50	<5	<5	<5	--
B12GS-CC3	8	soil	2.3	130	<50	<50	<50	<50	<5	<5	<5	--
B12GS-CC4	12.5	soil	1.8	100	<50	<50	70	<50	<5	<5	<5	--
B12GS-CC5	24.5	soil	2.0	66	<50	<50	65	<50	<5	<5	<5	--
B13GS-CC1	8	soil	2.1	110	<50	<50	59	69	<5	<5	<5	--
B14GS-CC1	3.5	soil	4.8	72	<50	<50	59	55	<5	<5	<5	<50
B16GS-CC1	7	waste	2.7	<50	<50	<50	<50	<50	<5	<5	<5	<50
B16GS-CC2	7.6	soil	--	120	<50	<50	<50	<50	<5	<5	<10	<50
B17GS-CC1	2.5	waste	1.6	<50	<50	<50	<50	<50	<5	<5	<10	<50
B17GS-CC2	4	waste	1.0	<50	<50	<50	<50	<50	<5	<5	<10	52
B17GS-CC3	6.5	waste	<1.0	50	<50	<50	<50	<50	<5	<5	<10	54
B17GS-CC4	8.0	soil	1.7	89	<50	<50	<50	<50	<5	<5	<10	<50
B17GS-CC5	12.0	soil	3.0	110	<50	<50	<50	60	<5	<5	<10	<50
GSR1	--	water	--	<1	<1	<1	<1	<1	<0.1	<0.1	<0.2	<50
GSR1027	--	water	--	<1	<50	<1	<50	<1	<5	<5	<0.1	<50

Notes:
mg/kg = milligrams per kilogram
-- = Not applicable / Not analyzed
B5GS/B6GS = Inorganic analysis unknown due to pages missing from scanned document received.

Reference:
DTSC, 1994. Soils/Sludge RemedialInvestigation Report, Gardena Sumps, 1440 West Artesia Boulevard, Gardena, California, November.

Table 10
Chemicals of Potential Concern in Air

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Sample Area	Chemical	Haack Property		Cooper Property	
		Vapor	Dust	Vapor	Dust
Flux Chamber	Benzene	X		X	
	Ethylbenzene	X		X	
	Hydrogen Sulfide	X		X	
	Methylene Chloride	X		X	
	Tetrachloroethene	X		X	
	Toluene	X		X	
	1,1,1-Trichloroethane	X		X	
	m- and p-Xylenes	X		X	
	o-Xylene	X		X	
Sludge	Acetone			X	
	Benzene			X	
	2-Butanone			X	
	Carbon disulfide			X	
	Ethylbenzene			X	
	Fluorene			X	
	Phenanthrene	X		X	
	Toluene			X	
Soil Bulk Organics	Bis (2-ethylhexyl) phthalate		X		
	Chrysene		X		
	Di-n-butylphthalate		X		
	Fluoranthene		X		
	2-Methylnaphthalene	X			
	Naphthalene	X			
	Phenanthrene	X		X	
	Pyrene		X		X
	Toluene	X			
	1,2,4-Trimethylbenzene	X			
	1,3,5-Trimethylbenzene	X			
	m- and p-Xylenes	X			
	o-Xylenes	X			

Table 10
Chemicals of Potential Concern in Air

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Sample Area	Chemical	Haack Property		Cooper Property	
		Vapor	Dust	Vapor	Dust
Soil Bulk Inorganics	Antimony		X		
	Arsenic				X
	Barium		X		X
	Beryllium				X
	Cadmium		X		X
	Chromium (as VI)		X		X
	Cobalt				X
	Copper		X		X
	Lead		X		X
	Molybdenum				X
	Nickel		X		X
	Vanadium		X		X
	Zinc		X		X

Reference:

Tetra Tech, 1995. *Baseline Human Health Risk Assessment*, Gardena Sumps, 1440 West Artesia Boulevard, Gardena, California, July 7.

Table 11

Chemicals of Potential Concern in Soil and Sludge -
Cooper Property

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Chemicals	Surface Soil (0 - 1 ft)	Near Surface Soil (0 - 10 ft)	Sludge (0 - 10 ft)
Acetone			X
Arsenic		X	
Barium	X	X	X
Benzene			X
Benzo (a) anthracene			X
Benzo (b) fluoranthene			X
Benzo (g,h) perylene			X
Benzo (a) pyrene			X
Beryllium	X	X	
2-Butanone			X
Cadmium	X	X	X
Carbon Disulfide			X
Chromium	X	X	X
Chrysene	X	X	X
Colbalt	X	X	X
Copper	X	X	X
Dibenzo (a,h) anthracene			X
Ethylbenzene			X
Flouranthene			X
Fluorene			X
Lead	X	X	X
Molybdenum		X	
Nickel	X	X	X
Phenanthrene	X	X	X
Phenols (total)			X
Pyrene			X
Sulfide			X
Toluene			X
Vanadium	X	X	X
Xylenes (total)			X
Zinc	X	X	X

Reference:

Tetra Tech, 1995. *Baseline Human Health Risk Assessment*, Gardena Sumps, 1440 West Artesia Boulevard, Gardena, California, July 7.

Table 12
Chemicals of Potential Concern in Soil and Sludge -
Haack Property

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Chemicals	Surface Soil (0 - 1 ft)	Near Surface Soil (0 - 10 ft)	Sludge (0 - 10 ft)
Antimony	X	X	
Barium	X	X	X
Benzo (b) fluoranthene		X	X
Bis(2-ethylhexyl) phthalate	X	X	
Cadmium		X	
Chromium	X	X	
Chrysene	X	X	X
Copper	X	X	X
Di-n-butyl phthalate	X	X	
Fluoranthene		X	X
Lead	X	X	X
2-Methylnaphthalene	X	X	
Naphthalene		X	
Nickel	X	X	
Phenanthrene	X	X	X
Pyrene	X	X	X
Toluene		X	
1,2,4-Trimethylbenzene	X	X	
1,3,5-Trinitrobenzene	X	X	
Vanadium		X	X
Xylenes (total)		X	
Zinc	X	X	X

Reference:

Tetra Tech, 1995. *Baseline Human Health Risk Assessment*, Gardena Sumps, 1440 West Artesia Boulevard, Gardena, California, July 7.

Table 13
Summary of CPT Logs From Previous Investigations

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

feet bgs	CPT-1	CPT-2	CPT-3	CPT-4	CPT-5	CPT-6	CPT-6a	CPT-7	CPT-8	CPT-9	CPT-10	CPT-10a	CPT-11	CPT-11a	CPT-12
	ML	SM/ML	SM	CL	ML	CL	SM	SM	CL	ML	ML	CL	ML	SM	SM
	CL	CL				SM						ML	CL		
	SP	SP	CL		CL		CL							ML	
			SP	Pt		ML		CL		CL		CL	SM	data	
10		ML											CL	missing	
	CL		ML	CL		CL									CL
			CL										ML/SM		ML
			ML	SM	ML			SM	ML	SM	SM	SM	ML/CL	SP	
				CL	CL								SM		SM
20											SP		CL		CL
									CL	CL					SM
	SM	CL		SM	SM			CL						ML	CL
	ML			CL	CL	SP					SM	CL			
						CL		SM						SP	SM
30		SM						CL	SM					CL	CL
		ML		depths					CL	ML			ML		
				missing											
	CL			CL/ML/SM	SC		SC		ML	CL			CL		
	ML				ML				CL		ML		SC		SC
40	SM	CL	CL	CL	CL			SC		SM	SC				CL
	CL		SM		SM			CL		CL	SM	SP			
		ML	ML		CL					ML	ML				
	ML								ML			ML		ML	ML
		SM		ML	SM						SM	SP			SC
50	SM/SP		SM					ML				SP		SP	CL
			SP		ML			SM	SM	SM	SP				
	ML		ML					ML							ML
										SP					
									ML	ML				SM	SM
60	SM			SP	SP			SM							
					ML				SM	SM				SP	
								CL							
								ML	SM/ML						
								SM	SP						
70															

Notes:
CL:Inorganic clays and silty clays
Pt: Highly organic soil
ML: Inorganic silts, sandy silts, and clayey silts
SC: Inorganic clayey sands
SM: Silty sands, silt-sand mixtures
SP: Poorly graded sands or gravelly sands with little to no fines

Reference:
URS, 1994. *Groundwater Remedial Investigation Technical Memorandum,* Gardena Sumps, Gardena, California, November 14.

Table 14
Groundwater Monitoring Well Construction Specifications
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Date Installed	Date Abandoned	Well Diameter (inches)	Well Material	Top of Casing Elevation (ft MSL)	Surface Elevation (ft MSL)	Total Depth of Boring (ft bgs)	Total Depth of Well (ft bgs)	Screen Interval (ft bgs)	Screen Interval (ft MSL)
MW-01A	02/16/94	--	4"	sch. 40 PVC	24.05	24.05	40	40	27-37	-2.95 to -12.95
MW-01B	02/14/94	--	4"	sch. 40 PVC	24.27	24.27	92	86	80-85	-55.73 to -60.73
MW-02A	01/26/94	--	4"	sch. 40 PVC	19.15	17.38	31.5	31.5	15.5-25.5	1.88 to -8.12
MW-02B	01/23/94	--	4"	sch. 40 PVC	19.36	17.08	90	83	75.5-80.5	-58.42 to -63.42
MW-03A	01/21/94	--	4"	sch. 40 PVC	25.45	23.46	31.5	27	15.5-25.5	7.96 to -2.04
MW-03B	01/18/94	--	4"	sch. 40 PVC	25.51	23.54	90	83.5	76.5-81.5	-52.96 to -57.96
MW-04A	02/15/07	--	4"	sch. 40 PVC	24.02	21.16	30	28	18-28	6.02 to -3.98
MW-04B	02/16/07	--	4"	sch. 40 PVC	23.99	21.19	88	85	75-80	-51.01 to 56.01
G-1	12/1/1982*	1987 or 1988	4"	PVC*	--	--	70	62	50-55	-25.92 to -30.92
G-2	12/1/1982*	1987 or 1988	4"	PVC*	--	--	70	65	40-50	-14.91 to -24.91
G-3	12/1/1982*	1987 or 1988	4"	PVC*	--	--	65	65	50-60	-24.94 to -34.94
G-4	12/01/82	--	2"	PVC	27.12	25.14	65	65	45-55	-19.86 to -29.86

Notes
ft bgs = Feet below ground surface
ft MSL = Feet Mean Sea Level
-- = Not applicable / Not analylized
* = Assumed from data for G-4
Total depth of well and screen intervals determined from downhole camera inspection conducted on December, 15, 2005

References
California Department of Health Services, 1987: *Site Inspection Report Gardena Sumps, Gardena, California.*
URS Consultants, Inc., 1994: *Groundwater Remedial Investigation Technical Memorandum, Gardena Sumps City of Gardena, California.*
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.
Top of well casing and surface elevation surveyed by WM Holdings, Incorporated on September 7, 2005 and March 1, 2007.

Table 15
Wells Within or Close to a One-Mile Radius of the Gardena Sumps

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Well ID	Ownership	Withdrawal Rate*
3S/14W-25KO6S	Mayflower Nurseries	Inactive
3S/14W-25PO4S	Southern California Water Company	586.66
3S/13W-31MO1S	Maxwell T. Zeigler	Inactive
3S/13W-30A1OS	Fujimoto	7.84
3S/13W-31 B07	Unknown	Inactive
3S/14W25LO1	Unknown	Inactive
3S/14W25NO2	Unknown	Inactive
3S/13W30KO2	Unknown	Inactive

Notes:
* = In acre feet for year 07/01/03 through 06/30/04

References:
Metcalf and Eddy, Inc, 1992. *Focused Remedial Investigation at Gardena Sumps* , Gardena Sumps, 1440 West Artesia Boulevard, Gardena, California. January 30.

CalDWR, 2004. Watermaster Service in the West Coast Basin, Los Angeles County, July 1, 2003 - June 2004

Table 16
Summary of Borings Completed at the Site as Part of This Investigation

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Boring ID	Boring Depth (ft-bgs)	CPT Depth (ft-bgs)	Surface Elevation (ft MSL)	Boring Completion (date)	First Groundwater (ft-bgs)	Top of Sludge (ft-bgs)	Thickness of Non-Sludge Interbeds (ft-bgs)	Bottom of Sludge (ft-bgs)	Total Sludge Thickness (ft)	Elev. Top of Sludge (ft MSL)	Elev. Bottom of Sludge (ft MSL)	Correlating Borings	Number Soil/Sludge Samples	QA/QC Depth (ft-bgs)	Number of Vapor Samples	Number of Geotech Samples	Number of Groundwater Samples	Drilling Method	PPDT Depths (ft-bgs)	Comments
Cooper Property																				
CPB01	24.0	--	19.77	1/19/2006	20.4	0.0	9.5	17.5	8.0	19.77	2.27	--	6	20	--	--	--	GeoProbe	--	microcone refusal within one-foot of ground surface, hydrocarbon odor from 17.5 to 20 ft. bgs.
CPB02	20.0	--	19.83	1/17/2006	R	0.0	0.0	4.9	4.9	19.83	14.93	--	5	NST	--	--	--	GeoProbe	--	microcone refusal within one-foot of ground surface - additional samples obtained for treatability study
CPB03	20.0	5.5	19.83	1/12/2006	R	0.0	0.0	5.0	5.0	19.83	14.83	--	5	20	--	--	--	GeoProbe	--	
CPB3A	--	5.9	19.82	12/21/2006	--	0.0	1.5	5.0	3.5	19.82	14.82	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log
CPB04	24.0	--	20.13	1/18/2006	R	***no sludge encountered in boring***						SV26, DPW01	6	NST	--	--	--	GeoProbe	--	geoprobe refusal within one-foot of ground surface
CPB05	20.0	--	19.82	1/19/2006	R	0.0	0.0	5.0	5.0	19.82	14.82	--	5	20	--	--	--	GeoProbe	--	geoprobe refusal within one-foot of ground surface, hydrocarbon odor from 5 to 8 ft. bgs.
CPB06	19.5	--	19.79	1/17/2006	14.8	0.0	0.0	6.2	6.2	19.79	13.59	--	5	10	--	--	--	GeoProbe	--	
CPB06A	--	--	--	--	--	--	--	--	--	--	--	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log
CPB06B	--	31.7	20.58	1/9/2006	--	***no sludge encountered in boring***						--	NST	NST	--	--	--	Microcone	--	center of berm - microcone only, no samples, no lithologic boring log
CPB07	**20.0**	**33.3**	19.78	1/12/2006	R	0.0	0.0	6.0	6.0	19.78	13.78	--	5	5	--	--	--	GeoProbe / Microcone	--	
CPB07A	--	12.6	19.79	1/9/2006	--	1.0	0.0	7.2	6.2	18.79	12.59	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log
CPB07B	--	31.7	20.64	1/9/2006	--	***no sludge encountered in boring***						--	NST	NST	--	--	--	Mircocone	--	center of berm - microcone only, no samples, no lithologic boring log
CPB08	**31.0**	**34.9**	17.35	1/18/2006	17.2	0.0	0.0	1.5	1.5	17.35	15.85	SV27	8	NST	--	--	--	GeoProbe / Microcone	--	Hydrocarbon odor from 1.5 to 4.5 ft. bgs., 5.5 to 7 ft. bgs., and 12 to 18.5 feet bgs. Hydrocarbon staining from 5.5 to 7 ft bgs.
CPB09	**20.0**	**22.9**	20.88	1/9/2006	14.2	***no sludge encountered in boring***						--	5	NST	--	--	--	GeoProbe / Microcone	--	
CPB09	20.0	97	20.88	1/23/2006	--	--	--	--	--	--	--	--	--		--	--	3	CPT	21, 41.7, 51.5, 75.6, 94.8	*CPT only - proposed deep boring has not yet been drilled* Water Depths- 29, 53, 80
CPB10	**20.0**	**31.9**	20.50	1/10/2006	R	0.0	0.0	7.6	7.6	20.50	12.90	--	5	NST	--	--	--	GeoProbe / Microcone	--	
CPB10A	--	23.2	20.52	12/21/2005	--	0.0	0.0	4.0	4.0	20.52	16.52	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log
CPB11	27.0	34.5	20.50	12/22/2005	--	0.0	0.0	9.0	9.0	20.50	11.50	--	7	NST	--	--	--	Microcone	--	boring used to test sampling methods - DO NOT USE lithologic or analytical results
CPB11A	--	23.1	20.49	12/21/2005	--	0.0	0.0	6.0	6.0	20.49	14.49	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log, hydrocarbon staining from 13.5 to 15 ft. bgs.
CPB11R	20.0	--	20.49	1/12/2006	R	0.0	2.0	13.5	11.5	20.49	6.99	--	5	NST	--	--	--	GeoProbe	--	this boring was a re-drill of boring CPB11 (offset approximately 2 feet) to obtain accurate lithologic and analytical data
CPB12	20.0	34.3	17.33	1/17/2006	R	0.0	0.0	1.5	1.5	17.33	15.83	--	5	15	--	--	--	GeoProbe / Microcone	--	
CPB13	**28.0**	**28.4**	25.21	1/16/2006	R	0.0	4.3	8.9	4.6	25.21	16.31	--	7	NST	--	--	--	GeoProbe / Microcone	--	
CPB14	**20.0**	**32.7**	20.52	1/10/2006	R	0.0	0.0	4.0	4.0	20.52	16.52	--	5	NST	--	--	--	GeoProbe / Microcone	--	additional samples obtained for treatability study
CPB14A	--	23.9	20.49	12/21/2006	--	0.0	0.0	1.0	1.0	20.49	19.49	--	NST	NST	--	--	--	Microcone	--	microcone only, no samples, no lithologic boring log
CPB15	**20.0**	**32.4**	20.50	12/20/2005	R	0.0	3.0	9.2	6.2	20.50	11.30	--	6	NST	--	--	--	GeoProbe / Microcone	--	
CPB15A	--	23.2	20.43	12/21/2005	--	0.0	1.5	4.0	2.5	20.43	16.43	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log
CPB15R	--	--	--	--	--	--	--	--	--	--	--	--	1	NST	--	--	--	GeoProbe	--	boring was a redrill to correlate chemical analysis with the treatability sludge sample profile
CPB16	20.0	34.9	17.77	1/17/2006	R	1.0	0.2	3.0	1.8	16.77	14.77	--	5	1.5	--	--	--	GeoProbe / Microcone	--	Hydrocarbon staining from 0 to 1 ft. bgs.
CPB17	**20.0**	**29.8**	20.50	1/11/2006	R	0.0	4.6	9.0	4.4	20.50	11.50	--	5	1.5	--	--	--	GeoProbe / Microcone	--	
CPB17A	--	22.8	20.48	12/21/2005	--	0.0	5.0	8.0	3.0	20.48	12.48	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log
CPB18	24.0	32.3	20.41	12/20/2006	R	0.0	7.0	12.8	5.8	20.41	7.61	--	6	NST	--	--	--	GeoProbe / Microcone	--	additional samples obtained for treatability study
CPB18A	--	23.5	20.43	12/21/2005	--	0.0	0.0	7.0	7.0	20.43	13.43	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log
CPB19	20.0	28.4	20.74	1/6/2006	14.6	0.0	0.0	1.0	1.0	20.74	19.74	--	5	5	--	--	--	GeoProbe / Microcone	--	hydrocarbon odor from at 2.5 ft bgs.
CPB20	20.0	26.8	18.54	1/17/2006	R	0.0	0.0	1.9	1.9	18.54	16.64	SV30	5	NST	--	--	--	GeoProbe / Microcone	--	

Table 16
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GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Boring ID	Boring Depth (ft-bgs)	CPT Depth (ft-bgs)	Surface Elevation (ft MSL)	Boring Completion (date)	First Groundwater (ft-bgs)	Top of Sludge (ft-bgs)	Thickness of Non-Sludge Interbeds (ft-bgs)	Bottom of Sludge (ft-bgs)	Total Sludge Thickness (ft)	Elev. Top of Sludge (ft MSL)	Elev. Bottom of Sludge (ft MSL)	Correlating Borings	Number Soil/Sludge Samples	QA/QC Depth (ft-bgs)	Number of Vapor Samples	Number of Geotech Samples	Number of Groundwater Samples	Drilling Method	PPDT Depths (ft-bgs)	Comments
CPB21	20.0	33.5	22.14	1/13/2006	15.0	***no sludge encountered in boring***						SV23	5	NST	--	--	--	GeoProbe / Microcone	--	
CPB22	20.0	32.4	21.22	1/12/2006	16.3	***no sludge encountered in boring***						SV25	5	NST	--	--	--	GeoProbe / Microcone	--	
CPB23	20.0	6.9	20.12	1/18/2006	R	***no sludge encountered in boring***						SV22	5	NST	--	--	--	GeoProbe / Microcone	--	
CPB24	20.0	13.3	20.27		R	***no sludge encountered in boring***						SV24	5	NST	--	--	--	GeoProbe / Microcone	--	
CPB25	100.0	100	20.45	1/25/2006	--	--	--	--	--	--	--	--	--	COC	--	--	3	CPT	21.3, 43.8, 50.2, 74.3	CPT only - proposed deep boring has not yet been drilled Water Depths- 28, 52, 80
CPB26	98.0	98	20.86	1/23/2006	--	--	--	--	--	--	--	SV18	--	COC	--	--	3	CPT	28.7, 50.2, 76.1	CPT only - proposed deep boring has not yet been drilled Water Depths- 29, 55, 80
CPB27	100.0	100	20.57	1/24/2006	--	--	--	--	--	--	--	SV20	--	COC	--	--	3	CPT	26.4, 58.1, 74.2	CPT only - proposed deep boring has not yet been drilled Water Depths- 25, 52, 78
CPB-28	17.0	--	20.17	12/6/2006	16.7	4	0	4.8	0.8	16.17	15.37	--	3	NST	--	--	--	CFHSA	--	
CPB-29	11.5	--	20.26	12/6/2006	NE	3.2	1.5	8	3.3	17.06	12.26	--	0	NST	--	--	--	CFHSA	--	hydrocarbon odor and staining from 10 to 11.5 ft. bgs.
CPB-30	30.0	--	20.52	12/7/2006	R	1	1	3	1	19.5	17.5	--	3	NST	--	--	--	CFHSA	--	
MW-04A	30.0	--	21.08	2/16/2007	26	***no sludge encountered in boring***						CPB-09	0	NST	--	--	--	CFHSA	--	
MW-04B	90.0	--	20.99	12/8/2006	13.2	***no sludge encountered in boring***						CPB-09	7	NST	--	4	--	CFHSA	--	
Cooper Property																				
SV01	16.0	--	19.82	5/19/2006	NE	--	--	--	--	--	--	HPB03	NST	NST	1	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV02	16.0	--	20.15	3/13/2006	2.0	***no sludge encountered in boring***						--	3	NST	2	3	--	GeoProbe	--	
SV03	16.0	--	23.18	3/7/2006	R	***no sludge encountered in boring***						--	2	NST	2	--	--	GeoProbe	--	hydrocarbon odor at 1 ft bgs.
SV04	16.0	--	24.61	3/7/2006	R	***no sludge encountered in boring***						--	2	NST	2	--	--	GeoProbe	--	
SV05	16.0	--	19.62	3/8/2006	R	11.5	1.8	14.7	1.4	8.12	4.92	HPB08	--	NST	2	3	--	GeoProbe	--	
SV06	16.0	--	20.07	3/7/2006	15.2	***no sludge encountered in boring***						--	2	NST	2	--	--	GeoProbe	--	
SV07	16.0	--	20.51	3/7/2006	R	***no sludge encountered in boring***						--	2	NST	2	2	--	GeoProbe	--	hydrocarbon odor and staining from 0.75 to 2 ft bgs.
SV08	16.0	--	28.74	3/7/2006	R	***no sludge encountered in boring***						--	2	NST	2	--	--	GeoProbe	--	
SV09	16.0	--	32.60	3/8/2006	R	***no sludge encountered in boring***						--	2	NST	2	--	--	GeoProbe	--	
SV10	16.0	--	19.86	3/13/2006	R	4.8	1.0	10.5	4.7	15.06	9.36	--	3	NST	--	--	--	GeoProbe	--	hydrocarbon odor 10.50 to 16 ft bgs.
SV11	16.0	--	20.88	5/19/2006	NE	--	--	--	--	--	--	HPB04	--	NST	--	3	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV12	16.0	--	30.42	3/8/2006	R	***no sludge encountered in boring***						--	2	NST	2	--	--	GeoProbe	--	
SV13	16.0	--	29.78	3/7/2006	R	***no sludge encountered in boring***						--	2	NST	2	--	--	GeoProbe	--	
SV14	16.0	--	34.89	3/14/2006	NE	--	--	--	--	--	--	--	--	NST	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV15	16.0	--	35.58	3/14/2006	NE	--	--	--	--	--	--	RB01	--	NST	3	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV16	16.0	--	20.23	5/10/2006	NE	--	--	--	--	--	--	--	NST	NST	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV17	16.0	--	20.23	5/18/2006	NE	--	--	--	--	--	--	--	NST	1	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV18	15.3	--	20.89	3/8/2006	R	3.8	0.0	4.0	0.2	17.09	16.89	--	NST	NST	2	2	--	GeoProbe	--	soil vapor boring only - no soil samples collected
SV18-AP	5.0	--	20.89	3/8/2006	--	--	--	--	--	--	--	--	NST	NST	--	--	--	GeoProbe	--	soil vapor boring only, temporary well installed, no soil samples, no lithologic boring log - **soil vapor test unsuccessful because of water in well**
SV19	16.0	--	20.42	5/18/2006	NE	--	--	--	--	--	--	--	NST	1	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV20	16.0	--	20.52		NE	--	--	--	--	--	--	CPB27	NST	NST	NST	--	--	GeoProbe	--	no samples successfully recovered, no lithologic boring log
SV21	16.0	--	34.67	3/14/2006	NE	--	--	--	--	--	--	RB03	NST	NST	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples collected
SV22	16.0	--	19.94	3/9/2006	NE	--	--	--	--	--	--	CBP23	NST	NST	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples collected

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Gardena, California

Boring ID	Boring Depth (ft-bgs)	CPT Depth (ft-bgs)	Surface Elevation (ft MSL)	Boring Completion (date)	First Groundwater (ft-bgs)	Top of Sludge (ft-bgs)	Thickness of Non-Sludge Interbeds (ft-bgs)	Bottom of Sludge (ft-bgs)	Total Sludge Thickness (ft)	Elev. Top of Sludge (ft MSL)	Elev. Bottom of Sludge (ft MSL)	Correlating Borings	Number Soil/Sludge Samples	QA/QC Depth (ft-bgs)	Number of Vapor Samples	Number of Geotech Samples	Number of Groundwater Samples	Drilling Method	PPDT Depths (ft-bgs)	Comments
SV23	16.0	--	22.15	5/18/2006	NE	--	--	--	--	--	--	CBP21	NST	NST	2	--	--	HA + GeoProbe	--	soil vapor boring only - no soil samples collected
SV24	16.0	--	20.03	3/9/2006	NE	--	--	--	--	--	--	CPB24	NST	NST	2	--	--	HA + GeoProbe	--	soil vapor boring only - no soil samples collected
SV24-AP	5.0	--	23.03	3/9/2006	--	--	--	--	--	--	--	CPB24	NST	NST	--	--	--	GeoProbe	--	soil vapor boring only, temporary well installed, no soil samples, no lithologic boring log - **soil vapor test unsuccessful because of water in well**
SV25	16.0	--	21.11	5/18/2006	NE	--	--	--	--	--	--	CPB22	NST	NST	3	--	--	GeoProbe	--	soil vapor boring only - no soil samples collected
SV26	16.0	--	21.02	3/9/2006	R	***no sludge encountered in boring***						--	NST	1	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples collected
SV27	16.0	--	17.33	3/9/2006	NE	--	--	--	--	--	--	CPB08	NST	NST	1	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV28	14.4	--	17.38	3/8/2006	R	0.0	0.0	2.5	2.5	17.38	14.88	(DPW04)	NST	NST	2	2	--	GeoProbe	--	
SV28-AP	5.0	--	17.38	3/8/2006	--	--	--	--	--	--	--	(DPW04)	NST	NST	--	--	--	GeoProbe	--	soil vapor boring only, temporary well installed, no soil samples, no lithologic boring log - **soil vapor test unsuccessful because of water in well**
SV29	16.0	--	17.52	5/18/2006	NE	--	--	--	--	--	--	(DPW05)	NST	NST	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV30	16.0	--	18.48	5/18/2006	NE	--	--	--	--	--	--	CPB20	NST	NST	1	--	--	GeoProbe	--	soil vapor boring only - no soil samples collected
LA County DPW Property																				
DPW01	20.0	--	17.01	1/18/2006	16.3	0.5	0.0	1.5	1.0	16.51	15.51	CPB04	5	NST	--	--	--	Geoprobe	--	LADPW Property, hydrocarbon staining 4.6 to 4.8 ft bgs, hydrocarbon odor 4.8 to 6.5 ft bgs.
DPW02	6.0	--	17.16	1/13/2006	NE	0.0	0.0	0.5	0.5	17.16	16.66	--	2	NST	--	--	--	Geoprobe	--	LADPW Property
DPW03	6.0	--	17.34	1/13/2006	NE	0.0	2.2	4.5	2.3	17.34	12.84	--	2	NST	--	--	--	Geoprobe	--	LADPW Property
DPW04	6.0	--	17.42	1/13/2006	NE	0.0	0.6	3.5	2.9	17.42	13.92	(SV28)	2	NST	--	--	--	Geoprobe	--	LADPW Property
DPW05	6.0	--	17.67	1/13/2006	NE	0.0	0.0	1.0	1.0	17.67	16.67	(SV29)	1	NST	--	--	--	Geoprobe	--	LADPW Property
DPW06	10.5	--	25.99	1/11/2006	NE	***no sludge encountered in boring***						--	2	NST	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
DPW07	10.5	--	26.48	1/11/2006	NE	***no sludge encountered in boring***						--	2	NST	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
DPW08	10.5	--	27.51	1/11/2006	NE	***no sludge encountered in boring***						--	2	NST	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
DPW09	10.5	--	28.83	1/11/2006	NE	***no sludge encountered in boring***						--	2	NST	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
DPW10	10.5	--	30.51	1/11/2006	NE	***no sludge encountered in boring***						--	1	NST	--	--	--	Geoprobe	--	LADPW Property
DPW11	11.0	--	25.79	1/11/2006	NE	***no sludge encountered in boring***						--	2	2	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
DPW12	11.0	--	26.25	1/11/2006	NE	***no sludge encountered in boring***						--	NST	NST	--	--	--	Geoprobe	--	LADPW Property - no analytical samples
DPW13	11.0	--	27.12	1/11/2006	NE	***no sludge encountered in boring***						--	2	NST	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
DPW14	11.0	--	27.95	1/11/2006	NE	***no sludge encountered in boring***						--	2	NST	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
DPW15	11.0	--	29.59	1/20/2006	NE	***no sludge encountered in boring***						--	2	NST	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
Haack Property																				
HPB01	24.0	--	20.82	2/8/2006	13.5	10.0	0.0	11.2	1.2	10.82	9.62	--	6	NST	--	--	--	HA + GeoProbe	--	
HPB02	24.0	--	20.95	2/9/2006	13.1	8.8	0.0	9.5	0.7	12.15	11.45	--	6	5	--	--	--	HA + GeoProbe	--	hydrocarbon odor 5 to 8 ft bgs, and 23 to 24 ft bgs.
HPB03	32.0	--	21.20	2/8/2006	20.3	***no sludge encountered in boring***						SV01	7	10	--	--	--	HA + GeoProbe	--	hydrocarbon odor 8 to 18 ft bgs, and 20.5 to 25 ft bgs.
HPB04	23.5	--	21.56	2/9/2006	17.0	***no sludge encountered in boring***						SV11	6	10	--	--	--	HA + GeoProbe	--	
HPB05	20.0	--	26.48	2/6/2006	R	1.8	1.2	9.0	6.0	24.68	17.48	--	5	5	--	--	--	Geoprobe	--	additional samples obtained for treatability study, hydrocarbon odor 9 to 12 ft bgs.
HPB06	28.0	--	26.93	2/6/2006	15.5	***no sludge encountered in boring***						--	6	25	--	--	--	Geoprobe	--	
HPB07	28.0	--	35.22	2/7/2006	R	10.0	0.0	11.2	1.2	25.22	24.02	--	6	20	--	--	--	Geoprobe	--	hydrocarbon staining 4 to 10 ft bgs and 13 ft bgs. hydrocarbon odor 20 to 20.25 ft bgs. and 25 to 26 ft bgs.
HPB08	24.0	--	20.65	2/8/2006	20.2	3.2	6.2	10.4	1.0	17.45	10.25	SV05	6	15	--	--	--	HA + GeoProbe	--	
HPB09	32.0	--	19.83	2/9/2006	16.4	7.8	0.0	8.0	0.2	12.03	11.83	--	8	1.5,10,15	--	--	--	HA + GeoProbe	--	hydrocarbon odor and staining 9.8 to 10 ft bgs. hydrocarbon odor 16 to 23 ft bgs.
HPB10	95.0	95	--	2/23/2006	--	***no sludge encountered in boring***						SV11	--	COC	--	--	2	CPT	36.4, 53.7, 84.6, 95.1	CPT only - proposed deep boring has not yet been drilled Water Depths- 55, 71 hydrocarbon staining 78 to 90 ft bgs.
HPB11	28.0	--	27.49	2/7/2006	R	5.0	0.0	5.5	0.5	22.49	21.99	SV11	7	25	--	--	--	Geoprobe	--	
HPB12	90.0	--	20.34	12/5/2007	20.0	***no sludge encountered in boring***						--	8	NST	--	--	--	CFHSA	--	hydrocarbon staining 10 to 11.5 ft bgs. hydrocarbon odor 78 to 90 ft bgs.

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Summary of Borings Completed at the Site as Part of This Investigation

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Boring ID	Boring Depth (ft-bgs)	CPT Depth (ft-bgs)	Surface Elevation (ft MSL)	Boring Completion (date)	First Groundwater (ft-bgs)	Top of Sludge (ft-bgs)	Thickness of Non-Sludge Interbeds (ft-bgs)	Bottom of Sludge (ft-bgs)	Total Sludge Thickness (ft)	Elev. Top of Sludge (ft MSL)	Elev. Bottom of Sludge (ft MSL)	Correlating Borings	Number Soil/Sludge Samples	QA/QC Depth (ft-bgs)	Number of Vapor Samples	Number of Geotech Samples	Number of Groundwater Samples	Drilling Method	PPDT Depths (ft-bgs)	Comments
Residential Property																				
RB01	36.0	--	37.33	2/14/2006	28.2	5.5	0.0	7.5	2.0	31.83	29.83	SV15	8	--	--	--	--	Geoprobe	--	hydrocarbon staining at 27.5 ft bgs.
RB02	36.0	--	37.63	2/14/2006	28.9	8.5	0.0	8.8	0.3	29.13	28.83	--	8	NST	--	--	--	Geoprobe	--	hydrocarbon staining 8.75 to 11 ft bgs.
RB03	36.0	--	35.86	2/15/2006	29.2	8.5	0.0	11.0	2.5	27.36	24.86	SV21	8	--	--	--	--	Geoprobe	--	hydrocarbon odor 20 to 21.25 ft bgs., 24.50 to 24.90 ft bgs., and 28 to 34.25 ft bgs.

Notes:

ft-bgs = feet below ground surface
ft MSL = elevation in feet relative to Mean Sea Level
HA = hand auger
NE = not encountered
R = Range of depth to first encountered groundwater (please refer to boring logs notes 4 & 5)
-- = Not Applicable
NST = no sample taken
SL = Soil/Sludge Samples
SS = Soil Samples
( ) = Represents correlating boring more than two feet from the primary boring
If both the Boring Depth and the CPT Depth numbers are bolded this indicates that the sludge thickness measured in the lithologic log matchs the sludge thickness measured in the CTP log.

CPT = cone penetration test
CFHSA = continuous flight hollow stem auger

TABLE 17
Soil Analytical Results - Selected Volatile Analytes

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	Benzene (ug/kg)				Chloroform (ug/kg)				Toluene (ug/kg)				bis(2-e)phthalate (ug/kg)				Ethylbenzene (ug/kg)				1,2,4-Trimethylbenzene (ug/kg)				Total Extractable Hydrocarbons (C13-C40) (mg/kg)				Volatile Fuel Hydrocarbons (C4-C12) (mg/kg)			
				Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
CPB01	01/19/06	1.5		<160	160	155		<160	160	155		150	160	155	VJ	<500000	500,000	1,500	BF	140	160	155	VJ	630	160	155		200,000	6000	1,200		23	16	155	
	01/19/06	5		210	180	185	VJ	<180	180	185	VUJ	750	180	185	VJ	<120000	120,000	375	BF	260	180	185	VJ	4,900	180	185	VJ	160,000	7500	1,500		78	18	185	VJ
	01/19/06	10		150	150	152		<150	150	152		320	150	152		<83000	83,000	250	BF	150	150	152		3,300	150	152		120,000	2500	500		130	15	152	
	01/19/06	15		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		23	5.0	1		<0.088	0.088	1	
	01/19/06	20	DUP	1	2	1	VJ	<1.6	2	1		1	2	1	VJ	<17000	17,000	50	BF	0	2	1	VJ	7	2	1		360	10	2	VJ	0	0.079	1	VJ
	01/19/06	19		0	2	1	VJ	<1.5	2	1		2	2	1		<330	330	1		0	2	1	VJ	4	2	1		94	10	2	VJ	1	0.077	1	VJ
	01/19/06	23		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		2	2	1		22	5.0	1		0	0.088	1	VJ
CPB02	01/17/06	1.5		170	170	167	J,DX	<170	170	167		340	170	167		<170000	170,000	498	BF	260	170	167		1,200	170	167		250,000	3000	600		39	17	167	
	01/17/06	5		1	2	1	VJ	<1.7	2	1	VUJ	10	2	1	VJ	<6600	6,600	20	BF	6	2	1	VJ	11	2	1	VJ	18,000	250	50	VJ	0	0.087	1	VJ
	01/17/06	10		<1.8	2	1		<1.8	2	1		<1.8	2	1		<670	670	2	DF	<1.8	2	1		<1.8	2	1	VUJ	33	15	3		<0.091	0.091	1	
	01/17/06	14		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1	RA	<1.6	2	1		<1.6	2	1		60	30	6		<0.079	0.079	1	
	01/17/06	18		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		30	15	3		<0.081	0.081	1	
CPB3	01/12/06	1.5		250	430	431	VJ	<430	430	431		1,100	430	431		<500000	500,000	1,500	DF	580	430	431		3,400	430	431		99,000	3000	600		99	41	103	
	01/12/06	5		<2	2	1		<2	2	1		1	2	1	VJ	<3300	3,300	10	BF	1	2	1	VJ	2	2	1	VJ	36,000	600	120		0	0.41	1	VJ
	01/12/06	10		<1.8	2	1		<1.8	2	1		<1.8	2	1		<670	670	2	BF	<1.8	2	1		<1.8	2	1		680	60	12		<0.39	0.39	1	
	01/12/06	15		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		47	15	3		<0.33	0.33	1	
	01/12/06	20	DUP	<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		320	15	3		<0.32	0.32	1	
	01/12/06	19		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		28	15	3		<0.31	0.31	1	
CPB04	01/18/06	1.5		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		39	7.5	2	VJ	<0.087	0.087	1	
	01/18/06	5		<1.7	2	1		<1.7	2	1		<1.7	2	1		<670	670	2	BF	<1.7	2	1		<1.7	2	1		110	15	3	VJ	<0.085	0.085	1	
	01/18/06	10		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		<7.5	7.5	2	DF	<0.091	0.091	1	
	01/18/06	15		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		2	2	1		<7.5	7.5	2	DF	<0.081	0.081	1	
	01/18/06	19		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<7.5	7.5	2	DF	<0.082	0.082	1	
	01/18/06	24		<1.5	2	1		<1.5	2	1		<1.5	2	1		<330	330	1		<1.5	2	1		<1.5	2	1		<7.5	7.5	2	DF	<0.076	0.076	1	
CPB05	01/19/06	1.5		-				-				-				<250000	250,000	750	BF	-				-				43,000	1500	300		-			
	01/19/06	5		<1.7	2	1		<1.7	2	1		<1.7	2	1		<17000	17,000	50	BF	<1.7	2	1		<1.7	2	1		8,900	250	50		0	0.086	1	
	01/19/06	10		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		5	5.0	1	VJ	<0.079	0.079	1	
	01/19/06	15		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<5.0	5.0	1		<0.080	0.080	1	
	01/19/06	20	DUP	<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<5.0	5.0	1		<0.081	0.081	1	
	01/19/06	19		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<5.0	5.0	1		<0.086	0.086	1	
CPB06	01/17/06	1.5		13	4	2		<4.1	4	2		39	4	2		<160000	160,000	495	BF	16	4	2		16	4	2		85,000	1200	240		1	0.20	2	
	01/17/06	5		1	2	1	VJ	<1.8	2	1		1	2	1	VJ	<1300	1,300	4	BF	<1.8	2	1		<1.8	2	1		6,700	150	30	VJ	0	0.089	1	
	01/17/06	10	DUP	<1.8	2	1		<1.8	2	1		1	2	1	VJ	<330	330	1		0	2	1	VJ	2	2	1		1,100	30	6	VJ	0	0.092	1	VJ
	01/17/06	11		<1.7	2	1		<1.7	2	1		1	2	1	VJ	<660	660	2	BF	1	2	1	VJ	2	2	1		270	15	3	VJ	0	0.087	1	
	01/17/06	15		<1.5	2	1		<1.5	2	1		<1.5	2	1		<330	330	1		<1.5	2	1		<1.5	2	1		7	15	3	VJ	<0.077	0.077	1	
	01/17/06	19		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<15	15	3	DF	<0.079	0.079	1	
CPB7	01/12/06	1.5	DUP	65	180	181	VJ	<180	180	181		180	180	181		<500000	500,000	1,500	DF	230	180	181		620	180	181		73,000	600	120		56	37	92	
	01/12/06	1.5		<140	140	140	VUJ	<140	140	140		340	140	140		<1000000	1,000,000	3,000	DF	92	140	140	VJ	300	140	140		160,000	3000	600		33	31	79	
	01/12/06	5		65	150	151	VJ	<150	150	151		140	150	151	VJ	<500000	500,000	1,500	DF	63	150	151	VJ	440	150	151		110,000	1500	300		43	38	95	
	01/12/06	10		<1.6	2	1		<1.6	2	1		<1.6	2	1		<1300	1,300	4	BF	<1.6	2	1		<1.6	2	1		14,000	480	96		<0.36	0.36	1	
	01/12/06	15		<1.5	2	1		<1.5	2	1		<1.5	2	1		<670	670	2	BF	<1.5	2	1		<1.5	2	1		7,000	60	12		0	0.35	1	VJ
	01/12/06	19		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		170	15	3		<0.34	0.34	1	
CPB08	01/17/06	1.5		5	2	1	VJ	<1.9	2	1	VUJ	26	2	1	VJ	<670	670	2	BF	13	2	1	VJ	37	2	1	VJ	140	30	6		1	0.095	1	VJ
	01/17/06	8		<1.9	2	1	VUJ	<1.9	2	1	VUJ	<1.9	2	1	VUJ	<10000	10,000	30	BF	<1.9	2	1	VUJ	3	2	1	VJ	50,000	1900	375		0	0.097	1	VJ
	01/17/06	10		<1.6	2	1		<1.6	2	1		<1.6	2	1		<1300	1,300	4	BF	<1.6	2	1		<1.6	2	1	VUJ	11,000	750	150		<0.079	0.079	1	
	01/17/06	15		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		79	7.5	2	VJ	<0.091	0.091	1	
	01/17/06	20		<1.7	2	1		<1.7	2	1		<1.7	2	1		<500	500	2	BF	<1.7	2	1		<1.7	2	1		6,200	150	30	VJ	<0.087	0.087	1	
	01/18/06	23		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		7	7.5	2	VJ	<0.087	0.087	1	
	01/18/06	25		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		8	7.5	2	VJ	<0.082	0.082	1	
	01/18/06	30		<1.7	2	1		1	2	1	J,DX	<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		4	7.5	2	VJ	<0.083	0.083	1	

TABLE 17
Soil Analytical Results - Selected Volatile Analytes

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	Benzene (ug/kg)				Chloroform (ug/kg)				Toluene (ug/kg)				bis(2-e)phthalate (ug/kg)				Ethylbenzene (ug/kg)				1,2,4-Trimethylbenzene (ug/kg)				Total Extractable Hydrocarbons (C13-C40) (mg/kg)				Volatile Fuel Hydrocarbons (C4-C12) (mg/kg)			
				Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
CPB9	01/13/06	1.5		<2	2	1		<2.0	2	1		<2	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		6	15	3	J,DX,DF	<0.34	0	1	
	01/13/06	5		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<7.5	8	2	DF	<0.33	0	1	
	01/13/06	10		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<15	15	3	DF	<0.32	0	1	
	01/13/06	15		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		<15	15	3	DF	<0.34	0	1	
	01/13/06	20		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<15	15	3	DF	<0.33	0	1	
CPB10	01/10/06	1.5		86	230	228	VJ	<230	230	228		400	230	228		<250000	250,000	747	DF	270	230	228		950	230	228		120,000	1500	300		2	0.93	2	
	01/10/06	5		120	160	157	VJ	<160	160	157		710	160	157		<250000	250,000	749		240	160	157		2,100	160	157		110,000	1500	300		1	0.69	2	VJ
	01/10/06	10		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		86	10	2		<0.31	0.31	1	
	01/10/06	15		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		14	10	2		<0.30	0.30	1	
	01/10/06	20		<1.5	2	1		<1.5	2	1		<1.5	2	1		<330	330	1		<1.5	2	1		<1.5	2	1		9	10	2	VJ	<0.39	0.39	1	
CPB11R	01/10/06	1.5		160	170	174	J,DX	<170	170	174		720	170	174		<250000	250,000	750	DF	370	170	174		1,400	170	174		150,000	1500	300		61	34	84	
	01/10/06	5		390	200	202		<200	200	202		3,600	200	202		<250000	250,000	746	DF	1,000	200	202		5,400	200	202		99,000	1500	300		73	37	93	
	01/10/06	10		<2.5	3	1		<2.5	3	1		2	3	1	VJ	<330	330	1		<2.5	3	1		3	3	1		10	10	2	VJ	<0.65	0.65	2	VU
	01/10/06	15		<2.2	2	1		<2.2	2	1		2	2	1		<12000	12,000	37	DF	<2.2	2	1		2	2	1	J,DX	7,000	100	20		<0.53	0.53	1	VU
	01/12/06	20		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		7	15	3	VJ	<0.36	0.36	1	
CPB12	01/17/06	1.5		<1.6	2	1		<1.6	2	1		<1.6	2	1		<3300	3,300	10	BF	<1.6	2	1		<1.6	2	1		3,800	75	15	VJ	<0.082	0.082	1	
	01/17/06	5		<1.9	2	1		<1.9	2	1		<1.9	2	1		<3300	3,300	10	BF	<1.9	2	1		<1.9	2	1		20,000	380	75		<0.094	0.094	1	
	01/17/06	10		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		54	15	3		0	0.085	1	
	01/17/06	15	DUP	<1.6	2	1		<1.6	2	1		<1.6	2	1		<1300	1,300	4	BF	<1.6	2	1		<1.6	2	1		3,500	75	15	VJ	<0.080	0.080	1	
	01/17/06	15		<1.6	2	1		<1.6	2	1		0	2	1	J,DX	<330	330	1		<1.6	2	1		1	2	1	VJ	300	7.5	2	VJ	<0.081	0.081	1	
	01/17/06	20		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<15	15	3	DF	<0.086	0.086	1	
CPB13	01/16/06	1.5		2	3	1	VJ	<2.8	3	1	VUJ	25	3	1	VJ	<62000	62,000	187	BF	10	3	1	VJ	68	3	1	VJ	49,000	600	120		0	0	1	VJ
	01/16/06	5		3	2	1	VJ	<1.7	2	1	VUJ	1	2	1	VJ	<6200	6,200	19	BF	1	2	1	VJ	1	2	1	VJ	830	20	4		0	0	1	VJ
	01/16/06	10		49	2	1	VJ	<1.6	2	1	VUJ	1	2	1	VJ	<6700	6,700	20	BF	22	2	1	VJ	<1.6	2	1	VUJ	1,500	30	6		<7.9	8	79	
	01/16/06	15		160	2	1	VJ	<1.7	2	1	VUJ	10	2	1	VJ	<1300	1,300	4	BF	130	2	1	VJ	<1.7	2	1	VUJ	4,400	80	16		3	9	87	VJ
	01/16/06	18		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		12	10	2		<0.088	0	1	
	01/16/06	25		<1.7	2	1		<1.7	2	1		2	2	1		<330	330	1		1	2	1	J,DX	2	2	1		<15	15	3	DF	<0.084	0	1	
	01/16/06	28		<1.5	2	1		<1.5	2	1		<1.5	2	1		<330	330	1		<1.5	2	1		<1.5	2	1		6	10	2	VJ	<0.077	0	1	
CPB14	01/10/06	1.5		250	200	202		<200	200	202		1,500	200	202		<25000	25,000	74	DF	760	200	202		2,000	200	202		120,000	1500	300		72	38	95	
	01/10/06	5		<2.0	2	1		<2.0	2	1	VJ	2	2	1	VJ	<330	330	1		1	2	1	VJ	3	2	1		410	10	2	VJ	<0.40	0.40	1	
	01/10/06	10		<1.7	2	1		<1.7	2	1		7	2	1		<330	330	1		2	2	1		10	2	1		50	10	2		<0.32	0.32	1	
	01/10/06	15		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		25	10	2		<0.33	0.33	1	
	01/10/06	19		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		12	10	2		<0.33	0.33	1	
CPB15	12/20/05	1.5		280	200	100		<200	200	100		3,000	200	100		<480000	480,000	10	DF	1,000	100	100		4,400	1,000	100		110,000	1500	1		340	400	500	J,DX
	12/20/05	5		1	2	1	VJ	<2	2	1		8	2	1		<3300	3,300	5	DF	2	2	1	J,DX	9	2	1		2,400	20	1		<0.33	0.33	1	
	12/20/05	9		<2.0	2	1		<2.0	2	1		<2.0	2	1		<330	330	1	IB,IA	<2.0	2	1		<2.0	2	1		70	10	1		0	0.32	1	MB,J,DX
	12/20/05	11		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		56	10	1		<0.32	0.32	1	
	12/20/05	14		<1.8	2	1		<1.8	2	1		<1.8	2	1		<660	660	2	BF	<1.8	2	1		<1.8	2	1	LP	340	10	1		<0.32	0.32	1	
	12/20/05	20		<1.9	2	1		<1.9	2	1		<1.9	2	1		<330	330	1		<1.9	2	1		<1.9	2	1	LP	21	10	1		<0.33	0.33	1	
CPB15R	01/20/06	1.5		<250	250	744		<250	250	744		<250	250	744		<250000	250,000	744	BF	<250	250	744		<250	250	744		-				-			
CPB16	01/17/06	2	DUP	<1.6	2	1		<1.6	2	1		<1.6	2	1		<100000	100,000	299	BF	<1.6	2	1		<1.6	2	1		510	15	3	VJ	<0.081	0.081	1	
	01/17/06	1		<1.7	2	1		<1.7	2	1		<1.7	2	1		<1300	1,300	4	BF	<1.7	2	1		1	2	1	VJ	600	30	6	VJ	<0.084	0.084	1	
	01/17/06	5		<1.9	2	1		<1.9	2	1		<1.9	2	1		<330	330	1		<1.9	2	1		<1.9	2	1		14	15	3	VJ	<0.095	0.095	1	
	01/17/06	9		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<15	15	3	DF	<0.080	0.080	1	
	01/17/06	15		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<15	15	3	DF	<0.080	0.080	1	
	01/17/06	20		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<15	15	3	DF	<0.084	0.084	1	

TABLE 17
Soil Analytical Results - Selected Volatile Analytes

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	Benzene (ug/kg)				Chloroform (ug/kg)				Toluene (ug/kg)				bis(2-e)phthalate (ug/kg)				Ethylbenzene (ug/kg)				1,2,4-Trimethylbenzene (ug/kg)				Total Extractable Hydrocarbons (C13-C40) (mg/kg)				Volatile Fuel Hydrocarbons (C4-C12) (mg/kg)			
				Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
CPB17	01/09/06	1.5	DUP	460	190	186		<190	190	186		7,300	190	186		<49000	49,000	148	DF	2,100	190	186		6,600	190	186		93,000	1500	300	VJ	63	35	87	
	01/09/06	1.5		95	180	177	VJ	<180	180	177	DF	1,400	180	177	DF	<41000	41,000	124	DF	430	180	177	DF	2,400	180	177	DF	110,000	1500	300	VJ	74	56	139	
	01/09/06	5		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		6	10	2	VJ	<0.36	0.36	1	VU
	01/09/06	9		2	2	1		<1.7	2	1		26	2	1		<330	330	1		7	2	1		23	2	1	VJ	30	10	2		<0.35	0.35	1	
	01/09/06	13		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		<10	10	2	DF	<0.32	0.32	1	
	01/09/06	19		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<10	10	2	DF	<0.35	0.35	1	
CPB18	12/20/05	1.5		<1000	1,000	100		<1000	1,000	100		1,700	1,000	100		<990000	990,000	10	DF	450,000	1,000	100		1,500	1,000	100		110,000	1500	1		1	0.40	1	
	12/20/05	5		<1.7	2	1		<1.7	2	1		2	2	1		<1300	1,300	2	BF	1	2	1	GR,J,DX	88	2	1	ЭR,D,JX	1,100	10	1	LN,AY	170	160	500	
	12/20/05	10		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		69	10	1		1	0.30	1	MB
	12/20/05	15		<2.1	2	1		<2.1	2	1		4	2	1		<330	330	1	IB,IA	1	2	1	J,DX	4	2	1		42	10	1		0	0.32	1	MB,J,DX
	12/20/05	20		<2.0	2	1		<2.0	2	1		<2.0	2	1		<330	330	1		<2.0	2	1		<2.0	2	1		<10	10	1	DF	<0.33	0.33	1	
	12/20/05	24		<2.1	2	1		<2.1	2	1		<2.1	2	1		<330	330	1		<2.1	2	1		<2.1	2	1		5	10	1	DF,J,DX	<0.34	0.34	1	
CPB19	01/16/06	1.5		<1.7	2	1	VUJ	<1.7	2	1	VUJ	<1.7	2	1	VUJ	<8300	8,300	25	BF	<1.7	2	1	GR	<1.7	2	1		21,000	300	60		<0.087	0	1	VUJ
	01/16/06	6	DUP	<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		8,300	80	16	VJ	<0.085	0	1	
	01/16/06	5		<1.6	2	1		<1.6	2	1		1	2	1	VJ	<330	330	1		<1.6	2	1		1	2	1	J,DX	10	15	3	VJ	<0.080	0	1	
	01/16/06	10		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<15	15	3	DF	<0.085	0	1	
	01/16/06	15		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		<15	15	3	DF	<0.088	0	1	
	01/16/06	20		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		7	10	2	VJ	<0.082	0	1	
CPB20	01/17/06	1.5		<2.3	2	1		<2.3	2	1		<2.3	2	1		<670	670	2	BF	<2.3	2	1	VUJ	<2.3	2	1	VUJ	310	15	3	VJ	<0.12	0.12	1	
	01/17/06	5		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<7.5	7.5	2	DF	<0.085	0.085	1	
	01/17/06	10		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<7.5	7.5	2	DF	<0.086	0.086	1	
	01/17/06	15		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		5	7.5	2	VJ	<0.088	0.088	1	
	01/17/06	20		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		<15	15	3	DF	<0.091	0.091	1	
CPB21	01/13/06	1		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<2.0	2	1		<2.0	2	1		59	10	2	LM,AY	<0.34	0	1	
	01/13/06	5		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<7.5	8	2	DF	<0.33	0	1	
	01/13/06	10		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		4	8	2	J,DX,DF	<0.31	0	1	
	01/13/06	15		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<15	15	3	DF	<0.37	0	1	
	01/13/06	20		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<15	15	3	DF	<0.35	0	1	
CPB22	01/12/06	1.5		<2	2	1		<2	2	1		1	2	1	VJ	<330	330	1		<2	2	1		<2	2	1		34	15	3		<0.38	0.38	1	
	01/12/06	5		<1.9	2	1		<1.9	2	1		<1.9	2	1		<330	330	1		<1.9	2	1		<1.9	2	1		7	15	3	VJ	<0.34	0.34	1	
	01/12/06	10		<1.9	2	1		<1.9	2	1		<1.9	2	1		<330	330	1		<1.9	2	1		<1.9	2	1		9	15	3	VJ	<0.31	0.31	1	
	01/12/06	15		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		6	15	3	VJ	<0.34	0.34	1	
	01/12/06	20		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		7	15	3	VJ	<0.32	0.32	1	
CPB23	01/18/06	1.5		<1.9	2	1		<1.9	2	1		<1.9	2	1		<3300	3,300	10	BF	<1.9	2	1		<1.9	2	1		430	10	2	VJ	<0.093	0.093	1	
	01/18/06	5		<1.8	2	1		<1.8	2	1		<1.8	2	1		<670	670	2	BF	<1.8	2	1		<1.8	2	1		42	5.0	1		<0.089	0.089	1	
	01/18/06	10		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		2	5.0	1	VJ	<0.089	0.089	1	
	01/18/06	15		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<5.0	5.0	1		<0.083	0.083	1	
	01/18/06	20		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<10	10	2	DF	<0.083	0.083	1	
CPB24	01/20/06	1.5		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		50	10	2	CQ	<0.082	0.082	1	
	01/20/06	5		0	2	1	VJ	<1.6	2	1		<1.6	2	1		<6700	6,700	20	BF	<1.6	2	1		<1.6	2	1	VUJ	23,000	620	125		<0.082	0.082	1	
	01/20/06	10		<2.4	2	1	VUJ	<2.4	2	1	VUJ	<2.4	2	1	VUJ	<3300	3,300	10	BF	<2.4	2	1	VUJ	3	2	1	VJ	9,800	250	50		<0.12	0.12	1	VUJ
	01/20/06	15		<1.6	2	1	VUJ	<1.6	2	1	VUJ	<1.6	2	1	VUJ	<670	670	2	BF	<1.6	2	1	VUJ	<1.6	2	1	VUJ	11,000	250	50		<0.079	0.079	1	VUJ
	01/20/06	20		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		7	5.0	1		<0.082	0.082	1	

TABLE 17
Soil Analytical Results - Selected Volatile Analytes

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	Benzene (ug/kg)				Chloroform (ug/kg)				Toluene (ug/kg)				bis(2-e)phthalate (ug/kg)				Ethylbenzene (ug/kg)				1,2,4-Trimethylbenzene (ug/kg)				Total Extractable Hydrocarbons (C13-C40) (mg/kg)				Volatile Fuel Hydrocarbons (C4-C12) (mg/kg)			
				Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
CPB28	12/05/06	6		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		10	5	1		<0.35	0	1	
	12/05/06	10		<1.5	2	1		<1.5	2	1		<1.5	2	1		<330	330	1		<1.5	2	1		<1.5	2	1		6	5	1		<0.32	0	1	
	12/05/06	14		<1.5	2	1		<1.5	2	1		<1.5	2	1		<330	330	1		<1.5	2	1		<1.5	2	1		8	5	1		<0.32	0	1	
CPB30	12/06/06	9		<1.6	2	1		<1.6	2	1		<1.6	2	1		<2,700	2,700	8		<1.6	2	1		<1.6	2	1		14,000	250	50		<0.32	0	1	
	12/06/06	19		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<5.0	5	1		<0.35	0	1	
	12/06/06	29		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<5.0	5	1		<0.33	0	1	
DPW01	01/18/06	1.5		<3.5	4	2		<3.5	4	2		<3.5	4	2		<3300	3,300	10	BF	<3.5	4	2		<3.5	4	2		430	15	3	VJ	0	0.088	1	VJ
	01/18/06	5		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		210	10	2	VJ	<0.088	0.088	1	
	01/18/06	10		<1.5	2	1		<1.5	2	1		<1.5	2	1		<330	330	1		<1.5	2	1		<1.5	2	1		<5.0	5.0	1		<0.074	0.074	1	
	01/18/06	15		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<7.5	7.5	2	DF	<0.080	0.080	1	
	01/18/06	20		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<7.5	7.5	2	DF	<0.079	0.079	1	
DPW02	01/12/06	2		<1.8	2	1		<1.8	2	1		<1.8	2	1		<670	670	2	BF	<1.8	2	1		<1.8	2	1		120	10	2		<0.36	0	1	
	01/12/06	5		<1.7	2	1		<1.7	2	1		<1.7	2	1		<3300	3,300	10	BF	<1.7	2	1		<1.8	2	1	GR	1,400	20	4		<0.36	0	1	
DPW03	01/12/06	1.5		<2.0	2	1		<2.0	2	1		3	2	1		<1300	1,300	4	BF	1	2	1	J,DX	4	2	1		280	10	2		0	0	1	J,DX
	01/12/06	5		<1.8	<1.8	1		<1.8	2	1		<1.8	2	1		<670	670	2	BF	<1.8	2	1		<1.8	2	1		340	10	2		0	0	1	J,DX
DPW04	01/16/06	2		110	170	167	VJ	<170	170	167		850	170	167		<100000	100,000	299	BF	410	170	167		1,200	170	167		11,000	150	30		1	1	2	
	01/16/06	5		1	2	1	VJ	<1.6	2	1		3	2	1		<330	330	1		1	2	1	J,DX	3	2	1		370	10	2		<0.32	0	1	
DPW05	01/13/06	5		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		5	10	2	VJ	<0.36	0.36	1	
DPW10	01/11/06	2		<2.5	3	1		1	3	1	VJ	<2.5	3	1		<330	330	1		<2.5	3	1		<2.5	3	1		<5.0	5.0	1		<0.40	0.40	1	
HPB01	02/08/06	1.5		<2.2	2	1		<2.2	2	1		<2.2	2	1		<330	330	1		<2.2	2	1		<2.2	2	1		54	5.0	1		0	0.11	1	J,DX
	02/08/06	5		<1.7	2	1		<1.7	2	1		0	2	1	J,DX	<330	330	1		<1.7	2	1		<1.7	2	1		97	10	2		<0.085	0.085	1	
	02/08/06	10		6	2	1	VJ	<1.9	2	1	VUJ	<1.9	2	1	VUJ	<330	330	1		1	2	1	VJ	21	2	1	VJ	<5.0	5.0	1		0	0	1	VJ
	02/08/06	15		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		430	10	2		<0.080	0	1	
	02/08/06	20		<1.7	2	1		<1.7	2	1		0	2	1	VJ	<330	330	1		<1.7	2	1		<1.7	2	1		<5.0	5.0	1		<0.084	0	1	
	02/08/06	24		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<5.0	5.0	1		<0.081	0	1	
HPB02	02/09/06	1.5		<1.6	2	1		<1.6	2	1		<1.6	2	1		<670	670	2	BF	<1.6	2	1		<1.6	2	1		140	5.0	1		<0.081	0.081	1	
	02/09/06	5	DUP	<1.9	2	1		<1.9	2	1		<1.9	2	1		<1300	1,300	4	BF	<1.9	2	1		<1.9	2	1		180	7.5	2		<0.094	0.094	1	
	02/09/06	5		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		550	50	10		<0.089	0.089	1	
	02/09/06	10		5	2	1		<1.9	2	1		1	2	1	J,DX	<670	670	2	BF	<1.9	2	1		8	2	1		800	50	10		0	0.096	1	
	02/09/06	15		4	2	1		<1.8	2	1		1	2	1	J,DX	<3300	3,300	10	BF	1	2	1	J,DX	14	2	1		4,200	380	75		0	0.090	1	
	02/09/06	20		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		11	5.0	1		0	0.086	1	
	02/09/06	24		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		5	5.0	1	J,DX	0	0.085	1	J,DX
HPB03	02/08/06	1.5		1	2	1	VJ	<1.8	2	1		2	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		25	5.0	1		0	0	1	VJ
	02/08/06	5		<1.7	2	1	VUJ	<1.7	2	1	VUJ	2	2	1	VJ	<670	670	2	BF	<1.7	2	1	VUJ	<1.7	2	1	VUJ	360	10	2	VJ	<0.085	0	1	VUJ
	02/08/06	11	DUP	1	2	1	VJ	<1.9	2	1	VUJ	1	2	1	VJ	<6600	6,600	20	BF	4	2	1	VJ	32	2	1	VJ	14,000	200	40		0	0	1	VJ
	02/08/06	11		2	2	1	VJ	<1.8	2	1	VUJ	2	2	1	VJ	<20000	20,000	60	BF	11	2	1	VJ	91	2	1	VJ	12,000	200	40		1	0	1	VJ
	02/08/06	15		1	2	1	VJ	<1.6	2	1	VUJ	1	2	1	VJ	<13000	13,000	40	BF	2	2	1	VJ	5	2	1	VJ	16,000	200	40		0	0	1	VJ
	02/08/06	20		<1.6	2	1		<1.6	2	1		<1.6	2	1		<670	670	2	BF	<1.6	2	1		<1.6	2	1	GR	5,100	100	20		<0.080	0.080	1	
	02/08/06	25		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		3	5.0	1	J,DX	0	0.090	1	J,DX
	02/08/06	30		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		4	5.0	1	J,DX	<0.081	0.081	1	

TABLE 17
Soil Analytical Results - Selected Volatile Analytes

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	Benzene (ug/kg)				Chloroform (ug/kg)				Toluene (ug/kg)				bis(2-e)phthalate (ug/kg)				Ethylbenzene (ug/kg)				1,2,4-Trimethylbenzene (ug/kg)				Total Extractable Hydrocarbons (C13-C40) (mg/kg)				Volatile Fuel Hydrocarbons (C4-C12) (mg/kg)			
				Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
HPB04	02/09/06	1.5		<1.6	2	1		<1.6	2	1		1	2	1	J,DX	<330	330	1		<1.6	2	1		1	2	1	J,DX	840	20	4	CQ	0	0.082	1	
	02/09/06	5		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		3	5.0	1	MB,J,DX	<0.081	0.081	1	
	02/09/06	10	DUP	<1.9	2	1		<1.9	2	1		<1.9	2	1		<330	330	1		<1.9	2	1		<1.9	2	1		4	5.0	1	J,DX,MB	<0.096	0.096	1	
	02/09/06	10		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		5	5.0	1	J,DX,MB	<0.087	0.087	1	
	02/09/06	15		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		4	5.0	1	MB,J,DX	<0.090	0.090	1	
	02/09/06	20		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		1	2	1	J,DX	<5.0	5.0	1		<0.083	0.083	1	
	02/09/06	23		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<5.0	5.0	1		<0.083	0.083	1	
HPB05	02/06/06	1.5		<170	170	168		<170	170	168		520	170	168		<49000	49,000	147	BF	180	170	168		1,000	170	168		23,000	430	86		48	17	168	
	02/06/06	5	DUP	53	110	115	J,DX	<110	110	115		1,100	110	115	CQ	<10000	10,000	30	BF	710	110	115		4,400	110	115		6,100	100	20		64	11	115	
	02/06/06	5		<83	83	83		<83	83	83		110	83	83	MB	<5000	5,000	15	BF	53	83	83	J,DX	280	83	83		7,300	120	24		6	8.3	83	J,DX
	02/06/06	10		0	2	1	J,DX	<1.6	2	1		5	2	1		<330	330	1		1	2	1	J,DX	3	2	1		44	10	2		0	0.081	1	
	02/06/06	15		<1.7	2	1		<1.7	2	1		2	2	1		<330	330	1		<1.7	2	1		1	2	1	J,DX	2	5.0	1	J,DX	0	0.085	1	
	02/06/06	18		<1.9	2	1		<1.9	2	1		<1.9	2	1		<330	330	1		<1.9	2	1		<1.9	2	1		2	5.0	1	J,DX	<0.097	0.097	1	
HPB06	02/06/06	1.5		<1.9	2	1		<1.9	2	1		<1.9	2	1		<3300	3,300	10	DF	<1.9	2	1		<1.9	2	1		240	10	2	LN,AY	<0.094	0.094	1	
	02/06/06	5		<1.7	2	1		<1.7	2	1		<1.7	2	1		<8300	8,300	25	BF	<1.7	2	1		<1.7	2	1		6,500	50	10		<0.083	0.083	1	
	02/06/06	10		<1.5	2	1		<1.5	2	1		<1.5	2	1		<330	330	1		<1.5	2	1		<1.5	2	1		5	5.0	1		<0.075	0.075	1	
	02/06/06	15		<1.9	2	1		<1.9	2	1		<1.9	2	1		<330	330	1		<1.9	2	1		<1.9	2	1		<5.0	5.0	1		<0.093	0.093	1	
	02/06/06	20		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		140	10	2		<0.082	0.082	1	
	02/06/06	25	DUP	<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<5.0	5.0	1		<0.085	0.085	1	
	02/06/06	25		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		<5.0	5.0	1		<0.088	0.088	1	
HPB07	02/06/06	1.5		1	2	1	J,DX	<2	2	1		1	2	1	J,DX	<17000	17,000	50	BF	<2	2	1		1	2	1	J,DX,GF	340	10	2		0	0.10	1	J,DX
	02/06/06	5	DUP	<1.7	2	1		<1.7	2	1		<1.7	2	1		<1300	1,300	4		<1.7	2	1		<1.7	2	1		21	5.0	1		<0.085	0.085	1	
	02/06/06	5		<1.9	2	1		<1.9	2	1		<1.9	2	1		<330	330	1		<1.9	2	1		<1.9	2	1		39	5.0	1		0	0.094	1	J,DX
	02/06/06	10		<140	140	139		<140	140	139		58	140	139	J,DX	<41000	41,000	124	DF	37	140	139	J,DX	560	140	139		5,000	100	20		13	14	139	J,DX
	02/06/06	15		<1.8	2	1		<1.8	2	1		<1.8	2	1		<8300	8,300	25	BF	<1.8	2	1		<1.8	2	1	GR	6,300	50	10		<0.092	0.092	1	
	02/06/06	20	DUP	<1.9	2	1		<1.9	2	1		2	2	1		<330	330	1		<1.9	2	1		<1.9	2	1		34	5.0	1		0	0.095	1	J,DX
	02/06/06	20		<1.9	2	1		<1.9	2	1		2	2	1		<660	660	2	DF	<1.9	2	1		<1.9	2	1		66	5.0	1		0	0.093	1	J,DX
	02/07/06	25		<2.6	3	1		<2.6	3	1		1	3	1	J,DX	<17000	17,000	50	BF	<2.6	3	1		35	3	1		8,200	620	125		0	0.13	1	
HPB08	02/08/06	1.5		<2	2	1		<2	2	1		<2	2	1		<17000	17,000	50	BF	<2	2	1		2	2	1	J,DX	1,400	40	8		0	0.10	1	J,DX
	02/08/06	5		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		5	5.0	1		<0.080	0.080	1	
	02/08/06	10		1	2	1	J,DX	<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		9	5.0	1		<0.083	0.083	1	
	02/08/06	15	DUP	<1.7	2	1		<1.7	2	1		1	2	1	J,DX	<330	330	1		<1.7	2	1		<1.7	2	1	GR	3	5.0	1	J,DX	<0.084	0.084	1	
	02/08/06	15		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		500	10	2		<0.083	0.083	1	
	02/08/06	20		<1.6	2	1		<1.6	2	1		1	2	1	J,DX	<330	330	1		<1.6	2	1		<1.6	2	1		3	5.0	1	J,DX	<0.078	0.078	1	
	02/08/06	24		<1.7	2	1		<1.7	2	1		0	2	1	J,DX	<330	330	1		<1.7	2	1		1	2	1	J,DX	2	5.0	1	J,DX	0	0.085	1	J,DX

TABLE 17
Soil Analytical Results - Selected Volatile Analytes

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	Benzene (ug/kg)				Chloroform (ug/kg)				Toluene (ug/kg)				bis(2-e)phthalate (ug/kg)				Ethylbenzene (ug/kg)				1,2,4-Trimethylbenzene (ug/kg)				Total Extractable Hydrocarbons (C13-C40) (mg/kg)				Volatile Fuel Hydrocarbons (C4-C12) (mg/kg)			
				Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
HPB09	02/09/06	1.5	DUP	<1.9	2	1		<1.9	2	1		4	2	1		<3300	3,300	10	BF	1	2	1	J,DX	8	2	1	GR	1,600	25	5	CQ	0	0	1	
	02/09/06	1.5		<1.5	2	1		<1.5	2	1		<1.5	2	1		<3300	3,300	10	BF	<1.5	2	1		1	2	1	J,DX	430	10	2	CQ	<0.075	0	1	
	02/09/06	5		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		1	2	1	J,DX	48	5.0	1	CQ	0	0	1	J,DX
	02/09/06	10	DUP	0	2	1		<1.5	2	1		<1.5	2	1		<3300	3,300	10	BF	<1.5	2	1		4	2	1		78	15	3	CQ	0	0	1	
	02/09/06	10		2	2	1		<2.0	2	1		1	2	1	J,DX	<670	670	2	DF	<2.0	2	1		11	2	1		130	5.0	1	CQ	0	0	1	
	02/09/06	15	DUP	<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		25	5.0	1	CQ	<0.087	0	1	
	02/09/06	15		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		4	5.0	1	MB,J,DX	0	0	1	J,DX
	02/09/06	20		<1.5	2	1		<1.5	2	1		<1.5	2	1		<330	330	1		<1.5	2	1		<1.5	2	1		<5.0	5.0	1		0	0	1	J,DX
	02/09/06	24		2	2	1		<1.7	2	1		1	2	1	J,DX	<3300	3,300	10	BF	<1.7	2	1		5	2	1		770	20	4	CQ	0	0	1	
	02/09/06	28		<2.1	2	1		<2.1	2	1		<2.1	2	1		<330	330	1		<2.1	2	1		<2.1	2	1		10	5.0	1	MB	<0.110	0	1	
	02/09/06	32		<2.0	2	1		<2.0	2	1		<2.0	2	1		<330	330	1		<2.0	2	1		<2.0	2	1		9	5.0	1	MB	<0.099	0	1	
HPB11	02/07/06	1.5		<1.8	2	1		<1.8	2	1		<1.8	2	1		<3300	3,300	10	DF	<1.8	2	1		<1.8	2	1		93	10	2		0	0.090	1	
	02/07/06	5		<2.3	2	1		<2.3	2	1		1	2	1	J,DX	<12000	12,000	37	BF	<2.3	2	1		2	2	1	J,DX	4,600	100	20		0	0.12	1	J,DX
	02/07/06	10		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		140	10	2		<0.089	0.089	1	
	02/07/06	15		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		6	5.0	1		<0.084	0.084	1	
	02/07/06	18		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		2	5.0	1	J,DX	<0.084	0.084	1	
	02/07/06	25	DUP	<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<5.0	5.0	1		<0.087	0.087	1	
	02/07/06	25		<1.9	2	1		<1.9	2	1		<1.9	2	1		<330	330	1		<1.9	2	1		<1.9	2	1		<5.0	5.0	1		<0.095	0.095	1	
	02/07/06	28		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<5.0	5.0	1		<0.082	0.082	1	
HPB12	12/04/06	7		<2.2	2	1		<2.2	2	1		<2.2	2	1		<330	330	1		<2.2	2	1		<2.2	2	1		3	5	1	J,DX	<0.35	0	1	
	12/04/06	12		<2.1	2	1		<2.1	2	1		<2.1	2	1		<330	330	1		<2.1	2	1		<2.1	2	1		<5.0	5	1		<0.34	0	1	
	12/04/06	17		<2.3	2	1		<2.3	2	1		<2.3	2	1		<330	330	1		<2.3	2	1		<2.3	2	1		2	5	1	J,DX	<0.32	0	1	
	12/04/06	32		<1.9	2	1		<1.9	2	1		<1.9	2	1		<330	330	1		<1.9	2	1		<1.9	2	1		2	5	1	J,DX	<0.34	0	1	
	12/04/06	42		<2.1	2	1		<2.1	2	1		<2.1	2	1		<330	330	1		<2.1	2	1		<2.1	2	1		<5.0	5	1		<0.35	0	1	
	12/04/06	62		<2.4	2	1		<2.4	2	1		<2.4	2	1		<330	330	1		<2.4	2	1		<2.4	2	1		<5.0	5	1		<0.35	0	1	
	12/04/06	80		<2.4	2	1		<2.4	2	1		<2.4	2	1		<620	620	2		<2.4	2	1		<2.4	2	1		4	5	1	J,DX	<0.37	0	1	
	12/04/06	90		<2.6	3	1		<2.6	3	1		<2.6	3	1		<620	620	2		<2.6	3	1		<2.6	3	1		8	5	1		<0.35	0	1	
RB01	02/14/06	1.5		<1.7	2	1		<1.7	2	1		<1.7	2	1		<1300	1,300	4	BF	<1.7	2	1		<1.7	1,700	1	GR	25	10	2		<0.1	0	1	
	02/14/06	6		<150	150	150		<150	150	150		120	150	150	J,DX	<120000	120,000	364	BF	67	150	150	J,DX	490	150	150		29,000	600	120		23	15	150	
	02/14/06	10		<1.7	2	1		<1.7	2	1		2	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		2	5.0	1	J,DX	0	0	1	J,DX
	02/14/06	15		<2.2	2	1		<2.2	2	1		<2.2	2	1		<330	330	1		<2.2	2	1		<2.2	2	1		<5.0	5.0	1		<0.085	0	1	
	02/14/06	20	DUP	<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		2	5.0	1	J,DX	<0.09	0	1	
	02/14/06	20		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		4	5.0	1	J,DX	<0.084	0	1	
	02/14/06	25		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		<5.0	5.0	1		<0.093	0	1	
	02/14/06	30		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<15	15	3	DF	<0.088	0	1	
	02/14/06	35		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<10	10	2	DF	<0.08	0	1	
RB02	02/14/06	1.5		<2.2	2	1		<2.2	2	1		<2.2	2	1		<670	670	2	LN,AY	<2.2	2	1		<2.2	2	1		16	10	2	LM,AY	<0.11	0	1	
	02/14/06	7		<2.5	3	1		<2.5	3	1		<2.5	3	1		<25000	25,000	75	BF	<2.5	3	1	GR	<2.5	3	1	GR	110	10	2		<0.12	0	1	
	02/14/06	10		<1.9	2	1		<1.9	2	1		<1.9	2	1		<8300	8,300	25	BF	<1.9	2	1		<1.9	2	1		11,000	100	20		<0.093	0	1	
	02/14/06	10.5		<2.4	2	1		<2.4	2	1		<2.4	2	1		<8300	8,300	25	BF	<2.4	2	1	GR	<2.4	2	1	GR	5,100	100	20		0	0	1	GR
	02/14/06	14	DUP	<2.3	2	1		<2.3	2	1		<2.3	2	1		<330	330	1		<2.3	2	1		<2.3	2	1		4	5.0	1	J,DX	<0.11	0	1	
	02/14/06	15		<2.4	2	1		<2.4	2	1		<2.4	2	1		<330	330	1		<2.4	2	1		<2.4	2	1		<5.0	5.0	1		<0.12	0	1	
	02/14/06	20		<1.5	2	1		<1.5	2	1		<1.5	2	1		<330	330	1		<1.5	2	1		<1.5	2	1		<5.0	5.0	1		<0.077	0	1	
	02/14/06	25		<1.9	2	1		<1.9	2	1		<1.9	2	1		<330	330	1		<1.9	2	1		<1.9	2	1		2	5.0	1	J,DX	<0.096	0	1	
	02/14/06	29		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<10	10	2	DF	<0.079	0	1	
	02/14/06	36		<1.7	2	1		<1.7	2	1		1	2	1	J,DX	<330	330	1		<1.7	2	1		1	2	1	J,DX	<15	15	3		<0.086	0	1	

TABLE 17
Soil Analytical Results - Selected Volatile Analytes

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	Benzene (ug/kg)				Chloroform (ug/kg)				Toluene (ug/kg)				bis(2-e)phthalate (ug/kg)				Ethylbenzene (ug/kg)				1,2,4-Trimethylbenzene (ug/kg)				Total Extractable Hydrocarbons (C13-C40) (mg/kg)				Volatile Fuel Hydrocarbons (C4-C12) (mg/kg)			
				Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
RB03	02/15/06	1.5	DUP	<1.9	2	1		<1.9	2	1		1	2	1	J,DX	<330	330	1		11	2	1		<1.9	2	1		11	5.0	1		0	0	1	J,DX
	02/15/06	1.5		<1.9	2	1		<1.9	2	1		<1.9	2	1		270	330	1	J,DX	6	2	1		<1.9	2	1		13	5.0	1		0	0	1	J,DX
	02/15/06	5		<2.6	3	1		<2.6	3	1		<2.6	3	1		<1300	1,300	4	DF	<2.6	3	1		<2.6	3	1		100	10	2		<0.13	0	1	
	02/15/06	10		490	150	154		<150	150	154		9,900	150	154		<82000	82,000	246	BF	2,800	150	154		6,700	150	154		51,000	1200	240		120	15	154	
	02/15/06	15		390	140	139		<140	140	139		6,500	140	139		<50000	50,000	149	BF	1,600	140	139		4,500	140	139		96,000	1200	240		81	14	139	
	02/15/06	20		<1.5	2	1		<1.5	2	1		<1.5	2	1		<1700	1,700	5	DF,LM,AY	<1.5	2	1		<1.5	2	1		8	5.0	1		<0.077	0	1	
	02/15/06	20.5		6	2	1		<1.8	2	1		70	2	1		<12000	12,000	37	BF	13	2	1		27	2	1		2,900	50	10		1	0	1	
	02/15/06	25	DUP	<1.6	2	1		<1.6	2	1		<1.6	2	1		<1700	1,700	5	DF	<1.6	2	1		<1.6	2	1		<5.0	5.0	1		<0.080	0	1	
	02/15/06	25		<1.6	2	1		<1.6	2	1		<1.6	2	1		<1700	1,700	5	DF	<1.6	2	1		<1.6	2	1		4	5.0	1	J,DX	<0.081	0	1	
	02/15/06	30		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		<5.0	5.0	1		<0.090	0	1	
	02/15/06	35		<1.9	2	1		<1.9	2	1		<1.9	2	1		<330	330	1		<1.9	2	1		<1.9	2	1		3	5.0	1	J,DX	<0.093	0	1	
SV02	03/13/06	5		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		2	5.0	1	J,DX	<0.083	0.083	1	
	03/13/06	9		<1.9	2	1		<1.9	2	1		<1.9	2	1		<330	330	1		<1.9	2	1		<1.9	2	1		4	5.0	1	J,DX	<0.094	0.094	1	
	03/13/06	15		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		<5.0	5.0	1		<0.083	0.083	1	
SV03	03/07/06	5	DUP	<2.1	2	1		<2.1	2	1		<2.1	2	1		<330	330	1		<2.1	2	1		<2.1	2	1		4	5	1	J,DX	<0.10	0	1	
	03/07/06	5		<2	2	1		<2	2	1		<2	2	1		<330	330	1		<2	2	1		<2	2	1		<5.0	5	1		<0.098	0	1	
	03/07/06	15		<1.6	2	1		<1.6	2	1		1	2	1	MB,J,DX	<330	330	1		<1.6	2	1		<1.6	2	1		<5.0	5	1		<0.082	0	1	
SV04	03/07/06	5		<2.1	2	1		<2.1	2	1		<2.1	2	1		<330	330	1		<2.1	2	1		<2.1	2	1		<5.0	5	1		<0.10	0	1	
	03/07/06	15		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		<5.0	5	1		<0.090	0	1	
SV06	03/07/06	5		<2.1	2	1		<2.1	2	1		<2.1	2	1		<330	330	1		<2.1	2	1		<2.1	2	1		<5.0	5	1		<0.11	0	1	
	03/07/06	15		<1.5	2	1		<1.5	2	1		<1.5	2	1		<330	330	1		<1.5	2	1		<1.5	2	1		2	5	1	J,DX	<0.074	0	1	
SV07	03/07/06	5		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<5.0	5	1		<0.080	0	1	
	03/07/06	16		<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		<5.0	5	1		<0.082	0	1	
SV08	03/07/06	5		<2.5	3	1		<2.5	3	1		<2.5	3	1		<330	330	1		<2.5	3	1		<2.5	3	1		<5.0	5.0	1		<0.13	0	1	
	03/07/06	15		<2.5	3	1		<2.5	3	1		<2.5	3	1		<330	330	1		<2.5	3	1		<2.5	3	1		<5.0	5.0	1		<0.12	0	1	
SV09	03/08/06	5		<1.8	2	1		<1.8	2	1		<1.8	2	1		<330	330	1		<1.8	2	1		<1.8	2	1		<5.0	5	1		<0.088	0	1	
	03/08/06	15		<1.8	2	1		<1.8	2	1		1	2	1	J,DX	<330	330	1		<1.8	2	1		<1.8	2	1		2	5	1	J,DX	<0.089	0	1	
SV10	03/13/06	5		250	160	156		<160	160	156		160	160	156		<170000	170,000	500	BF	94	160	156	J,DX	3,400	160	156		170,000	3800	750		2	0.19	2	
	03/13/06	10		2	2	1		<1.7	2	1		1	2	1	J,DX	<330	330	1		<1.7	2	1		9	2	1		18	5.0	1		0	0.083	1	
	03/13/06	15		<1.5	2	1		<1.5	2	1		<1.5	2	1		<330	330	1		<1.5	2	1		<1.5	2	1		<5.0	5.0	1		<0.077	0.077	1	
SV12	03/08/06	5		<2.2	2	1		<2.2	2	1		<2.2	2	1		<330	330	1		<2.2	2	1		<2.2	2	1		400	10	2	LM,AY	<0.11	0	1	
	03/08/06	13	DUP	<1.6	2	1		<1.6	2	1		<1.6	2	1		<330	330	1		<1.6	2	1		<1.6	2	1		4	5	1	J,DX	<0.080	0	1	
	03/08/06	13		<1.7	2	1		<1.7	2	1		<1.7	2	1		<330	330	1		<1.7	2	1		<1.7	2	1		9	5	1		<0.084	0	1	
SV13	03/07/06	5		<2.7	3	1		<2.7	3	1		<2.7	3	1		<330	330	1		<2.7	3	1		<2.7	3	1		24	5.0	1		<0.13	0	1	
	03/07/06	15		<2.3	2	1		<2.3	2	1		<2.3	2	1		<330	330	1		<2.3	2	1		<2.3	2	1		3	5.0	1	J,DX,MB	<0.11	0	1	

TABLE 17
Soil Analytical Results - Selected Volatile Analytes

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	Benzene (ug/kg)				Chloroform (ug/kg)				Toluene (ug/kg)				bis(2-e)phthalate (ug/kg)				Ethylbenzene (ug/kg)				1,2,4-Trimethylbenzene (ug/kg)				Total Extractable Hydrocarbons (C13-C40) (mg/kg)				Volatile Fuel Hydrocarbons (C4-C12) (mg/kg)			
				Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
MW04	12/07/06	28		<2.0	2	1		<2.0	2	1		<2.0	2	1		<330	330	1		<2.0	2	1		<2.0	2	1		<5.0	5			<0.31	0	1	
	12/07/06	38		<2.0	2	1		<2.0	2	1		<2.0	2	1		<330	330	1		<2.0	2	1		<2.0	2	1		9	5			<0.32	0	1	
	12/07/06	49		<2.3	2	1		<2.3	2	1		<2.3	2	1		<330	330	1		<2.3	2	1		<2.3	2	1		<5.0	5			<0.35	0	1	
	12/07/06	59		<2.5	3	1		<2.5	3	1		<2.5	3	1		<330	330	1		<2.5	3	1		<2.5	3	1		4	5		J,DX	<0.35	0	1	
	12/07/06	69		<2.3	2	1		<2.3	2	1		<2.3	2	1		<330	330	1		<2.3	2	1		<2.3	2	1		<5.0	5			<0.35	0	1	
	12/08/06	79		<2.3	2	1		<2.3	2	1		<2.3	2	1		<1,000	1,000	3		<2.3	2	1		<2.3	2	1		4	5		J,DX	<0.35	0	1	
	12/08/06	89		<2.8	3	1		<2.8	3	1		<2.8	3	1		<1,000	1,000	3		<2.8	3	1		<2.8	3	1		21	5			<0.37	0	1	

Notes:

ft bgs = Feet below ground surface
ug/kg = Micrograms per killigram
< = Analyte was not detected above the specified method reporting limit
- = Not measured or analyzed
AY = Matrix interference suspected
BF = Reporting limits raised due to high hydrocarbon background
CQ = Analyte conc. greater that 10 times the blank conc.
DF = Reporting limits elevated due to matrix interferences
DX = Value < lowest standard (MQL), but > than MDL
GR = Internal standard recovery is outside method recovery limit
IA = Results are valid even though CCV recovery outside of limits
IB = CCV recovery above limit; analyte not detected
J = EPA Flag - Estimated value
LM = MS and/or MSD above acceptance limits. See Blank Spike(LCS).
LN = MS and/or MSD below acceptance limits. See Blank Spike(LCS).
MB = Analyte present in the method blank
MC = Sample received unpreserved but analyzed within 7 days
RA = RPD exceeds limit due to matrix interf.; % recovs. within limits
RE = Elevated reporting limits due to limited sample volume
VJ = Val. Qual.: Estimated value
VUJ = Val. Qual.: MDL and EQL may be biased low
Not RPB11 - Pilot
Sample depths refer to +/- 2 feet acetate liner

Samples analyzed for Volatile Organic Compounds by EPA Mehtod 8260B.
DUP = Duplicate sample
Green = sludge
Blue = disturbed

TABLE 18
Soil Analytical Results - Selected Semi-Volatile Analytes

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	Chrysene (ug/kg)				Benzo(b)-fluoranthene (ug/kg)				Phenanthrene (ug/kg)				Naphthalene (ug/kg)				Fluoranthene (ug/kg)				Pyrene (ug/kg)				Benzo(a)-pyrene (ug/kg)				Dibenzo(a,h)-anthracene (ug/kg)			
					Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
CPB01	01/19/06	1.5	SW8310		170,000	7,700	773	VJ	49,000	7,700	773	VJ	58,000	3,900	773	VJ	4,500	77,000	773	VJ	160,000	7,700	773	VJ	69,000	7,700	773	VJ	<500,000	500,000	1,500	BF	<630,000	630,000	1,500	BF
	01/19/06	5	SW8310		16,000	1,500	153	VJ	11,000	1,500	153	VJ	29,000	770	153	VJ	<15000	15,000	153		79,000	1,500	153	VJ	32,000	1,500	153	VJ	<120,000	120,000	375	BF	<160,000	160,000	375	BF
	01/19/06	10	SW8310		110,000	7,300	728	VJ	20,000	7,300	728		55,000	3,600	728	CQ	<73000	73,000	728		100,000	7,300	728	VJ	46,000	7,300	728	VJ	<83,000	83,000	250	BF	<100,000	100,000	250	BF
	01/19/06	15	SW8310		<10	10	1		6	10	1	VJ	13	5	1	CQ	<100	100	1		23	10	1	VJ	<10	10	1		<330	330	1		<420	420	1	
	01/19/06	20	SW8310	DUP	22,000	1,400	144	VJ	5,000	1,400	144	VJ	9,600	720	144	VJ	<14000	14,000	144		27,000	1,400	144	VJ	11,000	1,400	144	VJ	<17,000	17,000	50	BF	<21,000	21,000	50	BF
	01/19/06	19	SW8310		630	50	5	VJ	230	50	5	VJ	270	25	5	VJ	<500	500	5		690	50	5	VJ	330	50	5	VJ	<330	330	1		<420	420	1	
	01/19/06	23	SW8310		54	10	1	VJ	20	10	1	VJ	23	5	1	CQ	<100	100	1		55	10	1	VJ	27	10	1	VJ	<330	330	1		<420	420	1	
CPB02	01/17/06	1.5	SW8310		160,000	19,000	1,860	VJ	31,000	19,000	1,860		88,000	9,300	1,860	CQ	<190000	190,000	1,860		<19000	19,000	1,860		51,000	19,000	1,860	VJ	<170,000	170,000	498	BF	<210,000	210,000	498	BF
	01/17/06	5	SW8310		17,000	1,200	125		4,200	500	50		8,900	250	50	CQ	<5000	5,000	50		13,000	500	50	VJ	7,900	500	50	VJ	<6,600	6,600	20	BF	<8,300	8,300	20	BF
	01/17/06	10	SW8310		2,200	200	20	VJ	480	200	20		1,000	100	20	CQ	<2000	2,000	20		<200	200	20		680	200	20	VJ	<670	670	2	DF	<830	830	2	DF
	01/17/06	14	SW8310		85	10	1	VJ	19	10	1		39	5	1	CQ	<100	100	1		78	10	1	VJ	35	10	1	VJ	<330	330	1		<420	420	1	
	01/17/06	18	SW8310		150	10	10	VJ	34	10	1		56	5	1	CQ	<100	100	1	VJ	120	10	1	VJ	51	10	1	VJ	<330	330	1		<420	420	1	
CPB3	01/12/06	1.5	SW8310		410,000	37,000	3,710	PI	100,000	19,000	1,860		270,000	9,300	1,860	CQ	13,000	190,000	1,860	J,DX	450,000	19,000	1,860	PI	210,000	19,000	1,860	PI	170,000	9,300	1,860	PI	<37,000	37,000	1,860	
	01/12/06	5	SW8310		31,000	1,200	125	PI	7,900	1,200	125		9,500	620	125	CQ	<12000	12,000	125		<1200	1,200	125		9,300	1,200	125	PI	<620	620	125		3,000	2,500	125	PI
	01/12/06	10	SW8310		720	100	10	PI	180	100	10		220	50	10	CQ	<1000	1,000	10		<100	100	10		220	100	10	PI	250	50	10	PI	100	100	10	J,DX
	01/12/06	15	SW8310		210	10	1	PI	57	10	1		88	5	1	CQ	<100	100	1		170	10	1	PI	16	10	1	PI	85	5	1	PI	<20	20	1	
	01/12/06	20	SW8310	DUP	<10	10	1		<10	10	1		4	5	1	CQ,J,DX	<100	100	1		<10	10	1		<10	10	1		81	5	1	PI	30	20	1	PI
	01/12/06	19	SW8310		200	10	1	PI	74	10	1	PI	85	5	1	CQ	<100	100	1		170	10	1	PI	18	10	1	PI	<5.0	5	1	IHa	<20	20	1	
CPB04	01/18/06	1.5	SW8310		9	50	5	VJ	4	50	5	VJ	<25	25	5	DF	<500	500	5	DF	<50	50	5	DF	<50	50	5	DF	<330	330	1		<420	420	1	
	01/18/06	5	SW8310		<100	100	10	DF	<100	100	10	DF	<50	50	10	DF	<1000	1,000	10	DF	<100	100	10	DF	<100	100	10	DF	<670	670	2	BF	<830	830	2	BF
	01/18/06	10	SW8310		<10	10	1	VUJ	<10	10	1	VUJ	<5.0	5	1	VUJ	<100	100	1	VUJ	<10	10	1	VUJ	<10	10	1	VUJ	<330	330	1		<420	420	1	
	01/18/06	15	SW8310		<10	10	1	VUJ	<10	10	1	VUJ	1	5	1	VJ	<100	100	1	VUJ	<10	10	1	VUJ	1	10	1	VJ	<330	330	1		<420	420	1	
	01/18/06	19	SW8310		<10	10	1	VU	1	10	1	VJ	1	5	1	VJ	<100	100	1	VUJ	<10	10	1	VUJ	<10	10	1	VUJ	<330	330	1		<420	420	1	
	01/18/06	24	SW8310		<10	10	1	VU	<10	10	1		0	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
CPB05	01/19/06	1.5	SW8310		210,000	16,000	781	VJ	77,000	7,800	781	VJ	93,000	3,900	781	CQ	<78000	78,000	781		<7800	7,800	781	VJ	67,000	7,800	781	VJ	<250,000	250,000	750	BF	<310,000	310,000	750	BF
	01/19/06	5	SW8310		16,000	2,500	248	VJ	4,600	250	25	VJ	7,700	1,200	248	VJ	<2500	2,500	25		18,000	2,500	248	VJ	9,100	2,500	248	VJ	<17,000	17,000	50	BF	<21,000	21,000	50	BF
	01/19/06	10	SW8310		51	10	1	VJ	20	10	1	VJ	17	5	1	CQ	<100	100	1		45	10	1	VJ	21	10	1	VJ	<330	330	1		<420	420	1	
	01/19/06	15	SW8310		19	10	1	VJ	5	10	1	VJ	7	5	1	VJ	<100	100	1		15	10	1	VJ	2	10	1	VJ	<330	330	1		<420	420	1	
	01/19/06	20	SW8310	DUP	2	10	1	VJ	1	10	1	VJ	1	5	1	VJ	<100	100	1	VUJ	<10	10	1	VUJ	<10	10	1	VUJ	<330	330	1		<420	420	1	
	01/19/06	19	SW8310		<10	10	1		<10	10	1		2	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
CPB06	01/17/06	1.5	SW8310		430,000	38,000	3,830	VJ	81,000	38,000	3,830		150,000	19,000	3,830	VJ	15,000	380,000	3,830	VJ	370,000	38,000	3,830	VJ	160,000	38,000	3,830	VJ	<160,000	160,000	495	BF	<210,000	210,000	495	BF
	01/17/06	5	SW8310		100,000	7,200	721	VJ	22,000	7,200	721		39,000	3,600	721	CQ	<72000	72,000	721	VJ	76,000	7,200	721	VJ	350,000	7,200	721	VJ	<1,300	1,300	4	BF	<1,700	1,700	4	BF
	01/17/06	10	SW8310		1,400	100	10	VJ	540	100	10	VJ	310	50	10	VJ	<1000	1,000	10	VJ	980	100	10	VJ	440	100	10	VJ	<660	660	2	BF	<830	830	2	BF
	01/17/06	11	SW8310	DUP	1,600	100	10	VJ	680	100	10	VJ	320	50	10	VJ	<1000	1,000	10		240	100	10	VJ	450	100	10	VJ	<330	330	1		<420	420	1	
	01/17/06	15	SW8310		56	10	1	VJ	24	10	1	VJ	22	5	1	CQ	<100	100	1		9	10	1	VJ	21	10	1	VJ	<330	330	1		<420	420	1	
	01/17/06	19	SW8310		14	10	1	VJ	6	10	1	VJ	6	5	1	VJ	<100	100	1		2	10	1	VJ	6	10	1	VJ	<330	330	1		<420	420	1	
CPB7	01/12/06	1.5	SW8310		410,000	19,000	1,860	PI	68,000	3,700	371		200,000	9,300	1,860	CQ,PI	<37000	37,000	371		310,000	19,000	1,860	PI	170,000	19,000	1,860	PI	10,000	1,900	371	PI	29,000	7,400	371	PI
	01/12/06	5	SW8310	DUP	320,000	19,000	1,870	PI	61,000	3,800	375		140,000	9,400	1,870	CQ	5,100	38,000	375	J,DX	320,000	19,000	1,870	PI	170,000	19,000	1,870	PI	8,500	1,900	375	PI	<7,500	7,500	375	
	01/12/06	5	SW8310		240,000	19,000	1,890	PI	48,000	3,800	379		82,000	1,900	379	CQ	<38000	38,000	379		170,000	7,600	758	PI	98,000	3,800	379	PI	7,600	1,900	379	PI	<7,600	7,600	379	
	01/12/06	10	SW8310		6,100	500	50	PI	2,300	200	20	PI	240	100	20	CQ	<2000	2,000	20		320	200	20	PI	790	200	20	PI	120	100	20	PI	<400	400	20	
	01/12/06	15	SW8310		4,300	200	20	PI	1,800	200	20	PI	<100	100	20		<2000	2,000	20		560	200	20	PI	<200	200	20		150	100	20	PI	<400	400	20	
	01/12/06	19	SW8310		240	10	1	PI	92	10	1	PI	54	5	1	CQ,PI	<100	100	1		160	10	1	PI	19	10	1	PI	100	5	1	PI	55	20	1	PI
CPB08	01/17/06	1.5	SW8310		9,400	1,200	125	VJ	3,800	1,200	125	VJ	2,800	620	125	VJ	<12000	12,000	125		1,400	1,200	125	VJ	3,900	1,200	125	VJ	<670	670	2	BF	<830	830	2	BF
	01/17/06	8	SW8310		160	50	5	VJ	76	50	5	VJ	53	25	5	CQ	<500	500	5		32	50	5	VJ	57	50	5	VJ	<10	10	30	BF	<13	13	30	BF
	01/17/06	10	SW8310		6,000	1,000	100	VJ	2,500	1,000	100	VJ	<500	500	100		<10000	10,000	100	LR	<1000	1,000	100		980	1,000	100	VJ	<1,300	1,300	4	BF	1,700	1,700	4	BF
	01/17/06	15	SW8310		220	10	1	VJ	110	10	1	VJ	<5.0	5	1	VU	<100	100	1		<10	10	1		40	10	1	VJ	<330	330	1		<420	420	1	
	01/17/06	20	SW8310		990	200	20	VJ	440	200	20	VJ	6	100	20	VJ	<2000	2,000	20	LR	<200	200	20		150	200	20	VJ	<500	500	2	BF	<630	630	2	BF
	01/18/06	23	SW8310		<10	10	1	VU	2	10	1	VJ	<5.0	5	1		<100	100	1		<10	10	1		3	10	1	VJ	<330	330	1		<420	420	1	
	01/18/06	25	SW8310		<10	10	1		<10	10	1		1	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
	01/18/06	30	SW8310		<10	10	1		1	10	1	VJ	0	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
CPB9	01/13/06	1.5	SW8310		23	50	5	VJ	8	50	5	VJ	10	25	5	VJ	<500	500	5	VUJ	<50	50	5	VUJ	<50	50	5	VUJ	<330	330	1		<420	420	1	
	01/13/06	5	SW8310		<10	10	1		<10	10	1		0	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
	01/13/06	10	SW8310		<10	10	1		<10	10	1		<5.0	5	1		<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
	01/13/06	15	SW8310		<10	10	1		<10	10	1		1	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
	01/13/06	20	SW8310		<10	10	1	VUJ	<10	10	1	VUJ	1	5	1	VJ	<100	100	1	VUJ	<10	10	1	VUJ	<10	10	1	VUJ	<330	330	1		<420	420	1	
CPB10	01/10/06	1.5	SW8310		170,000	7,200	721	PI	27,000	3,600	361		28,000	1,800	361	CQ	<36000	36,000	361		66,000	3,600	361	PI	36,000	3,600	721	PI	8,700	3,600	721	PI	<7,200	7,200	361	
	01/10/06	5	SW8310		180,000	7,100	743	PI	59,000	7,400	743		140,000	3,700	743	CQ	3,600	74,000	743	PI,J,DX	300,000	7,400	743	PI	170,000	7,400	743	PI	7,200	3,700	743	PI	<15,000	15,000	743	
	01/10/06	10	SW8310		210	20	2	ET,PI	100	20	2	ET,PI	130	10	2	ET	<200	200	2	ET	340	20	2	ET,PI	150	20	2	ET,PI	<10	10	2	ET	<40	40	2	ET
	01/10/06	15	SW8310		16	10	1	PI	5	10	1	J,DX	8	5	1	CQ	<100	100	1		6	10	1	J,DX	12	10	1	PI	1	5	1	PI,J,DX	<20	20	1	
	01/10/06	20	SW8310		7	10	1	J,DX,PI	2	10	1	PI,J,DX	4	5	1	CQ,J,DX	<100	100	1		9	10	1	J,DX,PI	6	10	1	PI,J,DX	0	5	1	PI,J,DX	<20	20	1	
CPB11R	01/10/06	1.5	SW8310		140,000	7,400	735	PI	40,000	3,700	368		37,000	1,800	368	CQ	<37000	37,000	368		91,000	3,700	368	PI	59,000	3,700	368	PI	7,100	1,800	368	PI	<7,400	7,400	368	
	01/10/06	5	SW8310		80,000	3,800	375	PI	21,000	3,800	375		79,000	1,900	375	CQ	1,900	38,000	375	J,DX,PI	170,000	3,800	375	PI	84,000	3,800	375	PI	<1,900	1,900	375		<7,500	7,500	375	
	01/10/06	10	SW8310		<10	10	1		2	10	1	J,DX	<5.0	5	1		<100	100	1		1	10	1	J,DX	<10	10	1		4	5	1	J,DX	<20	20	1	
	01/10/06	15	SW8310		1,400	100	10	PI	480	100	10		970	50	10	CQ	<1000	1,000	10		2,100	100	10	PI	1,100	100	10	PI	66	50	10	PI	<200	200	10	
	01/12/06	20	SW8310		5	10	1	PI,J,DX	2	10	1	J,DX	5	5	1	CQ,J,DX	<100	100	1		9	10	1	PI,J,DX	5	10	1	PI,J,DX	0	5	1	PI,J,DX	<20	20	1	
CPB12	01/17/06	1.5	SW8310		3	10	1	VJ	1	10	1	VJ	<5	5	1	VU	<100	100	1		4	10	1	VJ	2	10	1	VJ	<3,300	3,300	10	BF	<4,200	4,200	10	BF
	01/17/06	5	SW8310		10	50	5	VJ	310	50	5	VJ	230	25	5	VJ	<500	500	5		140	50	5	VJ	300	50	5	VJ	<3,300	3,300	10	BF	<4,200	4,200	10	BF
	01/17/06	10	SW8310		16,000	1,200	125	VJ	4,700	1,200	125		1,600	620	125	VJ	<12000	12,000	125		<1200	1,200	125		1,800	1,200	125	VJ	<330	330	1		<420	420	1	
	01/17/06	15	SW8310	DUP	2,600	100	10	VJ	950	100	10	VJ	1,100	25	10	VJ	<1000	1,000	10		2,000	100	10	VJ	870	100	10	VJ	<1,300	1,300	4	BF	<1,700	1,700	4	BF
	01/17/06	15	SW8310		180	50	5	VJ	77	50	5	VJ	49	50	5	VJ	<500	500	5	LR	34	50	5	VJ	56	50	5	VJ	<330	330	1		<420	420	1	
	01/17/06	20	SW8310		18	10	1	VJ	4	10	1	VJ	5	5	1	VJ	<100	100	1		3	10	1	VJ	6	10	1	VJ	<330	330	1		<420	420	1	

TABLE 18
Soil Analytical Results - Selected Semi-Volatile Analytes

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	Chrysene (ug/kg)				Benzo(b)-fluoranthene (ug/kg)				Phenanthrene (ug/kg)				Naphthalene (ug/kg)				Fluoranthene (ug/kg)				Pyrene (ug/kg)				Benzo(a)-pyrene (ug/kg)				Dibenzo(a,h)-anthracene (ug/kg)			
					Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
CPB13	01/16/06	1.5	SW8310		15,000	1,200	125	VJ	8,100	1,200	125	VJ	13,000	620	125	CQ	<12000	12,000	125		25,000	1,200	125	VJ	12,000	1,200	125	VJ	830	620	125	PI	2,800	2,500	125	PI
	01/16/06	5	SW8310		860	200	20	VJ	340	200	20	VJ	690	100	20	VJ	<2000	2,000	20		<200	200	20		<200	200	20		170	100	20	PI	190	400	20	J,DX
	01/16/06	10	SW8310		12,000	500	50	VJ	3,800	500	50		1,900	250	50	VJ	<5000	5,000	50		<500	500	50		<500	500	50		<250	250	50		<1,000	1,000	50	
	01/16/06	15	SW8310		7,200	1,000	100	VJ	1,800	50	5		3,200	500	100	CQ	<500	500	5		5,800	1,000	100	VJ	3,700	1,000	100	VJ	<25	25	5		<100	100	5	
	01/16/06	18	SW8310		17	10	1	VJ	10	10	1	VJ	11	5	1	CQ	<100	100	1		23	10	1	VJ	8	10	1	VJ	1	5	1	PI,J,DX	4	20	1	PI,J,DX
	01/16/06	25	SW8310		3	10	1	VJ	1	10	1	VJ	<5	5	1	VU	<100	100	1		<10	10	1		1	10	1	VJ	0	5	1	PI,J,DX	<20	20	1	
	01/16/06	28	SW8310		10	10	1	VJ	5	10	1	VJ	6	5	1	MB	<100	100	1		14	10	1	VJ	7	10	1	VJ	<5.0	5	1		<20	20	1	
CPB14	01/10/06	1.5	SW8310		160,000	18,000	1,840		65,000	7,400	735		68,000	3,700	735	CQ	<74000	74,000	735		170,000	7,400	735	PI	99,000	7,400	735	PI	9,400	9,200	1,840	PI	<15,000	15,000	735	
	01/10/06	5	SW8310		150	50	5	PI	160	50	5		270	25	5	CQ	13	500	5	J,DX	560	50	5	PI	290	50	5	PI	<25	25	5		27	100	5	J,DX
	01/10/06	10	SW8310		32	10	1	PI	15	10	1	PI	18	5	1	CQ	<100	100	1		44	10	1	PI	21	10	1	PI	2	5	1	PI,J,DX	<20	20	1	
	01/10/06	15	SW8310		6	10	1	J,DX,PI	2	10	1	J,DX	2	5	1	CQ,J,DX	<100	100	1		6	10	1	PI,J,DX	3	10	1	J,DX,PI	<5.0	5	1		<20	20	1	
	01/10/06	19	SW8310		7	10	1	PI,J,DX	2	10	1	J,DX	3	5	1	J,DX,CQ	<100	100	1		8	10	1	PI,J,DX	4	10	1	J,DX,PI	0	5	1	J,DX,PI	<20	20	1	
CPB15	12/20/05	1.5	SW8270C		<480000	480,000	10	DF	<480000	480,000	10	DF	300,000	480,000	10	DF,J,DX	<480000	480,000	10	DF	<480000	480,000	10	DF	<480000	480,000	10	DF	<480,000	480,000	10	DF	<600,000	600,000	10	DF
	12/20/05	5	SW8270C		<3300	3,300	5	DF	<3300	3,300	5	DF	<3300	3,300	5	DF	<3300	3,300	5	DF	<3300	3,300	5	DF	<3300	3,300	5	DF	<3,300	3,300	5	DF	<4,200	4,200	5	DF
	12/20/05	9	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/20/05	11	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/20/05	14	SW8310		3	10	1	VJ	0	10	1	VJ	2	5	1	VJ	<100	100	1	VUJ	<10	10	1	VUJ	<10	10	1	VJ	<5.0	5	1	BV	<20	20	1	BV
	12/20/05	20	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
CPB15R	01/20/06	1.5	SW8310		230,000	18,000	1,790	PI	62,000	18,000	1,790		170,000	8,900	1,790		6,600	180,000	1,790	PI,J,DX	480,000	18,000	1,790	PI	190,000	1,800	1,790	PI	100,000	8,900	1,790	PI	<36,000	36,000	1,790	
CPB16	01/17/06	2	SW8310	DUP	120,000	15,000	1,490	VJ	55,000	15,000	1,490	VJ	64,000	7,400	1,490	VJ	<150000	150,000	1,490	VUJ	140,000	15,000	1,490	VJ	61,000	15,000	1,490	VJ	<100,000	100,000	299	BF	<120,000	120,000	299	BF
	01/17/06	1	SW8310		2,400	200	20	VJ	1,100	200	20	VJ	1,100	100	20	VJ	<2000	2,000	20		280	200	20	VJ	1,100	200	20	VJ	<1,300	1,300	4	BF	<1,700	1,700	4	BF
	01/17/06	5	SW8310		4	10	1	VJ	2	10	1	VJ	<5.0	5	1	VUJ	<100	100	1	VUJ	3	10	1	VJ	2	10	1	VJ	<330	330	1		<420	420	1	
	01/17/06	9	SW8310		75	50	5	VJ	35	50	5	VJ	20	25	5	VJ	<500	50	5		13	50	5	VJ	24	50	5	VJ	<330	330	1		<420	420	1	
	01/17/06	15	SW8310		2	10	1	VJ	<10	10	1		<5.0	5	1	VUJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
	01/17/06	20	SW8310		<10	10	1		1	10	1	VJ	<5.0	5	1	VUJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
CPB17	01/09/06	1.5	SW8310	DUP	96,000	7,300	728	PI	28,000	3,600	364		76,000	1,800	364		<36000	36,000	364		180,000	3,600	364	PI	88,000	3,600	364	PI	<1,800	1,800	364		<7,300	7,300	364	
	01/09/06	1.5	SW8310		170,000	7,300	728	PI	51,000	3,600	364		110,000	3,600	728		3,600	36,000	364	J,DX	270,000	7,300	728	PI	140,000	3,600	364	PI	<1,800	1,800	364		<7,300	7,300	364	
	01/09/06	5	SW8310		13	10	1	PI	3	10	1	J,DX	5	5	1		<100	100	1		11	10	1	PI	5	10	1	J,DX,PI	<5.0	5	1		<20	20	1	
	01/09/06	9	SW8310		100	10	1	PI,LM,AY	32	10	1		52	5	1	LM,AY	<100	100	1		120	10	1	PI,LM,AY	58	10	1	LM,AY,PI	5	5	1	PI,J,DX	<20	20	1	PI
	01/09/06	13	SW8310		<10	10	1		<10	10	1		1	5	1	PI,J,DX	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	01/10/06	19	SW8310		<10	10	1		<10	10	1		1	5	1	J,DX,MB	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
CPB18	12/20/05	1.5	SW8270C		<990000	990,000	10	DF	<990000	990,000	10	DF	<990000	990,000	10	DF	<990000	990,000	10	DF	<990000	990,000	10	DF	<990000	990,000	10	DF	<990,000	990,000	10	DF	<1,200,000	1,200,000	10	DF
	12/20/05	5	SW8270C		<1300	1,300	2	BF	<1300	1,300	2	BF	1,600	1,300	2	BF	<1300	1,300	2	BF	<1300	1,300	2	BF	<1300	1,300	2	BF	<1,300	1,300	2	BF	<1,700	1,700	2	BF
	12/20/05	10	SW8310		290	50	5	VJ	130	50	5	VJ	200	25	5	VJ	<500	500	5	VUJ	300	50	5	VJ	150	50	5	VJ	<25	25	5	BV	63	100	1	BV,J,DX
	12/20/05	15	SW8310		3	10	1	VJ	0	10	1		2	5	1	VJ	400	100	1	VJ	40	10	1	VJ	0	10	1	VJ	<330	330	1		<420	420	1	
	12/20/05	20	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/20/05	24	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
CPB19	01/16/06	6	SW8310	DUP	12	20	2	VJ	27	20	2	VJ	9	10	2	VJ	<200	200	2		<20	20	2		<20	20	2		<10	10	2		10	40	2	PI,J,DX
	01/16/06	1.5	SW8310		6,500	500	50		2,800	200	20	VJ	<100	100	20	VU	<2000	2,000	20		1,100	200	20	VJ	<200	200	20		<250	250	50		<400	400	20	
	01/16/06	5	SW8310		16	10	1	VJ	7	10	1	VJ	7	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		6	20	1	PI,J,DX
	01/16/06	10	SW8310		5	10	1	VJ	1	10	1	VJ	<5	5	1	VU	<100	100	1		<10	10	1		<10	10	1		3	5	1	PI,J,DX	<20	20	1	
	01/16/06	15	SW8310		39	10	1	VJ	28	10	1	VJ	19	5	1	CQ	<100	100	1		<10	10	1		24	10	1	VJ	3	5	1	PI,J,DX	6	20	1	PI,J,DX
	01/16/06	20	SW8310		<10	10	1		<10	10	1		<5	5	1	VU	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
CPB20	01/17/06	1.5	SW8310		130	100	10		130	100	10	VJ	<50	50	10	VUJ	<1000	1,000	10	VUJ	<100	100	10		42	100	10	VJ	<670	670	2	BF	<830	830	2	BF
	01/17/06	5	SW8310		5	10	1	VJ	1	10	1	VJ	3	5	1	VJ	<100	100	1		<10	10	1		2	10	1	VJ	<330	330	1		<420	420	1	
	01/17/06	10	SW8310		13	10	1	VJ	8	10	1	VJ	3	5	1	VJ	<100	100	1		12	10	1	VJ	1	10	1	VJ	<330	330	1		<420	420	1	
	01/17/06	15	SW8310		9	10	1	VJ	3	10	1	VJ	5	5	1		<100	100	1		11	10	1	VJ	2	10	1	VJ	<330	330	1		<420	420	1	
	01/17/06	20	SW8310		<10	10	1	VUJ	1	10	1	VJ	<5.0	5	1	VUJ	<100	100	1	VUJ	<10	10	1	VUJ	<10	10	1	VUJ	<330	<330	1		<420	420	1	
CPB21	01/13/06	1	SW8310		120	10	1	VJ	48	10	1	VJ	38	5	1	VJ	<100	100	1		88	10	1	VJ	45	10	1	VJ	<330	330	1		<420	420	1	
	01/13/06	5	SW8310		1	10	1	VJ	<10	10	1		1	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
	01/13/06	10	SW8310		<10	10	1		<10	10	1		1	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
	01/13/06	15	SW8310		<10	10	1		<10	10	1		0	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
	01/13/06	20	SW8310		<10	10	1		<10	10	1		<5.0	5	1		<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
CPB22	01/12/06	1.5	SW8310		610	100	10	PI	130	100	10		210	50	10	CQ	<1000	1,000	10		510	100	10	PI	260	100	10	PI	27	50	10	PI,J,DX	100	200	10	PI,J,DX
	01/12/06	5	SW8310		<10	10	1		<10	10	1		1	5	1	MB,PI,J,DX	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	01/12/06	10	SW8310		<10	10	1		<10	10	1		0	5	1	MB,J,DX	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	01/12/06	15	SW8310		<10	10	1		<10	10	1		<10	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	01/12/06	20	SW8310		<10	10	1		<10	10	1		<10	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
CPB23	01/18/06	1.5	SW8310		58	100	10	VJ	28	100	10	VJ	8	50	10	VJ	<1000	1,000	10	VUJ	<100	100	10	DF	<100	100	10	BF	<3,300	3,300	10	BF	<4,200	4,200	10	BF
	01/18/06	5	SW8310		79	50	5	VJ	51	50	5	VJ	13	25	5	VJ	<500	500	5	VUJ	<50	50	5		22	50	5	VJ	<670	670	2	BF	<830	830	2	BF
	01/18/06	10	SW8310		3	10	1	VJ	1	10	1	VJ	<5	5	1	VUJ	<100	100	1	VUJ	2	10	1	VJ	<10	10	1	VUJ	<330	330	1		<420	420	1	
	01/18/06	15	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	01/18/06	20	SW8310		3	10	1	VJ	1	10	1	VJ	<5	5	1	VUJ	<100	100	1	VUJ	<10	10	1		<10	10	1		<330	330	1		<420	420	1	
CPB24	01/20/06	1.5	SW8310		<20	20	2		<20	20	2		80	10	2	VJ	<200	200	2		<20	20	2		<20	20	2		<330	330	1		<420	420	1	
	01/20/06	5	SW8310		18,000	1,200	125	VJ	4,700	250	25	VJ	2,900	120	25	VJ	<2500	2,500	25		<250	250	25		3,900	250	25	VJ	<6,700	6,700	20	BF	<8,300	8,300	20	BF
	01/20/06	10	SW8310		4,800	500	50	VJ	1,200	50	5	VJ	500	25	5	VJ	<500	500	5		1,300	50	5	VJ	1,300	50	5	VJ	<3,300	3,300	10	BF	<4,200	4,200	10	BF
	01/20/06	15	SW8310		3,900	250	25	VJ	2,000	120	13	VJ	25	62	13	VJ	<1200	1,200	13		<120	120	13		540	120	13	VJ	<670	670	2	BF	<830	830	2	BF
	01/20/06	20	SW8310		70	10	1	VJ	41	10	1	VJ	<5	5	1	VU	<100	100	1		<10	10	1		9	10	1	VJ	<330	330	1		<420	420	1	
CPB28	12/05/06	6	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/05/06	10	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/05/06	14	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	

TABLE 18
Soil Analytical Results - Selected Semi-Volatile Analytes

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	Chrysene (ug/kg)				Benzo(b)-fluoranthene (ug/kg)				Phenanthrene (ug/kg)				Naphthalene (ug/kg)				Fluoranthene (ug/kg)				Pyrene (ug/kg)				Benzo(a)-pyrene (ug/kg)				Dibenzo(a,h)-anthracene (ug/kg)			
					Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
CPB30	12/06/06	9	SW8270C		1,600	2,700	8	J,DX	<2,700	2,700	8		<2,700	2,700	8		<2,700	2,700	8		<2,700	2,700	8		<2,700	2,700	8		<2,700	2,700	8	BF	<3,300	3,300	8	BF
	12/06/06	19	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/06/06	29	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
DPW01	01/18/06	1.5	SW8310		130	100	10	VJ	130	100	10		36	50	10	VJ	<1000	1,000	10		<100	100	10		57	100	10	VJ	<3,300	3,300	10	BF	<4,200	4,200	10	BF
	01/18/06	5	SW8310		<50	50	5	DF	<50	50	5	DF	<25	25	5	DF	<500	500	5	DF	<50	50	5	DF	<50	50	5	DF	<330	330	1		<420	420	1	
	01/18/06	10	SW8310		<10	10	1		<10	10	1		1	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
	01/18/06	15	SW8310		<10	10	1	VUJ	1	10	1	VJ	1	5	1	VJ	<100	100	1	VUJ	<10	10	1	VUJ	<10	10	1	VUJ	<330	330	1		<420	420	1	
	01/18/06	20	SW8310		<10	10	1	VUJ	0	10	1	VJ	1	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
DPW02	01/13/06	2	SW8310		1,300	100	10	VJ	830	100	10	VJ	1,200	50	10	VJ	<1000	1,000	10		4,700	100	10	VJ	3,200	500	50	VJ	<670	670	2	BF	<830	830	2	BF
	01/13/06	5	SW8310		<100	100	10	VUJ	<100	100	10	VUJ	<50	50	10	VUJ	<1000	1,000	10	VUJ	<100	100	10	VUJ	<100	100	10	VUJ	<3,300	3,300	10	BF	<4,200	4,200	10	BF
DPW03	01/13/06	2	SW8310		580	100	10	VJ	190	100	10	VJ	240	50	10	VJ	<1000	1,000	10		490	100	10	VJ	210	100	10	VJ	<1,300	1,300	4	BF	<1,700	1,700	4	BF
	01/13/06	5	SW8310		580	100	10	VJ	220	100	10	VJ	150	50	10	VJ	<1000	1,000	10		460	100	10	VJ	200	100	10	VJ	<670	670	2	BF	<830	830	2	BF
DPW04	01/13/06	2	SW8310		8,900	1,200	125	VJ	4,600	1,200	125	VJ	3,900	620	125		<12000	12,000	125		13,000	1,200	125	VJ	5,000	1,200	125	VJ	<100,000	100,000	299	BF	<120,000	120,000	299	BF
	01/13/06	5	SW8310		440	100	10	VJ	150	100	10	VJ	110	50	10	VJ	<1000	1,000	10		71	100	10	VJ	140	100	10	VJ	<330	330	1		<420	420	1	
DPW05	01/13/06	5	SW8310		<10	10	1		<10	10	1		1	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
DPW10	01/11/06	2	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
HPB01	02/08/06	1.5	SW8310		93	50	5	PI	78	50	5	PI	<25	25	5		<500	500	5		62	50	5	PI	<50	50	5	PI	<25	25	5		<100	100	5	PI
	02/08/06	5	SW8310		<10	10	1	PI	<10	10	1		<5.0	5	1	PI	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1	PI	<20	20	1	
	02/08/06	10	SW8310		<10	10	1	VUR	<10	10	1	VUR	<5	5	1	VUR	<100	100	1	VUJ	<10	10	1	VUJ	<10	10	1	VUJ	<330	330	1		<420	420	1	
	02/08/06	15	SW8310		<10	10	1		22	10	1		3	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
	02/08/06	20	SW8310		<10	10	1		<10	10	1		1	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
	02/08/06	24	SW8310		1	10	1	VJ	<10	10	1		1	5	1	VJ	<100	100	1		<10	10	1		<10	10	1		<330	330	1		<420	420	1	
HPB02	02/09/06	1.5	SW8270C		<670	670	2	BF	<670	670	2	BF	<670	670	2	BF	<670	670	2	BF	<670	670	2	BF	<670	670	2	BF	<670	670	2	BF	<830	830	2	BF
	02/09/06	5	SW8270C	DUP	710	1,300	4	J,DX,BF	<1300	1,300	4	BF	<1300	1,300	4	BF	<1300	1,300	4	BF	<1300	1,300	4	BF	<1300	1,300	4	BF	<1,300	1,300	4	BF	<1,700	1,700	4	BF
	02/09/06	5	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	02/09/06	10	SW8270C		660	670	2	BF,J,DX	<670	670	2	BF	990	670	2	BF	<670	670	2	BF	<670	670	2	BF	<670	670	2	BF	<670	670	2	BF	<830	830	2	BF
	02/09/06	15	SW8270C		1,800	3,300	10	BF,J,DX	<3300	3,300	10	BF	2,200	3,300	10	BF,J,DX	<3300	3,300	10	BF	<3300	3,300	10	BF	<3300	3,300	10	BF	<3,300	3,300	10	BF	<4,200	4,200	10	BF
	02/09/06	20	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	02/09/06	24	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
HPB03	02/08/06	1.5	SW8310		32	50	5	VJ	17	50	5	VJ	8	25	5	VJ	<500	500	5		<50	50	5		2	50	5	VJ	<330	330	1		<420	420	1	
	02/08/06	5	SW8310		<200	200	20		61	200	20	VJ	<100	100	20		<2000	2,000	20		<200	200	20		<200	200	20		<670	670	2		<830	830	2	
	02/08/06	11	SW8270c	DUP	<6600	6,600	20	BF	<6600	6,600	20	BF	5,100	6,600	20	BF,J,DX	<6600	6,600	20	BF	<6600	6,600	20	BF	<6600	6,600	20	BF	<6,600	6,600	20	BF	<8,300	8,300	20	BF
	02/08/06	11	SW8310		28,000	2,500	250	VJ	9,100	250	25	VJ	14,000	1,200	250	VJ	<2500	2,500	250		29,000	2,500	250	VJ	15,000	2,500	250	VJ	<20,000	20,000	60	BF	<25,000	25,000	60	BF
	02/08/06	15	SW8310		28,000	1,200	125	VJ	8,100	250	25	VJ	11,000	620	125	VJ	<2500	2,500	25		26,000	1,200	125	VJ	13,000	1,200	125	VJ	<13,000	13,000	40	BF	<17,000	17,000	40	BF
	02/08/06	20	SW8310		7,700	500	50	PI	2,000	200	20		<100	100	20		<2000	2,000	20		620	200	20	PI	760	200	20	PI	<100	100	20		<400	400	20	
	02/08/06	25	SW8310		<10	10	1		<10	10	1		<5.0	5	1	PI	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	02/08/06	30	SW8310		<10	10	1		<10	10	1		<5.0	5	1	PI	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
HPB04	02/09/06	1.5	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	02/09/06	5	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	02/09/06	10	SW8270C	DUP	<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	02/09/06	10	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	02/09/06	15	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	02/09/06	20	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	02/09/06	23	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
HPB05	02/06/06	1.5	SW8310		26,000	1,200	125	PI	6,800	1,200	125		21,000	620	125		600	12,000	125	J,DX	52,000	1,200	125	PI	23,000	1,200	125	PI	8,700	620	125	PI	<2,500	2,500	125	PI
	02/06/06	5	SW8270C	DUP	<10000	10,000	30	BF	<10000	10,000	30	BF	13,000	10,000	30	BF	<10000	10,000	30	BF	<10000	10,000	30	BF	<10000	10,000	30	BF	<10	10	30	BF	<12	12	30	BF
	02/06/06	5	SW8310		24,000	2,500	250	PI	11,000	2,500	250	PI	46,000	1,200	250		7,800	25,000	250	PI,J,DX	99,000	2,500	250	PI	41,000	2,500	250	PI	<1,200	1,200	250		<5,000	5,000	250	
	02/06/06	10	SW8310		180	50	5	PI	84	50	5	PI	150	25	5		<500	500	5		570	50	5	PI	270	50	5	PI	110	25	5	PI	<100	100	5	
	02/06/06	15	SW8310		2	10	1	J,DX,PI	1	10	1	J,DX,PI	1	5	1	PI,J,DX	<100	100	1		6	10	1	PI,J,DX	1	10	1	J,DX,PI	<5.0	5	1		<20	20	1	
	02/06/06	18	SW8310		<10	10	1		<10	10	1		0	5	1	J,DX,PI	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
HPB06	02/06/06	1.5	SW8270C		7,200	3,300	10	DF	4,500	3,300	10	DF	19,000	3,300	10	DF	<3300	3,300	10	DF	16,000	3,300	10	DF	20,000	3,300	10	DF	5,700	3,300	10	DF	<4,200	4,200	10	DF
	02/06/06	5	SW8310		1,400	500	50		6,300	500	50	PI	18	250	50	J,DX,PI	590	5,000	50	J,DX,PI	<500	500	50		360	500	50	PI,J,DX	<250	250	50		<1,000	1,000	50	
	02/06/06	10	SW8310		120	25	3	LN,AY,PI	76	25	3	PI,LN,AY	53	12	3	LN,AY	<250	250	3		200	25	3	PI,LN,AY	93	25	3	LN,AY,PI	86	12	3	LN,AY,PI	37	50	3	LN,AY,PI,J,DX
	02/06/06	15	SW8310		<25	25	3		8	25	3	PI,J,DX	2	12	3	J,DX,PI	<250	250	3		<25	25	3		<25	25	3		<12	12	3		<50	50	3	
	02/06/06	20	SW8310		710	250	25	PI	490	250	25	PI	310	120	25		<2500	2,500	25		1,400	250	25	PI	730	250	25	PI	540	120	25	PI	<500	500	25	
	02/06/06	25	SW8310		1	10	1	PI,J,DX	<10	10	1		1	5	1	J,DX,PI	<100	100	1		<10	10	1		1	10	1	J,DX,PI	<5.0	5	1		<20	20	1	
HPB07	02/06/06	1.5	SW8310		1,600	500	50	PI	1,900	500	50	PI	140	250	50	J,DX,PI	<5000	5,000	50		<500	500	50		500	500	50	PI	<250	250	50		<1,000	1,000	50	
	02/06/06	5	SW8310		7	50	5	J,DX	39	50	5	PI,J,DX	4	25	5	J,DX	<500	500	5		<50	50	5		<50	50	5		<25	25	5		<100	100	5	
	02/06/06	10	SW8310		79,000	5,000	500	PI	36,000	5,000	500	PI	59,000	2,500	500		<50000	50,000	500		150,000	5,000	500	PI	70,000	5,000	500	PI	36,000	2,500	500	PI	<10,000	10,000	500	
	02/06/06	15	SW8270C		<8300	8,300	25	BF	<8300	8,300	25	BF	<8300	8,300	25	BF	<8300	8,300	25	BF	<8300	8,300	25	BF	<8300	8,300	25	BF	<8300	8,300	25	BF	<10,000	10,000	25	BF
	02/06/06	20	SW8270C	DUP	<330	330	1		<330	330	1		<330	330	1		<300	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	02/06/06	20	SW8270C		<660	660	2	DF	<660	660	2	DF	<660	660	2	DF	<660	660	2	DF	<660	660	2	DF	<660	660	2	DF	<660	660	2	DF	<830	830	2	DF
	02/07/06	25	SW8310		9,100	1,200	125	PI,CQ	7,100	1,200	125	PI,CQ	3,200	620	125	CQ	<12000	12,000	125		13,000	1,200	125	CQ,PI	8,500	1,200	125	CQ,PI	10,000	620	125	PI	<2,500	2,500	125	
HPB08	02/08/06	1.5	SW8310		4,300	500	50	PI	2,200	500	50	PI	790	250	50	CQ	<5000	5,000	50		<500	500	50		1,100	500	50	PI	2,900	250	50	PI	<1,000	1,000	50	
	02/08/06	5	SW8310		<10	10	1	PI	<10	10	1		<5.0	5	1	MB	<100	100	1		<10	10	1	PI	<10	10	1		<5.0	5	1		<20	20	1	
	02/08/06	10	SW8310		<10	10	1	PI	<10	10	1		<5.0	5		MB	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1	PI	<20	20	1	
	02/08/06	15	SW8310	DUP	10	10	1	PI	<10	10	1	PI	<5.0	5		MB	<100	100	1		<10	10	1	PI	<10	10	1	PI	<5.0	5	1		<20	20	1	
	02/08/06	15	SW8310		120	10	1	PI	75	10	1		<5.0	5		MB	<100	100	1		37	10	1	PI	18	10	1		<5.0	5	1	PI	<20	20	1	
	02/08/06	20	SW8310		<10	10	1	PI	<10	10	1	PI	<5.0	5		MB,PI	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	02/08/06	24	SW8310		<10	10	1	PI	<10	10	1	PI	<5.0	5			<100	100	1		<10	10	1	PI	<10	10	1	PI	<5.0	5	1		<20	20	1	

TABLE 18
Soil Analytical Results - Selected Semi-Volatile Analytes

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	Chrysene (ug/kg)				Benzo(b)-fluoranthene (ug/kg)				Phenanthrene (ug/kg)				Naphthalene (ug/kg)				Fluoranthene (ug/kg)				Pyrene (ug/kg)				Benzo(a)-pyrene (ug/kg)				Dibenzo(a,h)-anthracene (ug/kg)			
					Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
HPB09	02/09/06	1.5	SW8310	DUP	2,100	500	50	CQ,PI	1,500	500	50	CQ,PI	460	250	50	CQ	<5000	5,000	50		<500	500	50		600	500	50	PI	220	250	50	CQ,PI,J,DX	600	1,000	50	PI,J,DX
	02/09/06	1.5	SW8310		1,700	500	50	CQ,PI	1,500	500	50	CQ,PI	340	250	50	CQ,PI	<5000	5,000	50		<500	500	50		390	500	50	PI,J,DX	<250	250	50		1,000	1,000	50	PI
	02/09/06	5	SW8310		60	20	2	PI,CQ	26	20	2	CQ,PI	26	10	2	CQ	<200	200	2		54	20	2	PI	23	20	2	PI	35	10	2	CQ,PI	<40	40	2	
	02/09/06	10	SW8310	DUP	190	20	2	CQ,PI	49	20	2	CQ	70	10	2	CQ	<200	200	2		160	20	2	PI	73	20	2	PI	71	10	2	CQ,PI	<40	40	2	
	02/09/06	10	SW8310		60	20	2	CQ,PI	14	20	2	CQ,J,DX	12	10	2	PI,CQ	110	200	2	J,DX	40	20	2	PI	38	20	2	PI	20	10	2	CQ,PI	<40	40	2	
	02/09/06	15	SW8310	DUP	<100	100	10	DF	<100	100	10	DF	<50	50	10	DF	<1000	1,000	10	DF	<100	100	10	DF	<100	100	10	DF	<50	50	10	DF	<200	200	10	DF
	02/09/06	15	SW8310		<10	10	1		<10	10	1		1	5	1	MB,PI,J,DX	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	02/09/06	20	SW8310		3	10	1	MB,J,DX,PI	1	10	1	J,DX,MB	<5.0	5	1		<100	100	1		<10	10	1		<10	10	1		0	5	1	MB,PI,J,DX	<20	20	1	
	02/09/06	24	SW8310		19	10	1	MB,PI	5	10	1	J,DX	7	5	1	MB	<100	100	1		15	10	1	PI	7	10	1	J,DX,PI	9	5	1	MB,PI	<20	20	1	
	02/09/06	28	SW8310		<10	10	1		<10	10	1		1	5	1	PI,J,DX,MB	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	02/09/06	32	SW8310		14	10	1	MB,PI	6	10	1	PI,J,DX,MB	5	5	1	MB,J,DX	<100	100	1		12	10	1	PI	6	10	1	PI,J,DX	<5.0	5	1		<20	20	1	
HPB11	02/07/06	1.5	SW8310		740	200	20	CQ,PI	660	200	20	CQ,PI	160	100	20	CQ	<2000	2,000	20		850	200	20	PI,CQ	600	200	20	CQ,PI	960	100	20	PI	<400	400	20	
	02/07/06	5	SW8310		570	120	13	PI,CQ	460	120	13	PI,CQ	190	62	13	CQ	<1200	1,200	13		920	120	13	PI,CQ	550	120	13	CQ,PI	690	62	13	PI	<250	250	13	
	02/07/06	10	SW8310		150	50	5	CQ,PI	93	50	5	CQ,PI	220	25	5	CQ	110	500	5	J,DX,PI	420	50	5	CQ,PI	200	50	5	CQ,PI	120	25	5	PI	<100	100	5	
	02/07/06	15	SW8310		6	10	1	MB,PI,J,DX	2	10	1	J,DX,MB	4	5	1	MB,J,DX	9	100	1	J,DX	11	10	1	MB,PI	5	10	1	MB,PI,J,DX	6	5	1	PI	<20	20	1	
	02/07/06	19	SW8310		13	10	1	PI,MB	11	10	1	PI,MB	8	5	1	MB	<100	100	1		<10	10	1	ET	10	10	1	PI,J,DX,MB	15	5	1	PI	<20	20	1	
	02/07/06	25	SW8310		<10	10	1		<10	10	1		0	5	1	PI,MB,J,DX	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	02/07/06	28	SW8310		0	10	1	PI,MB,J,DX	<10	10	1		1	5	1	J,DX,MB,PI	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
HPB12	12/04/06	7	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/04/06	12	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/04/06	17	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/04/06	32	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/04/06	42	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/04/06	62	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/04/06	80	SW8270C		<620	620	2		<620	620	2		<620	620	2		<620	620	2		<620	620	2		<620	620	2	DF	<620	620	2	DF	<780	780	2	DF
	12/04/06	90	SW8270C		<620	620	2		<620	620	2		<620	620	2		<620	620	2		<620	620	2		<620	620	2		<620	620	2	DF	<780	780	2	DF
RB01	02/14/06	1.5	SW8270C		<1300	1,300	4	BF	<1300	1,300	4	BF	<1300	1,300	4	BF	<1300	1,300	4	BF	<1300	1,300	4	BF	<1300	1,300	4	BF	<1,300	1,300	4	BF	<1,700	1,700	4	BF
	02/14/06	6	SW8310		44,000	2,500	250	PI	11,000	2,500	250		36,000	1,200	250		880	25,000	250	LR,PI,J,DX	64,000	2,500	250	PI	8,800	2,500	250	PI	2,200	1,200	250	PI	<5,000	5,000	250	
	02/14/06	10	SW8310		150	50	5	PI	67	50	5	PI	170	25	5		<500	500	5	LR	300	50	5	PI	150	50	5	PI	<25	25	5	PI	<100	100	5	PI
	02/14/06	15	SW8310		<10	10	1		<10	10	1		1	5	1	MB,PI,J,DX	<100	100	1	LR	<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	02/14/06	20	SW8310		11	10	1	PI	4	10	1	J,DX	11	5	1	PI	<100	100	1	LR	18	10	1	PI	9	10	1	PI,J,DX	1	5	1	PI,J,DX	<20	20	1	
	02/14/06	25	SW8310		<10	10	1		<10	10	1		3	5	1	CQ,J,DX	<100	100	1	LR	3	10	1	PI,J,DX	3	10	1	PI,J,DX	<5.0	5	1		<20	20	1	
	02/14/06	30	SW8310		<10	10	1		<10	10	1	LR	3	5	1	CQ,PI,J,DX	<100	100	1		<10	10	1		2	10	1	J,DX	<5.0	5	1		<20	20	1	
	02/14/06	35	SW8310		<10	10	1		<10	10	1	LR	1	5	1	J,DX	<100	100	1	LR	<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
RB02	02/14/06	1.5	SW8270C		<670	670	2	LN,AY	<670	670	2	LN,AY	<670	670	2	LN,AY	<670	670	2	LN,AY	<670	670	2	LN,AY	<670	670	2		<670	670	2	LN,AY	<830	830	2	
	02/14/06	7	SW8310		28	120	13	PI,J,DX	93	120	13	J,DX	47	62	13	J,DX	<1200	1,200	13	LR	<120	120	13		41	120	13	J,DX	64	62	13	PI	<250	120	13	
	02/14/06	10	SW8270C		<8300	8,300	25	BF	<8300	8,300	25	BF	6,200	8,300	25	BF,J,DX	<8300	8,300	25	BF	<8300	8,300	25	BF	<8300	8,300	25	BF	<8,300	8,300	25	BF	<10,000	10,000	25	BF
	02/14/06	10.5	SW8310		3,000	200	20	PI	1,000	100	10	PI	840	50	10	PI	<1000	1,000	10	LR	2,400	100	10	PI	1,600	100	10	PI	950	50	10	PI	720	200	10	PI
	02/14/06	14	SW8310		<10	10	1		<10	10	1		<5.0	5	1		<100	100	1	LR	<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	02/14/06	20	SW8310		<10	10	1		<10	10	1		<5.0	5	1		<100	100	1	LR	<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	02/14/06	25	SW8310		<10	10	1		<10	10	1		<5.0	5	1		<100	100	1	LR	<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	02/14/06	29	SW8310		<10	10	1		<10	10	1		<5.0	5	1		<100	100	1	LR	<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	02/14/06	36	SW8310		<10	10	1		<10	10	1		<5.0	5	1		<100	100	1	LR	<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
RB03	02/15/06	1.5	SW8270C	DUP	<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	02/15/06	1.5	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	02/15/06	5	SW8310		<100	100	10		<100	100	10		4	50	10	CQ,PI,J,DX	<1000	1,000	10	LR	<100	100	10		<100	100	10		<50	50	10		<200	200	10	
	02/15/06	10	SW8310		22,000	2,500	250	PI	5,800	2,500	250		19,000	1,200	250	CQ	<25000	25,000	250	LR	48,000	2,500	250	PI	20,000	2,500	250	PI	6,400	1,200	250	PI	<5,000	5,000	250	
	02/15/06	15	SW8270C		47,000	50,000	149	BF,J,DX	<50000	50,000	149	BF	48,000	50,000	149	BF,J,DX	<50000	50,000	149	BF	<50000	50,000	149	BF	25,000	50,000	149	BF,J,DX	<50,000	50,000	149	BF	<62,000	62,000	149	BF
	02/15/06	20	SW8270C		<1700	1,700	5	DF	<1700	1,700	5	DF,BA,AY,LM	<1700	1,700	5	DF	<1700	1,700	5	DF	<1700	1,700	5	DF	<1700	1,700	5	DF,LM,AY	<1,700	1,700	5	LM,AY,DF	<2,100	2,100	5	DF
	02/15/06	20.5	SW8310		22,000	2,500	250	PI	8,800	2,500	250	PI	21,000	1,200	250	CQ	<25000	25,000	250	LR	37,000	2,500	250	PI	18,000	2,500	250	PI	1,600	1,200	250	PI	<5,000	5,000	250	
	02/15/06	25	SW8310		<10	10	1		1	10	1	PI,J,DX	5	5	1	CQ,J,DX,PI	<100	100	1	LR	<10	10	1		4	10	1	J,DX,PI	<5.0	5	1		<20	20	1	
	02/15/06	30	SW8310		<10	10	1		<10	10	1		2	5	1	MB,J,DX	<100	100	1	LR	<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	02/15/06	35	SW8310		<10	10	1		<10	10	1		1	5	1	J,DX,MB,PI	<100	100	1	LR	<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
SV02	03/13/06	5	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	03/13/06	9	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	03/13/06	15	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
SV03	03/07/06	5	SW8310		<10	10	1		<10	10	1		<5	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	03/07/06	5	SW8310	DUP	<10	10	1		<10	10	1		<5	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	03/07/06	15	SW8310		<10	10	1		<10	10	1		0	5	1	J,DX	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
SV04	03/07/06	5	SW8310		<10	10	1		<10	10	1		<5	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	03/07/06	15	SW8310		<10	10	1		<10	10	1		<5	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
SV06	03/07/06	5	SW8310		<10	10	1		<10	10	1		<5	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	03/07/06	15	SW8310		3	10	1	J,DX	1	10	1	J,DX	<5	5	1		<100	100	1		<10	10	1		6	10	1	J,DX	<5.0	5	1		<20	20	1	
SV07	03/07/06	5	SW8310		<10	10	1		<10	10	1		<5	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	03/07/06	16	SW8310		2	10	1	J,DX	1	10	1	J,DX	1	5	1	J,DX	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
SV08	03/07/06	5	SW8310		<10	10	1		<10	10	1		<5.0	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	03/07/06	15	SW8310		<10	10	1		<10	10	1		<5.0	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
SV09	03/08/06	5	SW8310		<10	10	1		<10	10	1		0	5	1	MB,PI,J,DX	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	03/08/06	15	SW8310		<10	10	1		<10	10	1		<5.0	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	

TABLE 18
Soil Analytical Results - Selected Semi-Volatile Analytes

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	Chrysene (ug/kg)				Benzo(b)-fluoranthene (ug/kg)				Phenanthrene (ug/kg)				Naphthalene (ug/kg)				Fluoranthene (ug/kg)				Pyrene (ug/kg)				Benzo(a)-pyrene (ug/kg)				Dibenzo(a,h)-anthracene (ug/kg)			
					Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
SV10	03/13/06	5	SW8270C		230,000	170,000	500	BF	<170000	170,000	500	BF	240,000	170,000	500	BF	<170000	170,000	500	BF	<170000	170,000	500	BF	<170000	170,000	500	BF	<170,000	170,000	500	BF	<210000	210,000	500	BF
	03/13/06	10	SW8270C		<330	330	1		<330	330	1		240	330	1	J,DX	<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	03/13/06	15	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
SV11	03/13/06	5	SW8310		<10	10	1		<10	10	1		<5.0	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	03/13/06	15	SW8310		<10	10	1		<10	10	1		<5.0	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
SV12	03/08/06	5	SW8310		<50	50	5		6	50	5	PI,J,DX	<25	25	5		<500	500	5		<50	50	5		<50	50	5		<25	25	5		<100	100	5	
	03/08/06	13	SW8310	DUP	1	10	1	PI,J,DX	<10	10	1		<5.0	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	03/08/06	13	SW8310		<10	10	1		<10	10	1		<5.0	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1	ET	<20	20	1	ET
SV13	03/07/06	5	SW8310		<10	10	1		<10	10	1		<5.0	5	1		<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
	03/07/06	15	SW8310		<10	10	1		<10	10	1		1	5	1	J,DX	<100	100	1		<10	10	1		<10	10	1		<5.0	5	1		<20	20	1	
MW04	12/07/06	28	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/07/06	38	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/07/06	49	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/07/06	59	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/07/06	69	SW8270C		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<330	330	1		<420	420	1	
	12/08/06	79	SW8270C		<1,000	1,000	3		<1,000	1,000	3		<1,000	1,000	3		<1,000	1,000	3		<1,000	1,000	3		<1,000	1,000	3		<1,000	1,000	3	DF	<1,300	1,300	3	DF
	12/08/06	89	SW8270C		<1,000	1,000	3		<1,000	1,000	3		<1,000	1,000	3		<1,000	1,000	3		<1,000	1,000	3		<1,000	1,000	3		<1,000	1,000	3	DF	<1,300	1,300	3	DF

Notes:

ft bgs = Feet below ground surface
ug/kg = Micrograms per killigram
< = Analyte was not detected above the specified method reporting limit
- = Not measured or analyzed
AY = Matrix interference suspected
BF = Reporting limits raised due to high hydrocarbon background
BV = Sample received after holding time expired
CQ = Analyte conc. greater that 10 times the blank conc.
DF = Reporting limits elevated due to matrix interferences
DX = Value < lowest standard (MQL), but > than MDL
ET = Sample was extracted past end of recommended max. holding time
J = EPA Flag - Estimated value
LM = MS and/or MSD above acceptance limits. See Blank Spike(LCS).
LN = MS and/or MSD below acceptance limits. See Blank Spike(LCS).
LR = LCS recovery below method control limits.
MB = Analyte present in the method blank
PI = Primary and confirm results varied by > than 40% RPD
RA = RPD exceeds limit due to matrix interf.; % recovs. within limits
VJ = Val. Qual.: Estimated value
VU = Val. Qual.: Compound analyzed for but not detected
VUJ = Val. Qual.: MDL and EQL may be biased low
Not RPB11 - Pilot
Sample depths refer to +/- 2 feet acetate liner

SW8270C = Semivolatile Organic Compounds analyzed by EPA Method 8270C (GC/MS)
SW8310 = Polynuclear Aromatic Hydrocarbons analyzed by EPA Method 8310
DUP = Duplicate sample
Green = sludge
Blue = disturbed

TABLE 19a
Soil Analytical Results - Metals and pH Analyses

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avneue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	pH		Field Screened pH	Antimony (mg/kg)				Arsenic (mg/kg)				Barium (mg/kg)				Copper (mg/kg)				Cadmium (mg/kg)				Lead (mg/kg)				Molybdenum (mg/kg)				Thallium (mg/kg)				Vanadium (mg/kg)				Zinc (mg/kg)			
				Result	Qual	Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
CPB01	01/19/06	1.5		1.01	VJ	-	0.066	1.0	1	VJ	<0.50	0.50	1		0.51	0.50	1	VJ	<1	1.0	1	VU	<0.50	0.50	1		26	0.50	1	CQ	<1.0	1.0	1		<0.50	0.50	1		2.0	1.0	1		0.83	10	1	VJ
	01/19/06	5		0.39	VJ	-	0.064	1.0	1	VJ	<0.50	0.50	1		19	0.50	1	VJ	4.0	1.0	1	CQ	0.034	0.50	1	VJ	85	0.50	1	CQ	0.18	1.0	1	VJ	<0.50	0.50	1		8.9	1.0	1		11	10	1	
	01/19/06	10		0.93	VJ	-	0.052	1.0	1	VJ	0.40	0.50	1	VJ	33	0.50	1	VJ	6.8	1.0	1	CQ	0.042	0.50	1	VJ	48	0.50	1	CQ	0.20	1.0	1	VJ	<0.50	0.50	1		15.0	1.0	1		17	10	1	
	01/19/06	15		4.33		-	<1.0	1.0	1		1.50	0.50	1		110	0.50	1	VJ	8.2	1.0	1	CQ	0.041	0.50	1	VJ	3	0.50	1	CQ	<1.0	1.0	1		0.10	0.50	1	VJ	32.0	1.0	1		32	10	1	
	01/19/06	20	DUP	1.20		-	<1.0	1.0	1		1.50	0.50	1		81	0.50	1	VJ	12.0	1.0	1	CQ	0.052	0.50	1	VJ	10	0.50	1	VJ	1.70	1.0	1		<0.50	0.50	1		26.0	1.0	1		34	10	1	
	01/19/06	19		5.55	VJ	-	<1.0	1.0	1		1.50	0.50	1		81	0.50	1	VJ	11.0	1.0	1	CQ	0.092	0.50	1	VJ	4	0.50	1	VJ	0.20	1.0	1	VJ	<0.50	0.50	1		25.0	1.0	1		29	10	1	
	01/19/06	23		7.86		-	<1.0	1.0	1		1.90	0.50	1		120	0.50	1	VJ	48.0	1.0	1	VJ	0.160	0.50	1	VJ	5	0.50	1	CQ	0.92	1.0	1	VJ	<0.50	0.50	1		26.0	1.0	1		46	10	1	
CPB02	01/17/06	1.5		0.85	VJ	-	<1.0	1.0	1		<0.50	0.50	1		0	0.50	1	VJ	0.7	1.0	1	VJ	<0.50	0.50	1		37	0.50	1	CQ	<1.0	1.0	1		<0.50	0.50	1		2.3	1.0	1		<10	10	1	
	01/17/06	5		1.39	VJ	-	0.170	1.0	1	VJ	1.50	0.50	1		80	0.50	1		9.9	1.0	1	VJ	0.100	0.50	1	VJ	6	0.50	1	CQ	0.42	1.0	1	VJ	0.23	0.50	1	VJ	31.0	1.0	1		42	10	1	CQ
	01/17/06	10		7.39		-	<1.0	1.0	1	VU	1.20	0.50	1		89	0.50	1		11.0	1.0	1	VJ	0.130	0.50	1	VJ	3	0.50	1	CQ	0.19	1.0	1	VJ	0.12	0.50	1	VJ	27.0	1.0	1		35	10	1	CQ
	01/17/06	14		7.32		-	0.082	1.0	1	VJ	2.00	0.50	1		110	0.50	1		16.0	1.0	1	VJ	0.150	0.50	1	VJ	5	0.50	1	CQ	0.60	1.0	1	VJ	0.12	0.50	1	VJ	39.0	1.0	1		44	10	1	CQ
	01/17/06	18		7.06		-	<1.0	1.0	1		0.79	0.50	1		65	0.50	1		8.9	1.0	1		0.044	0.50	1	VJ	2	0.50	1	CQ	0.24	1.0	1	VJ	<0.50	0.50	1		25.0	1.0	1		28	10	1	CQ
CPB03	01/12/06	1.5		1.38		-	<1.0	1.0	1		<0.50	0.50	1		0	0.50	1	J,DX	0.5	1.0	1	J,DX	<0.50	0.50	1		5	0.50	1	CQ	<1.0	1.0	1		<0.50	0.50	1		<1.0	1.0	1		2	10	1	MB,J,DX
	01/12/06	5		4.47		-	0.110	1.0	1	J,DX	0.77	0.50	1		27	0.50	1		4.9	1.0	1		0.068	0.50	1	J,DX	3	0.50	1	CQ	0.28	1.0	1	J,DX	<0.50	0.50	1		11.0	1.0	1		15	10	1	CQ
	01/12/06	10		8.16		-	0.290	1.0	1	J,DX	2.80	0.50	1		160	0.50	1		28.0	1.0	1		0.300	0.50	1	J,DX	7	0.50	1	CQ	0.86	1.0	1	J,DX	0.17	0.50	1	J,DX	31.0	1.0	1		47	10	1	CQ
	01/12/06	15		7.85		-	0.160	1.0	1	J,DX	1.70	0.50	1		120	0.50	1		12.0	1.0	1		0.170	0.50	1	J,DX	4	0.50	1	CQ	0.53	1.0	1	J,DX	0.15	0.50	1	J,DX	32.0	1.0	1		35	10	1	CQ
	01/12/06	20	DUP	7.97		-	0.140	1.0	1	J,DX	1.10	0.50	1		62	0.50	1		11.0	1.0	1		0.160	0.50	1	J,DX	3	0.50	1	CQ	0.54	1.0	1	J,DX	0.10	0.50	1	J,DX	22.0	1.0	1		27	10	1	CQ
	01/12/06	19		8.14		-	0.170	1.0	1	J,DX	1.70	0.50	1		58	0.50	1		11.0	1.0	1		0.078	0.50	1	J,DX	4	0.50	1	CQ	0.28	1.0	1	J,DX	<0.50	0.50	1		24.0	1.0	1		30	10	1	CQ
CPB04	01/18/06	1.5		7.58		-	0.130	1.0	1	VJ	1.20	0.50	1		92	0.50	1		13.0	1.0	1		0.190	0.50	1	VJ	9	0.50	1	CQ	0.35	1.0	1	VJ	0.12	0.50	1	VJ	27.0	1.0	1		41	10	1	CQ
	01/18/06	5		7.59		-	0.180	1.0	1	VJ	1.40	0.50	1		93	0.50	1		15.0	1.0	1		0.180	0.50	1	VJ	13	0.50	1	CQ	0.34	1.0	1	VJ	0.12	0.50	1	VJ	28.0	1.0	1		55	10	1	CQ
	01/18/06	10		8.23		-	0.270	1.0	1	VJ	2.60	0.50	1		190	0.50	1		21.0	1.0	1		0.320	0.50	1	VJ	6	0.50	1	CQ	0.31	1.0	1	VJ	0.14	0.50	1	VJ	30.0	1.0	1		41	10	1	CQ
	01/18/06	15		8.53		-	<1.0	1.0	1	VU	1.00	0.50	1		64	0.50	1		9.1	1.0	1		0.042	0.50	1	VJ	3	0.50	1	CQ	0.47	1.0	1	VJ	<0.50	0.50	1		21.0	1.0	1		34	10	1	CQ
	01/18/06	19		8.30		-	0.110	1.0	1	VJ	1.30	0.50	1		70	0.50	1	VJ	10.0	1.0	1	CQ	0.081	0.50	1	VJ	3	0.50	1	CQ	0.43	1.0	1	VJ	0.20	0.50	1	VJ	24.0	1.0	1		27	10	1	VJ
	01/18/06	24		8.14		-	0.078	1.0	1	VJ	2.10	0.50	1		110	0.50	1	VJ	21.0	1.0	1	CQ	0.110	0.50	1	VJ	5	0.50	1	CQ	0.46	1.0	1	VJ	0.18	0.50	1	VJ	33.0	1.0	1		49	10	1	
CPB05	01/19/06	1.5		1.66		-	<1.0	1.0	1		<0.50	0.50	1		1	0.50	1	VJ	160.0	1.0	1	CQ	<0.50	0.50	1		7	0.50	1	CQ	0.26	1.0	1	VJ	<0.50	0.50	1		1.1	1.0	1		66	10	1	
	01/19/06	5		2.50		-	0.076	1.0	1	VJ	0.81	0.50	1		61	0.50	1	CQ	11.0	1.0	1		0.100	0.50	1	VJ	4	0.50	1	CQ	0.33	1.0	1	VJ	0.12	0.50	1	VJ	23.0	1.0	1		28	10	1	
	01/19/06	10		7.75		-	0.065	1.0	1	VJ	1.40	0.50	1		100	0.50	1	CQ	12.0	1.0	1		0.140	0.50	1	VJ	4	0.50	1	CQ	0.25	1.0	1	VJ	0.15	0.50	1	VJ	32.0	1.0	1		36	10	1	
	01/19/06	15		7.83		-	0.088	1.0	1	VJ	1.80	0.50	1		120	0.50	1	CQ	15.0	1.0	1		0.160	0.50	1	VJ	5	0.50	1	CQ	0.24	1.0	1	VJ	0.15	0.50	1	VJ	33.0	1.0	1		38	10	1	
	01/19/06	20	DUP	8.10		-	<1.0	1.0	1		1.30	0.50	1		79	0.50	1	CQ	15.0	1.0	1		0.140	0.50	1	VJ	5	0.50	1	CQ	0.10	1.0	1	VJ	0.14	0.50	1	VJ	29.0	1.0	1		40	10	1	
	01/19/06	19		8.31		-	0.049	1.0	1	VJ	1.90	0.50	1		130	0.50	1	CQ	19.0	1.0	1		0.150	0.50	1	VJ	5	0.50	1	CQ	0.15	1.0	1	VJ	0.18	0.50	1	VJ	39.0	1.0	1		47	10	1	
CPB06	01/17/06	1.5		0.84	VJ	-	<1.0	1.0	1	VU	<0.50	0.50	1		4	0.50	1	CQ	<2.1	1.0	1	VU	<0.50	0.50	1	VU	8	0.50	1	CQ	<1.0	1.0	1	VU	0.11	0.50	1	VJ	0.8	1.0	1	VJ	<10	10	1	VU
	01/17/06	5		6.52		-	<1.0	1.0	1	VU	2.40	0.50	1		150	0.50	1	CQ	22.0	1.0	1	CQ	0.280	0.50	1	VJ	8	0.50	1	CQ	<1.0	1.0	1	VU	0.29	0.50	1	VJ	42.0	1.0	1		56	10	1	
	01/17/06	10	DUP	7.40		-	<1.0	1.0	1	VU	0.75	0.50	1		90	0.50	1	CQ	11.0	1.0	1	CQ	<0.50	0.50	1	VU	4	0.50	1	CQ	<1.0	1.0	1	VU	0.20	0.50	1	VJ	22.0	1.0	1		33	10	1	
	01/17/06	11		7.04		-	<1.0	1.0	1	VU	1.20	0.50	1		120	0.50	1	CQ	17.0	1.0	1	CQ	0.260	0.50	1	VJ	6	0.50	1	CQ	<1.0	1.0	1	VU	0.22	0.50	1	VJ	30.0	1.0	1		43	10	1	
	01/17/06	15		7.62		-	<1.0	1.0	1	VU	2.50	0.50	1		110	0.50	1	CQ	14.0	1.0	1	CQ	<0.50	0.50	1	VU	5	0.50	1	CQ	<1.0	1.0	1	VU	0.20	0.50	1	VJ	42.0	1.0	1		39	10	1	
	01/17/06	19		7.29		-	<1.0	1.0	1	VU	1.80	0.50	1		160	0.50	1	CQ	18.0	1.0	1	CQ	<0.50	0.50	1	VU	5	0.50	1	CQ	<1.0	1.0	1	VU	0.23	0.50	1	VJ	41.0	1.0	1		55	10	1	
CPB07	01/12/06	1.5	DUP	1.62		-	0.042	1.0	1	J,DX	<0.50	0.50	1		0	0.50	1	J,DX	0.2	1.0	1	J,DX	<0.50	0.50	1		4	0.50	1	CQ	<1.0	1.0	1		<0.50	0.50	1		<1.0	1.0	1		1	10	1	J,DX,MB
	01/12/06	1.5		1.36		-	0.030	1.0	1	J,DX	<0.50	0.50	1		0	0.50	1	J,DX	1.1	1.0	1		<0.50	0.50	1		2	0.50	1	CQ	0.16	1.0	1	J,DX	<0.50	0.50	1		<1.0	1.0	1		2	10	1	J,DX,MB
	01/12/06	5		0.43		-	0.038	1.0	1	J,DX	<0.50	0.50	1		0	0.50	1	J,DX	0.7	1.0	1	J,DX	<0.50	0.50	1		10	0.50	1	CQ	0.30	1.0	1	J,DX	<0.50	0.50	1		<1.0	1.0	1		4	10	1	J,DX,MB
	01/12/06	10		8.11		0.75	0.110	1.0	1	J,DX	0.43	0.50	1	J,DX	94	0.50	1		11.0	1.0	1		0.140	0.50	1	J,DX	4	0.50	1	CQ	0.23	1.0	1	J,DX	0.11	0.50	1	J,DX	14.0	1.0	1		20	10	1	CQ
	01/12/06	15		8.14		-	0.110	1.0	1	J,DX	2.40	0.50	1		110	0.50	1		9.3	1.0	1		0.095	0.50	1	J,DX	4	0.50	1	CQ	0.26	1.0	1	J,DX	0.12	0.50	1	J,DX	21.0	1.0	1		27	10	1	CQ
	01/12/06	19		7.99		-	0.170	1.0	1	J,DX	2.30	0.50	1		83	0.50	1		14.0	1.0	1		0.120	0.50	1	J,DX	4	0.50	1	CQ	0.48	1.0	1	J,DX	0.14	0.50	1	J,DX	32.0	1.0	1		41	10	1	CQ
CPB08	01/17/06	1.5		7.30		0.6 - 1.4	0.190	1.0	1	VJ	1.10	0.50	1		140	0.50	1		16.0	1.0	1		0.220	0.50	1	VJ	7	0.50	1	CQ	0.48	1.0	1	VJ	0.13	0.50	1	VJ	30.0	1.0	1		41	10	1	CQ
	01/17/06	8		7.74		-	0.590	1.0	1	VJ	5.30	0.50	1		120	0.50	1		26.0	1.0	1		0.950	0.50	1		82	0.50	1	CQ	0.59	1.0	1	VJ	0.14	0.50	1	VJ	32.0	1.0	1		170	10	1	CQ
	01/17/06	10		8.62		-	0.120	1.0	1	VJ	<0.50	0.50	1		81	0.50	1		8.0	1.0	1		0.140	0.50	1	VJ	3	0.50	1	CQ	0.41	1.0	1	VJ	<0.50	0.50	1		20.0	1.0	1		26	10	1	CQ
	01/17/06	15		8.33		-	0.180	1.0	1	VJ	2.80	0.50	1		140	0.50	1		17.0	1.0	1		0.110	0.50	1	VJ	6	0.50	1	CQ	0.57	1.0	1	VJ	0.15	0.50	1	VJ	40.0	1.0	1		45	10	1	CQ
	01/17/06	20		7.84		6.11	0.088	1.0	1	VJ	0.90	0.50	1		74	0.50	1		9.2	1.0	1		0.082	0.50	1	VJ	3	0.50	1	CQ	0.39	1.0	1	VJ	<0.50	0.50	1		20.0	1.0	1		26	10	1	CQ
	01/18/06	23		7.62		-	0.092	1.0	1	VJ	1.10	0.50	1		120	0.50	1		15.0	1.0	1		0.080	0.50	1	VJ	4	0.50	1	CQ	0.49	1.0	1	VJ	0.12	0.50	1	VJ	27.0	1.0	1		43	10	1	CQ
	01/18/06	25		7.78		6.70	0.099	1.0	1	VJ	1.30	0.50	1		120	0.50	1		13.0	1.0	1		0.260	0.50	1	VJ	4	0.50	1	CQ	0.53	1.0	1	VJ	0.12	0.50	1	VJ	26.0	1.0	1		40	10	1	CQ
	01/18/06	30		7.99		-	0.180	1.0	1	VJ	2.20	0.50	1		190	0.50	1		21.0	1.0	1		0.190	0.50	1	VJ	7	0.50	1	CQ	0.87	1.0	1	VJ	0.16	0.50	1	VJ	36.0	1.0	1		53	10	1	CQ
CPB09	01/13/06	1.5		8.91		-	0.120	1.0	1	VJ	2.10	0.50	1		97	0.50	1	CQ	13.0	1.0	1		<0.50	0.50	1	VU	7	0.50	1	CQ	<1.0	1.0	1	VJ	0.14	0.50	1	VJ	37.0	1.0	1		42	10	1	
	01/13/06	5		8.43		-	0.086	1.0	1	VJ	1.80	0.50	1		96	0.50	1	CQ	11.0	1.0	1		<0.50	0.50	1	VU	4	0.50	1	CQ	<1.0	1.0	1	VJ	0.13	0.50	1	VJ	32.0	1.0	1		35	10	1	
	01/13/06	10		8.26		-	0.110	1.0	1	VJ	2.10	0.50	1		130	0.50	1	CQ	14.0	1.0	1		<0.50	0.50	1	VU	5	0.50	1	CQ	<1.0	1.0	1	VJ	0.16	0.50	1	VJ	39.0	1.0	1		45	10	1	
	01/13/06	15		8.49		-	0.090	1.0	1	VJ	2.00	0.50	1		100	0.50	1	CQ	13.0	1.0	1		<0.50	0.50	1	VU	3	0.50	1	CQ	<1.0	1.0	1	VU	0.14	0.50	1	VJ	33.0	1.0	1		38	10	1	
	01/13/06	20		8.36		-	0.083	1.0	1	VJ	1.60	0.50	1		88	0.50	1	CQ	17.0	1.0	1		<0.50	0.50	1	VU	4	0.50	1	CQ	<1.0	1.0	1	VU	0.15	0.50	1	VJ	30.0	1.0	1		45	10	1	
CPB10	01/10/06	1.5		0.36		-	<1.0	1.0	1		<0.5	0.50	1		<0.63	0.50	1	VU	1.1	1.0	1		<0.5	0.50	1		3	0.50	1	CQ	<1	1.0	1		<0.5	0.50	1		0.6	1.0	1	VJ	<10	10	1	VU
	01/10/06	5		0.43		-	<1.0	1.0	1	VJ	<0.5	0.50	1		<0.50	0.50	1	VU	4.5	1.0	1		<0.5	0.50	1		3	0.50	1	CQ	<1	1.0	1		<0.5	0.50	1		<1	1.0	1		<10	10	1	VU
	01/10/06	10		6.62		-	0.086	1.0	1	VJ	<0.85	0.50	1	VU	81	0.50	1	CQ	11.0	1.0	1		0.130	0.50	1	VJ	3	0.50	1	CQ	0.61	1.0	1	VJ	<0.5	0.50	1		23.0	1.0	1		29	10	1	CQ
	01/10/06	15		2.98		-	0.085	1.0	1	VJ	<1.5	0.50	1	VU	120	0.50	1	CQ	12.0	1.0	1		0.060	0.50	1	VJ	4	0.50	1	CQ	0.26	1.0	1	VJ	0.12	0.50	1	VJ	34.0	1.0	1		37	10	1	CQ
	01/10/06	20		6.74		-	0.074	1.0	1	VJ	<1.9	0.50	1	VU	100	0.50	1	CQ	14.0	1.0	1		0.110	0.50	1	VJ	3	0.50	1	CQ	0.45	1.0	1	VJ	0.12	0.50	1	VJ	34.0	1.0	1		44	10	1	CQ
CPB11R	01/10/06	1.5		0.63		-	<1.0	1.0	1		<0.5	0.50	1		<0.84	0.50	1	VU	0.4	1.0	1	VJ	<0.5	0.50	1		8	0.50	1	CQ	<1.0	1.0	1		<0.5	0.50	1		0.4	1.0	1	VJ	<10	10	1	VU
	01/10/06	5		0.40		-	<1.0	1.0	1	VU	<0.5	0.50	1		<0.7	0.50	1	VU	3.7	1.0	1		<0.5	0.50	1		9	0.50	1	CQ	2.70	1.0	1		<0.5	0.50	1		0.6	1.0	1	VJ	<10	10	1	VU
	01/10/06	10		7.39		-	0.110	1.0	1	VJ	<0.63	0.50	1	VU	95	0.50	1	CQ	16.0	1.0	1		0.130	0.50	1	VJ	4	0.50	1	CQ	0.52	1.0	1	VJ	0.12	0.50	1	VJ	21.0	1.0	1		32	10	1	CQ
	01/10/06	15		0.66		-	0.095	1.0	1	VJ	<0.51	0.50	1	VU	84	0.50	1	CQ	18.0	1.0	1		0.038	0.50	1	VJ	4	0.50	1	CQ	0.52	1.0	1	VJ	<0.5	0.50	1		18.0	1.0	1		<10	10	1	VU
	01/12/06	20		5.17		-	0.250	1.0	1	J,DX,LN,AY	1.90	0.50	1		86	0.50	1		12.0	1.0	1		0.170	0.50	1	J,DX	4	0.50	1	CQ	0.68	1.0	1	J,DX	0.22	0.50	1	J,DX	25.0	1.0	1		31	10	1	CQ
CPB12	01/17/06	1.5		3.90		-	<1.0	1.0	1	VU	3.80	0.50	1		120	0.50	1	CQ	27.0	1.0	1	CQ	0.520	0.50	1	CQ	17	0.50	1	CQ	<1.0	1.0	1	VU	0.22	0.50	1	VJ	38.0	1.0	1		160	10	1	
	01/17/06	5		7.50		-	<1.0	1.0	1	VU	3.80	0.50	1		180	0.50	1	CQ	34.0	1.0	1	CQ	0.310	0.50	1	VJ	8	0.50	1	CQ	<1.0	1.0	1	VU	0.25	0.50	1	VJ	44.0	1.0	1		96	10	1	
	01/17/06	10		8.14		-	0.120	1.0	1	VJ	1.90	0.50	1		70	0.50	1		11.0	1.0	1		0.130	0.50	1	VJ	4	0.50	1	CQ	0.77	1.0	1	VJ	0.24	0.50	1	VJ	30.0	1.0	1		31	10	1	CQ
	01/17/06	15	DUP	7.50		-	0.100	1.0	1	VJ	<0.50	0.50	1		69	0.50	1		12.0	1.0	1		0.062	0.50	1	VJ	4	0.50	1	CQ	0.29	1.0	1	VJ	0.10	0.50	1	VJ	26.0	1.0	1		29	10	1	CQ
	01/17/06	15		7.58		-	0.140	1.0	1	VJ	<0.50	0.50	1		91	0.50	1		11.0	1.0	1		0.071	0.50	1	VJ	5	0.50	1	CQ	0.52	1.0	1	VJ	0.25	0.50	1	VJ	31.0	1.0	1		32	10	1	CQ
	01/17/06	20		7.72		-	0.140	1.0	1	VJ	1.50	0.50	1		120	0.50	1		16.0	1.0	1		0.160	0.50	1	VJ	5	0.50	1	CQ	0.64	1.0	1	VJ	0.14	0.50	1	VJ	30.0	1.0	1		48	10	1	CQ
CPB13	01/16/06	1.5		2.82		-	1.500	1.0	1		3.00	0.50	1		88	0.50	1		43.0	1.0	1		0.032	0.50	1	VJ	54	0.50	1	CQ	3.50	1.0	1		0.12	0.50	1	VJ	25.0	1.0	1		82	10	1	CQ
	01/16/06	5		6.63		-	0.088	1.0	1	VJ	2.40	0.50	1		130	0.50	1		18.0	1.0	1		0.150	0.50	1	VJ	4	0.50	1	CQ	0.54	1.0	1	VJ	0.17	0.50	1	VJ	46.0	1.0	1		55	10	1	CQ
	01/16/06	10		4.55		-	1.200	1.0	1		2.50	0.50	1		110	0.50	1		31.0	1.0	1		0.220	0.50	1	VJ	18	0.50	1	CQ	1.40	1.0	1		0.16	0.50	1	VJ	45.0	1.0	1		63	10	1	CQ
	01/16/06	15		7.53		-	0.092	1.0	1	VJ	1.40	0.50	1		110	0.50	1		18.0	1.0	1		0.120	0.50	1	VJ	4	0.50	1	CQ	0.34	1.0	1	VJ	0.15	0.50	1

TABLE 19a
Soil Analytical Results - Metals and pH Analyses

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avneue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	pH		Field Screened pH	Antimony (mg/kg)				Arsenic (mg/kg)				Barium (mg/kg)				Copper (mg/kg)				Cadmium (mg/kg)				Lead (mg/kg)				Molybdenum (mg/kg)				Thallium (mg/kg)				Vanadium (mg/kg)				Zinc (mg/kg)			
				Result	Qual	Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
CPB15	12/20/05	1.5		2.12		2.39	<1.0	1.0	1		<0.50	0.50	1		1	0.50	1		0.3	1.0	1	VJ	<0.50	0.50	1		9	0.50	1		<1.0	1.0	1		<0.50	0.50	1		0.6	1.0	1	VJ	1	10	1	VJ
	12/20/05	5		6.14		-	<1.0	1.0	1		<0.50	0.50	1		1	0.50	1		0.8	1.0	1	VJ	<0.50	0.50	1		27	0.50	1		0.16	1.0	1	VJ	<0.50	0.50	1		0.5	1.0	1	VJ	3	10	1	VJ
	12/20/05	9		8.42		-	0.140	1.0	1	VJ	<1.5	0.50	1	VU	89	0.50	1		63.0	1.0	1		0.160	0.50	1	VJ	9	0.50	1		1.00	1.0	1	VJ	0.10	0.50	1	VJ	24.0	1.0	1		61	10	1	
	12/20/05	11		8.40		-	0.120	1.0	1	VJ	<2.8	0.50	1	VU	130	0.50	1		13.0	1.0	1		0.096	0.50	1	VJ	4	0.50	1		0.68	1.0	1	VJ	0.14	0.50	1	VJ	40.0	1.0	1		40	10	1	
	12/20/05	14		7.56		-	0.110	1.0	1	VJ	<0.53	0.50	1	VU	130	0.50	1		14.0	1.0	1		0.095	0.50	1	VJ	4	0.50	1		0.15	1.0	1	VJ	0.16	0.50	1	VJ	26.0	1.0	1		43	10	1	
	12/20/05	20		7.45		-	0.150	1.0	1	VJ	<1.5	0.50	1	VU	130	0.50	1		14.0	1.0	1		0.100	0.50	1	VJ	4	0.50	1		0.24	1.0	1	VJ	0.13	0.50	1	VJ	34.0	1.0	1		44	10	1	
CPB16	01/17/06	2	DUP	4.29		-	<1.0	1.0	1	VU	2.50	0.50	1		110	0.50	1	CQ	19.0	1.0	1	CQ	0.250	0.50	1	VJ	19	0.50	1	CQ	<1.0	1.0	1	VU	0.20	0.50	1	VJ	36.0	1.0	1		77	10	1	
	01/17/06	1		3.69		-	<1.0	1.0	1	VU	2.70	0.50	1		80	0.50	1	CQ	16.0	1.0	1	CQ	<0.5	0.50	1	VU	24	0.50	1	CQ	<1.0	1.0	1	VU	0.15	0.50	1	VJ	29.0	1.0	1		46	10	1	
	01/17/06	5		7.46		-	<1.0	1.0	1	VU	2.40	0.50	1		120	0.50	1	CQ	20.0	1.0	1	CQ	0.240	0.50	1	VJ	7	0.50	1	CQ	<1.0	1.0	1	VU	0.20	0.50	1	VJ	35.0	1.0	1		47	10	1	
	01/17/06	9		8.02		-	<1.0	1.0	1	VU	0.80	0.50	1		82	0.50	1	CQ	12.0	1.0	1	CQ	<0.5	0.50	1	VU	4	0.50	1	CQ	<1.0	1.0	1	VU	0.19	0.50	1	VJ	34.0	1.0	1		36	10	1	
	01/17/06	15		7.77		-	<1.0	1.0	1	VU	1.80	0.50	1		140	0.50	1	CQ	15.0	1.0	1	CQ	0.240	0.50	1	VJ	4	0.50	1	CQ	<1.0	1.0	1	VU	0.18	0.50	1	VJ	34.0	1.0	1		38	10	1	
	01/17/06	20		7.86		-	<1.0	1.0	1	VU	2.40	0.50	1		110	0.50	1	CQ	18.0	1.0	1	CQ	<0.5	0.50	1	VU	5	0.50	1	CQ	<1.0	1.0	1	VU	0.22	0.50	1	VJ	43.0	1.0	1		51	10	1	
CPB17	01/09/06	1.5	DUP	0.84		-	<1.0	1.0	1		0.27	0.50	1	VJ	0	0.50	1	VJ	0.6	1.0	1	VJ	<0.50	0.50	1		10	0.50	1		<1.0	1.0	1		<0.50	0.50	1		<1.0	1.0	1		<10	10	1	VU
	01/09/06	1.5		0.85		-	<1.0	1.0	1		<0.50	0.50	1		0	0.50	1	VJ	0.7	1.0	1	VJ	<0.50	0.50	1		4	0.50	1		<1.0	1.0	1		<0.50	0.50	1		<1.0	1.0	1		<10	10	1	VU
	01/09/06	5		6.99		-	0.140	1.0	1	VJ	3.40	0.50	1		100	0.50	1		14.0	1.0	1		0.057	0.50	1	VJ	5	0.50	1		0.56	1.0	1	VJ	0.17	0.50	1	VJ	40.0	1.0	1		41	10	1	CQ
	01/09/06	9		4.92		-	0.200	1.0	1	VJ-	<2.3	0.50	1	VU	120	0.50	1	VJ-	16.0	1.0	1		0.100	0.50	1	VJ	6	0.50	1		0.81	1.0	1	VJ	0.31	0.50	1	VJ	41.0	1.0	1	VJ-	52	10	1	VJ-
	01/09/06	13		7.21		-	0.110	1.0	1	VJ	<2.6	0.50	1	VU	190	0.50	1		23.0	1.0	1		0.220	0.50	1	VJ	7	0.50	1		0.50	1.0	1	VJ	0.34	0.50	1	VJ	47.0	1.0	1		69	10	1	
	01/10/06	19		7.55		-	0.120	1.0	1	VJ	<2.3	0.50	1	VU	83	0.50	1	CQ	12.0	1.0	1		0.110	0.50	1	VJ	4	0.50	1	CQ	0.32	1.0	1	VJ	0.15	0.50	1	VJ	28.0	1.0	1		30	10	1	CQ
CPB18	12/20/05	1.5		1.68		3.05	0.098	1.0	1	VJ	<0.58	0.50	1	VU	0	0.50	1	VJ	0.2	1.0	1	VJ	<0.50	0.50	1		6	0.50	1		<1.0	1.0	1		<0.50	0.50	1		0.4	1.0	1	VJ	1	10	1	VJ
	12/20/05	5		8.18		-	0.200	1.0	1	VJ	<1	0.50	1	VU	66	0.50	1	VJ+	11.0	1.0	1		0.110	0.50	1	VJ	4	0.50	1		0.30	1.0	1	VJ	0.18	0.50	1	VJ	24.0	1.0	1		29	10	1	
	12/20/05	10		9.05		-	0.160	1.0	1	VJ	<1.4	0.50	1	VU	96	0.50	1		12.0	1.0	1		0.180	0.50	1	VJ	4	0.50	1		0.37	1.0	1	VJ	0.16	0.50	1	VJ	32.0	1.0	1		36	10	1	
	12/20/05	15		4.20		-	0.170	1.0	1	VJ	<2.1	0.50	1	VU	130	0.50	1		13.0	1.0	1		0.200	0.50	1	VJ	4	0.50	1		0.29	1.0	1	VJ	0.14	0.50	1	VJ	37.0	1.0	1		37	10	1	
	12/20/05	20		6.43		-	0.130	1.0	1	VJ	<2.3	0.50	1	VU	77	0.50	1		12.0	1.0	1		0.110	0.50	1	VJ	4	0.50	1		0.30	1.0	1	VJ	0.11	0.50	1	VJ	33.0	1.0	1		31	10	1	
	12/20/05	24		7.39		-	0.210	1.0	1	VJ	<2.8	0.50	1	VU	160	0.50	1		28.0	1.0	1		0.220	0.50	1	VJ	6	0.50	1		1.00	1.0	1		0.20	0.50	1	VJ	45.0	1.0	1		62	10	1	
CPB19	01/16/06	1.5		7.94		-	0.120	1.0	1	VJ	2.40	0.50	1		110	0.50	1		20.0	1.0	1		0.160	0.50	1	VJ	4	0.50	1	CQ	0.45	1.0	1	VJ	0.23	0.50	1	VJ	46.0	1.0	1		59	10	1	CQ
	01/16/06	6	DUP	8.23		-	0.098	1.0	1	VJ	2.30	0.50	1		110	0.50	1		15.0	1.0	1		0.130	0.50	1	VJ	4	0.50	1	CQ	0.34	1.0	1	VJ	0.14	0.50	1	VJ	41.0	1.0	1		44	10	1	CQ
	01/16/06	5		8.35		-	0.160	1.0	1	VJ	2.80	0.50	1		140	0.50	1		23.0	1.0	1		0.240	0.50	1	VJ	6	0.50	1	CQ	0.87	1.0	1	VJ	0.21	0.50	1	VJ	53.0	1.0	1		59	10	1	CQ
	01/16/06	10		8.25		-	0.100	1.0	1	VJ	1.90	0.50	1		140	0.50	1		21.0	1.0	1		0.120	0.50	1	VJ	4	0.50	1	CQ	0.34	1.0	1	VJ	0.19	0.50	1	VJ	44.0	1.0	1		57	10	1	CQ
	01/16/06	15		8.03		-	0.097	1.0	1	VJ	2.20	0.50	1		97	0.50	1		15.0	1.0	1		0.110	0.50	1	VJ	3	0.50	1	CQ	0.31	1.0	1	VJ	0.13	0.50	1	VJ	36.0	1.0	1		44	10	1	CQ
	01/16/06	20		7.79		-	0.084	1.0	1	VJ	2.00	0.50	1		120	0.50	1		18.0	1.0	1		0.150	0.50	1	VJ	4	0.50	1	CQ	0.41	1.0	1	VJ	0.16	0.50	1	VJ	39.0	1.0	1		53	10	1	CQ
CPB20	01/17/06	1.5		6.79		-	<1.0	1.0	1	VUJ	3.70	0.50	1	VJ	100	0.50	1	CQ	24.0	1.0	1	VJ	<0.5	0.50	1	VU	26	0.50	1	CQ	<1.0	1.0	1	VU	0.32	0.50	1	VJ	40.0	1.0	1		73	10	1	VJ
	01/17/06	5		8.54		-	<1.0	1.0	1	VU	2.30	0.50	1		90	0.50	1	CQ	13.0	1.0	1	CQ	<0.5	0.50	1	VU	4	0.50	1	CQ	<1.0	1.0	1	VU	0.20	0.50	1	VJ	33.0	1.0	1		33	10	1	
	01/17/06	10		8.77		-	<1.0	1.0	1	VU	2.20	0.50	1		110	0.50	1	CQ	15.0	1.0	1	CQ	<0.5	0.50	1	VU	5	0.50	1	CQ	<1.0	1.0	1	VU	0.19	0.50	1	VJ	37.0	1.0	1		38	10	1	
	01/17/06	15		7.81		-	<1.0	1.0	1	VU	1.90	0.50	1		110	0.50	1	CQ	15.0	1.0	1	CQ	<0.5	0.50	1	VU	4	0.50	1	CQ	<1.0	1.0	1	VU	0.21	0.50	1	VJ	38.0	1.0	1		43	10	1	
	01/17/06	20		8.09		-	<1.0	1.0	1	VU	2.20	0.50	1		120	0.50	1	CQ	20.0	1.0	1	CQ	<0.5	0.50	1	VU	5	0.50	1	CQ	<1.0	1.0	1	VU	0.23	0.50	1	VJ	44.0	1.0	1		55	10	1	
CPB21	01/13/06	1		9.59		-	0.190	1.0	1	VJ	1.60	0.50	1		94	0.50	1	CQ	15.0	1.0	1		<0.5	0.50	1	VU	6	0.50	1	CQ	<1.0	1.0	1	VU	0.13	0.50	1	J,DX	32.0	1.0	1		63	10	1	
	01/13/06	5		8.60		-	0.120	1.0	1	VJ	2.10	0.50	1		75	0.50	1	CQ	14.0	1.0	1		<0.5	0.50	1	VU	5	0.50	1	CQ	<1.0	1.0	1	VU	0.13	0.50	1	J,DX	41.0	1.0	1		42	10	1	
	01/13/06	10		8.27		-	0.140	1.0	1	VJ	1.80	0.50	1		140	0.50	1	CQ	16.0	1.0	1		<0.5	0.50	1	VU	5	0.50	1	CQ	<1.0	1.0	1	VU	0.14	0.50	1	J,DX	34.0	1.0	1		44	10	1	
	01/13/06	15		8.20		-	0.110	1.0	1	VJ	1.80	0.50	1		86	0.50	1	CQ	13.0	1.0	1		<0.5	0.50	1	VU	4	0.50	1	CQ	<1.0	1.0	1	VU	<0.50	0.50	1		30.0	1.0	1		36	10	1	
	01/13/06	20		8.01		-	0.100	1.0	1	VJ	2.20	0.50	1		120	0.50	1	VJ	18.0	1.0	1	VJ	<0.5	0.50	1	VU	5	0.50	1	CQ	<1.0	1.0	1	J,DX	0.17	0.50	1	VJ	40.0	1.0	1	VJ	56	10	1	VJ
CPB22	01/12/06	1.5		7.49		-	0.200	1.0	1	J,DX	0.79	0.50	1		62	0.50	1		9.0	1.0	1		0.120	0.50	1	J,DX	18	0.50	1	CQ	0.27	1.0	1	J,DX	<0.50	0.50	1		16.0	1.0	1		27	10	1	CQ
	01/12/06	5		8.37		-	0.120	1.0	1	J,DX	1.80	0.50	1		73	0.50	1		9.6	1.0	1		0.092	0.50	1	J,DX	4	0.50	1	CQ	0.29	1.0	1	J,DX	0.11	0.50	1	J,DX	26.0	1.0	1		27	10	1	CQ
	01/12/06	10		7.77		-	0.160	1.0	1	J,DX	1.30	0.50	1		99	0.50	1		10.0	1.0	1		0.064	0.50	1	J,DX	4	0.50	1	CQ	0.38	1.0	1	J,DX	0.15	0.50	1	J,DX	31.0	1.0	1		33	10	1	CQ
	01/12/06	15		8.18		-	0.200	1.0	1	J,DX	1.40	0.50	1		90	0.50	1	CQ	13.0	1.0	1		0.110	0.50	1	MB,J,DX	4	0.50	1	CQ	0.72	1.0	1	J,DX	0.22	0.50	1	J,DX	30.0	1.0	1		37	10	1	
	01/12/06	20		8.14		-	0.140	1.0	1	J,DX	3.20	0.50	1		150	0.50	1		24.0	1.0	1		0.270	0.50	1	J,DX,MB	6	0.50	1	CQ	1.00	1.0	1		0.21	0.50	1	J,DX	47.0	1.0	1		63	10	1	
CPB23	01/18/06	1.5		7.97		-	0.230	1.0	1	VJ	1.50	0.50	1		89	0.50	1	VJ	58.0	1.0	1	CQ	0.250	0.50	1	VJ	77	0.50	1	CQ	<1.0	1.0	1	VU	0.12	0.50	1	VJ	25.0	1.0	1		180	10	1	
	01/18/06	5		8.49		-	<1.0	1.0	1		1.50	0.50	1		77	0.50	1	VJ	14.0	1.0	1	CQ	0.130	0.50	1	VJ	6	0.50	1	CQ	<1.0	1.0	1	VU	0.10	0.50	1	VJ	21.0	1.0	1		<34	10	1	VU
	01/18/06	10		7.95		-	<1.0	1.0	1		1.20	0.50	1		90	0.50	1	VJ	19.0	1.0	1	CQ	0.120	0.50	1	VJ	4	0.50	1	CQ	<1.0	1.0	1		0.13	0.50	1	VJ	22.0	1.0	1		57	10	1	
	01/18/06	15		7.91		-	<1.0	1.0	1		0.73	0.50	1		99	0.50	1	VJ	14.0	1.0	1	CQ	0.056	0.50	1	VJ	4	0.50	1	CQ	<1.0	1.0	1		<0.50	0.50	1		28.0	1.0	1		<31	10	1	VU
	01/18/06	20		7.39		5.41	<1.0	1.0	1		1.70	0.50	1		76	0.50	1	VJ	19.0	1.0	1	CQ	0.130	0.50	1	VJ	4	0.50	1	CQ	<1.0	1.0	1	VU	0.12	0.50	1	VJ	25.0	1.0	1		40	10	1	
CPB24	01/20/06	1.5		7.98		-	0.240	1.0	1	VJ	2.00	0.50	1		140	0.50	1	CQ	130.0	1.0	1		0.260	0.50	1	VJ	46	0.50	1	CQ	0.47	1.0	1	VJ	0.14	0.50	1	VJ	31.0	1.0	1		290	10	1	
	01/20/06	5		8.26		-	0.130	1.0	1	VJ	2.50	0.50	1		86	0.50	1	CQ	29.0	1.0	1		0.130	0.50	1	VJ	10	0.50	1	CQ	0.28	1.0	1	VJ	0.12	0.50	1	VJ	26.0	1.0	1		69	10	1	
	01/20/06	10		8.43		-	0.210	1.0	1	VJ	3.10	0.50	1		200	0.50	1	CQ	38.0	1.0	1		0.300	0.50	1	VJ	10	0.50	1	CQ	0.85	1.0	1	VJ	0.19	0.50	1	VJ	47.0	1.0	1		75	10	1	
	01/20/06	15		8.48		-	0.096	1.0	1	VJ	1.50	0.50	1		78	0.50	1	CQ	10.0	1.0	1		0.082	0.50	1	VJ	3	0.50	1	CQ	0.98	1.0	1	VJ	0.11	0.50	1	VJ	26.0	1.0	1		28	10	1	
	01/20/06	20		8.17		-	<1.0	1.0	1	VU	1.30	0.50	1		62	0.50	1	CQ	13.0	1.0	1		0.120	0.50	1	VJ	3	0.50	1	CQ	0.14	1.0	1	VJ	0.10	0.50	1	VJ	37.0	1.0	1		30	10	1	
CPB28	12/05/06	6		3.89		-	0.450	5.0	5	LN,AY,J,DX,DF	1.60	2.50	5	DF,J,DX	90	2.50	5	LN,AY	37.0	5.0	5	CQ	0.220	2.50	5	MB,DF,J,DX	4	2.50	5		0.89	5.0	5	DF,J,DX	0.78	2.50	5	DF,J,DX	45.0	5.0	5		200	50	5	LN,AY
	12/05/06	10		5.07		-	<5.0	5.0	5	DF	<2.5	2.50	5	DF,J,DX	94	2.50	5		20.0	5.0	5	CQ	0.230	2.50	5	MB,DF,J,DX	4	2.50	5		<5.0	5.0	5	DF	<2.5	2.50	5	DF	36.0	5.0	5		80	50	5	
	12/05/06	14		6.33		-	<5.0	5.0	5	DF	3.00	2.50	5		100	2.50	5		290.0	5.0	5	CQ	0.210	2.50	5	MB,DF,J,DX	5	2.50	5		<5.0	5.0	5	DF	<2.5	2.50	5	DF	50.0	5.0	5		140	50	5	
CPB29	12/28/06	4		-		2.06	-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-	
	12/28/06	11		-		5.23	-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-	
CPB30	12/06/06	9		8.19		-	0.058	1.0	1	J,DX	1.20	0.50	1	MB	72	0.50	1		16.0	1.0	1		0.240	0.50	1	J,DX	3	0.50	1		<1.0	1.0	1		0.11	0.50	1	J,DX	26.0	1.0	1		49	10	1	
	12/06/06	19		8.14		-	0.067	1.0	1	J,DX	1.20	0.50	1	MB	75	0.50	1		15.0	1.0	1		0.060	0.50	1	J,DX	3	0.50	1		0.24	1.0	1	J,DX	0.11	0.50	1	J,DX	31.0	1.0	1		39	10	1	
	12/06/06	29		8.84		-	0.150	1.0	1	J,DX	3.80	0.50	1	MB	140	0.50	1		31.0	1.0	1		0.120	0.50	1	J,DX	7	0.50	1		1.40	1.0	1		0.19	0.50	1	J,DX	51.0	1.0	1		58	10	1	
DPW01	01/18/06	1.5		4.24		-	0.250	1.0	1	VJ	5.20	0.50	1		90	0.50	1	VJ	28.0	1.0	1	CQ	0.210	0.50	1	VJ	46	0.50	1	CQ	0.31	1.0	1	VJ	0.14	0.50	1	VJ	30.0	1.0	1		99	10	1	
	01/18/06	5		8.02		-	<1.0	1.0	1	VU	2.00	0.50	1		160	0.50	1	VJ	22.0	1.0	1	CQ	0.190	0.50	1	VJ	7	0.50	1	CQ	<1.0	1.0	1		0.21	0.50	1	VJ	34.0	1.0	1		50	10	1	
	01/18/06	10		8.08		-	<1.0	1.0	1		2.70	0.50	1		97	0.50	1	VJ	16.0	1.0	1	CQ	0.061	0.50	1	VJ	5	0.50	1	CQ	0.70	1.0	1	VJ	0.18	0.50	1	VJ	40.0	1.0	1		41	10	1	
	01/18/06	15		7.93		-	<1.0	1.0	1		2.00	0.50	1		98	0.50	1	VJ	12.0	1.0	1	CQ	0.064	0.50	1	VJ	4	0.50	1	CQ	0.33	1.0	1	VJ	0.12	0.50	1	VJ	30.0	1.0	1		31	10	1	
	01/18/06	20		8.03		-	<1.0	1.0	1		1.20	0.50	1		120	0.50	1	VJ	14.0	1.0	1	CQ	0.100	0.50	1	VJ	4	0.50	1	CQ	0.30	1.0	1	VJ	0.13	0.50	1	VJ	28.0	1.0	1		42	10	1	
DPW02	01/13/06	2		5.87		-	0.180	1.0	1	VJ	2.10	0.50	1		92	0.50	1	CQ	17.0	1.0	1		<0.50	0.50	1	VU	15	0.50	1	CQ	<1.0	1.0	1	VU	0.14	0.50	1	VJ	34.0	1.0	1		67	10	1	
	01/13/06	5		8.20		-	0.260	1.0	1	VJ	3.50	0.50	1		230	0.50	1	CQ	31.0	1.0	1		<0.50	0.50	1	VU	9	0.50	1	CQ	<1.0	1.0	1	VU	0.19	0.50	1	VJ	44.0	1.0	1		61	10	1	
DPW03	01/13/06	2		3.79		-	0.130	1.0	1	VJ	2.20	0.50	1		100	0.50	1	CQ	16.0	1.0	1		<0.50	0.50	1	VU	36	0.50	1	CQ	<1.0	1.0	1	VU	0.14	0.50	1	VJ	32.0	1.0	1		120	10	1	
	01/13/06	5		4.02		-	0.250	1.0	1	VJ	8.30	0.50	1		130	0.50	1	CQ	24.0	1.0	1		<0.59	0.50	1	VU	10	0.50	1	CQ	<1.0	1.0	1	VU	0.19	0.50	1	VJ	35.0	1.0	1		180	10	1	

TABLE 19a
Soil Analytical Results - Metals and pH Analyses

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avneue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	pH		Field Screened pH	Antimony (mg/kg)				Arsenic (mg/kg)				Barium (mg/kg)				Copper (mg/kg)				Cadmium (mg/kg)				Lead (mg/kg)				Molybdenum (mg/kg)				Thallium (mg/kg)				Vanadium (mg/kg)				Zinc (mg/kg)			
				Result	Qual	Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
DPW04	01/13/06	2		0.88		-	0.072	1.0	1	VJ	0.90	0.50	1		29	0.50	1	CQ	12.0	1.0	1		<0.50	0.50	1	VU	13	0.50	1	CQ	<1.0	1.0	1	VU	<0.50	0.50	1		12.0	1.0	1		18	10	1	
	01/13/06	5		6.50		-	0.130	1.0	1	VJ	2.80	0.50	1		76	0.50	1	CQ	13.0	1.0	1		<0.50	0.50	1	VU	6	0.50	1	CQ	<1.0	1.0	1	VU	0.10	0.50	1	VJ	25.0	1.0	1		30	10	1	
DPW05	01/13/06	5		8.04		-	0.200	1.0	1	VJ	2.70	0.50	1		160	0.50	1		25.0	1.0	1		0.220	0.50	1	VJ	6	0.50	1	CQ	0.82	1.0	1	VJ	0.25	0.50	1	VJ	46.0	1.0	1		55	10	1	CQ
DPW06	01/11/06	2		-		-	0.160	1.0	1	VJ	1.50	0.50	1		<0.50	0.50	1	LM,AY	16.0	1.0	1		0.046	0.50	1	VJ	<0.50	0.50	1	VU	<1.0	1.0	1	VU	0.15	0.50	1	VJ	<1.0	1.0	1	LM,AY	<10	10	1	LM,AY
	01/11/06	10		-		-	0.430	1.0	1	VJ	2.10	0.50	1		160	0.50	1		22.0	1.0	1		0.180	0.50	1	VJ	5	0.50	1	CQ	<1.0	1.0	1	VU	0.31	0.50	1	VJ	39.0	1.0	1		55	10	1	CQ
DPW07	01/11/06	2		-		-	0.280	1.0	1	VJ	1.50	0.50	1		100	0.50	1		16.0	1.0	1		0.130	0.50	1	VJ	5	0.50	1	CQ	<1.0	1.0	1	VU	0.20	0.50	1	VJ	40.0	1.0	1		45	10	1	CQ
	01/11/06	10		-		-	0.310	1.0	1	VJ	2.20	0.50	1		120	0.50	1		24.0	1.0	1		0.220	0.50	1	VJ	5	0.50	1	CQ	<1.0	1.0	1	VU	0.19	0.50	1	VJ	42.0	1.0	1		48	10	1	CQ
DPW08	01/11/06	2		-		-	0.200	1.0	1	VJ	1.40	0.50	1		100	0.50	1		17.0	1.0	1		0.086	0.50	1	VJ	4	0.50	1	CQ	<1.0	1.0	1	VU	0.15	0.50	1	VJ	32.0	1.0	1		37	10	1	CQ
	01/11/06	10		-		-	0.320	1.0	1	VJ	2.50	0.50	1		120	0.50	1		20.0	1.0	1		0.150	0.50	1	VJ	5	0.50	1	CQ	<1.0	1.0	1	VU	0.18	0.50	1	VJ	41.0	1.0	1		59	10	1	CQ
DPW09	01/11/06	2		-		-	0.210	1.0	1	VJ	1.30	0.50	1		100	0.50	1		14.0	1.0	1		0.068	0.50	1	VJ	4	0.50	1	CQ	<1.0	1.0	1	VU	0.15	0.50	1	VJ	34.0	1.0	1		38	10	1	CQ
	01/11/06	10		-		-	0.180	1.0	1	VJ	1.30	0.50	1		91	0.50	1		18.0	1.0	1		0.170	0.50	1	VJ	4	0.50	1	CQ	<1.0	1.0	1	VU	0.14	0.50	1	VJ	31.0	1.0	1		48	10	1	CQ
DPW10	01/11/06	2		8.02		-	0.230	1.0	1	VJ	82.00	0.50	1		100	0.50	1		26.0	1.0	1		0.068	0.50	1	VJ	5	0.50	1	CQ	<1.0	1.0	1	VU	0.16	0.50	1	VJ	43.0	1.0	1		45	10	1	CQ
DPW11	01/20/06	2		-		-	0.220	1.0	1	J,DX	3.40	0.50	1		110	0.50	1	CQ	33.0	1.0	1		0.770	0.50	1		40	0.50	1	CQ	0.53	1.0	1	J,DX	0.14	0.50	1	J,DX	35.0	1.0	1		110	10	1	
	01/20/06	10		-		-	0.073	1.0	1	J,DX	2.10	0.50	1		98	0.50	1	CQ	21.0	1.0	1		0.072	0.50	1	J,DX	4	0.50	1	CQ	0.31	1.0	1	J,DX	0.12	0.50	1	J,DX	42.0	1.0	1		39	10	1	
DPW12	01/20/06	2		-		-	0.170	1.0	1	J,DX	1.80	0.50	1		99	0.50	1	CQ	19.0	1.0	1		0.220	0.50	1	J,DX	57	0.50	1	CQ	0.39	1.0	1	J,DX	0.11	0.50	1	J,DX	34.0	1.0	1		76	10	1	
	01/20/06	10		-		-	0.072	1.0	1	J,DX	2.50	0.50	1		120	0.50	1	CQ	30.0	1.0	1		0.120	0.50	1	J,DX	5	0.50	1	CQ	0.35	1.0	1	J,DX	0.16	0.50	1	J,DX	44.0	1.0	1		57	10	1	
DPW13	01/20/06	2		-		-	0.200	1.0	1	J,DX	1.90	0.50	1		78	0.50	1	CQ	33.0	1.0	1		0.330	0.50	1	J,DX	24	0.50	1	CQ	0.78	1.0	1	J,DX	<0.50	0.50	1		19.0	1.0	1		100	10	1	
	01/20/06	10		-		-	0.077	1.0	1	J,DX	3.00	0.50	1		130	0.50	1	CQ	24.0	1.0	1		0.190	0.50	1	J,DX	5	0.50	1	CQ	0.43	1.0	1	J,DX	0.17	0.50	1	J,DX	44.0	1.0	1		52	10	1	
DPW14	01/20/06	2		-		-	0.200	1.0	1	J,DX	1.90	0.50	1		120	0.50	1	CQ	24.0	1.0	1		0.330	0.50	1	J,DX	23	0.50	1	CQ	0.46	1.0	1	J,DX	0.11	0.50	1	J,DX	26.0	1.0	1		110	10	1	
	01/20/06	10		-		-	0.082	1.0	1	J,DX	2.60	0.50	1		110	0.50	1	CQ	25.0	1.0	1		0.230	0.50	1	J,DX	5	0.50	1	CQ	0.46	1.0	1	J,DX	0.18	0.50	1	J,DX	44.0	1.0	1		53	10	1	
DPW15	01/20/06	2		-		-	0.210	1.0	1	J,DX,LN,AY	1.60	0.50	1		120	0.50	1	CQ	25.0	1.0	1		0.096	0.50	1	J,DX	4	0.50	1	CQ	0.69	1.0	1	J,DX	0.29	0.50	1	J,DX	35.0	1.0	1		41	10	1	
	01/20/06	10		-		-	0.170	1.0	1	J,DX,LN,AY	2.10	0.50	1	MB	110	0.50	1	LN,AY	38.0	1.0	1		0.065	0.50	1	J,DX	4	0.50	1		0.53	1.0	1	J,DX	0.25	0.50	1	J,DX	34.0	1.0	1		71	10	1	LN,AY
HPB01	02/08/06	1.5		8.02		-	1.300	1.0	1		1.40	0.50	1		100	0.50	1		45.0	1.0	1		0.150	0.50	1	J,DX	55	0.50	1		0.44	1.0	1	J,DX	0.12	0.50	1	J,DX	33.0	1.0	1		270	10	1	CQ
	02/08/06	5		8.04		-	<1.0	1.0	1		0.80	0.50	1		75	0.50	1		12.0	1.0	1		3.500	0.50	1		22	0.50	1		0.10	1.0	1	J,DX	<0.50	0.50	1		31.0	1.0	1		180	10	1	CQ
	02/08/06	10		4.04		-	<1.0	1.0	1		0.67	0.50	1		76	0.50	1		8.6	1.0	1		0.026	0.50	1	VJ	3	0.50	1		0.12	1.0	1	VJ	<0.50	0.50	1		24.0	1.0	1		32	10	1	CQ
	02/08/06	15		3.90		6.25	<1.0	1.0	1		1.70	0.50	1		93	0.50	1		18.0	1.0	1		0.420	0.50	1	VJ	4	0.50	1		0.28	1.0	1	VJ	0.12	0.50	1	VJ	38.0	1.0	1		69	10	1	CQ
	02/08/06	20		8.03		6.62	<1.0	1.0	1		1.60	0.50	1		110	0.50	1		17.0	1.0	1		0.120	0.50	1	VJ	3	0.50	1		0.42	1.0	1	VJ	0.14	0.50	1	VJ	35.0	1.0	1		51	10	1	CQ
	02/08/06	24		9.09		6.40	<1.0	1.0	1		1.70	0.50	1		120	0.50	1		19.0	1.0	1		0.140	0.50	1	VJ	4	0.50	1		0.34	1.0	1	VJ	0.14	0.50	1	VJ	38.0	1.0	1		55	10	1	CQ
HPB02	02/09/06	1.5		4.24		-	<1.0	1.0	1		1.60	0.50	1		84	0.50	1		47.0	1.0	1		0.058	0.50	1	J,DX	9	0.50	1		0.19	1.0	1	J,DX	0.11	0.50	1	J,DX	29.0	1.0	1		72	10	1	CQ
	02/09/06	5	DUP	5.18		-	<1.0	1.0	1		1.40	0.50	1		91	0.50	1		21.0	1.0	1		0.049	0.50	1	J,DX	4	0.50	1		0.20	1.0	1	J,DX	0.11	0.50	1	J,DX	29.0	1.0	1		160	10	1	CQ
	02/09/06	5		5.23		-	<1.0	1.0	1		1.40	0.50	1		85	0.50	1		12.0	1.0	1		0.055	0.50	1	J,DX	5	0.50	1		0.19	1.0	1	J,DX	0.11	0.50	1	J,DX	30.0	1.0	1		150	10	1	CQ
	02/09/06	10		4.16		-	<1.0	1.0	1		2.20	0.50	1		120	0.50	1		4.5	1.0	1		<0.50	0.50	1		5	0.50	1		0.46	1.0	1	J,DX	<0.50	0.50	1		15.0	1.0	1		14	10	1	CQ
	02/09/06	15		4.02		-	<1.0	1.0	1		0.94	0.50	1		77	0.50	1		10.0	1.0	1		0.034	0.50	1	J,DX	5	0.50	1		0.19	1.0	1	J,DX	<0.50	0.50	1		23.0	1.0	1		51	10	1	CQ
	02/09/06	20		7.24		-	<1.0	1.0	1		1.70	0.50	1		100	0.50	1		15.0	1.0	1		0.048	0.50	1	J,DX	4	0.50	1		0.67	1.0	1	J,DX	0.12	0.50	1	J,DX	33.0	1.0	1		45	10	1	CQ
	02/09/06	24		7.28		5.84	<1.0	1.0	1		1.40	0.50	1		120	0.50	1		16.0	1.0	1		0.048	0.50	1	J,DX	5	0.50	1		0.77	1.0	1	J,DX	0.12	0.50	1	J,DX	32.0	1.0	1		49	10	1	CQ
HPB03	02/08/06	1.5		8.10		-	0.220	1.0	1	VJ	1.90	0.50	1		97	0.50	1		27.0	1.0	1		0.210	0.50	1	VJ	16	0.50	1		0.60	1.0	1	VJ	0.14	0.50	1	VJ	40.0	1.0	1		130	10	1	CQ
	02/08/06	5		4.99		-	<1.0	1.0	1		2.10	0.50	1		100	0.50	1		17.0	1.0	1		0.170	0.50	1	VJ	4	0.50	1	VJ	0.36	1.0	1	VJ	0.13	0.50	1	VJ	32.0	1.0	1		90	10	1	CQ
	02/08/06	11	DUP	8.36		-	0.460	1.0	1	VJ	3.40	0.50	1		110	0.50	1		20.0	1.0	1		0.190	0.50	1	VJ	4	0.50	1	VJ	0.64	1.0	1	VJ	0.13	0.50	1	VJ	37.0	1.0	1		75	10	1	CQ
	02/08/06	11		7.81		-	<1.0	1.0	1		1.30	0.50	1	VJ	120	0.50	1		16.0	1.0	1		0.130	0.50	1	VJ	3	0.50	1	VJ	0.30	1.0	1	VJ	0.14	0.50	1	VJ	32.0	1.0	1		64	10	1	CQ
	02/08/06	15		8.69		-	0.110	1.0	1	VJ	3.30	0.50	1		110	0.50	1		20.0	1.0	1		0.130	0.50	1	VJ	5	0.50	1	VJ	0.45	1.0	1	VJ	0.11	0.50	1	VJ	35.0	1.0	1		47	10	1	CQ
	02/08/06	20		5.82		5.84	0.040	1.0	1	VJ	2.30	0.50	1		100	0.50	1		18.0	1.0	1		0.190	0.50	1	VJ	4	0.50	1		0.48	1.0	1	VJ	0.16	0.50	1	VJ	36.0	1.0	1		65	10	1	CQ
	02/08/06	25		8.20		-	0.033	1.0	1	VJ	2.80	0.50	1		160	0.50	1		29.0	1.0	1		0.560	0.50	1		7	0.50	1		0.69	1.0	1	VJ	0.16	0.50	1	VJ	46.0	1.0	1		67	10	1	CQ
	02/08/06	30		9.25		-	<1.0	1.0	1		2.00	0.50	1		140	0.50	1		17.0	1.0	1		0.250	0.50	1	VJ	4	0.50	1		0.70	1.0	1	VJ	0.15	0.50	1	VJ	36.0	1.0	1		51	10	1	CQ
HPB04	02/09/06	1.5		5.72		-	0.600	1.0	1	J,DX	1.80	0.50	1		89	0.50	1		29.0	1.0	1		0.120	0.50	1	J,DX	27	0.50	1		0.59	1.0	1	J,DX	0.12	0.50	1	J,DX	31.0	1.0	1		110	10	1	CQ
	02/09/06	5		7.22		-	0.032	1.0	1	J,DX	2.30	0.50	1		140	0.50	1		18.0	1.0	1		0.130	0.50	1	J,DX	4	0.50	1		0.42	1.0	1	J,DX	0.14	0.50	1	J,DX	38.0	1.0	1		49	10	1	CQ
	02/09/06	10	DUP	6.85		-	0.460	1.0	1	J,DX	1.40	0.50	1		130	0.50	1		17.0	1.0	1		0.200	0.50	1	J,DX	4	0.50	1		0.61	1.0	1	J,DX	0.23	0.50	1	J,DX	36.0	1.0	1		46	10	1	
	02/09/06	10		6.84		-	<1.0	1.0	1		1.50	0.50	1		130	0.50	1		15.0	1.0	1		0.140	0.50	1	J,DX	3	0.50	1		0.32	1.0	1	J,DX	0.12	0.50	1	J,DX	29.0	1.0	1		46	10	1	CQ
	02/09/06	15		4.32		-	0.380	1.0	1	J,DX	1.80	0.50	1		86	0.50	1		14.0	1.0	1		0.032	0.50	1	J,DX	3	0.50	1		0.31	1.0	1	J,DX	0.14	0.50	1	J,DX	36.0	1.0	1		42	10	1	
	02/09/06	20		4.30		-	0.310	1.0	1	J,DX	2.70	0.50	1		110	0.50	1		19.0	1.0	1		0.095	0.50	1	J,DX	5	0.50	1		1.00	1.0	1		0.18	0.50	1	J,DX	39.0	1.0	1		110	10	1	
	02/09/06	23		4.31		-	0.190	1.0	1	J,DX	1.50	0.50	1		94	0.50	1		15.0	1.0	1		0.056	0.50	1	J,DX	3	0.50	1		0.45	1.0	1	J,DX	0.14	0.50	1	J,DX	35.0	1.0	1		61	10	1	
HPB05	02/06/06	1.5		1.22		0.58	0.044	1.0	1	J,DX	<0.50	0.50	1		2	0.50	1		510.0	2.0	2		0.170	0.50	1	J,DX	4	0.50	1	CQ	0.12	1.0	1	MB,J,DX	<0.50	0.50	1		1.1	1.0	1		500	20	2	
	02/06/06	5	DUP	2.09		-	0.052	1.0	1	J,DX	0.35	0.50	1	J,DX	80	0.50	1		11.0	1.0	1		0.032	0.50	1	J,DX	3	0.50	1	CQ	<1.0	1.0	1		<0.50	0.50	1		17.0	1.0	1		24	10	1	
	02/06/06	5		2.03		-	0.064	1.0	1	J,DX	0.28	0.50	1	J,DX	72	0.50	1		38.0	1.0	1		0.027	0.50	1	J,DX	27	0.50	1		0.12	1.0	1	J,DX,MB	<0.50	0.50	1		3.9	1.0	1		30	10	1	
	02/06/06	10		3.28		-	0.080	1.0	1	J,DX	2.90	0.50	1		92	0.50	1		30.0	1.0	1		0.020	0.50	1	J,DX	4	0.50	1	CQ	0.66	1.0	1	J,DX,MB	0.32	0.50	1	J,DX	47.0	1.0	1		33	10	1	
	02/06/06	15		3.57		-	0.150	1.0	1	J,DX	2.00	0.50	1		110	0.50	1		25.0	1.0	1		0.050	0.50	1	J,DX	4	0.50	1	CQ	0.46	1.0	1	MB,J,DX	0.16	0.50	1	J,DX	40.0	1.0	1		55	10	1	
	02/06/06	18		3.98		-	0.160	1.0	1	J,DX	2.00	0.50	1		95	0.50	1		23.0	1.0	1		0.042	0.50	1	J,DX	4	0.50	1	CQ	0.35	1.0	1	J,DX,MB	0.14	0.50	1	J,DX	43.0	1.0	1		62	10	1	
HPB06	02/06/06	1.5		7.72		-	3.300	2.0	2	LN,AY	11.00	1.00	2	LN,AY	41	1.00	2		250.0	2.0	2	LN,AY	0.063	1.00	2	DF,LN,AY,J,DX	12	1.00	2	CQ	30.00	2.0	2	CQ,LN,AY	0.28	1.00	2	DF,J,DX	14.0	2.0	2		30	20	2	LN,AY
	02/06/06	5		4.18		-	0.270	1.0	1	J,DX	1.70	0.50	1		100	0.50	1		16.0	1.0	1		0.096	0.50	1	J,DX	4	0.50	1	CQ	0.67	1.0	1	MB,J,DX	0.25	0.50	1	J,DX	39.0	1.0	1		48	10	1	
	02/06/06	10		6.35		-	0.190	1.0	1	J,DX	2.50	0.50	1		140	0.50	1		26.0	1.0	1		0.170	0.50	1	J,DX	5	0.50	1	CQ	0.57	1.0	1	MB,J,DX	0.23	0.50	1	J,DX	47.0	1.0	1		56	10	1	
	02/06/06	15		6.60		-	0.150	1.0	1	J,DX	1.90	0.50	1		160	0.50	1		30.0	1.0	1		0.180	0.50	1	J,DX	5	0.50	1	CQ	0.60	1.0	1	MB,J,DX	0.21	0.50	1	J,DX	46.0	1.0	1		62	10	1	
	02/06/06	20		6.74		-	0.210	1.0	1	J,DX	2.50	0.50	1		140	0.50	1		27.0	1.0	1		0.160	0.50	1	J,DX	6	0.50	1	CQ	3.40	1.0	1	CQ	0.18	0.50	1	J,DX	40.0	1.0	1		57	10	1	
	02/06/06	25	DUP	6.90		-	0.090	1.0	1	J,DX	1.50	0.50	1		100	0.50	1		18.0	1.0	1		0.096	0.50	1	J,DX	3	0.50	1	CQ	0.38	1.0	1	MB,J,DX	0.16	0.50	1	J,DX	35.0	1.0	1		45	10	1	
	02/06/06	25		6.53		-	0.110	1.0	1	J,DX	1.30	0.50	1		98	0.50	1		25.0	1.0	1		0.100	0.50	1	J,DX	3	0.50	1	CQ	0.41	1.0	1	MB,J,DX	0.16	0.50	1	J,DX	32.0	1.0	1		61	10	1	
HPB07	02/06/06	1.5		3.95		-	1.500	2.0	2	DF,J,DX,CQ	3.40	1.00	2	CQ	84	1.00	2	CQ	100.0	2.0	2		0.160	1.00	2	DF,J,DX	75	1.00	2	CQ	4.20	2.0	2	CQ	<1.0	1.00	2	DF	26.0	2.0	2		150	20	2	
	02/06/06	5	DUP	6.83		-	0.430	1.0	1	MB,J,DX	2.90	0.50	1		140	0.50	1	CQ	23.0	1.0	1		0.480	0.50	1	J,DX	42	0.50	1	CQ	1.00	1.0	1	MB	0.13	0.50	1	J,DX	26.0	1.0	1		190	10	1	
	02/06/06	5		7.34		-	1.500	3.0	3	DF,CQ,J,DX	6.30	1.50	3	CQ	98	1.50	3	CQ	180.0	3.0	3		0.420	1.50	3	J,DX,DF	37	1.50	3	CQ	25.00	3.0	3	CQ	<1.5	1.50	3	DF	23.0	3.0	3		120	30	3	
	02/06/06	10		3.04		-	0.100	1.0	1	MB,J,DX	0.86	0.50	1		35	0.50	1	CQ	5.0	1.0	1		0.022	0.50	1	J,DX	9	0.50	1	CQ	0.14	1.0	1	MB,J,DX	<0.50	0.50	1		5.9	1.0	1		11	10	1	
	02/06/06	15		3.86		-	0.042	1.0	1	J,DX	0.85	0.50	1		110	0.50	1		9.1	1.0	1		<0.50	0.50	1		3	0.50	1		0.14	1.0	1	J,DX	<0.50	0.50	1		15.0	1.0	1		11	10	1	
	02/06/06	20	DUP	3.82		-	0.160	1.0	1	J,DX	2.70	0.50	1		130	0.50	1		55.0	1.0	1		0.370	0.50	1	J,DX	6	0.50	1	CQ	1.00	1.0	1	MB	0.20	0.50	1	J,DX	53.0	1.0	1	J,DX	290	10	1	
	02/06/06	20		3.91		-	0.170	1.0	1	J,DX	2.20	0.50	1		120	0.50	1		33.0	1.0	1		0.070	0.50	1	J,DX	6	0.50	1	CQ	0.70	1.0	1	MB,J,DX	0.17	0.50	1	J,DX	45.0	1.0	1		67	10	1	
	02/07/06	25		3.62		-	1.700	1.0	1	LN,AY	3.90	1.00	2	LN,AY	81	1.00	2	LN,AY	110.0	1.0	1		0.230	0.50	1	J,DX	150	0.50	1	LN,AY	5.10	1.0	1		0.17	0.50	1	J,DX	27.0	1.0	1		240	10	1	CQ,BB

TABLE 19a
Soil Analytical Results - Metals and pH Analyses

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avneue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	pH		Field Screened pH	Antimony (mg/kg)				Arsenic (mg/kg)				Barium (mg/kg)				Copper (mg/kg)				Cadmium (mg/kg)				Lead (mg/kg)				Molybdenum (mg/kg)				Thallium (mg/kg)				Vanadium (mg/kg)				Zinc (mg/kg)			
				Result	Qual	Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
HPB08	02/08/06	1.5		4.12		-	0.160	1.0	1	J,DX	1.40	0.50	1		82	0.50	1		22.0	1.0	1		0.066	0.50	1	J,DX	23	0.50	1		0.21	1.0	1	J,DX	0.11	0.50	1	J,DX	31.0	1.0	1		63	10	1	CQ
	02/08/06	5		7.53		-	<1.0	1.0	1		1.50	0.50	1		93	0.50	1		15.0	1.0	1		0.160	0.50	1	J,DX	7	0.50	1		0.26	1.0	1	J,DX	0.13	0.50	1	J,DX	33.0	1.0	1		47	10	1	CQ
	02/08/06	10		6.87		2.60	<1.0	1.0	1		1.40	0.50	1		98	0.50	1		15.0	1.0	1		0.160	0.50	1	J,DX	7	0.50	1		0.22	1.0	1	J,DX	0.14	0.50	1	J,DX	36.0	1.0	1		48	10	1	CQ
	02/08/06	15	DUP	6.57		-	<1.0	1.0	1		2.10	0.50	1		100	0.50	1		16.0	1.0	1		0.042	0.50	1	J,DX	3	0.50	1		0.35	1.0	1	J,DX	0.11	0.50	1	J,DX	32.0	1.0	1		140	10	1	CQ
	02/08/06	15		5.70		-	0.034	1.0	1	J,DX	2.50	0.50	1		98	0.50	1		16.0	1.0	1		0.073	0.50	1	J,DX	4	0.50	1		0.38	1.0	1	J,DX	0.12	0.50	1	J,DX	34.0	1.0	1		130	10	1	CQ
	02/08/06	20		8.43		-	<1.0	1.0	1		1.10	0.50	1		92	0.50	1		12.0	1.0	1		0.075	0.50	1	J,DX	3	0.50	1		0.24	1.0	1	J,DX	0.11	0.50	1	J,DX	29.0	1.0	1		42	10	1	CQ
	02/08/06	24		8.91		-	<1.0	1.0	1		2.60	0.50	1		170	0.50	1		27.0	1.0	1		0.150	0.50	1	J,DX	7	0.50	1		0.90	1.0	1	J,DX	0.17	0.50	1	J,DX	48.0	1.0	1		65	10	1	CQ
HPB09	02/09/06	1.5	DUP	3.90		-	0.400	1.0	1	J,DX	1.10	0.50	1		81	0.50	1		18.0	1.0	1		0.094	0.50	1	J,DX	22	0.50	1		0.22	1.0	1	J,DX	0.12	0.50	1	J,DX	28.0	1.0	1		130	10	1	
	02/09/06	1.5		4.94		-	1.200	1.0	1		1.20	0.50	1		82	0.50	1		18.0	1.0	1		0.086	0.50	1	J,DX	16	0.50	1		0.24	1.0	1	J,DX	0.13	0.50	1	J,DX	32.0	1.0	1		130	10	1	
	02/09/06	5		4.95		-	0.300	1.0	1	J,DX	1.10	0.50	1		99	0.50	1		14.0	1.0	1		0.073	0.50	1	J,DX	7	0.50	1		0.27	1.0	1	J,DX	0.15	0.50	1	J,DX	35.0	1.0	1		45	10	1	
	02/09/06	10	DUP	3.62		-	0.190	1.0	1	J,DX	1.20	0.50	1		84	0.50	1		12.0	1.0	1		0.190	0.50	1	J,DX	4	0.50	1		0.27	1.0	1	J,DX	0.12	0.50	1	J,DX	33.0	1.0	1		120	10	1	
	02/09/06	10		3.58		-	0.230	1.0	1	J,DX	2.70	0.50	1		140	0.50	1		16.0	1.0	1		0.031	0.50	1	J,DX	4	0.50	1		0.42	1.0	1	J,DX	0.26	0.50	1	J,DX	36.0	1.0	1		46	10	1	
	02/09/06	15	DUP	4.75		-	0.380	1.0	1	J,DX	3.50	0.50	1		93	0.50	1		14.0	1.0	1		0.028	0.50	1	J,DX	4	0.50	1		0.36	1.0	1	J,DX	0.20	0.50	1	J,DX	34.0	1.0	1	J,DX	40	10	1	
	02/09/06	15		5.47		-	0.230	1.0	1	J,DX	1.50	0.50	1		110	0.50	1		19.0	1.0	1		0.039	0.50	1	J,DX	3	0.50	1		0.48	1.0	1	J,DX	0.15	0.50	1	J,DX	36.0	1.0	1		50	10	1	
	02/09/06	20		7.48		-	0.170	1.0	1	J,DX	1.40	0.50	1		92	0.50	1		13.0	1.0	1		0.047	0.50	1	J,DX	4	0.50	1		0.60	1.0	1	J,DX	0.12	0.50	1	J,DX	30.0	1.0	1		44	10	1	
	02/09/06	24		7.67		-	0.140	1.0	1	J,DX	1.00	0.50	1		74	0.50	1		9.5	1.0	1		0.074	0.50	1	J,DX	6	0.50	1		0.38	1.0	1	J,DX	0.11	0.50	1	J,DX	25.0	1.0	1		91	10	1	
	02/09/06	28		8.74		-	0.450	1.0	1	J,DX	2.40	0.50	1		120	0.50	1		21.0	1.0	1		0.088	0.50	1	J,DX	8	0.50	1		1.40	1.0	1		0.15	0.50	1	J,DX	40.0	1.0	1		56	10	1	
	02/09/06	32		9.02		-	0.260	1.0	1	J,DX	2.00	0.50	1		91	0.50	1		18.0	1.0	1		0.280	0.50	1	J,DX	4	0.50	1		1.30	1.0	1	J,DX	0.14	0.50	1	J,DX	35.0	1.0	1		46	10	1	
HPB11	02/07/06	1.5		5.16		-	0.570	1.0	1	J,DX	1.80	0.50	1		75	0.50	1		29.0	1.0	1		0.170	0.50	1	J,DX	16	0.50	1		0.83	1.0	1	J,DX	<0.50	0.50	1		25.0	1.0	1		88	10	1	
	02/07/06	5		5.76		3.50	0.570	1.0	1	J,DX	1.80	0.50	1		93	0.50	1		27.0	1.0	1		0.046	0.50	1	J,DX	36	0.50	1		0.85	1.0	1	J,DX	0.16	0.50	1	J,DX	45.0	1.0	1		69	10	1	
	02/07/06	10		3.66		3.50	0.290	1.0	1	J,DX	2.50	0.50	1		120	0.50	1		30.0	1.0	1		0.037	0.50	1	J,DX	5	0.50	1		0.59	1.0	1	J,DX	0.24	0.50	1	J,DX	47.0	1.0	1		70	10	1	
	02/07/06	15		3.77		4.30	0.200	1.0	1	J,DX	1.60	0.50	1		110	0.50	1		64.0	1.0	1		0.024	0.50	1	J,DX	4	0.50	1		0.39	1.0	1	J,DX	0.16	0.50	1	J,DX	40.0	1.0	1		330	10	1	
	02/07/06	19		3.78		-	0.340	1.0	1	J,DX	2.10	0.50	1		87	0.50	1		50.0	1.0	1		0.042	0.50	1	J,DX	4	0.50	1		0.42	1.0	1	J,DX	0.13	0.50	1	J,DX	40.0	1.0	1		140	10	1	
	02/07/06	25	DUP	3.91		-	0.700	1.0	1	J,DX	1.80	0.50	1		110	0.50	1		37.0	1.0	1		0.056	0.50	1	J,DX	3	0.50	1		0.28	1.0	1	J,DX	0.16	0.50	1	J,DX	38.0	1.0	1		340	10	1	CQ
	02/07/06	25		3.88		-	0.260	1.0	10	J,DX	1.10	0.50	10		81	0.50	10		47.0	1.0	10		0.035	0.50	10	J,DX	2	0.50	10		0.31	1.0	10	J,DX	0.19	0.50	10	J,DX	26.0	1.0	10		610	100	10	CQ
	02/07/06	28		3.99		-	<1.0	1.0	1		1.20	0.50	1		76	0.50	1		54.0	1.0	1		0.036	0.50	1	J,DX	2	0.50	1		0.23	1.0	1	J,DX	0.11	0.50	1	J,DX	29.0	1.0	1		150	10	1	CQ
HPB12	12/04/06	7		7.00		-	0.150	1.0	1	LN,AY,J,DX	1.30	0.50	1	LN,AY	90	0.50	1	LN,AY	15.0	1.0	1	LN,AY	0.110	0.50	1	LN, AY,J,DX	4	0.50	1		0.39	1.0	1	LN,AY,J,DX	0.23	0.50	1	J,DX	33.0	1.0	1		39	10	1	LN,AY
	12/04/06	12		4.61		-	0.190	1.0	1	J,DX	1.40	0.50	1		77	0.50	1		14.0	1.0	1		0.220	0.50	1	J,DX	3	0.50	1		0.50	1.0	1	J,DX	0.22	0.50	1	J,DX	30.0	1.0	1		36	10	1	
	12/04/06	17		4.11		-	0.087	1.0	1	J,DX	1.30	0.50	1		90	0.50	1		15.0	1.0	1		0.054	0.50	1	J,DX	4	0.50	1		0.38	1.0	1	J,DX	0.14	0.50	1	J,DX	33.0	1.0	1		42	10	1	
	12/04/06	32		6.75		-	0.098	1.0	1	J,DX	1.20	0.50	1		120	0.50	1		19.0	1.0	1		0.180	0.50	1	J,DX	4	0.50	1		0.62	1.0	1	J,DX	0.14	0.50	1	J,DX	33.0	1.0	1		44	10	1	
	12/04/06	42		7.04		-	0.100	1.0	1	J,DX	1.70	0.50	1		100	0.50	1		17.0	1.0	1		0.120	0.50	1	J,DX	4	0.50	1		0.50	1.0	1	J,DX	0.16	0.50	1	J,DX	33.0	1.0	1		46	10	1	
	12/04/06	62		7.96		-	0.056	1.0	1	J,DX	0.55	0.50	1		56	0.50	1		22.0	1.0	1		0.230	0.50	1	J,DX	2	0.50	1		<1.0	1.0	1		0.11	0.50	1	J,DX	45.0	1.0	1		38	10	1	
	12/04/06	80		7.01		-	0.270	1.0	1	J,DX	21.00	0.50	1		97	0.50	1		28.0	1.0	1		0.220	0.50	1	J,DX	7	0.50	1		1.20	1.0	1		0.16	0.50	1	J,DX	41.0	1.0	1		51	10	1	
	12/04/06	90		7.30		-	0.240	1.0	1	J,DX	13.00	0.50	1		91	0.50	1		28.0	1.0	1		0.250	0.50	1	J,DX	8	0.50	1		1.80	1.0	1	J,DX	0.16	0.50	1	J,DX	41.0	1.0	1		51	10	1	
	12/04/06	20		-		5.04	-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-		-	-	-	
RB01	02/14/06	1.5		8.02		-	0.500	1.0	1	MB,J,DX	2.80	0.50	1	CQ	210	0.50	1	CQ	32.0	1.0	1		1.000	0.50	1		160	0.50	1		1.10	1.0	1	J,DX	0.13	0.50	1	J,DX	33.0	1.0	1		210	10	1	
	02/14/06	6		0.65		-	0.290	1.0	1	MB,J,DX	1.50	0.50	1	CQ	50	0.50	1	CQ	9.9	1.0	1		0.036	0.50	1	J,DX	16	0.50	1		0.52	1.0	1	J,DX	<0.50	0.50	1		11.0	1.0	1		26	10	1	
	02/15/06	10		6.97		-	0.140	1.0	1	MB,J,DX	1.30	0.50	1	CQ	110	0.50	1	CQ	16.0	1.0	1		0.042	0.50	1	J,DX	5	0.50	1		0.30	1.0	1	J,DX	0.15	0.50	1	J,DX	37.0	1.0	1		45	10	1	
	02/15/06	15		3.66		-	0.100	1.0	1	MB,J,DX	0.92	0.50	1		91	0.50	1	CQ	14.0	1.0	1		0.034	0.50	1	J,DX	3	0.50	1		0.29	1.0	1	J,DX	0.13	0.50	1	J,DX	41.0	1.0	1		41	10	1	
	02/15/06	20	DUP	3.83		-	0.150	1.0	1	MB,J,DX	2.60	0.50	1		210	0.50	1	CQ	23.0	1.0	1		0.380	0.50	1	J,DX	5	0.50	1		0.58	1.0	1	J,DX	0.18	0.50	1	J,DX	47.0	1.0	1		56	10	1	
	02/15/06	20		3.91		-	0.080	1.0	1	MB,J,DX	0.95	0.50	1		85	0.50	1	CQ	12.0	1.0	1		0.053	0.50	1	J,DX	3	0.50	1		0.20	1.0	1	J,DX	0.14	0.50	1	J,DX	33.0	1.0	1		40	10	1	
	02/15/06	25		4.05		-	0.160	1.0	1	MB,J,DX	1.40	0.50	1	CQ	110	0.50	1	CQ	25.0	1.0	1		0.200	0.50	1	J,DX	8	0.50	1		0.44	1.0	1	J,DX	0.12	0.50	1	J,DX	35.0	1.0	1		49	10	1	
	02/15/06	30		3.71		-	0.120	1.0	1	MB,J,DX	1.30	0.50	1	CQ	86	0.50	1	CQ	13.0	1.0	1		0.044	0.50	1	J,DX	3	0.50	1		0.29	1.0	1	J,DX	0.10	0.50	1	J,DX	29.0	1.0	1		44	10	1	
	02/15/06	35		3.63		-	0.080	1.0	1	MB,J,DX	0.96	0.50	1	CQ	69	0.50	1	CQ	9.1	1.0	1		0.028	0.50	1	J,DX	2	0.50	1		0.20	1.0	1	J,DX	<0.5	0.50	1		24.0	1.0	1		31	10	1	
RB02	02/14/06	1.5		8.78		-	0.520	1.0	1	J,DX,MB,LN,AY	7.50	0.50	1	CQ	130	0.50	1	CQ	21.0	1.0	1		0.130	0.50	1	J,DX	14	0.50	1		1.40	1.0	1		0.23	0.50	1	J,DX	36.0	1.0	1		57	10	1	LN,AY
	02/15/06	7		8.32		-	1.100	1.0	1	CQ	3.30	0.50	1	CQ	200	0.50	1	CQ	30.0	1.0	1		0.440	0.50	1	J,DX	53	0.50	1		1.20	1.0	1		0.26	0.50	1	J,DX	40.0	1.0	1		140	10	1	
	02/14/06	10		6.91		-	0.210	1.0	1	J,DX,MB	1.20	0.50	1	CQ	84	0.50	1	CQ	12.0	1.0	1		0.043	0.50	1	J,DX	4	0.50	1		0.28	1.0	1	J,DX	0.17	0.50	1	J,DX	33.0	1.0	1		40	10	1	
	02/15/06	10.5		7.30		-	0.098	1.0	1	MB,J,DX	1.20	0.50	1	CQ	74	0.50	1	CQ	12.0	1.0	1		0.028	0.50	1	J,DX	3	0.50	1		0.23	1.0	1	J,DX	0.13	0.50	1	J,DX	32.0	1.0	1		36	10	1	
	02/15/06	14	DUP	8.97		-	0.130	1.0	1	MB,J,DX	1.00	0.50	1	CQ	90	0.50	1	CQ	12.0	1.0	1		0.048	0.50	1	J,DX	3	0.50	1		0.26	1.0	1	J,DX	0.17	0.50	1	J,DX	33.0	1.0	1		46	10	1	
	02/15/06	15		8.39		-	0.150	1.0	1	MB,J,DX	1.10	0.50	1	CQ	89	0.50	1	CQ	11.0	1.0	1		0.048	0.50	1	J,DX	3	0.50	1		0.20	1.0	1	J,DX	0.15	0.50	1	J,DX	29.0	1.0	1		39	10	1	
	02/15/06	20		5.68		-	0.200	1.0	1	MB,J,DX	2.60	0.50	1	CQ	130	0.50	1	CQ	22.0	1.0	1		0.380	0.50	1	J,DX	5	0.50	1		0.60	1.0	1	J,DX	0.19	0.50	1	J,DX	47.0	1.0	1		55	10	1	
	02/15/06	25		5.10		-	0.160	1.0	1	MB,J,DX	1.80	0.50	1	CQ	140	0.50	1	CQ	20.0	1.0	1		0.260	0.50	1	J,DX	5	0.50	1		0.57	1.0	1	J,DX	0.15	0.50	1	J,DX	41.0	1.0	1		56	10	1	
	02/15/06	29		3.97		-	0.110	1.0	1	MB,J,DX	1.20	0.50	1	CQ	95	0.50	1	CQ	13.0	1.0	1		0.120	0.50	1	J,DX	3	0.50	1		0.32	1.0	1	J,DX	0.12	0.50	1	J,DX	32.0	1.0	1		39	10	1	
	02/15/06	36		3.74		-	0.083	1.0	1	MB,J,DX	1.10	0.50	1	CQ	84	0.50	1	CQ	12.0	1.0	1		0.066	0.50	1	J,DX	3	0.50	1		0.32	1.0	1	J,DX	0.10	0.50	1	J,DX	28.0	1.0	1		35	10	1	
RB03	02/15/06	1.5	DUP	7.34		-	0.360	1.0	1	J,DX	3.00	0.50	1		130	0.50	1		19.0	1.0	1		0.480	0.50	1	J,DX	41	0.50	1		0.59	1.0	1	J,DX	0.13	0.50	1	J,DX	31.0	1.0	1		66	10	1	
	02/15/06	1.5		7.74		-	0.330	1.0	1	J,DX	2.90	0.50	1		130	0.50	1		18.0	1.0	1		0.380	0.50	1	J,DX	35	0.50	1		0.60	1.0	1	J,DX	0.14	0.50	1	J,DX	32.0	1.0	1		59	10	1	
	02/15/06	5		8.24		2.56	0.600	1.0	1	J,DX	8.50	0.50	1		92	0.50	1		48.0	1.0	1		0.820	0.50	1		61	0.50	1		1.10	1.0	1		0.17	0.50	1	J,DX	32.0	1.0	1		160	10	1	
	02/15/06	10		0.39		-	0.110	1.0	1	J,DX	3.60	0.50	1		61	0.50	1		7.2	1.0	1		0.050	0.50	1	J,DX	17	0.50	1		0.29	1.0	1	J,DX	<0.50	0.50	1		9.4	1.0	1		28	10	1	
	02/15/06	15		2.17		2.00	0.200	1.0	1	J,DX	1.90	0.50	1		47	0.50	1		20.0	1.0	1		0.070	0.50	1	J,DX	17	0.50	1		0.33	1.0	1	J,DX	<0.50	0.50	1		21.0	1.0	1		31	10	1	
	02/15/06	20		4.18		-	0.120	1.0	1	J,DX	1.70	0.50	1		110	0.50	1		16.0	1.0	1		0.360	0.50	1	J,DX	4	0.50	1		0.43	1.0	1	J,DX	0.15	0.50	1	J,DX	35.0	1.0	1		49	10	1	
	02/15/06	20.5		4.11		-	0.190	1.0	1	J,DX	2.20	0.50	1		100	0.50	1		18.0	1.0	1		0.360	0.50	1	J,DX	46	0.50	1		1.90	1.0	1		0.11	0.50	1	J,DX	26.0	1.0	1		110	10	1	
	02/15/06	25	DUP	7.24		-	0.210	1.0	1	J,DX	1.20	0.50	1		75	0.50	1		12.0	1.0	1		0.100	0.50	1	J,DX	3	0.50	1		0.27	1.0	1	J,DX	0.12	0.50	1	J,DX	28.0	1.0	1		34	10	1	CQ
	02/15/06	25		6.98		-	0.120	1.0	1	J,DX	1.50	0.50	1		91	0.50	1		15.0	1.0	1		0.110	0.50	1	J,DX	3	0.50	1		0.31	1.0	1	J,DX	0.13	0.50	1	J,DX	31.0	1.0	1		35	10	1	
	02/15/06	30		3.68		-	0.120	1.0	1	J,DX	1.10	0.50	1		82	0.50	1		12.0	1.0	1		0.038	0.50	1	J,DX	3	0.50	1		0.23	1.0	1	J,DX	0.11	0.50	1	J,DX	27.0	1.0	1		36	10	1	CQ
	02/15/06	35		3.83		-	0.130	1.0	1	J,DX	1.80	0.50	1		120	0.50	1		19.0	1.0	1		0.100	0.50	1	J,DX	5	0.50	1		0.67	1.0	1	J,DX	0.18	0.50	1	J,DX	33.0	1.0	1		48	10	1	CQ
SV02	03/13/06	5		9.13		-	0.250	1.0	1	J,DX	2.00	0.50	1	MB	120	0.50	1		18.0	1.0	1		0.130	0.50	1	J,DX	5	0.50	1	CQ	0.62	1.0	1	J,DX	0.33	0.50	1	J,DX	39.0	1.0	1		46	10	1	
	03/13/06	9		9.07		-	0.220	1.0	1	LN,AY,J,DX	1.70	0.50	1	MB,LN,AY	110	0.50	1	LN,AY	15.0	1.0	1		0.130	0.50	1	J,DX	4	0.50	1	CQ	0.53	1.0	1	J,DX	0.28	0.50	1	J,DX	34.0	1.0	1		40	10	1	LN,AY
	03/13/06	15		8.26		-	0.180	1.0	1	J,DX	2.40	0.50	1	MB	100	0.50	1		15.0	1.0	1		0.110	0.50	1	J,DX	4	0.50	1	CQ	0.35	1.0	1	J,DX	0.18	0.50	1	J,DX	32.0	1.0	1		38	10	1	

TABLE 19a
Soil Analytical Results - Metals and pH Analyses

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avneue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	pH		Field Screened pH	Antimony (mg/kg)				Arsenic (mg/kg)				Barium (mg/kg)				Copper (mg/kg)				Cadmium (mg/kg)				Lead (mg/kg)				Molybdenum (mg/kg)				Thallium (mg/kg)				Vanadium (mg/kg)				Zinc (mg/kg)			
				Result	Qual	Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
SV03	03/07/06	5	DUP	9.29		-	0.130	1.0	1	J,DX	1.30	0.50	1		78	0.50	1	CQ	11.0	1.0	1		0.096	0.50	1	J,DX	4	0.50	1	CQ	0.31	1.0	1	J,DX	0.17	0.50	1	J,DX	30.0	1.0	1		31	10	1	CQ
	03/07/06	5		9.18		-	0.098	1.0	1	J,DX	0.72	0.50	1		51	0.50	1	CQ	10.0	1.0	1		0.086	0.50	1	J,DX	4	0.50	1	CQ	0.19	1.0	1	J,DX	0.15	0.50	1	J,DX	25.0	1.0	1		28	10	1	CQ
	03/07/06	15		9.48		-	0.150	1.0	1	J,DX	1.10	0.50	1		120	0.50	1	CQ	14.0	1.0	1		0.180	0.50	1	J,DX	4	0.50	1	CQ	0.33	1.0	1	J,DX	0.17	0.50	1	J,DX	30.0	1.0	1		35	10	1	CQ
SV04	03/07/06	5		8.89		-	0.140	1.0	1	J,DX	1.60	0.50	1		93	0.50	1	CQ	16.0	1.0	1		0.170	0.50	1	J,DX	5	0.50	1	CQ	0.33	1.0	1	J,DX	0.20	0.50	1	J,DX	36.0	1.0	1		41	10	1	CQ
	03/07/06	15		7.70		-	0.140	1.0	1	J,DX	0.97	0.50	1		130	0.50	1	CQ	15.0	1.0	1		0.130	0.50	1	J,DX	4	0.50	1	CQ	0.33	1.0	1	J,DX	0.18	0.50	1	J,DX	29.0	1.0	1		40	10	1	CQ
SV06	03/07/06	5		8.40		-	0.160	1.0	1	J,DX	1.40	0.50	1		110	0.50	1	CQ	15.0	1.0	1		0.180	0.50	1	J,DX	4	0.50	1	CQ	0.40	1.0	1	J,DX	0.19	0.50	1	J,DX	33.0	1.0	1		39	10	1	CQ
	03/07/06	15		8.46		-	0.210	1.0	1	J,DX	2.00	0.50	1		96	0.50	1	CQ	15.0	1.0	1		0.160	0.50	1	J,DX	4	0.50	1	CQ	0.36	1.0	1	J,DX	0.17	0.50	1	J,DX	30.0	1.0	1		37	10	1	CQ
SV07	03/07/06	5		8.74		-	0.190	1.0	1	J,DX	1.90	0.50	1		120	0.50	1	CQ	17.0	1.0	1		0.230	0.50	1	J,DX	5	0.50	1	CQ	0.52	1.0	1	J,DX	0.22	0.50	1	J,DX	36.0	1.0	1		44	10	1	CQ
	03/07/06	16		8.29		-	0.200	1.0	1	J,DX	2.00	0.50	1		100	0.50	1	CQ	17.0	1.0	1		0.200	0.50	1	J,DX	5	0.50	1	CQ	0.54	1.0	1	J,DX	0.19	0.50	1	J,DX	33.0	1.0	1		42	10	1	CQ
SV08	03/07/06	5		7.44		-	0.084	1.0	1	J,DX	0.45	0.50	1	J,DX	83	0.50	1	CQ	8.4	1.0	1		0.084	0.50	1	J,DX	2	0.50	1	CQ	<1.0	1.0	1		0.16	0.50	1	J,DX	22.0	1.0	1		29	10	1	CQ
	03/07/06	15		7.55		-	0.150	1.0	1	J,DX	1.40	0.50	1		87	0.50	1	CQ	14.0	1.0	1		0.150	0.50	1	J,DX	4	0.50	1	CQ	0.32	1.0	1	J,DX	0.17	0.50	1	J,DX	29.0	1.0	1		35	10	1	CQ
SV09	03/08/06	5		8.02		-	0.150	1.0	1	J,DX	1.50	0.50	1		60	0.50	1		15.0	1.0	1		0.066	0.50	1	J,DX	5	0.50	1		0.35	1.0	1	J,DX	0.19	0.50	1	J,DX	40.0	1.0	1		40	10	1	
	03/08/06	15		8.57		-	0.180	1.0	1	J,DX	2.10	0.50	1		100	0.50	1		18.0	1.0	1		0.260	0.50	1	J,DX	5	0.50	1		0.53	1.0	1	J,DX	0.19	0.50	1	J,DX	39.0	1.0	1		47	10	1	
SV10	03/13/06	5		1.23		-	0.050	1.0	1	J,DX	<0.50	0.50	1		1	0.50	1		1.3	1.0	1		0.020	0.50	1	J,DX	20	0.50	1	CQ	<1.0	1.0	1		<0.50	0.50	1		0.9	1.0	1	J,DX	5	10	1	J,DX
	03/13/06	10		3.95		-	0.140	1.0	1	J,DX	1.70	0.50	1	MB	140	0.50	1		26.0	1.0	1		0.088	0.50	1	J,DX	5	0.50	1	CQ	0.52	1.0	1	J,DX	0.20	0.50	1	J,DX	42.0	1.0	1		52	10	1	
	03/13/06	15		8.14		-	0.180	1.0	1	J,DX	2.30	0.50	1	MB	110	0.50	1		16.0	1.0	1		0.079	0.50	1	J,DX	4	0.50	1	CQ	0.51	1.0	1	J,DX	0.17	0.50	1	J,DX	34.0	1.0	1		44	10	1	
SV12	03/08/06	5		4.91		-	0.190	1.0	1	LN,AY,J,DX	0.64	0.50	1		59	0.50	1		9.8	1.0	1		0.057	0.50	1	J,DX	3	0.50	1		0.29	1.0	1	J,DX	0.21	0.50	1	J,DX	27.0	1.0	1		35	10	1	
	03/08/06	13	DUP	4.89		-	0.180	1.0	1	J,DX	2.60	0.50	1		97	0.50	1		18.0	1.0	1		0.150	0.50	1	J,DX	5	0.50	1		0.59	1.0	1	J,DX	0.18	0.50	1	J,DX	43.0	1.0	1		42	10	1	
	03/08/06	13		5.00		-	0.200	1.0	1	J,DX	1.80	0.50	1		82	0.50	1		14.0	1.0	1		0.160	0.50	1	J,DX	4	0.50	1		0.47	1.0	1	J,DX	0.24	0.50	1	J,DX	34.0	1.0	1		36	10	1	
SV13	03/07/06	5		8.75		-	0.100	1.0	1	J,DX	0.51	0.50	1		82	0.50	1	CQ	9.5	1.0	1		0.080	0.50	1	J,DX	3	0.50	1	CQ	0.10	1.0	1	J,DX	0.17	0.50	1	J,DX	23.0	1.0	1		32	10	1	CQ
	03/07/06	15		7.31		-	0.160	1.0	1	J,DX	1.30	0.50	1		100	0.50	1	CQ	14.0	1.0	1		0.170	0.50	1	J,DX	4	0.50	1	CQ	0.34	1.0	1	J,DX	0.20	0.50	1	J,DX	30.0	1.0	1		37	10	1	CQ
MW04	12/07/06	28		7.98		-	0.260	5.0	5	LN,AY,J,DX,DF	3.40	2.50	5		180	2.50	5	LN,AY	58.0	5.0	5	LN,AY	0.120	2.50	5	DF, J,DX	6	2.50	5		1.10	5.0	5	DF,J,DX	<2.5	2.50	5		47.0	5.0	5		75	50	5	
	12/07/06	38		8.03		-	0.360	5.1	5	DF,J,DX	2.80	2.50	5		130	2.50	5		29.0	5.1	5		<2.5	2.50	5		5	2.50	5		0.97	5.1	5	DF,J,DX	<2.5	2.50	5		40.0	5.1	5		59	51	5	
	12/07/06	49		7.86		-	0.300	5.0	5	DF,J,DX	1.80	2.50	5	DF, J,DX	120	2.50	5		42.0	5.0	5		<2.5	2.50	5	DF	6	2.50	5		0.53	5.0	5	DF,J,DX	<2.5	2.50	5		38.0	5.0	5		72	50	5	
	12/07/06	59		8.10		-	0.300	5.0	5	DF,J,DX	8.50	2.50	5		93	2.50	5		27.0	5.0	5		0.360	2.50	5	DF, J,DX	7	2.50	5		1.40	5.0	5	DF,J,DX	<2.5	2.50	5	DF	40.0	5.0	5		71	50	5	
	12/07/06	69		8.32		-	<5.0	5.0	5	DF	2.30	2.50	5	DF, J,DX	79	2.50	5		14.0	5.0	5		<2.5	2.50	5	DF	3	2.50	5		<5.0	5.0	5	DF	<2.5	2.50	5		24.0	5.0	5		36	50	5	DF,J,DX
	12/07/06	79		7.60		-	<5.0	5.0	5	DF	5.10	2.50	5		56	2.50	5		15.0	5.0	5		<2.5	2.50	5	DF	3	2.50	5		<5.0	5.0	5		<2.5	2.50	5	DF	19.0	5.0	5		45	50	5	DF,J,DX
	12/07/06	89		8.93		-	0.250	5.0	5	DF,J,DX	35.00	2.50	5		150	2.50	5		39.0	5.0	5		0.900	2.50	5	DF, J,DX	9	2.50	5		4.20	5.0	5	DF,J,DX	<2.5	2.50	5	DF	47.0	5.0	5		15	50	5	

Notes:

ft bgs = Feet below ground surface
mg/kg = Milligrams per killigram
< = Analyte was not detected above the specif
- = Not measured or analyzed
AY = Matrix interference suspected
BB = Sample > 4x spike concentration
CQ = Analyte conc. greater that 10 times the blank conc.
DF = Reporting limits elevated due to matrix interferences
DX = Value < lowest standard (MQL), but > than MDL
J = EPA Flag - Estimated value
LM = MS and/or MSD above acceptance limits. See Blank Spike(LCS).
LN = MS and/or MSD below acceptance limits. See Blank Spike(LCS).
MB = Analyte present in the method blank
VJ = Val. Qual.: Estimated value
VJ- = Val. Qual.: Estimated value (may be biased low)
VU = Val. Qual.: Compound analyzed for but not detected
VUJ = Val. Qual.: MDL and EQL may be biased low
Sample depths refer to +/- 2 feet acetate liner

Metals analyzed by EPA Method 6020.
pH analyzed by EPA Method 9040.
DUP = Duplicate sample
Green = sludge
Blue = disturbed

TABLE 19b
Soil Analytical Results - Al, Fe, Cr VI, TOC, and pH Analyses

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avneue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	TOC (mg/kg)	pH		Field Screened pH	Aluminium (mg/kg)				Iron (mg/kg)				Hexavalent Chromium (mg/kg)			
				Result	Result	Qual	Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
CPB01	01/19/06	1.5		**390,000**	1.01	VJ	-	-	-	-	-	-	-	-	-	**0.73**	1.0	1	J,DX
	01/19/06	5		**260,000**	0.39	VJ	-	-	-	-	-	-	-	-	-	**0.59**	1.0	1	J,DX
	01/19/06	10		**160,000**	0.93	VJ	-	-	-	-	-	-	-	-	-	**0.48**	1.0	1	J,DX
	01/19/06	15		<2000	4.33		-	-	-	-	-	-	-	-	-	**0.065**	1.0	1	J,DX
	01/19/06	20	DUP	<2000	1.20		-	-	-	-	-	-	-	-	-	**0.26**	1.0	1	J,DX
	01/19/06	19		<2000	5.55	VJ	-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/19/06	23		<2000	7.86		-	-	-	-	-	-	-	-	-	**0.31**	1.0	1	J,DX
CPB02	01/17/06	1.5		**730,000**	0.85	VJ	-	**17**	5.0	1	CQ	**130**	5.0	1	CQ	**0.41**	1.0	1	J,DX
	01/17/06	5		**50,000**	1.39	VJ	-	**13000**	500	100	CQ,BB	**16000**	5.0	1	CQ,BB	<0.026	1.0	1	
	01/17/06	10		<2000	7.39		-	**11000**	500	100	CQ	**15000**	5.0	1	CQ	<0.026	1.0	1	
	01/17/06	14		<2000	7.32		-	**14000**	500	100	CQ	**21000**	5.0	1	CQ	<0.026	1.0	1	
	01/17/06	18		<2000	7.06		-	**7800**	500	100	CQ	**13000**	5.0	1	CQ	<0.026	1.0	1	
CPB03	01/12/06	1.5		**600,000**	1.38		-	**12**	5.0	1	CQ	**43**	5.0	1	CQ	<0.026	1.0	1	
	01/12/06	5		**59,000**	4.47		-	**2800**	500	100	CQ	**4000**	5.0	1	CQ	<0.026	1.0	1	
	01/12/06	10		**8,500**	8.16		-	**9900**	500	100	CQ	**13000**	5.0	1	CQ	**0.14**	1.0	1	J,DX
	01/12/06	15		**3,000**	7.85		-	**7300**	500	100	CQ	**12000**	5.0	1	CQ	**0.29**	1.0	1	J,DX
	01/12/06	20	DUP	**5,600**	7.97		-	**4900**	500	100	CQ	**8900**	5.0	1	CQ	**0.16**	1.0	1	J,DX
	01/12/06	19		<2000	8.14		-	**5800**	500	100	CQ	**11000**	5.0	1	CQ	**0.12**	1.0	1	J,DX
CPB04	01/18/06	1.5		<2000	7.58		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/18/06	5		<2000	7.59		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/18/06	10		<2000	8.23		-	-	-	-	-	-	-	-	-	**0.11**	1.0	1	J,DX
	01/18/06	15		<2000	8.53		-	-	-	-	-	-	-	-	-	**0.31**	1.0	1	J,DX
	01/18/06	19		<2000	8.30		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/18/06	24		<2000	8.14		-	-	-	-	-	-	-	-	-	**0.028**	1.0	1	J,DX
CPB05	01/19/06	1.5		**530,000**	1.66		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/19/06	5		**110,000**	2.50		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/19/06	10		<2000	7.75		-	-	-	-	-	-	-	-	-	**0.20**	1.0	1	J,DX
	01/19/06	15		<2000	7.83		-	-	-	-	-	-	-	-	-	**0.27**	1.0	1	J,DX
	01/19/06	20	DUP	<2000	8.10		-	-	-	-	-	-	-	-	-	**0.095**	1.0	1	J,DX
	01/19/06	19		<2000	8.31		-	-	-	-	-	-	-	-	-	**0.15**	1.0	1	J,DX
CPB06	01/17/06	1.5		**630,000**	0.84	VJ	-	-	-	-	-	-	-	-	-	**0.046**	1.0	1	J,DX
	01/17/06	5		<2000	6.52		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/17/06	10	DUP	**5,200**	7.40		-	-	-	-	-	-	-	-	-	**0.027**	1.0	1	J,DX
	01/17/06	11		<2000	7.04		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/17/06	15		**3,100**	7.62		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/17/06	19		<2000	7.29		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	LN,AY
CPB07	01/12/06	1.5	DUP	**510,000**	1.62		-	**22**	5.0	1	CQ	**150**	5.0	1	CQ	<0.026	1.0	1	
	01/12/06	1.5		**610,000**	1.36		-	**8.6**	5.0	1	MB	**130**	5.0	1	CQ	<0.026	1.0	1	
	01/12/06	5		**430,000**	0.43		-	**68**	5.0	1	CQ	**370**	5.0	1	CQ	<0.026	1.0	1	
	01/12/06	10		**29,000**	8.11		0.75	**3700**	500	100	CQ	**5400**	5.0	1	CQ	**0.18**	1.0	1	J,DX
	01/12/06	15		**5,700**	8.14		-	**5400**	500	100	CQ	**8300**	5.0	1	CQ	**0.046**	1.0	1	J,DX
	01/12/06	19		<2000	7.99		-	**8200**	500	100	CQ	**14000**	5.0	1	CQ	<0.026	1.0	1	

TABLE 19b
Soil Analytical Results - Al, Fe, Cr VI, TOC, and pH Analyses

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avneue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	TOC (mg/kg)	pH		Field Screened pH	Aluminium (mg/kg)				Iron (mg/kg)				Hexavalent Chromium (mg/kg)			
				Result	Result	Qual	Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
CPB08	01/17/06	1.5		**3,800**	7.30		0.6 - 1.4	-	-	-	-	-	-	-	-	**0.33**	1.0	1	J,DX
	01/17/06	8		**45,000**	7.74		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/17/06	10		**11,000**	8.62		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	LN,AY
	01/17/06	15		<2000	8.33		-	-	-	-	-	-	-	-	-	**0.30**	1.0	1	J,DX
	01/17/06	20		<2000	7.84		6.11	-	-	-	-	-	-	-	-	**0.084**	1.0	1	J,DX
	01/18/06	23		<2000	7.62		-	-	-	-	-	-	-	-	-	**0.15**	1.0	1	J,DX
	01/18/06	25		<2000	7.78		6.70	-	-	-	-	-	-	-	-	**0.070**	1.0	1	J,DX
	01/18/06	30		<2000	7.99		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
CPB09	01/13/06	1.5		<2000	8.91		-	-	-	-	-	-	-	-	-	**0.094**	1.0	1	J,DX
	01/13/06	5		<2000	8.43		-	-	-	-	-	-	-	-	-	**0.040**	1.0	1	J,DX
	01/13/06	10		<2000	8.26		-	-	-	-	-	-	-	-	-	**0.14**	1.0	1	J,DX
	01/13/06	15		<2000	8.49		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/13/06	20		<2000	8.36		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
CPB10	01/10/06	1.5		**480,000**	0.36		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/10/06	5		**440,000**	0.43		-	-	-	-	-	-	-	-	-	**0.10**	1.0	1	J,DX
	01/10/06	10		<2000	6.62		-	-	-	-	-	-	-	-	-	**0.14**	1.0	1	J,DX
	01/10/06	15		<2000	2.98		-	-	-	-	-	-	-	-	-	**0.37**	1.0	1	J,DX
	01/10/06	20		<2000	6.74		-	-	-	-	-	-	-	-	-	**0.15**	1.0	1	J,DX
CPB11R	01/10/06	1.5		**480,000**	0.63		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/10/06	5		**370,000**	0.40		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/10/06	10		**4,800**	7.39		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/10/06	15		**14,000**	0.66		-	-	-	-	-	-	-	-	-	<0.052	2.0	1	
	01/12/06	20		<2000	5.17		-	**6000**	500	100	CQ,BB	**10000**	5.0	1	CQ,BB	**1.1**	1.0	1	
CPB12	01/17/06	1.5		**13,000**	3.90		-	-	-	-	-	-	-	-	-	**0.21**	1.0	1	J,DX
	01/17/06	5		**6,800**	7.50		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/17/06	10		<2000	8.14		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/17/06	15	DUP	**22,000**	7.50		-	-	-	-	-	-	-	-	-	**0.25**	1.0	1	J,DX
	01/17/06	15		**3,000**	7.58		-	-	-	-	-	-	-	-	-	**0.17**	1.0	1	J,DX
	01/17/06	20		<2000	7.72		-	-	-	-	-	-	-	-	-	**0.32**	1.0	1	J,DX
CPB13	01/16/06	1.5		**120,000**	2.82		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/16/06	5		**41,000**	6.63		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/16/06	10		**40,000**	4.55		-	-	-	-	-	-	-	-	-	**0.12**	1.0	1	J,DX
	01/16/06	15		<2000	7.53		-	-	-	-	-	-	-	-	-	**0.41**	1.0	1	J,DX
	01/16/06	18		<2000	7.88		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/16/06	25		<2000	6.60		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/16/06	28		<2000	7.77		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
CPB14	01/10/06	1.5		**470,000**	0.81		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/10/06	5		<2000	4.42		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/10/06	10		**15,000**	6.97		-	-	-	-	-	-	-	-	-	**0.15**	1.0	1	J,DX
	01/10/06	15		<2000	6.96		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/10/06	19		<2000	7.36		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	

TABLE 19b
Soil Analytical Results - Al, Fe, Cr VI, TOC, and pH Analyses

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avneue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	TOC (mg/kg)	pH		Field Screened pH	Aluminium (mg/kg)				Iron (mg/kg)				Hexavalent Chromium (mg/kg)			
				Result	Result	Qual	Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
CPB15	12/20/05	1.5		**3,800,000**	2.12		2.39	-	-	-	-	-	-	-	-	**0.072**	1.0	1	MB,J,DX
	12/20/05	5		**19,000**	6.14		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	12/20/05	9		**8,800**	8.42		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	12/20/05	11		<2000	8.40		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	12/20/05	14		<2000	7.56		-	-	-	-	-	-	-	-	-	**0.16**	1.0	1	MB,J,DX
	12/20/05	20		<2000	7.45		-	-	-	-	-	-	-	-	-	**0.19**	1.0	1	MB,J,DX
CPB16	01/17/06	2	DUP	**500,000**	4.29		-	-	-	-	-	-	-	-	-	**0.57**	1.0	1	J,DX
	01/17/06	1		**2,700**	3.69		-	-	-	-	-	-	-	-	-	**0.060**	1.0	1	J,DX
	01/17/06	5		<2000	7.46		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/17/06	9		<2000	8.02		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/17/06	15		<2000	7.77		-	-	-	-	-	-	-	-	-	**0.70**	1.0	1	J,DX
	01/17/06	20		<2000	7.86		-	-	-	-	-	-	-	-	-	**0.36**	1.0	1	J,DX
CPB17	01/09/06	1.5	DUP	**500,000**	0.84		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/09/06	1.5		**400,000**	0.85		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	LN,AY
	01/09/06	5		<2000	6.99		-	-	-	-	-	-	-	-	-	**0.11**	1.0	1	J,DX
	01/09/06	9		<2000	4.92		-	-	-	-	-	-	-	-	-	**0.34**	1.0	1	J,DX
	01/09/06	13		<2000	7.21		-	-	-	-	-	-	-	-	-	**0.28**	1.0	1	J,DX
	01/10/06	19		<2000	7.55		-	-	-	-	-	-	-	-	-	**0.045**	<1.0	1	J,DX
CPB18	12/20/05	1.5		**4,200,000**	1.68		3.05	-	-	-	-	-	-	-	-	**0.39**	1.0	1	MB,J,DX
	12/20/05	5		**7,800**	8.18		-	-	-	-	-	-	-	-	-	**0.32**	1.0	1	LN,AY,J,DX
	12/20/05	10		**6,000**	9.05		-	-	-	-	-	-	-	-	-	**0.37**	1.0	1	MB,J,DX
	12/20/05	15		<2000	4.20		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	12/20/05	20		<2000	6.43		-	-	-	-	-	-	-	-	-	**0.32**	1.0	1	MB,J,DX
	12/20/05	24		<2000	7.39		-	-	-	-	-	-	-	-	-	**0.20**	1.0	1	MB,J,DX
CPB19	01/16/06	1.5		**38,000**	7.94		-	-	-	-	-	-	-	-	-	**0.040**	1.0	1	J,DX
	01/16/06	6	DUP	<2000	8.23		-	-	-	-	-	-	-	-	-	**0.096**	1.0	1	J,DX
	01/16/06	5		<2000	8.35		-	-	-	-	-	-	-	-	-	**0.040**	1.0	1	J,DX
	01/16/06	10		<2000	8.25		-	-	-	-	-	-	-	-	-	**0.055**	1.0	1	J,DX
	01/16/06	15		<2000	8.03		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/16/06	20		<2000	7.79		-	-	-	-	-	-	-	-	-	**0.042**	1.0	1	J,DX
CPB20	01/17/06	1.5		<2000	6.79		-	-	-	-	-	-	-	-	-	**0.084**	1.0	1	J,DX
	01/17/06	5		**34,000**	8.54		-	-	-	-	-	-	-	-	-	**0.12**	1.0	1	J,DX
	01/17/06	10		<2000	8.77		-	-	-	-	-	-	-	-	-	**0.13**	1.0	1	J,DX
	01/17/06	15		<2000	7.81		-	-	-	-	-	-	-	-	-	**0.14**	1.0	1	J,DX
	01/17/06	20		<2000	8.09		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
CPB21	01/13/06	1		<2000	9.59		-	-	-	-	-	-	-	-	-	**0.30**	1.0	1	J,DX
	01/13/06	5		<2000	8.60		-	-	-	-	-	-	-	-	-	**0.13**	1.0	1	J,DX
	01/13/06	10		<2000	8.27		-	-	-	-	-	-	-	-	-	**0.089**	1.0	1	J,DX
	01/13/06	15		<2000	8.20		-	-	-	-	-	-	-	-	-	**0.060**	1.0	1	J,DX
	01/13/06	20		<2000	8.01		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	

TABLE 19b
Soil Analytical Results - Al, Fe, Cr VI, TOC, and pH Analyses

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avneue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	TOC (mg/kg)	pH		Field Screened pH	Aluminium (mg/kg)				Iron (mg/kg)				Hexavalent Chromium (mg/kg)			
				Result	Result	Qual	Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
CPB22	01/12/06	1.5		**6,000**	7.49		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/12/06	5		<2000	8.37		-	-	-	-	-	-	-	-	-	**0.17**	1.0	1	J,DX
	01/12/06	10		<2000	7.77		-	-	-	-	-	-	-	-	-	**0.063**	1.0	1	J,DX
	01/12/06	15		<2000	8.18		-	-	-	-	-	-	-	-	-	**0.28**	1.0	1	J,DX
	01/12/06	20		<2000	8.14		-	-	-	-	-	-	-	-	-	**0.20**	1.0	1	J,DX
CPB23	01/18/06	1.5		<2000	7.97		-	-	-	-	-	-	-	-	-	**0.13**	1.0	1	J,DX
	01/18/06	5		<2000	8.49		-	-	-	-	-	-	-	-	-	**0.20**	1.0	1	J,DX
	01/18/06	10		<2000	7.95		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/18/06	15		<2000	7.91		-	-	-	-	-	-	-	-	-	**0.36**	1.0	1	J,DX
	01/18/06	20		<2000	7.39		5.41	-	-	-	-	-	-	-	-	**0.31**	1.0	1	J,DX
CPB24	01/20/06	1.5		<2000	7.98		-	**15000**	500	100	CQ	**18000**	5.0	1	-	**0.24**	1.0	1	J,DX
	01/20/06	5		**59,000**	8.26		-	**9800**	500	100	CQ	**9200**	5.0	1	-	<0.026	1.0	1	
	01/20/06	10		**15,000**	8.43		-	**23000**	500	100	CQ	**20000**	5.0	1	-	**0.12**	1.0	1	J,DX
	01/20/06	15		**15,000**	8.48		-	**11000**	500	100	CQ	**11000**	5.0	1	-	<0.026	1.0	1	
	01/20/06	20		<2000	8.17		-	**10000**	500	100	CQ	**13000**	5.0	1	-	<0.026	1.0	1	
CPB28	12/05/06	6		<2200	3.89		-	-	-	-	-	-	-	-	-	**31**	1.0	5	CQ,LN,AY
	12/05/06	10		<2200	5.07		-	-	-	-	-	-	-	-	-	<0.16	1.0	5	
	12/05/06	14		<2200	6.33		-	-	-	-	-	-	-	-	-	**0.40**	1.0	5	MB,J,DX
CPB29	12/28/06	4		-	-		2.06	-	-	-	-	-	-	-	-	-	-	-	
	12/28/06	11		-	-		5.23	-	-	-	-	-	-	-	-	-	-	-	
CPB30	12/06/06	9		**14,000**	8.19		-	-	-	-	-	-	-	-	-	<0.16	1.0	1	
	12/06/06	19		<2200	8.14		-	-	-	-	-	-	-	-	-	<0.16	1.0	1	
	12/06/06	29		<2200	8.84		-	-	-	-	-	-	-	-	-	<0.16	1.0	1	
DPW01	01/18/06	1.5		<2000	4.24		-	-	-	-	-	-	-	-	-	**0.58**	1.00	1	J,DX
	01/18/06	5		**7,600**	8.02		-	-	-	-	-	-	-	-	-	<0.026	1.00	1	
	01/18/06	10		<2000	8.08		-	-	-	-	-	-	-	-	-	**0.099**	1.00	1	J,DX
	01/18/06	15		<2000	7.93		-	-	-	-	-	-	-	-	-	<0.026	1.00	1	
	01/18/06	20		<2000	8.03		-	-	-	-	-	-	-	-	-	<0.026	1.00	1	
DPW02	01/13/06	2		**2,600**	5.87		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	LN,AY
	01/13/06	5		**13,000**	8.20		-	-	-	-	-	-	-	-	-	**0.19**	1.0	1	J,DX
DPW03	01/13/06	2		**5,700**	3.79		-	-	-	-	-	-	-	-	-	**0.10**	1.0	1	J,DX
	01/13/06	5		**7,200**	4.02		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
DPW04	01/13/06	2		**120,000**	0.88		-	-	-	-	-	-	-	-	-	**0.11**	1.0	1	J,DX
	01/13/06	5		**3,800**	6.50		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
DPW05	01/13/06	5		-	8.04		-	-	-	-	-	-	-	-	-	-	-	-	-
DPW06	01/11/06	2		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
	01/11/06	10		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
DPW07	01/11/06	2		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
	01/11/06	10		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
DPW08	01/11/06	2		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
	01/11/06	10		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 19b
Soil Analytical Results - Al, Fe, Cr VI, TOC, and pH Analyses

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avneue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	TOC (mg/kg)	pH		Field Screened pH	Aluminium (mg/kg)				Iron (mg/kg)				Hexavalent Chromium (mg/kg)			
				Result	Result	Qual	Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
DPW09	01/11/06	2		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
	01/11/06	10		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
DPW10	01/11/06	2		<2000	8.02		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
DPW11	01/20/06	2		-	-		-	-	-	-	-	-	-	-	-	**0.39**	1.0	1	J,DX
	01/20/06	10		-	-		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
DPW12	01/20/06	2		-	-		-	-	-	-	-	-	-	-	-	**0.20**	1.0	1	J,DX
	01/20/06	10		-	-		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
DPW13	01/20/06	2		-	-		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/20/06	10		-	-		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
DPW14	01/20/06	2		-	-		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	01/20/06	10		-	-		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
DPW15	01/20/06	2		-	-		-	-	-	-	-	-	-	-	-	**0.084**	1.0	1	J,DX
	01/20/06	10		-	-		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
HPB01	02/08/06	1.5		<2000	8.02		-	-	-	-	-	-	-	-	-	**0.10**	1.0	1	MB,J,DX
	02/08/06	5		**8,800**	8.04		-	-	-	-	-	-	-	-	-	**0.032**	1.0	1	MB,J,DX
	02/08/06	10		**46,000**	4.04		-	-	-	-	-	-	-	-	-	**0.17**	1.0	1	J,DX
	02/08/06	15		<2000	3.90		6.25	-	-	-	-	-	-	-	-	**0.060**	1.0	1	J,DX
	02/08/06	20		<2000	8.03		6.62	-	-	-	-	-	-	-	-	**0.11**	1.0	1	J,DX
	02/08/06	24		<2000	9.09		6.40	-	-	-	-	-	-	-	-	**0.22**	1.0	1	J,DX
HPB02	02/09/06	1.5		<2000	4.24		-	-	-	-	-	-	-	-	-	**0.23**	1.0	1	J,DX
	02/09/06	5	DUP	<2000	5.18		-	-	-	-	-	-	-	-	-	**0.095**	1.0	1	J,DX
	02/09/06	5		<2000	5.23		-	-	-	-	-	-	-	-	-	**0.15**	1.0	1	J,DX
	02/09/06	10		<2000	4.16		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/09/06	15		**7,400**	4.02		-	-	-	-	-	-	-	-	-	**0.075**	1.0	1	J,DX
	02/09/06	20		<2000	7.24		-	-	-	-	-	-	-	-	-	**0.050**	1.0	1	J,DX
	02/09/06	24		<2000	7.28		5.84	-	-	-	-	-	-	-	-	**0.065**		1	
HPB03	02/08/06	1.5		<2000	8.10		-	-	-	-	-	-	-	-	-	**0.17**	1.0	1	
	02/08/06	5		**24,000**	4.99		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/08/06	11	DUP	**40,000**	8.36		-	-	-	-	-	-	-	-	-	**0.15**	1.0	1	
	02/08/06	11		**50,000**	7.81		-	-	-	-	-	-	-	-	-	**0.046**	1.0	1	
	02/08/06	15		**36,000**	8.69		-	-	-	-	-	-	-	-	-	**0.18**	1.0	1	
	02/08/06	20		**6,800**	5.82		5.84	-	-	-	-	-	-	-	-	**0.064**	1.0	1	MB,J,DX
	02/08/06	25		<2000	8.20		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/08/06	30		<2000	9.25		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
HPB04	02/09/06	1.5		**12,000**	5.72		-	-	-	-	-	-	-	-	-	**0.25**	1.0	1	J,DX
	02/09/06	5		<2000	7.22		-	-	-	-	-	-	-	-	-	**0.23**	1.0	1	J,DX
	02/09/06	10	DUP	<2000	6.85		-	-	-	-	-	-	-	-	-	**0.15**	1.0	1	J,DX
	02/09/06	10		<2000	6.84		-	-	-	-	-	-	-	-	-	**0.15**	1.0	1	MB,J,DX
	02/09/06	15		<2000	4.32		-	-	-	-	-	-	-	-	-	**0.16**	1.0	1	MB,J,DX
	02/09/06	20		<2000	4.30		-	-	-	-	-	-	-	-	-	**0.12**	1.0	1	MB,J,DX
	02/09/06	23		<2000	4.31		-	-	-	-	-	-	-	-	-	**0.16**	1.0	1	MB,J,DX

TABLE 19b
Soil Analytical Results - Al, Fe, Cr VI, TOC, and pH Analyses

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avneue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	TOC (mg/kg)	pH		Field Screened pH	Aluminium (mg/kg)				Iron (mg/kg)				Hexavalent Chromium (mg/kg)			
				Result	Result	Qual	Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
HPB05	02/06/06	1.5		**320,000**	1.22		0.58	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/06/06	5	DUP	**49,000**	2.09		-	-	-	-	-	-	-	-	-	**0.033**	1.0	1	MB,J,DX
	02/06/06	5		**15,000**	2.03		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/06/06	10		<2000	3.28		-	-	-	-	-	-	-	-	-	**0.20**	1.0	1	MB,J,DX
	02/06/06	15		<2000	3.57		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/06/06	18		<2000	3.98		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
HPB06	02/06/06	1.5		**2,500**	7.72		-	-	-	-	-	-	-	-	-	**0.090**	1.00	1	J,DX
	02/06/06	5		**26,000**	4.18		-	-	-	-	-	-	-	-	-	**4.3**	1.00	1	
	02/06/06	10		<2000	6.35		-	-	-	-	-	-	-	-	-	**0.060**	1.00	1	J,DX
	02/06/06	15		<2000	6.60		-	-	-	-	-	-	-	-	-	**0.12**	1.00	1	J,DX
	02/06/06	20		<2000	6.74		-	-	-	-	-	-	-	-	-	<0.026	1.00	1	
	02/06/06	25	DUP	<2000	6.90		-	-	-	-	-	-	-	-	-	**0.034**	1.00	1	J,DX
	02/06/06	25		<2000	6.53		-	-	-	-	-	-	-	-	-	<0.026	1.00	1	
HPB07	02/06/06	1.5		**9,900**	3.95		-	-	-	-	-	-	-	-		**0.034**	1.0	1	MB,J,DX
	02/06/06	5	DUP	**6,300**	6.83		-	-	-	-	-	-	-	-		<0.026	1.0	1	
	02/06/06	5		**3,100**	7.34		-	-	-	-	-	-	-	-		**0.043**	1.0	1	MB,J,DX
	02/06/06	10		**33,000**	3.04		-	-	-	-	-	-	-	-		<0.26	10	10	
	02/06/06	15		**33,000**	3.86		-	-	-	-	-	-	-	-		<0.26	10	10	
	02/06/06	20	DUP	<2000	3.82		-	-	-	-	-	-	-	-		**0.88**	1.0	1	J,DX
	02/06/06	20		<2000	3.91		-	-	-	-	-	-	-	-		**0.26**	1.0	1	J,DX
	02/07/06	25		**50,000**	3.62		-	-	-	-	-	-	-	-		**0.055**	1.0	1	J,DX
HPB08	02/08/06	1.5		**11,000**	4.12		-	-	-	-	-	-	-	-	-	**0.58**	1.0	1	MB,J,DX
	02/08/06	5		<2000	7.53		-	-	-	-	-	-	-	-	-	**0.57**	1.0	1	MB,J,DX
	02/08/06	10		<2000	6.87		2.60	-	-	-	-	-	-	-	-	**0.25**	1.0	1	MB,J,DX
	02/08/06	15	DUP	<2000	6.57		-	-	-	-	-	-	-	-	-	**1.3**	1.0	1	MB,J,DX
	02/08/06	15		<2000	5.70		-	-	-	-	-	-	-	-	-	**0.20**	1.0	1	CQ
	02/08/06	20		<2000	8.43		-	-	-	-	-	-	-	-	-	**0.85**	1.0	1	MB,J,DX
	02/08/06	24		<2000	8.91		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
HPB09	02/09/06	1.5	DUP	**8,400**	3.90		-	-	-	-	-	-	-	-	-	**0.074**	1.0	1	MB,J,DX
	02/09/06	1.5		**8,800**	4.94		-	-	-	-	-	-	-	-	-	**0.074**	1.0	1	MB,J,DX
	02/09/06	5		<2000	4.95		-	-	-	-	-	-	-	-	-	**0.12**	1.0	1	MB,J,DX
	02/09/06	10	DUP	<2000	3.62		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/09/06	10		<2000	3.58		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/09/06	15	DUP	<2000	4.75		-	-	-	-	-	-	-	-	-	**0.65**	1.0	1	CQ,J,DX
	02/09/06	15		**20,000**	5.47		-	-	-	-	-	-	-	-	-	**0.95**	1.0	1	MB,J,DX
	02/09/06	20		**6,200**	7.48		-	-	-	-	-	-	-	-	-	**0.41**	1.0	1	MB,J,DX
	02/09/06	24		<2000	7.67		-	-	-	-	-	-	-	-	-	**0.27**	1.0	1	MB,J,DX
	02/09/06	28		<2000	8.74		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/09/06	32		<2000	9.02		-	-	-	-	-	-	-	-	-	**0.19**	1.0	1	MB,J,DX

TABLE 19b
Soil Analytical Results - Al, Fe, Cr VI, TOC, and pH Analyses

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avneue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	TOC (mg/kg)	pH		Field Screened pH	Aluminium (mg/kg)				Iron (mg/kg)				Hexavalent Chromium (mg/kg)			
				Result	Result	Qual	Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
HPB11	02/07/06	1.5		**44,000**	5.16		-	-	-	-	-	-	-	-	-	**0.10**	1.0	1	J,DX
	02/07/06	5		**17,000**	5.76		3.50	-	-	-	-	-	-	-	-	**0.26**	1.0	1	J,DX
	02/07/06	10		<2000	3.66		3.50	-	-	-	-	-	-	-	-	**0.98**	1.0	1	J,DX
	02/07/06	15		<2000	3.77		4.30	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/07/06	19		<2000	3.78		-	-	-	-	-	-	-	-	-	**0.38**	1.0	1	J,DX
	02/07/06	25	DUP	<2000	3.91		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/07/06	25		<2000	3.88		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/07/06	28		<2000	3.99		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
HPB12	12/04/06	7		<2200	7.00		-	-	-	-	-	-	-	-	-	<0.16	1.0	1	
	12/04/06	12		<2200	4.61		-	-	-	-	-	-	-	-	-	<0.16	1.0	1	
	12/04/06	17		<2200	4.11		-	-	-	-	-	-	-	-	-	**0.16**	1.0	1	J,DX
	12/04/06	32		<2200	6.75		-	-	-	-	-	-	-	-	-	<0.16	1.0	1	
	12/04/06	42		<2200	7.04		-	-	-	-	-	-	-	-	-	**0.36**	1.0	1	J,DX
	12/04/06	62		<2200	7.96		-	-	-	-	-	-	-	-	-	**0.29**	1.0	1	J,DX
	12/04/06	80		<2200	7.01		-	-	-	-	-	-	-	-	-	<0.16	1.0	1	
	12/04/06	90		**2,600**	7.30		-	-	-	-	-	-	-	-	-	<0.16	1.0	1	
	12/04/06	20	-	-	-		5.04	-	-	-	-	-	-	-	-	-	-	-	-
RB01	02/14/06	1.5		**8,000**	8.02		-	-	-	-	-	-	-	-	-	**100**	1.0	1	CQ
	02/14/06	6		**330,000**	0.65		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/15/06	10		<2000	6.97		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/15/06	15		<2000	3.66		-	-	-	-	-	-	-	-	-	**0.18**	1.0	1	MB,J,DX
	02/15/06	20	DUP	<2000	3.83		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/15/06	20		<2000	3.91		-	-	-	-	-	-	-	-	-	**0.38**	1.0	1	MB,J,DX
	02/15/06	25		<2000	4.05		-	-	-	-	-	-	-	-	-	**0.23**	1.0	1	MB,J,DX
	02/15/06	30		<2000	3.71		-	-	-	-	-	-	-	-	-	**0.22**	1.0	1	MB,J,DX
	02/15/06	35		<2000	3.63		-	-	-	-	-	-	-	-	-	**0.20**	1.0	1	MB,J,DX
RB02	02/14/06	1.5		<2000	8.78		-	-	-	-	-	-	-	-	-	**0.064**	1.0	1	J,DX
	02/15/06	7		**6,600**	8.32		-	-	-	-	-	-	-	-	-	**0.074**	1.0	1	J,DX
	02/14/06	10		**46,000**	6.91		-	-	-	-	-	-	-	-	-	**0.064**	1.0	1	J,DX
	02/15/06	10.5		**44,000**	7.30		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/15/06	14	DUP	<2000	8.97		-	-	-	-	-	-	-	-	-	**0.10**	1.0	1	J,DX
	02/15/06	15		<2000	8.39		-	-	-	-	-	-	-	-	-	**0.14**	1.0	1	J,DX
	02/15/06	20		<2000	5.68		-	-	-	-	-	-	-	-	-	**0.29**	1.0	1	J,DX
	02/15/06	25		<2000	5.10		-	-	-	-	-	-	-	-	-	**0.31**	1.0	1	J,DX
	02/15/06	29		<2000	3.97		-	-	-	-	-	-	-	-	-	**0.17**	1.0	1	J,DX
	02/15/06	36		<2000	3.74		-	-	-	-	-	-	-	-	-	**0.29**	1.0	1	J,DX

TABLE 19b
Soil Analytical Results - Al, Fe, Cr VI, TOC, and pH Analyses

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avneue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	TOC (mg/kg)	pH		Field Screened pH	Aluminium (mg/kg)				Iron (mg/kg)				Hexavalent Chromium (mg/kg)			
				Result	Result	Qual	Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
RB03	02/15/06	1.5	DUP	**3,500**	7.34		-	-	-	-	-	-	-	-	-	**79**	1.0	1	
	02/15/06	1.5		<2000	7.74		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/15/06	5		**6,700**	8.24		2.56	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/15/06	10		**390,000**	0.39		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/15/06	15		**240,000**	2.17		2.00	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/15/06	20		<2000	4.18		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/15/06	20.5		<2000	4.11		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/15/06	25	DUP	<2000	7.24		-	-	-	-	-	-	-	-	-	**0.053**	1.0	1	J,DX
	02/15/06	25		<2000	6.98		-	-	-	-	-	-	-	-	-	**0.074**	1.0	1	J,DX
	02/15/06	30		<2000	3.68		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	02/15/06	35		<2000	3.83		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
SV02	03/13/06	5		<2000	9.13		-	-	-	-	-	-	-	-	-	**0.064**	1.0	1	J,DX
	03/13/06	9		<2000	9.07		-	-	-	-	-	-	-	-	-	**0.10**	1.0	1	J,DX
	03/13/06	15		<2000	8.26		-	-	-	-	-	-	-	-	-	**0.084**	1.0	1	J,DX
SV03	03/07/06	5	DUP	<2000	9.29		-	-	-	-	-	-	-	-	-	**0.067**	1.0	1	J,DX
	03/07/06	5		<2000	9.18		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	03/07/06	15		<2000	9.48		-	-	-	-	-	-	-	-	-	**0.082**	1.0	1	J,DX
SV04	03/07/06	5		<2000	8.89		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	03/07/06	15		<2000	7.70		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
SV06	03/07/06	5		<2000	8.40		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	03/07/06	15		<2000	8.46		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
SV07	03/07/06	5		<2000	8.74		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	03/07/06	16		<2000	8.29		-	-	-	-	-	-	-	-	-	**0.057**	1.0	1	J,DX
SV08	03/07/06	5		<2000	7.44		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	03/07/06	15		<2000	7.55		-	-	-	-	-	-	-	-	-	**0.067**	1.0	1	J,DX
SV09	03/08/06	5		<2000	8.02		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	03/08/06	15		<2000	8.57		-	-	-	-	-	-	-	-	-	**0.21**	1.0	1	MB,J,DX
SV10	03/13/06	5		**440,000**	1.23		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	03/13/06	10		<2000	3.95		-	-	-	-	-	-	-	-	-	**0.15**	1.0	1	J,DX
	03/13/06	15		<2000	8.14		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
SV12	03/08/06	5		<2000	4.91		-	-	-	-	-	-	-	-	-	**0.14**	1.0	1	MB,J,DX
	03/08/06	13	DUP	<2000	4.89		-	-	-	-	-	-	-	-	-	**0.66**	1.0	1	CQ,J,DX
	03/08/06	13		<2000	5.00		-	-	-	-	-	-	-	-	-	**0.35**	1.0	1	MB,J,DX
SV13	03/07/06	5		<2000	8.75		-	-	-	-	-	-	-	-	-	<0.026	1.0	1	
	03/07/06	15		<2000	7.31		-	-	-	-	-	-	-	-	-	**0.077**	1.0	1	J,DX

TABLE 19b
Soil Analytical Results - Al, Fe, Cr VI, TOC, and pH Analyses

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avneue
Gardena, California

Location	Date	Depth (ft bgs)	Notes	TOC (mg/kg)	pH		Field Screened pH	Aluminium (mg/kg)				Iron (mg/kg)				Hexavalent Chromium (mg/kg)			
				Result	Result	Qual	Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual
MW04	12/07/06	28		<2200	7.98		-	-	-	-	-	-	-	-	-	<0.16	1.0	5	
	12/07/06	38		<2200	8.03		-	-	-	-	-	-	-	-	-	<0.16	1.0	5	
	12/07/06	49		<2200	7.86		-	-	-	-	-	-	-	-	-	<0.16	1.0	5	
	12/07/06	59		**2,800**	8.10		-	-	-	-	-	-	-	-	-	<0.16	1.0	5	
	12/07/06	69		<2200	8.32		-	-	-	-	-	-	-	-	-	**0.20**	1.0	5	J,DX
	12/07/06	79		<2200	7.60		-	-	-	-	-	-	-	-	-	<0.16	1.0	5	
	12/07/06	89		**4,900**	8.93		-	-	-	-	-	-	-	-	-	<0.16	1.0	5	

Notes:

ft bgs = Feet below ground surface
mg/kg = Milligrams per killigram
< = Analyte was not detected above the specified method detection limit
- = Not measured or analyzed
AY = Matrix interference suspected
BB = Sample > 4x spike concentration
CQ = Analyte conc. greater that 10 times the blank conc.
DF = Reporting limits elevated due to matrix interferences
DX = Value < lowest standard (MQL), but > than MDL
J = EPA Flag - Estimated value
LM = MS and/or MSD above acceptance limits. See Blank Spike(LCS).
LN = MS and/or MSD below acceptance limits. See Blank Spike(LCS).
MB = Analyte present in the method blank
VJ = Val. Qual.: Estimated value
VJ- = Val. Qual.: Estimated value (may be biased low)
VU = Val. Qual.: Compound analyzed for but not detected
VUJ = Val. Qual.: MDL and EQL may be biased low
Sample depths refer to +/- 2 feet acetate liner

Metals analyzed by EPA Method 6020 unless noted below.
Aluminum analyzed by EPA Method 6020.
Iron analyzed by EPA Method 6010B.
Hexavalent Chromium by EPA Method 7196A.
TOC analyzed by EPA Method 9060A Mod.
pH analyzed by EPA Method 9040.
DUP = Duplicate sample
Green = sludge
Blue = disturbed

TABLE 20
Laboratory and Field Screened pH Measurements of Soil and Sludge

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
CPB01	01/19/06	1.5	SW6020		1.01	VJ	-	
	01/19/06	5	SW6020		0.39	VJ	-	
	01/19/06	10	SW6020		0.93	VJ	-	
	01/19/06	15	SW6020		4.33		-	
	01/19/06	20	SW6020	DUP	1.20		-	obtained 1.5 feet below sludge contact
	01/19/06	19	SW6020		5.55	VJ	-	
	01/19/06	23	SW6020		7.86		-	
CPB02	01/17/06	1.5	SW6020		0.85	VJ	-	
	01/17/06	5	SW6020		1.39	VJ	-	obtained within 1.0 foot of sludge contact
	01/17/06	10	SW6020		7.39		-	
	01/17/06	14	SW6020		7.32		-	
	01/17/06	18	SW6020		7.06		-	
CPB03	01/12/06	1.5	SW6020		1.38		-	
	01/12/06	5	SW6020		4.47		-	obtained within 1.0 foot of sludge contact
	01/12/06	10	SW6020		8.16		-	
	01/12/06	15	SW6020		7.85		-	
	01/12/06	20	SW6020	DUP	7.97		-	
	01/12/06	19	SW6020		8.14		-	
CPB04	01/18/06	1.5	SW6020		7.58		-	
	01/18/06	5	SW6020		7.59		-	
	01/18/06	10	SW6020		8.23		-	
	01/18/06	15	SW6020		8.53		-	
	01/18/06	19	SW6020		8.30		-	
	01/18/06	24	SW6020		8.14		-	
CPB05	01/19/06	1.5	SW6020		1.66		-	
	01/19/06	5	SW6020		2.50		-	obtained within 1.0 foot of sludge contact
	01/19/06	10	SW6020		7.75		-	
	01/19/06	15	SW6020		7.83		-	
	01/19/06	20	SW6020	DUP	8.10		-	
	01/19/06	19	SW6020		8.31		-	

TABLE 20
Laboratory and Field Screened pH Measurements of Soil and Sludge

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
CPB06	01/17/06	1.5	SW6020		0.84	VJ	-	
	01/17/06	5	SW6020		6.52		-	
	01/17/06	10	SW6020	DUP	7.40		-	obtained 4 feet below sludge contact
	01/17/06	11	SW6020		7.04		-	
	01/17/06	15	SW6020		7.62		-	
	01/17/06	19	SW6020		7.29		-	
CPB07	01/12/06	1.5	SW6020	DUP	1.62		-	
	01/12/06	1.5	SW6020		1.36		-	
	01/12/06	5	SW6020		0.43		-	
	01/12/06	10	SW6020		8.11		0.75	obtained 3.5 feet below sludge contact
	01/12/06	15	SW6020		8.14		-	
	01/12/06	19	SW6020		7.99		-	
CPB08	01/17/06	1.5	SW6020		7.30		0.6 - 1.4	
	01/17/06	8	SW6020		7.74		-	obtained 6.5 feet below sludge contact
	01/17/06	10	SW6020		8.62		-	
	01/17/06	15	SW6020		8.33		-	
	01/17/06	20	SW6020		7.84		6.11	
	01/18/06	23	SW6020		7.62		-	
	01/18/06	25	SW6020		7.78		6.70	
	01/18/06	30	SW6020		7.99		-	
CPB09	01/13/06	1.5	SW6020		8.91		-	boring located on berm approximately 6 feet from sump boundary
	01/13/06	5	SW6020		8.43		-	
	01/13/06	10	SW6020		8.26		-	
	01/13/06	15	SW6020		8.49		-	
	01/13/06	20	SW6020		8.36		-	
CPB10	01/10/06	1.5	SW6020		0.36		-	
	01/10/06	5	SW6020		0.43		-	
	01/10/06	10	SW6020		6.62		-	obtained 2.5 feet below sludge contact
	01/10/06	15	SW6020		2.98		-	
	01/10/06	20	SW6020		6.74		-	

TABLE 20
Laboratory and Field Screened pH Measurements of Soil and Sludge

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
CPB11R	01/10/06	1.5	SW6020		0.63		-	
	01/10/06	5	SW6020		0.40		-	
	01/10/06	10	SW6020		7.39		-	obtained within 1.0 foot of sludge contact
	01/10/06	15	SW6020		0.66		-	obtained 1 foot below sludge contact
	01/12/06	20	SW6020		5.17		-	
CPB12	01/17/06	1.5	SW6020		3.90		-	
	01/17/06	5	SW6020		7.50		-	
	01/17/06	10	SW6020		8.14		-	
	01/17/06	15	SW6020	DUP	7.50		-	
	01/17/06	15	SW6020		7.58		-	
	01/17/06	20	SW6020		7.72		-	
CPB13	01/16/06	1.5	SW6020		2.82		-	
	01/16/06	5	SW6020		6.63		-	
	01/16/06	10	SW6020		4.55		-	obtained 1 foot below sludge contact
	01/16/06	15	SW6020		7.53		-	
	01/16/06	18	SW6020		7.88		-	
	01/16/06	25	SW6020		6.60		-	
	01/16/06	28	SW6020		7.77		-	
CPB14	01/10/06	1.5	SW6020		0.81		-	
	01/10/06	5	SW6020		4.42		-	obtained 1 foot below sludge contact
	01/10/06	10	SW6020		6.97		-	
	01/10/06	15	SW6020		6.96		-	
	01/10/06	19	SW6020		7.36		-	
CPB15	12/20/05	1.5	SW6020		2.12		2.39	
	12/20/05	5	SW6020		6.14		-	
	12/20/05	9	SW6020		8.42		-	
	12/20/05	11	SW6020		8.40		-	obtained 1.5 feet below sludge contact
	12/20/05	14	SW6020		7.56		-	
	12/20/05	20	SW6020		7.45		-	

TABLE 20
Laboratory and Field Screened pH Measurements of Soil and Sludge

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
CPB16	01/17/06	2	SW6020	DUP	4.29		-	
	01/17/06	1	SW6020		3.69		-	
	01/17/06	5	SW6020		7.46		-	obtained 2 feet below sludge contact
	01/17/06	9	SW6020		8.02		-	
	01/17/06	15	SW6020		7.77		-	
	01/17/06	20	SW6020		7.86		-	
CPB17	01/09/06	1.5	SW6020	DUP	0.84		-	
	01/09/06	1.5	SW6020		0.85		-	
	01/09/06	5	SW6020		6.99		-	obtained 1.5 feet below sludge contact
	01/09/06	9	SW6020		4.92		-	obtained within 1.0 foot of sludge contact
	01/09/06	13	SW6020		7.21		-	obtained 4 feet below sludge contact
	01/10/06	19	SW6020		7.55		-	
CPB18	12/20/05	1.5	SW6020		1.68		3.05	
	12/20/05	5	SW6020		8.18		-	
	12/20/05	10	SW6020		9.05		-	
	12/20/05	15	SW6020		4.20		-	obtained 2 feet below sludge contact
	12/20/05	20	SW6020		6.43		-	
	12/20/05	24	SW6020		7.39		-	
CPB19	01/16/06	1.5	SW6020		7.94		-	obtained within 1.0 foot of sludge contact
	01/16/06	6	SW6020	DUP	8.23		-	
	01/16/06	5	SW6020		8.35		-	
	01/16/06	10	SW6020		8.25		-	
	01/16/06	15	SW6020		8.03		-	
	01/16/06	20	SW6020		7.79		-	
CPB20	01/17/06	1.5	SW6020		6.79		-	obtained within 1.0 foot of sludge contact
	01/17/06	5	SW6020		8.54		-	
	01/17/06	10	SW6020		8.77		-	
	01/17/06	15	SW6020		7.81		-	
	01/17/06	20	SW6020		8.09		-	

TABLE 20
Laboratory and Field Screened pH Measurements of Soil and Sludge

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
CPB21	01/13/06	1	SW6020		9.59		-	boring located on berm approximately 10 feet from sump boundary
	01/13/06	5	SW6020		8.60		-	
	01/13/06	10	SW6020		8.27		-	
	01/13/06	15	SW6020		8.20		-	
	01/13/06	20	SW6020		8.01		-	
CPB22	01/12/06	1.5	SW6020		7.49		-	boring located on berm approximately 10 feet from sump boundary
	01/12/06	5	SW6020		8.37		-	
	01/12/06	10	SW6020		7.77		-	
	01/12/06	15	SW6020		8.18		-	
	01/12/06	20	SW6020		8.14		-	
CPB23	01/18/06	1.5	SW6020		7.97		-	boring located on berm approximately 8 feet from sump boundary
	01/18/06	5	SW6020		8.49		-	
	01/18/06	10	SW6020		7.95		-	
	01/18/06	15	SW6020		7.91		-	
	01/18/06	20	SW6020		7.39		5.41	
CPB24	01/20/06	1.5	SW6020		7.98		-	boring located on berm approximately 6 feet from sump boundary
	01/20/06	5	SW6020		8.26		-	
	01/20/06	10	SW6020		8.43		-	
	01/20/06	15	SW6020		8.48		-	
	01/20/06	20	SW6020		8.17		-	

TABLE 20
Laboratory and Field Screened pH Measurements of Soil and Sludge

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
CPB28	12/05/06	6	SW6020		3.89		-	sample obtained in soil between sludge layers
	12/05/06	10	SW6020		5.07		-	
	12/05/06	14	SW6020		6.33		-	
CPB29	12/28/06	4	-		-		2.06	
	12/28/06	11	-		-		5.23	
CPB30	12/06/06	9	SW6020		8.19		-	
	12/06/06	19	SW6020		8.14		-	
	12/06/06	29	SW6020		8.84		-	
DPW01	01/18/06	1.5	SW6020		4.24		-	
	01/18/06	5	SW6020		8.02		-	
	01/18/06	10	SW6020		8.08		-	
	01/18/06	15	SW6020		7.93		-	
	01/18/06	20	SW6020		8.03		-	
DPW02	01/13/06	2	SW6020		5.87		-	
	01/13/06	5	SW6020		8.20		-	
DPW03	01/13/06	2	SW6020		3.79		-	
	01/13/06	5	SW6020		4.02		-	
DPW04	01/13/06	2	SW6020		0.88		-	
	01/13/06	5	SW6020		6.50		-	
DPW05	01/13/06	5	SW6020		8.04		-	

TABLE 21
Comparison of Laboratory and Field Screened pH Measurements

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments	pH difference
				Result	Qual	Result		
CPB06	1.5	-		-		3.05		
CPB07	10	SW6020		8.11		0.75		7.3
CPB08	1.5	SW6020		7.3		0.6 - 1.4		6.3
CPB08	20	SW6020		7.84		6.11		1.7
CPB08	25	SW6020		7.78		6.7		1.1
CPB15	1.5	SW6020		2.12		2.39		0.3
CPB18	1.5	SW6020		1.68		3.05		1.4
CPB23	20	SW6020		7.39		5.41		2
CPB28	4	-		-		1.94		
CPB29	4	-		-		2.06		
CPB29	11	-		-		5.23		
HPB01	15	SW6020		3.9		6.25		2.3
HPB01	20	SW6020		8.03		6.62		1.4
HPB01	24	SW6020		9.09		6.4		2.7
HPB02	7	-		-		4.71		
HPB02	20	SW6020		7.24		-		
HPB02	22	-		-		5.84		
HPB02	24	SW6020		7.28		-		
HPB03	20	SW6020		5.82		5.84		0
HPB05	1.5	SW6020		1.22		0.58	sample obtained 0.5 feet above sludge	0.6
HPB08	9.5	SW6020		6.87			sample obtained immediately above sludge	
HPB08	10	-		-		2.6		
HPB11	5	SW6020		5.76		3.5	sample obtained immediately below sludge	2.3
HPB11	10	SW6020		3.66		3.5		0.2
HPB11	13	-		-		3.25		
HPB11	15	SW6020		3.77		4.3		0.5
HPB12	12	SW6020		4.61		-		
HPB12	17	SW6020		4.11		-		
HPB12	20	-		-		5.04		
HPB12	32	SW6020		6.75		-		
HPB12	42	SW6020		7.04		-		
HPB12	62	SW6020		7.96		-		
HPB12	80	SW6020		7.01		-		
HPB12	90	SW6020		7.3		-		
RB01	6	-		-		2.5		
RB03	5	SW6020		8.24				
RB03	7.5	-		-		2.56	sample obtained 1 foot above sludge	
RB03	15	SW6020		2.17		2		0.2

Table 22
Sludge Volume Calculations for the Gardena Sumps Site

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Sump	Layer Thickness (feet)	Layer Area (sq ft)	Layer Volume (cu yards)	Cumulative Subtotals (cu yards)	Cumulative Total (cu yards)
Cooper North	0	54,909	2,034	2,034	2,034
	1	51,099	1,893	3,926	3,926
	2	43,822	1,623	5,549	5,549
	3	32,500	1,204	6,753	6,753
	4	25,767	954	7,707	7,707
	5	19,781	733	8,440	8,440
	6	10,848	402	8,842	8,842
	7	3,214	119	8,961	8,961
	8	2,608	97	9,057	9,057
	9	2,022	75	9,132	9,132
	10	1,554	58	9,190	9,190
	11	1,143	42	9,232	9,232
	12	865	32	9,264	9,264
	13	610	23	9,287	9,287
	14	342	13	9,299	9,299
	15	130	5	9,304	9,304
		Cooper North Subtotal:	**9,304**	**9,304**	**9,304**
Cooper South	0	55,845	2,068	2,068	11,373
	1	53,163	1,969	4,037	13,342
	2	45,262	1,676	5,714	15,018
	3	30,361	1,124	6,838	16,142
	4	17,077	632	7,471	16,775
	5	6,901	256	7,726	17,030
	6	3,535	131	7,857	17,161
	7	1,488	55	7,912	17,217
	8	924	34	7,947	17,251
	9	536	20	7,966	17,271
	10	234	9	7,975	17,279
		Cooper South Subtotal:	**7,975**	**7,975**	**17,279**
Haack North	0	21,519	797	797	18,076
	1	17,523	649	1,446	18,725
	2	13,932	516	1,962	19,241
	3	11,039	409	2,371	19,650
	4	7,762	287	2,658	19,938
	5	2,176	81	2,739	20,018
	6	1,268	47	2,786	20,065
	7	801	30	2,816	20,095
	8	608	23	2,838	20,117
	9	435	16	2,854	20,133
	10	312	12	2,866	20,145
	11	202	7	2,873	20,152
		Haack North Subtotal:	**2,873**	**2,873**	**20,152**
Haack Rework Area	0	13,043	483	483	20,636
	1	9,446	350	833	20,985
	2	7,362	273	1,106	21,258
	3	2,512	93	1,199	21,351
	4	307	11	1,210	21,362
	5	112	4	1,214	21,367
		Haack Rework Area Subtotal:	**1,214**	**1,214**	**21,367**

Notes:
sq ft = square feet
cu yards = cubic yards

Layer volume was calculated assuming the sides were normal to the surface, and the surface area of a particular layer was assumed to be the area of the top of the layer.

Table 23
Physical and Chemical Properties of Untreated Acid Sludge

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

	Degrees Fahrenheit (°F)	Cooper North	Cooper South	Rework Area
Acidity		12.2-13.4%	18.0-20.8%	10.4% avg
Wet Density		65.7 lb/ft^3	72.8 lb/ft^3	74.9 lb/ft^3
Moisture		9.8-22.3%		
Viscosity		1,700,00 cP	2,500,000 cP	Too viscous for testing
Softening Point		159° F	180° F	>210° F
Benzene in Headspace	60° F	BDL	BDL	BDL
	100° F	BDL	BDL	BDL
	140° F	BDL	BDL	BDL
	180° F	BDL	BDL	BDL
	212° F	BDL	BDL	BDL
Toluene in Headspace	60° F	BDL	1 ppm	BDL
	100° F	1.9 ppm	2.9 ppm	BDL
	140° F	3.6 ppm	7.8 ppm	BDL
	180° F	8.4 ppm	12.9 ppm	BDL
	212° F	11.8 ppm	21.4 ppm	0.8 ppm
Ethylbenzene in Headspace	60° F	BDL	BDL	BDL
	100° F	BDL	BDL	BDL
	140° F	0.9 ppm	1.9 ppm	BDL
	180° F	2.9 ppm	3.3 ppm	BDL
	212° F	4.1 ppm	5.1 ppm	BDL
Total Xylenes in Headspace	60° F	BDL	0.8 ppm	BDL
	100° F	1.5 ppm	2.3 ppm	BDL
	140° F	4.3 ppm	9.5 ppm	BDL
	180° F	12.4 ppm	16.7 ppm	1.1 ppm
	212° F	17.5 ppm	23.5 ppm	2.5 ppm
TPH in Headspace	60° F	3.0 ppm	1.8 ppm	BDL
	100° F	28.6 pmm	19.7 pmm	BDL
	140° F	47.7 ppm	82.2 ppm	1.8 ppm
	180° F	155 ppm	147 ppm	7.4 ppm
	212° F	259 ppm	223 ppm	26.7 ppm
SO_2 in Headspace	60° F	>150 ppm	>150 ppm	8 ppm
	100° F	>150 ppm	>150 ppm	12 ppm
	140° F	>150 ppm	>150 ppm	27 ppm
	180° F	>150 ppm	>150 ppm	45 ppm
	212° F	>150 ppm	>150 ppm	71 ppm
H_2S in Headspace	60° F	408 ppm	471 ppm	2 ppm
	100° F	>500 ppm	>500 ppm	7 ppm
	140° F	>500 ppm	>500 ppm	11 ppm
	180° F	>500 ppm	>500 ppm	32 ppm
	212° F	>500 ppm	>500 ppm	50 ppm

Notes:

BDL = below detection limit
lb/ft^3 = pounds per foot cubed
cP = centipoise
ppm = parts per million

Table 24
Properties of Untreated Acid Sludge Composite
(Cooper North and Cooper South Sumps)

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Analysis	Result
Permeability	$<1x10^{-8}$ cm/sec
Total Lead	22.4 mg/kg
TCLP Lead	0.24 mg/l
SPLP Lead	0.31 mg/l
Total Barium	1.2 mg/kg
TCLP Barium	0.06 mg/l
SPLP Barium	<0.01 mg/l
Total Benzo(a)anthracene	70,000 ug/kg
Total Chrysene	160,000 ug/kg
Total 2-Methylnaphthalene	30,000 ug/kg
Total Phenanthrene	200,000 ug/kg
Total Pyrene	60,000 ug/kg
Total Ethylbenzene	200 ug/kg
Total Toluene	400 ug/kg
SPLP Toluene	7 ug/l
Total Xylenes	1,000 ug/kg
Total 2-methylnapthalene	1,900 ug/kg
Total 1,2,4-trimethylbenzene	700 ug/kg
Total 1,3,5-trimethylbenzene	500 ug/kg
Total 1,2,3-trimethylbenzene	1,100 ug/kg
SPLP 1,2,3-trimethylbenzene	1 ug/l
TPH Gasoline Range Organics	70 mg/kg
TPH Diesel Range Organics	39,000 mg/kg

Notes:
cm/sec = centimeters per second
mg/kg = milligrams per kilograms
mg/l = milligrams per liter
ug/kg = micrograms per kilograms
ug/l = micrograms per liter
TCLP = Toxic Characteristic Leaching Procedure
SPLP = Synthetic Precipitation Leaching Procedure

Table 25
Properties of Treated Acid Sludge Composite
(Cooper North and Cooper South Sumps)

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Analysis	Result
Permeability[2]	$9x10^{-3}$ cm/sec
SPLP Lead[1]	<0.03 mg/l
SPLP Barium[1]	0.01 mg/l
Dry Density without soil[3]	52.3 lb/ft^3
Dry Density with 25% soil[3]	64.1 lb/ft^3
Dry Density with 50% soil[3]	68.8 lb/ft^3
Dry Density with 75% soil[3]	71.6 lb/ft^3
Moisture Content without soil[3]	46.70%
Moisture Content with 25% soil[3]	29.50%
Moisture Content with 50% soil[3]	25.70%
Moisture Content with 75% soil[3]	24.40%

Notes:

1 = Treated with 50/50 mix of $Ca(OH)_2$ and $CaCO_3$ at 22%, 24%, 26%, and 28% by weight.

2 = Treated with 15% $Ca(OH)_2$ and 15% $CaCO_3$ by weight.

3 = Treated with 50/50 mix of $Ca(OH)_2$ and $CaCO_3$ at 25% by weight.

cm/sec = centimeters per second

mg/l - milligrams per liter

lb/ft^3 = pounds per foot cubed

SPLP = Synthetic Precipitation Leaching Procedure

TABLE 26
Range of Metals Concentrations in Background DPW Borings & Native Soil

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Metal	DPW6 thru DPW15 min. value (mg/kg)	DPW6 thru DPW15 max. value (mg/kg)	Native Soil min. value (mg/kg)	Native Soil max. value (mg/kg)	Sludge samples min. value (mg/kg)	Sludge samples max. value (mg/kg)
antimony	0.072	0.430	0.040	0.700	0.030	0.290
arsenic	1.3	3.4	0.43	3.80	0.27	3.60
barium	78	160	51	230	<0.5	150
copper	14	38	8	64	0.2	160.0
cadmium	0.046	0.33	0.02	0.56	0.02	0.28
lead	4	5	2	10	2	85
molybdenum	0.31	0.78	0.10	1.80	0.14	2.70
thallium	0.11	0.31	0.10	0.34	0.11	0.29
vanadium	19	44	14	53	0.4	42
zinc	37	110	20	150	0.83	120
# of borings		10		56		23
#of samples		19		196		34

soil analytical outliers	36 of 2,144 lab analyses (1.7%)
antimony	CPB13 -10' = 1.2 mg/kg
arsenic	CPB08 - 8' = 5.3 mg/kg, DPW03 - 5' = 8.3 mg/kg,
	DPW10 - 2' = 82 mg/kg
	MW04B - 59' = 8.5 mg/kg, - 79' = 5.1 mg/kg, - 89' = 35 mg/kg
	HPB12 - 80' = 21 mg/kg, - 90' = 13 mg/kg
barium	DPW6 - 2' < 0.5 mg/kg
copper	CPB28 - 14' = 290 mg/kg
cadmium	DPW11 - 2' = 0.77 mg/kg, CPB08 - 8' = 0.95 mg/kg,
	MW04B - 89' = 0.90 mg/kg
lead	CPB08 - 8' = 82 mg/kg, CPB13 - 10' = 18 mg/kg, DPW6 - 2' < 0.5 mg/kg
	CPB22 - 1.5' = 18 mg/kg, DPW2 - 2' = 15 mg/kg, DPW11 - 2' = 40 mg/kg,
	DPW12 - 2' = 57 mg/kg, DPW13 - 2' =24 mg/kg, DPW14 - 2' = 23 mg/kg
	HPB03 - 1.5' = 16 mg/kg
molybdenum	HPB06 - 20' = 3.4 mg/kg
thallium	MW04B - 89' = 4.2 mg/kg
vanadium	DPW6 - 2' < 1.0 mg/kg
zinc	CPB08 - 8' = 170 mg/kg, CPB11R - 15' <10 mg/kg, DPW3 - 5' = 180 mg/kg
	DPW6 - 2' <10 mg/kg
	HPB11 - 15' = 330 mg/kg, - 25' = 340 mg/kg & 610 mg/kg
	MW04B - 89' = 15 mg/kg

Table 27
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
MW-01A	05/11/94		--	ND	ND	ND	ND	ND	ND	1.8*	1.9*	ND	ND	ND	ND
MW-01A	06/15/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-01A	06/22/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01A	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01A	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01A	02/16/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	05/17/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	08/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	03/02/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	05/18/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20070518	05/18/07	Duplicate	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	08/23/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	02/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	01/21/94		--	ND	ND	1.5*	1.5*	1.7*	ND	ND	ND	ND	ND	ND	ND
MW-01B	05/11/94		--	ND	ND	ND	ND	ND	ND	2.3*	ND	1.6*	1.4*	ND	ND
MW-01B	06/15/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-01B	06/22/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01B	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01B	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01B	02/16/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	05/17/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	08/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	03/02/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	05/18/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	08/23/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	02/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Table 27
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
MW-02A	01/21/94		--	45*	ND	ND	2.7*	ND	ND	ND	ND	ND	ND	ND	ND
MW-02A	05/10/94		--	--	ND	ND	2.7*	ND	ND	2.4*	--	1.4*	1.3*	ND	ND
MW-02A	05/11/94		--	ND	ND	ND	ND	ND	ND	2.5*	1.0*	1.1*	1.4*	ND	ND
MW-02A	06/15/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-02A	06/25/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02A	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02A	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02A	02/16/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	05/18/06		**26 J,MB**	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-02A	05/18/06	Duplicate	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	0.37 J	<2.0	<2.0	<2.0	<2.0
MW-02A	08/22/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-02A	08/22/06	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	11/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	08/24/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20070824	08/24/07	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	11/16/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20080220	02/20/08	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20080520	05/20/08	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	05/11/94		--	ND	ND	ND	ND	ND	ND	2.0*	ND	ND	ND	ND	ND
MW-02B	06/19/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-02B	06/25/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02B	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02B	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02B	02/16/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-02B	02/16/06	Duplicate	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	05/17/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	08/22/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	11/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	08/24/07		**290 LH,AY**	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	11/16/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20071116	11/16/07	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	0.34 J	<2.0	<2.0
MW-02B	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Table 27
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
MW-03A	05/10/94		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03A	06/15/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-03A	6/22/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03A	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03A	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03A	02/17/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	05/18/06		27 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	08/22/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-03A	11/20/06	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-03A	03/01/07	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	08/24/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	02/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	05/10/94		--	ND	1.1*	ND	ND	ND	ND	ND	3.7*	**8.9**	**8.9**	1.1*	1.5*
MW-03B	07/05/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-03B	06/25/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03B	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03B	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03B	02/17/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	05/18/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	0.54 J	<2.0	<2.0	<2.0	<2.0
MW-03B	08/22/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	08/24/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	02/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Table 27
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
MW-04A	03/02/07	New Well	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	08/23/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	11/16/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	03/02/07	New Well	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	08/23/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	11/16/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	05/20/08		30 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
G-4	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
G-4	02/17/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	05/18/06		28 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	08/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	05/18/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	08/24/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
CPB09-GW-29	01/26/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
CPB09-GW-53	01/26/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
CPB09-GW-80	01/26/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
CPB25-GW-28	01/25/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
CPB25-GW-52	01/25/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
CPB26-GW-29	01/25/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
CPB26-GW-55	01/25/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
CPB26-GW-80	01/25/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
CPB26-GW-80	01/26/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
CPB26-2GW-80	01/25/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
CPB27-GW-25	01/24/06		--	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
CPB27-GW-52	01/24/06		--	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
CPB27-GW-78	01/24/06		--	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Table 27
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
HPB10-GW-55	02/23/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
HPB10-GW-71	02/23/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
UG-CHAN-20060216	02/16/06		58 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	**23**	<2.0	<2.0	<2.0	<2.0	<2.0
FDCC-W-20080520	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	**19**	<2.0	<2.0	<2.0	<2.0	<2.0
DG-CHAN-20060216	02/16/06		58 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	**15**	<2.0	<2.0	<2.0	<2.0	<2.0
FDCC-E-20080520	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	**8.7**	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	02/16/06	Field Blank	<100	--	<2.0	<2.0	0.49 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	02/17/06	Field Blank	<100	--	<2.0	<2.0	0.39 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	05/17/06	Field Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	05/17/06	Field Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	08/21/06	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	08/22/06	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	11/20/06	Field Blank	<50	--	<2.0	<2.0	1.2 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	11/21/06	Field Blank	<50	--	<2.0	<2.0	1.4 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	03/01/07	Field Blank	<50	--	<2.0	<2.0	**2.3**	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	03/02/07	Field Blank	<50	--	<2.0	<2.0	**2.8**	0.67 J	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20070517	05/17/07	Field Blank	<100	--	<2.0	<2.0	0.6 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20070518	05/18/07	Field Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-082307	08/23/07	Field Blank	<50	--	<2.0	<2.0	1.9 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20070824	08/24/07	Field Blank	**65 PV**	--	<2.0	<2.0	1.7 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20071115	11/15/07	Field Blank	<50	--	<2.0	<2.0	**2.2**	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20071116	11/16/07	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	0.53 J	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080219	02/19/08	Field Blank	<50	--	<2.0	<2.0	0.74 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080220	02/20/08	Field Blank	<50	--	<2.0	<2.0	0.69 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080519	05/19/08	Field Blank	<50	--	<2.0	<2.0	1.0 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080520	05/20/08	Field Blank	41 J	--	<2.0	<2.0	1.1 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB1-Sump	02/16/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB2-Sump	02/16/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB3-Sump	02/16/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB1-Sump	02/17/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB2-Sump	02/17/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Table 27
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
TB-Sump	05/17/06	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	05/17/06	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	05/18/06	Trip BlankA	33 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	05/18/06	Trip BlankB	25 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	05/18/06	Trip BlankC	26 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	08/21/06	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	08/21/06	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	08/22/06	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	08/22/06	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	11/20/06	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	11/20/06	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	11/20/06	Trip BlankC	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	11/21/06	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/01/07	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/01/07	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/01/07	Trip BlankC	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/02/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/02/07	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB3-Sump-20060216	02/16/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20070517	05/17/07	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20070518	05/18/07	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-082307	08/23/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20070824	08/24/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20071115	11/15/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20071116	11/16/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080219-A	02/19/08	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080219-B	02/19/08	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080219-C	02/19/08	Trip BlankC	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080220-A	02/20/08	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080220-B	02/20/08	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080519-A	05/19/08	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080519-B	05/19/08	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080519-C	05/19/08	Trip BlankC	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080520-D	05/20/08	Trip BlankD	34 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080520-E	05/20/08	Trip BlankE	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080520-F	05/20/08	Trip BlankF	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Table 27
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)

Notes:

GRO = Gasolone Range Organics by modified EPA Method 8015B

* = Analyte was quantitated below the established linear calibration range. Amount reported is an estimate.

ND = Not Detected. This data was obtained from a summary table of a report not prepared by SECOR.
The actual laboratory reports are not available, thus MDL's can not be determined for this data.

<# = Analyte was not detected above the Reporting Limit (#)

µg/L = micrograms per liter

-- = Not applicable / Not analyzed

J = Analyte was detected between the MDL and the RL

MB = Analyte detected in the method blank

LH,AY = Due to sample matrix effects, the surrogate recovery was outside of acceptance limits.

PV = Hydrocarbon result partly due to individual peak(s) in quantity range.

Results highlighted with **Bold** font indicate results > RL

Sample ID'd with GW as a precurser to the depth indicates a hydropunch sample.

For safety and security reasons, the surface water sampling locations in the Dominguez Flood Control Channel (DFCC) have been re-located.

References:

DTSC, 2000 and 2001. *2000 and 2001 Groundwater Sampling Report for Gardena Sumps.*

DTSC, 2002. *2002 Groundwater Sampling Report for Gardena Sumps.*

URS, 1994. *Groundwater Remedial Investigation Technical Memorandum* , Gardena Sumps, 1440 West Artesia Boulevard, Gardena, CA., November 14.

SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.

Table 28
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium, pH, and Sulfide Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

		EPA Method:	8270C			376.2	SW846 9030B	7196 A	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (µg/L)	Chrysene (µg/L)	Pyrene (µg/L)	Total (µg/L)	Reactive (µg/L)	(µg/L)		
MW-01A	05/11/94		8.6*	--	--	--	--	--	--	7.50
MW-01A	06/15/00		D	--	--	--	--	--	--	7.00
MW-01A	06/12/01	Add.Data	--	--	--	--	--	--	--	NS
MW-01A	06/22/01		ND	--	--	--	--	--	--	--
MW-01A	02/28/02		ND	--	--	--	--	--	--	7.26
MW-01A	03/10/02		ND	--	--	--	--	--	--	--
MW-01A	02/16/06		<48	<9.5	<9.5	23 J	ND *	1.6 J	7.13	6.77
MW-01A	05/17/06		<47	<9.4	<9.4	<100	ND *	<25	7.27	6.76
MW-01A	08/21/06		<47	<9.4	<9.4	51 J	ND *	<25	7.05	6.74
MW-01A	11/20/06		<47	<9.4	<9.4	20 J	ND *	<25	7.30	6.56
MW-01A	03/02/07		<47	<9.5	<9.5	<100	--	7.3 MB,J	--	6.72
MW-01A	05/18/07		8.2 J	<9.4	<9.4	44 J	--	<25	--	5.40
MW-01A	08/23/07		<47	<9.4	<9.4	<100	--	<25	7.17	6.93
MW-01A	11/15/07		<47	<9.4	<9.4	<100	--	<25	7.46	6.53
MW-01A	02/19/08		<47	<9.4	<9.4	<100	--	<25	7.35	6.90
MW-01A	05/19/08		<47	<9.4	<9.4	20 J	--	<25	7.53	6.68
MW-01B	01/21/94		--	--	--	--	--	--	--	--
MW-01B	05/11/94		--	--	--	--	--	--	--	10.80
MW-01B	06/15/00		D	--	--	--	--	--	--	7.00
MW-01B	06/12/01	Add.Data	--	--	--	--	--	--	--	NS
MW-01B	06/22/01		ND	--	--	--	--	--	--	--
MW-01B	02/28/02		ND	--	--	--	--	--	--	9.01
MW-01B	03/10/02		ND	--	--	--	--	--	--	--
MW-01B	02/16/06		<48	<9.5	<9.5	23 J	ND *	1.1 J	7.49	7.09
MW-01B	05/17/06		<47	<9.4	<9.4	<100	ND *	<25	7.63	7.12
MW-01B	08/21/06		<47	<9.4	<9.4	39 J	ND *	<25	7.32	7.05
MW-01B	11/20/06		<47	<9.4	<9.4	23 J	ND *	<25	7.52	6.88
MW-01B	03/02/07		<47	<9.5	<9.5	<100	--	8.5 MB,J	--	7.19
MW-01B	05/18/07		5.0 J	<9.4	<9.4	67 J	--	<25	--	7.21
MW-01B	08/23/07		<47	<9.4	<9.4	51 J	--	4.3 J	7.52	7.50
MW-01B	11/15/07		<48	<9.6	<9.6	<100	--	8.7 J	7.70	7.10
MW-01B	02/19/08		<47	<9.4	<9.4	<100	--	<25	7.58	7.11
MW-01B	05/19/08		<47	<9.4	<9.4	78 J	--	<25	7.73	7.07

Table 28
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium, pH, and Sulfide Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

		EPA Method:	8270C			376.2	SW846 9030B	7196 A	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (µg/L)	Chrysene (µg/L)	Pyrene (µg/L)	Total (µg/L)	Reactive (µg/L)	(µg/L)		
MW-02A	01/21/94		ND	--	--	--	--	--	--	--
MW-02A	05/10/94		13	--	--	--	--	--	--	--
MW-02A	05/11/94		12	--	--	--	--	--	--	6.90
MW-02A	06/15/00		D	--	--	--	--	--	--	7.00
MW-02A	06/12/01	Add.Data	--	--	--	--	--	--	--	7.25
MW-02A	06/25/01		ND	--	--	--	--	--	--	--
MW-02A	02/28/02		ND	--	--	--	--	--	--	--
MW-02A	03/10/02		ND	--	--	--	--	--	--	--
MW-02A	02/16/06		<48	<9.5	<9.5	23 J	ND *	0.97 J	7.02	6.63
MW-02A	05/18/06		<47	<9.4	<9.4	14 J	ND *	1.9 J	6.86	6.61
2MW-02A	05/18/06	Duplicate	<47	<9.4	<9.4	20 J	--	1.7 J	6.98	6.61
MW-02A	08/22/06		<47	<9.4	<9.4	35 J	ND *	<25	6.97	6.73
2MW-02A	08/22/06	Duplicate	<47	<9.4	<9.4	37 J	ND *	<25	6.98	6.73
MW-02A	11/21/06		<47	<9.4	<9.4	24 J	ND *	<25	7.22	6.52
MW-02A	03/01/07		<47	<9.5	<9.5	<100	--	<25	--	6.72
MW-02A	05/17/07		<47	<9.4	0.073 J	<100	--	<25	7.29	5.62
MW-02A	08/24/07		<47	<9.4	<9.4	44 J	--	<25	7.21	6.67
MW-02A	11/16/07		<48	<9.5	<9.5	<100	--	<25	7.32	6.39
MW-02A	02/20/08		<47	<9.4	<9.4	<100	--	<25	7.15	6.91
MW-02A	05/20/08		<47	<9.4	<9.4	63 J	--	<25	7.45	6.82
MW-02B	05/11/94		21	--	--	--	--	--	--	8.30
MW-02B	06/15/00		ND	--	--	--	--	--	--	7.00
MW-02B	06/12/01	Add.Data	--	--	--	--	--	--	--	7.39
MW-02B	06/25/01		ND	--	--	--	--	--	--	--
MW-02B	02/28/02		ND	--	--	--	--	--	--	10.30
MW-02B	03/10/02		ND	--	--	--	--	--	--	--
MW-02B	02/16/06		<48	<9.5	<9.5	27 J	ND *	1.7 J	7.12	6.88
2MW-02B	02/16/06	Duplicate	<48	<9.5	<9.5	30 J	ND *	8.6 J	7.14	6.88
MW-02B	05/17/06		<47	<9.4	<9.4	<100	ND *	<25	7.26	6.88
MW-02B	08/22/06		<47	<9.4	<9.4	37 J	ND *	7.3 J	7.09	6.87
MW-02B	11/21/06		<47	<9.4	<9.4	58 J	500 J	<25	7.31	6.78
MW-02B	03/01/07		<47	<9.5	<9.5	37 J	--	25	--	6.98
MW-02B	05/17/07		<47	<9.4	<9.4	9.7 J	--	<25	7.36	7.19
MW-02B	08/24/07		<47	<9.4	<9.4	34 J	--	<25	7.33	8.47
MW-02B	11/16/07		<47	<9.4	<9.4	24 J	--	<25	7.34	6.70
MW-02B	02/20/08		<47	<9.4	<9.4	<100	--	<25	7.26	7.05
MW-02B	05/20/08		<47	<9.4	<9.4	69 J	--	<25	7.59	7.02

Table 28
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium, pH, and Sulfide Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

		EPA Method:	8270C			376.2	SW846 9030B	7196 A	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (µg/L)	Chrysene (µg/L)	Pyrene (µg/L)	Total (µg/L)	Reactive (µg/L)	(µg/L)		
MW-03A	05/10/94		ND	--	--	--	--	--	--	7.40
MW-03A	06/15/00		ND	--	--	--	--	--	--	7.00
MW-03A	06/12/01	Add.Data	--	--	--	--	--	--	--	7.19
MW-03A	06/22/01		ND	--	--	--	--	--	--	--
MW-03A	02/28/02		ND	--	--	--	--	--	--	8.51
MW-03A	03/10/02		ND	--	--	--	--	--	--	--
MW-03A	02/17/06		<48	<9.5	<9.5	13 J	ND *	3.4 J	7.20	6.81
MW-03A	05/18/06		<47	<9.4	<9.4	14 J	ND *	<25	6.97	6.67
MW-03A	08/22/06		<47	<9.4	<9.4	35 J	ND *	<25	7.01	6.78
MW-03A	11/20/06		<47	<9.4	<9.4	66.J	ND *	<25	7.18	6.53
2MW-03A	11/20/06	Duplicate	<47	<9.4	<9.4	38 J	ND *	<25	7.14	6.78
MW-03A	03/01/07		<47	<9.5	<9.5	<100	--	4.2 J	6.56	6.53
2MW-03A	03/01/07	Duplicate	<47	<9.5	<9.5	<100	--	4.0 J	--	6.56
MW-03A	05/17/07		<47	<9.4	<9.4	<100	--	<25	7.16	5.29
MW-03A	08/24/07		<47	<9.4	<9.4	40 J	--	<25	7.11	6.10
MW-03A	11/15/07		<47	<9.4	<9.4	<100	--	7.6 J	7.29	6.32
MW-03A	02/19/08		<47	<9.4	<9.4	<100	--	<25	7.22	6.81
MW-03A	05/19/08		<47	<9.4	<9.4	83 J	--	<25	7.34	6.57
MW-03B	05/10/94		8.9*	--	--	--	--	--	--	7.40
MW-03B	07/05/00		ND	--	--	--	--	--	--	7.00
MW-03B	06/12/01	Add.Data	--	--	--	--	--	--	--	7.45
MW-03B	06/25/01		ND	--	--	--	--	--	--	--
MW-03B	02/28/02		ND	--	--	--	--	--	--	7.98
MW-03B	03/10/02		ND	--	--	--	--	--	--	--
MW-03B	02/17/06		<48	<9.6	<9.6	<100	ND *	1.9 J	8.02	8.61
MW-03B	05/18/06		<47	<9.4	<9.4	<100	ND *	<25	7.86	8.56
MW-03B	08/22/06		<47	<9.4	<9.4	32 J	ND *	<25	8.01	8.85
MW-03B	11/20/06		<47	<9.4	<9.4	23 J	ND *	<25	7.98	8.82
MW-03B	03/01/07		<47	<9.5	<9.5	<100	--	<25	--	8.08
MW-03B	05/17/07		<47	<9.4	<9.4	<100	--	<25	8.02	8.98
MW-03B	08/24/07		<47	<9.4	<9.4	45 J	--	<25	8.09	9.09
MW-03B	11/15/07		<49	<9.7	<9.7	<100	--	9.1 J	8.06	8.50
MW-03B	02/19/08		<47	<9.4	<9.4	<100	--	6.6 J	7.48	7.25
MW-03B	05/19/08		<47	<9.4	<9.4	<100	--	<25	7.66	7.10

Table 28
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium, pH, and Sulfide Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

		EPA Method:	8270C			376.2	SW846 9030B	7196 A	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (µg/L)	Chrysene (µg/L)	Pyrene (µg/L)	Total (µg/L)	Reactive (µg/L)	(µg/L)		
MW-04A	03/02/07	New Well	<47	<9.5	<9.5	<100	--	**77 MB,LN,AY**	--	6.77
MW-04A	05/17/07		<47	<9.4	<9.4	15 J	--	<25	7.12	5.50
MW-04A	08/23/07		<47	<9.4	<9.4	<100	--	4.9 J	7.23	6.59
MW-04A	11/16/07		<47	<9.4	<9.4	<100	--	<25	7.09	6.40
MW-04A	02/20/08		<47	<9.4	<9.4	<100	--	<25	7.01	6.79
MW-04A	05/20/08		<47	<9.4	<9.4	57 J	--	5.4 J	7.29	6.80
MW-04B	03/02/07	New Well	<47	<9.5	<9.5	69 J	--	24 MB,J	--	7.02
MW-04B	05/17/07		<47	<9.4	<9.4	10 J	--	<25	7.34	7.12
MW-04B	08/23/07		<47	<9.4	<9.4	<100	--	6.8 J	7.05	9.22
MW-04B	11/16/07		<47	<9.4	<9.4	28 J	--	<25	7.27	6.42
MW-04B	02/20/08		<47	<9.4	<9.4	<100	--	<25	7.21	7.01
MW-04B	05/20/08		<47	<9.4	<9.4	60 J	--	<25	7.45	6.96
G-4	05/10/94		140	--	--	--	--	--	--	9.50
G-4	06/15/00		ND	--	--	--	--	--	--	7.00
G-4	06/12/01	Add.Data	--	--	--	--	--	--	--	7.41
G-4	06/22/01		ND	--	--	--	--	--	--	--
G-4	02/28/02		ND	--	--	--	--	--	--	8.43
G-4	03/10/02		ND	--	--	--	--	--	--	--
G-4	02/17/06		<48	<9.5	<9.5	31 J	ND *	<25	7.38	7.05
G-4	05/18/06		<47	<9.4	<9.4	45 J	ND *	<25	7.09	6.84
G-4	08/21/06		<47	<9.4	<9.4	75 J	ND *	13 J	7.17	6.91
G-4	11/20/06		<47	<9.4	<9.4	49 J	ND *	<25	7.97	6.80
G-4	03/01/07		<47	<9.5	<9.5	<100	--	4.0 J	--	6.86
G-4	05/18/07		<47	<9.4	<9.4	44 J	--	15 J	--	6.98
G-4	08/24/07		<47	<9.4	<9.4	64 J	--	6.7 J	7.39	7.71
G-4	11/15/07		<47	<9.4	<9.4	<100	--	11 J	7.51	6.60
G-4	02/20/08		<47	<9.4	<9.4	62 J	--	<25	7.24	7.02
G-4	05/19/08		<47	<9.4	<9.4	25 J	--	<25	7.52	6.90
CPB09-GW-29	01/26/06		<53	<11	<11	<100	--	<25	7.26	
CPB09-GW-53	01/26/06		<62	<12	<12	<100	--	<25	7.33	
CPB09-GW-80	01/26/06		<100	<20	<20	<100	--	<25	7.62	
CPB25-GW-28	01/25/06		<53	<11	<11	<100	<20	<25	7.31	
CPB25-GW-52	01/25/06		<53	<11	<11	<100	<20	<25	7.32	

Table 28
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium, pH, and Sulfide Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

		EPA Method:	8270C			376.2	SW846 9030B	7196 A	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (µg/L)	Chrysene (µg/L)	Pyrene (µg/L)	Total (µg/L)	Reactive (µg/L)	(µg/L)		
CPB26-GW-29	01/25/06		<53	<11	<11	<100	<20	<25	7.22	
CPB26-GW-55	01/25/06		<53	<11	<11	<100	<20	<25	7.26	
CPB26-GW-80	01/25/06		<53	<11	<11	<100	<20	<25	7.71	
CPB26-GW-80	01/26/06		<100	<20	<20	<100	--	<25	7.63	
CPB26-2GW-80	01/25/06		<53	<11	<11	<100	<20	<25	7.78	
CPB27-GW-25	01/24/06		<53	<11	<11	<100	<20	<25	7.15	
CPB27-GW-52	01/24/06		<53	<11	<11	<100	<20	<25	7.47	
CPB27-GW-78	01/24/06		<53	<11	<11	<100	<20	3.5 J	7.82	
HPB10-GW-55	02/23/06		<47	<9.4	<9.4	0.021 J	<1.0	<0.025	7.19	
HPB10-GW-71	02/23/06		<72	<14	<14	0.021 J	<1.0	<0.025	7.57	
UG-CHAN-20060216	02/16/06		<47	<9.5	<9.5	27 J	<100,000	2.3 J	9.07	--
FDCC-W-20080520	05/20/08		<47	<9.4	<9.4	69 J	--	<25	9.11	--
DG-CHAN-20060216	02/16/06		<47	<9.4	<9.4	42 J	<100,000	2.6 J	8.94	--
FDCC-E-20080520	05/20/08		<47	<9.4	<9.4	83 J	--	<25	9.29	--
FB-SUMP	02/16/06	Field Blank	<48	<9.5	<9.5	22	ND *	0.97 J	8.67	8.67
FB-SUMP	02/17/06	Field Blank	<48	<9.5	<9.5	<100	ND *	<25	6.80	6.80
FB-SUMP	05/17/06	Field Blank	<47	<9.4	<9.4	--	--	--	--	--
FB-SUMP	05/18/06	Field Blank	<47	<9.4	<9.4	--	--	--	--	--
FB-SUMP	08/21/06	Field Blank	<47	<9.4	<9.4	--	--	--	--	--

Table 28
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium, pH, and Sulfide Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8270C			376.2	SW846 9030B	7196 A	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (µg/L)	Chrysene (µg/L)	Pyrene (µg/L)	Total (µg/L)	Reactive (µg/L)	(µg/L)		

Notes:
* = Analyte was quantitated below the established linear calibration range. Amount reported is an estimate.
** = pH was measured in the field using a Horriba U-22XB water quality meter
J = Analyte was detected between the MDL and the RL
LN,AY = The MS &/or the MSD were below acceptance limits due to sample matrix interference.
ND = Not Detected. This data was obtained from a summary table of a report not prepared by SECOR. The actual laboratory reports are not available, thus MDL's can not be determined for this data.
ND* = no MDL for reactive sulfide identified by the laboratory
<# = Analyte was not detected above the Reporting Limit (#)
NS = Not sampled
D = detected below quantitation limit
MB = Analyte present in Method Blank
µg/L = micrograms per liter
-- = Not applicable / Not analyzed
Add.Data = additional data located (Sep 2006) and included in this table, reference DTSC, 2000 and 2001 report.
pH measurements on June 15, 2000 were obtained using pH paper
pH measurements reported prior to 2006 were obtained from a summary table of a report not prepared by SECOR. The pH measurements are presumed to have been obtained in the field.
Results highlighted with **Bold** font indicate results > RL
Sample ID'd with GW as a precurser to the depth indicates a hydropunch sample.
Prior to 2006, some table data was incorrectly represented in mg/L and has been updated to correctly reflect µg/L.
For safety and security reasons, the surface water sampling locations in the Dominguez Flood Control Channel (DFCC) have been re-located.
During the second quarter 2007 the instrument used to measure pH in wells completed in the upper saturated zone had calibration issues that resulted in slightly lower pH values.
During the third quarter 2007 a calibration issue developed in the instrument used to measure pH values in wells within the lower saturated zone resulting in slightly elevated pH values.

References:

DTSC, 2000 and 2001. *2000 and 2001 Groundwater Sampling Report for Gardena Sumps.*
DTSC, 2002. *2002 Groundwater Sampling Report for Gardena Sumps.*
URS, 1994. *Groundwater Remedial Investigation Technical Memorandum* , Gardena Sumps, 1440 West Artesia Boulevard, Gardena, CA., November 14.
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.

Table 29
Summary of Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
MW-01A	05/11/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.20
MW-01A	06/15/00		--	--	**161**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	06/22/01		--	--	**61**	--	--	--	--	--	--	--	--	--	--	--	--	--	0.40**
MW-01A	02/28/02		<10	<10	**53**	<1.0	<1.0	<10	--	<2.0	<10	--	<10	<10	<10	<10	<10	<10	--
MW-01A	02/16/06		0.38 J	0.97 J	**77**	<0.50	0.18 J	<2.0	0.34 J	1.8 J	<1.0	**3.2**	<2.0	1.5 J	<1.0	<1.0	**6.4**	2.4 J	<0.20
MW-01A	05/17/06		<2.0	<1.0	**69**	<0.50	<1.0	<2.0	<2.0	<2.0	<1.0	**3.4**	<2.0	<2.0	<1.0	<1.0	**6.1**	<20	<0.20
MW-01A	08/21/06		0.36 J	1.1 J	**88**	<0.50	0.18 J	<2.0	0.35 J	1.1 J	0.13 J	**4.7**	1.9 J	1.9 J	<1.0	0.31 J	**5.6**	3.4 J	<0.20
MW-01A	11/20/06		0.14 J	<1.0	**80**	<0.50	0.22 J	<2.0	0.44 J	1.7 J	<1.0	**3.6**	1.5 J	1.2 J	<1.0	<1.0	**6.8**	3.4 J	<0.20
MW-01A	03/02/07		0.066 J	0.74 J	**74**	<0.50	0.15 J	<2.0	0.44 J	1.5 J	<1.0	**3.3**	<2.0	0.78 J	<1.0	<1.0	**5.8**	4.1 J	<0.20
MW-01A	05/18/07		<2.0	**1.1**	**71 CQ**	<0.50	0.18 J	<2.0	0.38 J	1.1 J	<1.0	**2.5**	1.1 J	1.2 J	<1.0	<1.0	**6.7**	3.2 J, MB	<0.20
MW-01A	08/23/07		<10	<5.0	**85**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.5 J	<10	1.9 J	<5.0	<5.0	4.1 J	<100	<0.20
MW-01A	11/15/07		<2.0	**1.4**	**72**	<0.50	0.13 J	<2.0	0.39 J	0.81 J	<1.0	**2.7**	<2.0	0.48 J	<1.0	<1..0	**5.2**	<20	<0.20
MW-01A	02/19/08		<2.0	**1.8**	**83**	<0.50	0.11 J	<2.0	0.47 MB,J	1.3 J	<1.0	**3.4**	<2.0	0.48 J	<1.0	<1..0	**5.4**	3.0 J	<0.20
MW-01A	05/19/08		<2.0	**1.5**	**74**	<0.50	0.18 J	<2.0	0.27 J	1.2 J	<1.0	**3.1**	<2.0	1.7 J,MB	<1.0	<1..0	**5.4**	3.9 J	<0.20
MW-01B	01/21/94		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	05/11/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.20
MW-01B	06/15/00		--	--	**480**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	06/22/01		--	--	**263**	--	--	--	--	--	--	--	--	--	--	--	--	--	0.40**
MW-01B	02/28/02		<10	<10	**110**	<1.0	**1.0**	<10	--	--	<10	--	<10	<10	<10	<10	<10		--
MW-01B	02/16/06		0.18 J	0.58 J	**500**	<0.5	0.16 J	<2.0	0.41 J	1.3 J	<1.0	**2.3**	<2.0	**3.0**	<1.0	<1.0	<2.0	1.4 J	<0.20
MW-01B	05/17/06		<2.0	<1.0	**440**	<0.50	<1.0	<2.0	<2.0	<2.0	<1.0	**2.5**	<2.0	**2.6**	<1.0	<1.0	<2.0	<20	<0.20
MW-01B	08/21/06		0.23 J	<1.0	**440**	<0.50	0.11 J	<2.0	0.45 J	0.60 J	0.15 J	2.2 J	2.6 J	**4.1**	<1.0	<1.0	<2.0	3.7 J	<0.20
MW-01B	11/20/06		0.56 J	0.75 J	**400**	0.078 J	0.11 J	<2.0	0.26 J	1.8 J	<1.0	**2.6**	<2.0	**2.1**	<1.0	<1.0	1.2 J	6.5 J	<0.20
MW-01B	03/02/07		0.82 J	0.71 J	**250**	<0.50	0.15 J	<2.0	0.25 J	**2.3**	<1.0	**3.1**	<2.0	1.7 J	<1.0	<1.0	1.6 J	3.8 J	<0.20
MW-01B	05/18/07		0.64 J	<1.0	**350 CQ**	<0.50	0.18 J	0.77 J	0.34 J	1.6 J	0.11 J	**2.9**	1.7 J	**2.2**	<1.0	<1.0	1.4 J	6.7 J,MB	<0.20
MW-01B	08/23/07		<10	<5.0	**270**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.3 J	<10	3.8 J	<5.0	<5.0	<10	18 J	<0.20
MW-01B	11/15/07		0.51 J	**1.4**	**280**	<0.50	0.14 J	<2.0	0.30 J	1.5 J	<1.0	**3.1**	<2.0	1.5 J	<1.0	<1.0	1.2 J	<20	<0.20
MW-01B	02/19/08		<2.0	**1.3**	**350**	<0.50	0.16 J	<2.0	0.29 MB,J	1.0 J	<1.0	**2.8**	<2.0	1.6 J	<1.0	<1.0	1.3 J	<20	<0.20
MW-01B	05/19/08		<2.0	**1.4**	**280**	<0.50	0.14 J	<2.0	0.40 J	0.77 J	<1.0	**2.5**	<2.0	**3.6 CQ**	<1.0	<1..0	1.4 J	11 J	<0.20
MW-02A	01/21/94		--	--	--	--	--	--		--	--	--	--	--	--	--	--	--	--
MW-02A	05/11/94		--	--	<1.0	--	--	--		--	--	--	--	--	--	--	--	--	<0.20
MW-02A	06/15/00		--	--	**130**	--	--	--		--	--	--	--	--	--	--	--	--	--
MW-02A	06/25/01		--	--	**30**	--	--	--		--	--	--	--	--	--	--	--	--	ND**
MW-02A	02/28/02		<10	<10	**34**	<1.0	<1.0	<10	<2.0	<2.0	<10	--	<10	<10	<10	<10	<10	<10	--
MW-02A	02/16/06		0.081 J	<1.0	**48**	<0.50	0.20 J	<2.0	**1.6**	**2.2**	<1.0	**6.5**	<2.0	1.6 J	<1.0	<1.0	**4.4**	**2.3**	<0.20
MW-02A	05/18/06		<2.0	0.68 J	**58**	<0.50	0.32 J	<2.0	0.92 J	1.9 J	<1.0	5.5 J	1.4 J	0.61 J	<1.0	<1.0	**5.5**	**1400 CQ**	<0.20
2MW-02A	05/18/06	Duplicate	<2.0	0.68 J	**59**	<0.50	0.28 J	<2.0	0.96 J	1.9 J	<1.0	5.7 J	1.7 J	0.47 J	<1.0	<1.0	**5.5**	**9.8**	<0.20
MW-02A	08/22/06		<2.0	<1.0	**47**	<0.50	0.27 J	<2.0	1.3 J	1.2 J	0.08 J	**5.4**	1.5 J	<2.0	<1.0	<1.0	**4.9**	5.4 J	<0.20
2MW-02A	08/22/06	Duplicate	<2.0	<1.0	**47**	<0.50	0.27 J	<2.0	1.3 J	1.1 J	<1.0	**5.3**	1.5 J	<2.0	<1.0	<1.0	**4.1**	2.1 J	<0.20
MW-02A	11/21/06		0.32 J	<1.0	**49**	<0.50	0.32 J	<2.0	**1.6**	**2.0**	<1.0	**6.8**	0.98 J	0.72 J	<1.0	<1.0	**5.0**	11 J	<0.20
MW-02A	03/01/07		0.067 J	<1.0	**46**	<0.50	0.20 J	<2.0	**1.4**	1.7 J	<1.0	**6.2**	<2.0	0.45 J	<1.0	<1.0	**4.6**	4.7 J	<0.20
MW-02A	05/17/07		<2.0	<1.0	**42 CQ**	<0.50	0.2 J	<2.0	0.86 J	1.5 J	<1.0	**5.8**	1.4 J	0.52 J	<1.0	<1.0	**3.8**	<20	<0.20
MW-02A	08/24/07		<10	<5.0	**40**	<2.5	<5.0	<10	1.5 J	8.2 J	<1.0	6.0 J	<10	<2.0	<5.0	<5.0	4.8 J	<100	**65**
MW-02A	11/16/07		<2.0	**1.2**	**46**	<0.50	0.21 J	<2.0	**1.6**	1.3 J	<1.0	**6.4**	<2.0	<2.0	<1.0	<1.0	**3.8**	<20	<0.20
MW-02A	02/20/08		<2.0	<1.0	**47**	<0.50	0.19 J	<2.0	**1.4 MB**	1.6 J	<1.0	**6.5**	<2.0	0.32 J	<1.0	<1.0	**4.7**	<20	<0.20
MW-02A	05/20/08		<2.0	<1.0	**37**	<0.50	0.14 J	<2.0	0.83 J	1.2 J	<1.0	**5.7**	<2.0	1.2 J,MB	<1.0	<1.0	**3.5**	<20	<0.20

Table 29
Summary of Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
MW-02B	05/11/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.20
MW-02B	06/19/00		--	--	**110**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-02B	06/25/01		--	--	**40**	--	--	--	--	--	--	--	--	--	--	--	--	--	ND**
MW-02B	02/28/02		**11**	**11**	**30**	**1.0**	**1.0**	<10	--	--	**14**	--	<10	14	<10	**18**	**11**	<10	--
MW-02B	02/16/06		<2.0	0.78 J	**33**	<0.50	<1.0	<2.0	0.35 J	**4.7**	<1.0	**2.7**	<2.0	**3.9**	<1.0	<1.0	<2.0	3.0 J	<0.20
2MW-02B	02/16/06	Duplicate	<2.0	0.61 J	**31**	<0.50	<1.0	1.6 J	0.32 J	**4.6**	<1.0	**2.7**	<2.0	**3.6**	<1.0	<1.0	<2.0	8.0 J	<0.20
MW-02B	05/17/06		<2.0	<1.0	**33**	<0.50	0.32 J	<2.0	<2.0	**2.2**	<1.0	**2.8**	<2.0	**2.9**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/22/06		<2.0	1.2 J	**32**	<0.50	<1.0	<2.0	0.39 J	1.2 J	0.14 J	3.2 J	2.9 J	**5.2**	<1.0	<1.0	<2.0	3.4 J	<0.20
MW-02B	11/21/06		0.22 J	<1.0	**32**	0.078 J	<1.0	<2.0	0.34 J	1.8 J	<1.0	**3.4**	1.6 J	**4.7**	<1.0	<1.0	<2.0	3.1 J	<0.20
MW-02B	03/01/07		<2.0	**1.4**	**28**	<0.50	<1.0	<2.0	0.28 J	1.7 J	<1.0	**2.8**	<2.0	**2.7**	<1.0	<1.0	<2.0	5.8 J	<0.20
MW-02B	05/17/07		<2.0	<1.0	**36 CQ**	<0.50	<1.0	<2.0	0.29 J	1.5 J	<1.0	**3.2**	2.0	**2.2**	<1.0	<1.0	<2.0	3.1 J	<0.20
MW-02B	08/24/07		<10	<5.0	**27**	<2.5	<5.0	<10	<5.0	<10	<5.0	2.8 J	<10	6.3 J	<5.0	<5.0	<10	**150**	<0.20
MW-02B	11/16/07		<2.0	**1.9**	**30**	<0.50	<1.0	<2.0	0.24 J	1.1 J	<1.0	**2.8**	<2.0	1.1 J	<1.0	<1.0	<2.0	5.0 J	<0.20
MW-02B	02/20/08		<2.0	0.97 J	**30**	<0.50	<1.0	<2.0	0.16 MB,J	**2.0**	<1.0	**3.0**	<2.0	<2.0	<1.0	<1.0	<2.0	2.9 J	0.10 J
MW-02B	05/20/08		<2.0	0.98 J	**32**	<0.50	<1.0	<2.0	0.24 J	**2.1**	<1.0	**3.2**	<2.0	**2.5 MB**	<1.0	<1.0	<2.0	3.0 J	<0.20
MW-03A	05/10/94		--	--	<1.0	--	--	--		--	--	--	--	--	--	--	--	--	<0.2
MW-03A	06/15/00		--	--	**170**	--	--	--		--	--	--	--	--	--	--	--	--	--
MW-03A	06/22/01		--	--	**70**	--	--	--		--	--	--	--	--	--	--	--	--	ND**
MW-03A	02/28/02		**15**	**12**	**70**	**1.0**	**1.0**	<10		**10**	**19**	--	<10	**18**	**<10**	**15**	**15**	<10	--
MW-03A	02/17/06		1.3 J	<1.0	**66**	<0.50	0.042 J	**2.3**	0.14 J	1.3 J	<1.0	1.4 J	<2.0	1.3 J	<1.0	<1.0	**4.6**	1.2 J	<0.20
MW-03A	05/18/06		0.10 J	<1.0	**70**	<0.50	0.034 J	1.7 J	0.21 J	1.3 J	0.066 J	1.1 J	1.2 J	0.42 J	<1.0	<1.0	**5.3**	15 J	<0.20
MW-03A	08/22/06		<2.0	<1.0	**68**	<0.50	0.17 J	2.2 J	0.26 J	0.93 J	0.23 J	0.96 J	1.6 J	0.68 J	<1.0	<1.0	**4.4**	4.9 J	<0.20
MW-03A	11/20/06		0.15 J	<1.0	**74**	<0.50	0.071 J	1.4 J	0.16 J	1.1 J	<1.0	1.1 J	<2.0	0.30 J	<1.0	<1.0	**5.5**	<20	<0.20
2MW-03A	11/20/06	Duplicate	0.13 J	<1.0	**76**	<0.50	0.083 J	1.5 J	0.22 J	1.4 J	<1.0	1.0 J	<2.0	<2.0	<1.0	<1.0	**5.3**	7.5 J	<0.20
MW-03A	03/01/07		0.099 J	0.78 J	**74**	<0.50	<1.0	1.8 J	0.22 J	0.91 J	<1.0	1.1 J	<2.0	<2.0	<1.0	<1.0	**5.1**	4.8 J	<0.20
2MW-03A	03/02/07	Not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-03A	05/17/07		0.2 J	<1.0	**82 CQ**	<0.50	<1.0	1.2 J	0.18 J	0.81 J	<1.0	1.2 J	1.6 J	0.38 J	<1.0	<1.0	**3.9**	<20	<0.20
MW-03A	08/24/07		<10	<5.0	**73**	<2.5	<5.0	<10	<5.0	<10	<5.0	1.2J	<10	1.8 J	<5.0	<5.0	3.7J	**130**	<0.20
MW-03A	11/15/07		<2.0	0.86 J	**79**	<0.50	<1.0	1.2 J	0.15 J	<2.0	<1.0	1.0 J	<2.0	<2.0	<1.0	<1.0	**3.4**	2.6 J	<0.20
MW-03A	02/19/08		<2.0	0.98 J	**88**	<0.50	<1.0	1.1 J	<1.0	1.2 J	<1.0	1.1 J	<2.0	<2.0	<1.0	<1.0	**3.9**	2.5 J	<0.20
MW-03A	05/19/08		<2.0	<1.0	**88**	<0.50	<1.0	1.5 J	0.23 J	0.83 J	<1.0	1.0 J	<2.0	1.4 J,MB	<1.0	<1..0	**4.3**	<20	<0.20
MW-03B	05/10/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.2
MW-03B	07/05/00		--	--	**130**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-03B	06/25/01		--	--	**40**	--	--	--	--	--	--	--	--	--	--	--	--	--	ND**
MW-03B	02/28/02		**10**	<10	**137**	**1.0**	**1.5**	<10	--	--	**15**	--	**14**	**11**	<10	<10	<10	<10	--
MW-03B	02/17/06		1.1 J	**3.0**	**65**	<0.50	<1.0	0.63 J	0.42 J	**3.1**	<1.0	**2.7**	<2.0	**2.8**	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-03B	05/18/06		0.40 J	<1.0	**65**	<0.50	0.32 J	<2.0	0.60 J	2.0 J	0.38 J	2.9 J	<2.0	1.7 J	0.33 J	<1.0	<2.0	**11**	<0.20
MW-03B	08/22/06		<2.0	<1.0	**68**	<0.50	<1.0	<2.0	0.37 J	0.70 J	0.11 J	3.5 J	4.7	2.8 J	<1.0	<1.0	<2.0	3.8 J	<0.20
MW-03B	11/20/06		0.34 J	**1.2**	**80**	<0.50	<1.0	<2.0	0.38 J	1.4 J	<1.0	**4.6**	**3.3**	**2.9**	<1.0	0.20 J	<2.0	4.1 J	<0.20
MW-03B	03/02/07	Not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-03B	05/17/07		0.2 J	**2.0**	**71 CQ**	<0.50	<1.0	<2.0	0.30 J	0.95 J	<1.0	**4.2**	**3.4**	**2.3**	<1.0	0.16 J	<2.0	3.4 J	<0.20
MW-03B	08/24/07		<10	<5.0	**54**	<2.5	<5.0	<10	<5.0	<10	<5.0	3.7 J	<10	5.5 J	<5.0	<5.0	<2.0	**230**	<0.20
MW-03B	11/15/07		<2.0	**3.0**	**57**	<0.50	<1.0	<2.0	0.30 J	<2.0	<1.0	**3.1**	<2.0	0.37 J	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-03B	02/19/08		<2.0	**4.0**	**54**	<0.50	<1.0	<2.0	0.35 J	1.8 J	<1.0	**2.9**	<2.0	<2.0	<1.0	<1.0	<2.0	7.9 J	<0.20
MW-03B	05/19/08		<2.0	**3.2**	**52**	<0.50	<1.0	<2.0	0.31 J	1.1 J	<1.0	**3.2**	<2.0	**2.0 MB**	<1.0	<1..0	<2.0	2.7 J	<0.20

Table 29
Summary of Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020															7470 A
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
MW-04A	03/02/07	New Well	0.36 J	**1.7**	**21**	<0.50	0.21 J	<2.0	**1.8**	**2.8**	0.16 J	**5.4**	**2.3**	**4.4**	<1.0	<1.0	**13**	**40 LN,AY**	<0.20
MW-04A	05/17/07		0.26 J	**2.3**	**22 CQ**	<0.50	0.24 J	<2.0	**1.1**	**2.5**	<1.0	**5.6**	**3.1**	**4.9**	<1.0	<1.0	**9.9**	**6.3**	<0.20
MW-04A	08/23/07		<10	4.8J	**21**	<2.5	<5.0	<10	1.2 J	<10	<1.0	5.6 J	7.2J	**13**	<5.0	<5.0	9.6J	18 J	<0.20
MW-04A	11/16/07		<2.0	3.30	**20**	<0.50	0.26 J	<2.0	**1.0**	**4.3**	<1.0	**4.7**	<2.0	**2.2**	<1.0	<1.0	**11**	4.8 J	<0.20
MW-04A	02/20/08		<2.0	**2.1**	**22**	<0.50	0.24 J	<2.0	0.84 MB,J	**3.1**	<1.0	**4.9**	<2.0	<2.0	<1.0	<1.0	**13**	4.6 J	<0.20
MW-04A	05/20/08		<2.0	**2.3**	**25**	<0.50	0.33 J	<2.0	**1.1**	**4.0**	<1.0	**5.3**	1.5 J	**3.9 CQ**	<1.0	<1.0	**12**	12 J	<0.20
MW-04B	03/02/07	New Well	0.80 J	**6.5**	**120**	<0.50	<1.0	<2.0	0.50 J	**2.1**	0.38 J	**7.1**	<2.0	**1.5**	<1.0	<1.0	0.93 J	12 J	<0.20
MW-04B	05/17/07		<2.0	**8.9**	**86 CQ**	<0.50	<1.0	<2.0	0.35 J	1.4 J	<1.0	**3.6**	1.6 J	**2.8**	<1.0	<1.0	<2.0	2.8 J	<0.20
MW-04B	08/23/07		<10	**13**	**74**	<2.5	<5.0	3.7 J	<5.0	<10	<1.0	3.0 J	5.0 J	7.4 J	<5.0	<5.0	<10	14 J	<0.20
MW-04B	11/16/07		<2.0	**8.4**	**67**	<0.50	<1.0	<2.0	0.36 J	1.3 J	<1.0	**2.9**	<2.0	1.2 J	<1.0	<1.0	<2.0	3.4 J	<0.20
MW-04B	02/20/08		<2.0	**6.8**	**60**	<0.50	<1.0	<2.0	0.28 MB,J	**2.0**	<1.0	**3.0**	<2.0	<2.0	<1.0	<1.0	<2.0	4.0 J	<0.20
MW-04B	05/20/08		<2.0	**5.8**	**54**	<0.50	<1.0	<2.0	0.35 J	**2.9**	<1.0	**3.0**	<2.0	**3.2 MB**	<1.0	<1.0	<2.0	4.2 J	<0.20
G-1	+		--	--	--	<0.50	--	--	--	<2.0	--	--	--	--	<1.0	--	--	<20	--
G-2	+		--	--	--	<0.50	--	--	--	<2.0	--	--	--	--	20	--	--	<20	--
G-3	+		--	--	--	<0.50	--	--	--	<2.0	--	--	--	--	30	--	--	<20	--
G-4	+		--	--	--	<0.50	--	--	--	<2.0	--	--	--	--	<1.0	--	--	<20	--
G-4	05/10/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.20
G-4	06/15/00		--	--	**134**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G-4	06/22/01		--	--	**50**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G-4	02/28/02		**14**	**11**	**44**	**1.0**	**1.5**	**25**	--	**11**	**19**	--	**26**	**17**	**11**	**21**	**19**	<20	<0.20
G-4	02/17/06		0.32 J	0.80 J	**44**	<0.50	<1.0	<2.0	0.92 J	**4.8**	<1.0	**2.4**	0.36 J	**4.6**	<1.0	<1.0	**8.4**	4.2 J	<0.20
G-4	05/18/06		0.17 J	**1.0**	**42**	<0.50	0.046 J	<2.0	0.95 J	**2.8**	0.057 J	**3.0**	**3.9**	**3.8**	<1.0	<1.0	**8.6**	**6.8**	<0.20
G-4	08/21/06		0.16 J	<1.0	**43**	<0.50	0.056 J	1.4 J	1.3 J	2.3 J	0.40 J	2.9 J	**5.0**	**4.2**	<1.0	<1.0	**10.0**	7.0 J	<0.20
G-4	11/20/06		0.15 J	0.80 J	**48**	<0.50	<1.0	<2.0	**1.1**	**2.3**	<1.0	**3.0**	**2.3**	**3.4**	<1.0	<1.0	**9.2**	10 J	<0.20
G-4	03/01/07		0.078 J	**1.1**	**35**	<0.50	<1.0	<2.0	0.99 J	**2.2**	<1.0	**3.0**	1.2 J	**2.6**	<1.0	<1.0	**9.4**	9.1 J	<0.20
G-4	05/18/07		<2.0	**1.0**	**43 CQ**	<0.50	<1.0	<2.0	**1.0**	**3.5**	0.12 J	**3.0**	**2.3**	**2.5**	<1.0	<1.0	**8.6**	4.1 J,MB	<0.20
G-4	08/24/07		<10	<5.0	**35**	<2.5	<5.0	<10	0.98J	<10	<1.0	2.6 J	<2.0	7.6 J	<1.0	<1.0	9.1 J	<100	<0.20
G-4	11/15/07		<2.0	<1.0	**37**	<0.50	<1.0	<2.0	0.93 J	1.6 J	<1.0	**2.6**	<2.0	1.2 J	<1.0	<1.0	**6.9**	<20	<0.20
G-4	02/20/08		<2.0	**2.0**	**44**	<0.50	<1.0	<2.0	0.96 MB,J	**3.0**	<1.0	**2.6**	<2.0	0.32 J	<1.0	<1.0	**8.3**	8.3 J	<0.20
G-4	05/19/08		<2.0	0.82 J	**54**	<0.50	<1.0	<2.0	**1.1**	**3.4**	<1.0	**2.5**	<2.0	**3.6 CQ**	<1.0	<1.0	**7.1**	5.6 J	<0.20
CPB09-GW-29	01/26/06		1.2 J	**60**	**5,400**	**15**	**7.9**	**520**	**300**	**680**	**230**	**14**	**560**	9.1 J	1.3 J	**5.2**	**1,100**	**1,600**	**0.4**
CPB09-GW-53	01/26/06		3.2 J	**190**	**1,200**	**4.3**	4.6 J	**340**	**110**	**270**	**81**	**38**	**220**	**25**	0.62 J	2.3 J	**670**	**540**	**0.58**
CPB09-GW-80	01/26/06		7.5 J	**220**	**2,300**	**5.8**	4.5 J	**330**	**170**	**580**	**190**	**17**	**300**	9.6 J	2.0 J	2.2 J	**550**	**770**	**1.5**
CPB25-GW-28	01/25/06		1.2 J	**50**	**5,800**	**20**	**7.1**	**460**	**290**	**580**	**190**	9.0 J	**400**	1.8 J	1.1 J	**5.1**	**1,000**	**1,600**	**0.55**
CPB25-GW-52	01/25/06		2.8 J	**130**	**750**	2.0 J	0.53 J	**180**	**58**	**110**	**42**	**30**	**110**	**18**	0.16 J	0.96 J	**400**	**280**	**0.48**
CPB26-GW-29	01/25/06		**3.5**	**55**	**3,700**	**10**	**3.4**	**440**	**260**	**540**	**160**	**20**	**360**	**2.7**	**0.56**	**4.4**	**910**	**1,200**	**0.49**
CPB26-GW-55	01/25/06		**3.4**	**280**	**1,400**	**5.1**	**2.6**	**370**	**130**	**260**	**98**	**44**	**250**	**32**	**1.1**	**4.6**	**770**	**660**	**0.2**
CPB26-GW-80	01/25/06		6.6 J	**960**	**5,600**	**16**	9.7 J	**890**	**490**	**1,600**	**570**	**62**	**860**	15 J	3.4 J	6.1 J	**1,200**	**2,000**	**3.1**
CPB26-GW-80	01/26/06		7.0 J	**210**	**3,300**	**8.5**	4.1 J	**450**	**250**	**880**	**310**	**14**	**460**	7.9 J	1.8 J	3.6 J	**740**	**1,100**	**2.8**
CPB26-2GW-80	01/25/06		8.7 J	**290**	**1,600**	**4.8**	2.7 J	**240**	**130**	**380**	**150**	**38**	**230**	8.2 J	0.78 J	3.2 J	**350**	**540**	**1.0**
CPB27-GW-25	01/24/06		0.58 J	<1.0	**66**	0.080 J	**2.3**	**3.6**	**28**	**9.8**	0.87 J	**9.1**	**39**	**9.7**	0.069 J	0.15 J	**9.3**	**20**	**0.71**
CPB27-GW-52	01/24/06		0.35 J	**5.1**	**73**	0.17 J	0.085 J	**8.7**	**5.4**	**13**	**2.0**	**7.2**	**17**	**13**	<1.0	<1.0	**23**	**24**	0.071 J
CPB27-GW-78	01/24/06		**3.7**	**36**	**230**	0.41 J	0.21 J	**27**	**11**	**36**	**14**	**20**	**27**	**2.7**	0.093 J	<1.0	**39**	**46**	0.17 J
HPB10-GW-55	02/23/06		<4.0	**74**	**1,100**	**4.5**	**2.2**	**260**	**110**	**150**	**67**	**11**	**180**	<4.0	0.41 J	**2.7**	**500**	**530**	**0.00078**
HPB10-GW-71	02/23/06		2.7 J	**60**	**850**	**3.2**	1.6 J	**150**	**66**	**280**	**110**	**15**	**120**	**6.4**	0.15 J	0.85 J	**250**	**320**	**0.0013**

Table 29
Summary of Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020															7470 A
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
UG-CHAN-20060216	02/16/06		0.37 J	**1.1**	**89**	<0.50	0.17 J	1.9 J	0.45 J	**11**	0.86 J	**6.0**	1.3 J	**3.2**	<1.0	<1.0	**4.4**	**21**	<0.20
FDCC-W-20080520	05/20/08		**2.5**	**2.7**	**100**	<0.50	0.24 J	1.1 J	0.60 J	**14**	**3.1**	**10**	**2.4**	0.98 J	<1.0	<1.0	**6.5**	**27**	<0.20
DG-CHAN-20060216	02/16/06		1.2 J	<1.0	**110**	<0.50	0.33 J	**2.9**	0.96 J	**17**	**4.9**	**5.4**	**2.4**	1.6 J	0.070 J	<1.0	**4.9**	**64**	<0.20
FDCC-E-20080520	05/20/08		**2.3**	**3.0**	**93**	<0.50	0.25 J	1.2 J	0.65 J	**16**	**2.4**	**11**	**2.9**	1.1 J	<1.0	<1.0	**6.3**	**33**	<0.20
FB-SUMP	02/16/06	Field Blank	0.050 J	<1.0	0.39 J	<0.50	<1.0	0.80 J	<2.0	0.52 J	<1.0	<2.0	<2.0	0.58 J	<1.0	<1.0	<2.0	<20	<0.20
FB-SUMP	02/17/06	Field Blank	0.15 J	<1.0	<1.0	<0.50	<1.0	0.89 J	<2.0	0.75 J	<1.0	<2.0	<2.0	0.53 J	<1.0	<1.0	<2.0	<20	<0.20
FB-SUMP	05/17/06	Field Blank	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FB-SUMP	05/18/06	Field Blank	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
* = Analyte was quantitated below the established linear calibration range. Amount reported is an estimate.
** = Method in water by manual cold vapor
+ = Sampling occurred between August 10 and 17, 1987
CQ = Analyte concentration greater than 10 times the blank concentration
J = Analyte was detected between the MDL and the RL
LN,AY = The MS &/or the MSD were below acceptance limits due to sample matrix interference.
ND = Not Detected. This data was obtained from a summary table of a report not prepared by SECOR.
The actual laboratory reports are not available, thus MDL's can not be determined for this data.
MB = Analyte present in Method Blank
<# = Analyte was not detected above the Reporting Limit (#)
µg/L = micrograms per liter
-- = Not applicable / Not analyzed
Results highlighted with **Bold** font indicate results > RL
Sample ID'd with GW as a precurser to the depth indicates a hydropunch sample.
Prior to 2006, some table data was incorrectly represented in mg/L and has been updated to correctly reflect µg/L.
For safety and security reasons, the surface water sampling locations in the Dominguez Flood Control Channel (DFCC) have been re-located.

References:

Ecology and Environment, 1987. *Site Inspection Report Gardena Sumps, Gardena California.*
DTSC, 2000 and 2001. *2000 and 2001 Groundwater Sampling Report for Gardena Sumps.*
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Table 30
Summary of Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)																7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
MW-01A	05/17/06		<2.0	**1.3**	**75**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.6**	<2.0	<2.0	<1.0	<1.0	**6.6**	<20	<0.20
MW-01A	08/21/06		0.26 J	<1.0	**79**	<0.50	0.14 J	<2.0	0.31 J	1.1 J	<1.0	**3.5**	**3.0**	1.1 J	<1.0	<1.0	**4.3**	2.5 J	<0.20
MW-01A	11/20/06		0.080 J	<1.0	**77**	<0.50	0.18 J	<2.0	0.34 J	1.4 J	<1.0	**3.4**	<2.0	0.99 J	<1.0	<1.0	**6.5**	2.6 J	<0.20
MW-01A	03/02/07	No sample	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	05/18/07		<2.0	**1.6**	**66**	<0.50	0.15 J	<2.0	0.37 J	1.0 J	<1.0	**2.7**	1.5 J	1.7 J	<1.0	<1.0	**6.0**	<20	<0.20
MW-01A	08/23/07		<10	<5.0	**78**	<2.5	<5.0	<10	<5.0	<10	<5.0	3.9 J	<10	<10	<5.0	<5.0	3.6 J	<100	<0.20
MW-01A	11/15/07		<2.0	**1.0**	**68**	<0.50	0.15 J	<2.0	0.41 J	1.3 J	0.13 J	**2.3**	<2.0	0.77 J	<1.0	<1.0	**5.7**	19 J	<0.20
MW-01A	02/19/08		0.23 J	**1.5**	**85**	<0.50	0.13 J	<2.0	0.57 J	1.4 J	<1.0	**3.6**	<2.0	0.68 J	<1.0	<1.0	**5.1**	2.7 J	<0.20
MW-01A	05/19/08		<2.0	**1.5**	**88**	<0.50	0.14 J	<2.0	0.35 J	1.1 J	<1.0	**3.5**	<2.0	**2.0 MB**	<1.0	<1.0	**5.4**	<20	<0.20
MW-01B	05/17/06		<2.0	**1.7**	**470**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**2.7**	<2.0	**2.5**	<1.0	<1.0	<2.0	<20	<0.20
MW-01B	08/21/06		0.21 J	<1.0	**450**	<0.50	0.091 J	<2.0	0.43 J	0.73 J	<1.0	1.9 J	**4.4**	**3.6**	<1.0	<1.0	1.0 J	3.3 J	<0.20
MW-01B	11/20/06		0.78 J	<1.0	**340**	<0.50	0.12 J	<2.0	0.24 J	**2.1**	<1.0	**3.1**	<2.0	1.6 J	<1.0	<1.0	1.5 J	<20	<0.20
MW-01B	03/02/07		0.95 J	0.76 J	**260**	<0.50	0.16 J	<2.0	0.24 J	**2.4 MB**	<1.0	**3.3**	<2.0	1.9 J	<1.0	<1.0	1.6 J	6.4 J	<0.20
MW-01B	05/18/07		0.66 J	**1.3**	**330**	<0.50	0.15 J	<2.0	0.37 J	1.3 J	<1.0	**3.2**	**2.2**	**4.5**	<1.0	<1.0	0.90 J	<20	<0.20
MW-01B	08/23/07		<2.0	<1.0	**260**	<2.5	<5.0	<10	<5.0	<10	<5.0	3.9J	<10	1.6J	<5.0	<5.0	<10	<100	<0.20
MW-01B	11/15/07		0.52 J	<1.0	**280**	<0.50	0.15 J	<2.0	0.35 J	1.8 J	<1.0	**3.0**	<2.0	**2.3**	<1.0	<1.0	1.1 J	2.6 J	<0.20
MW-01B	02/19/08		0.22 J	<1.0	**340**	<0.50	0.20 J	<2.0	0.45 J	1.2 J	<1.0	**3.2**	<2.0	**2.2**	<1.0	<1.0	1.0 J	3.0 J	<0.20
MW-01B	05/19/08		<2.0	<1.0	**350**	<0.50	<1.0	<2.0	0.38 J	<2.0	<1.0	**2.6**	<2.0	**3.4 MB**	<1.0	<1.0	0.98 J	<20	<0.20
MW-02A	05/18/06		<2.0	**1.1**	**57**	<0.50	0.31 J	<2.0	**1.0**	**9.4**	<1.0	**5.5**	1.4 J	0.35 J	<1.0	<1.0	**5.9**	3.6 J	<0.20
2MW-02A	05/18/06	Duplicate	<2.0	<1.0	**54**	<0.50	0.32 J	<2.0	**1.1**	**2.0**	<1.0	**5.9**	**2.3**	0.40 J	<1.0	<1.0	**5.6**	3.4 J	<0.20
MW-02A	08/22/06		<2.0	<1.0	**49**	<0.50	0.21 J	<2.0	**1.0**	1.4 J	0.18 J	**5.0**	**2.5**	0.35 J	<1.0	<1.0	**3.2**	3.7 J	<0.20
2MW-02A	08/22/06	Duplicate	<2.0	<1.0	**50**	<0.50	0.22 J	<2.0	**1.0**	1.3 J	<1.0	**5.2**	**2.5**	<2.0	<1.0	<1.0	**2.6**	2.3 J	<0.20
MW-02A	11/21/06		0.083 J	<1.0	**48**	<0.50	0.22 J	<2.0	**1.5**	1.8 J	<1.0	**6.2**	<2.0	0.72 J	<1.0	<1.0	**4.8**	<20	<0.20
MW-02A	03/02/07		0.087 J	**1.0 MB**	**45 CQ**	<0.50	0.22 J	<2.0	**1.4**	**2.7 MB**	<1.0	**6.1**	<2.0	0.38 J	<1.0	<1.0	**4.5**	5.2 MB,J	<0.20
MW-02A	05/17/07		<2.0	<1.0	**41**	<0.50	0.18 J	<2.0	0.82 J	1.3 J	<1.0	**5.8**	0.95 J	0.60 J	<1.0	<1.0	**4.4**	<20	<0.20
MW-02A	08/24/07		<10	<5.0	**47**	<2.5	<5.0	<10	1.6 J	<10	<1.0	7.6 J	<10	<10	<5.0	<5.0	4.4J	<100	<0.20
MW-02A	11/16/07		<2.0	<1.0	**42**	<0.50	0.20 J	**4.8 MB**	**1.6**	1.7 MB,J	<1.0	**6.2**	1.5 J	0.57 J	<1.0	<1.0	**3.8**	<20	<0.20
MW-02A	02/20/08		<2.0	<1.0	**45**	<0.50	0.20 J	<2.0	**1.5**	1.6 J	<1.0	**6.7**	<2.0	0.36 J	<1.0	<1.0	**4.7**	<20	<0.20
MW-02A	05/20/08		<2.0	<1.0	**39**	<0.50	0.15 J	<2.0	0.88 J	1.1 J	<1.0	**6.0**	<2.0	0.93 J,MB	<1.0	<1.0	**4.3**	<20	<0.20
MW-02B	05/17/06		<2.0	**2.3**	**34**	<0.50	<1.0	<2.0	<1.0	**2.1**	<1.0	**2.9**	<2.0	**2.8**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/22/06		<2.0	<1.0	**33**	<0.50	<1.0	<2.0	0.34 J	1.5 J	<1.0	**2.6**	**3.4**	**5.0**	<1.0	<1.0	<2.0	2.2 J	<0.20
MW-02B	11/21/06		<2.0	0.90 J	**30**	<0.50	<1.0	<2.0	0.21 J	1.6 J	<1.0	**2.9**	<2.0	**3.2**	<1.0	<1.0	<2.0	2.8 J	<0.20
MW-02B	03/02/07		<2.0	**1.8 MB**	**27 CQ**	<0.50	<1.0	<2.0	0.25 J	**2.3 MB**	<1.0	**3.4**	<2.0	**2.4**	<1.0	<1.0	<2.0	5.1 MB,J	<0.20
MW-02B	05/17/07		<2.0	**1.0**	**32**	<0.50	<1.0	<2.0	0.23 J	1.2 J	<1.0	**3.0**	0.96 J	**4.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/24/07		<2.0	<1.0	**34**	<2.5	<5.0	<10	<5.0	<10	<5.0	3.0 J	<10	3.3 J	<5.0	<5.0	<10	<100	<0.20
MW-02B	11/16/07		<2.0	<1.0	**28**	<0.50	<1.0	<2.0	0.26 J	1.7 MB,J	<1.0	**2.2**	<2.0	**2.0**	<1.0	<1.0	<2.0	3.7 MB,J	<0.20
MW-02B	02/20/08		<2.0	<1.0	**29**	<0.50	<1.0	<2.0	0.29 J	**2.5**	<1.0	**3.2**	<2.0	0.54 J	<1.0	<1.0	<2.0	4.0 J	<0.20
MW-02B	05/20/08		<2.0	**1.0**	**33**	<0.50	<1.0	<2.0	0.22 J	1.6 J	<1.0	**3.0**	<2.0	**2.1 MB**	<1.0	<1.0	<2.0	<20	<0.20

Table 30
Summary of Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)																7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
MW-03A	05/18/06		<2.0	**1.1**	**65**	<0.50	<1.0	1.8 J	0.12 J	0.89 J	<1.0	0.86 J	0.64 J	<2.0	<1.0	<1.0	**4.5**	3.1 J	<0.20
MW-03A	08/22/06		<2.0	<1.0	**69**	<0.50	0.053 J	0.87 J	0.16 J	0.99 J	0.15 J	0.84 J	**2.3**	0.44 J	<1.0	<1.0	**3.6**	3.5 J	<0.20
MW-03A	11/20/06		0.16 J	<1.0	**73**	<0.50	0.084 J	1.3 J	<1.0	1.1 J	<1.0	1.2 J	<2.0	0.52 J	<1.0	<1.0	**4.8**	<20	<0.20
2MW-03A	11/20/06	Duplicate	0.13 J	<1.0	**74**	<0.50	0.085 J	1.3 J	<1.0	0.95 J	<1.0	1.1 J	<2.0	0.38 J	<1.0	<1.0	**4.7**	2.5 J	<0.20
MW-03A	03/01/07		0.087 J	<1.0	**75 CQ**	<0.50	0.073 J	1.3 J	<1.0	1.5 MB,J	<1.0	1.2 J	<2.0	<2.0	<1.0	<1.0	**4.4**	5.6 MB,J	<0.20
2MW-03A	03/01/07	Duplicate	0.084 J	<1.0	**72 CQ**	<0.50	<1.0	1.4 J	<1.0	**6.6 MB**	<1.0	1.2 J	<2.0	0.33 J	<1.0	<1.0	**4.4**	7.9 MB,J	<0.20
MW-03A	05/17/07		<2.0	<1.0	**74**	<0.50	<1.0	1.6 J	0.16 J	<2.0	<1.0	1.3 J	<2.0	0.47 J	<1.0	<1.0	**4.1**	<100	<0.20
MW-03A	08/24/07		<2.0	<1.0	**88**	<2.5	<5.0	<10	<5.0	<10	<5.0	1.7 J	5.8 J	<10	<5.0	<5.0	<10	15 J	<0.20
MW-03A	11/15/07		<2.0	<1.0	**78**	<0.50	0.15 J	1.5 J	0.22 J	1.2 J	<1.0	0.71 J	<2.0	0.34 J	<1.0	<1.0	**4.1**	3.0 J	<0.20
MW-03A	02/19/08		<2.0	<1.0	**86**	<0.50	<1.0	1.7 J	0.23 J	1.3 J	<1.0	1.3 J	<2.0	<2.0	<1.0	<1.0	**3.7**	3.0 J	<0.20
MW-03A	05/19/08		<2.0	<1.0	**85**	<0.50	<1.0	1.3 J	0.15 J	<2.0	<1.0	0.92 J	<2.0	1.6 J,MB	<1.0	<1.0	**3.8**	<20	<0.20
MW-03B	05/18/06		<2.0	<1.0	**64**	<0.50	<1.0	<2.0	0.41 J	1.6 J	<1.0	2.8 J	<2.0	<2.0	0.21 J	<1.0	<2.0	10 J	<0.20
MW-03B	08/22/06		<2.0	<1.0	**69**	<0.50	<1.0	<2.0	0.36 J	0.97 J	0.045 J	**2.7**	**4.6**	**2.7**	<1.0	<1.0	<2.0	2.6 J	<0.20
MW-03B	11/20/06		0.33 J	**1.7**	**71**	<0.50	<1.0	<2.0	0.24 J	1.4 J	<1.0	**4.6**	1.1 J	**3.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	03/01/07		<2.0	**3.4 MB**	**58 CQ**	<0.50	<1.0	<2.0	0.30 J	1.0 MB,J	<1.0	**3.5**	<2.0	1.6 J	<1.0	<1.0	<2.0	7.1 MB,J	<0.20
MW-03B	05/17/07		<2.0	**2.5**	**63**	<0.50	<1.0	<2.0	0.26 J	0.80 J	<1.0	**3.8**	**2.3**	**3.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/24/07		<2.0	<1.0	**63**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.2 J	5.8 J	2.2 J	<5.0	<5.0	<10	<100	<0.20
MW-03B	11/15/07		<2.0	**1.8**	**63**	<0.50	<1.0	<2.0	0.39 J	1.5 J	<1.0	**3.5**	<2.0	1.7 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/19/08		<2.0	**3.2**	**51**	<0.50	<1.0	<2.0	0.43 J	1.6 J	<1.0	**3.0**	<2.0	0.49 J	<1.0	<1.0	<2.0	4.4 J	<0.20
MW-03B	05/19/08		<2.0	**3.6**	**50**	<0.50	<1.0	<2.0	0.32 J	1.0 J	<1.0	**2.5**	<2.0	**2.0 MB**	<1.0	<1.0	<2.0	<20	<0.20
MW-04A	03/02/07	New Well	0.30 J	**1.7**	**21**	<0.50	0.22 J	<2.0	**1.8**	**2.9 MB**	<1.0	**5.7**	**2.1**	**5.4**	<1.0	<1.0	**12**	**32**	<0.20
MW-04A	05/17/07		0.24 J	**2.6**	**22**	<0.50	0.22 J	<2.0	**1.0**	**2.2**	<1.0	**5.6**	**2.4**	**9.9**	<1.0	<1.0	**11**	**5.2**	<0.20
MW-04A	08/23/07		<2.0	<3.5	**21**	<2.5	<5.0	<10	1.2 J	<10	<1.0	5.3 J	7.2 J	6.2 J	<5.0	<5.0	**12**	<100	<0.20
MW-04A	11/16/07		<2.0	**1.6**	**19**	<0.50	0.28 J	1.9 MB,J	**1.1**	**2.9 MB**	<1.0	**4.3**	1.4 J	**2.8**	<1.0	<1.0	**11**	5.3 MB,J	<0.20
MW-04A	02/20/08		<2.0	**1.5**	**21**	<0.50	0.28 J	<2.0	**1.0**	**3.8**	<1.0	**4.9**	<2.0	1.3 J	<1.0	<1.0	**13**	5.4 J	<0.20
MW-04A	05/20/08		<2.0	**1.3**	**24**	<0.50	0.31 J	<2.0	0.84 J	**3.1**	<1.0	**4.7**	<2.0	**2.8 MB**	<1.0	<1.0	**13**	3.3 J	<0.20
MW-04B	03/02/07	New Well	0.78 J	**6.2**	**120**	<0.50	<1.0	<2.0	0.31 J	1.4 MB,J	<1.0	**7.4**	<2.0	**2.8**	<1.0	<1.0	<2.0	4.1 J	<0.20
MW-04B	05/17/07		<2.0	**9.5**	**83**	<0.50	<1.0	<2.0	0.30 J	1.2 J	<1.0	**3.6**	1.5 J	**4.7**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	08/23/07		<2.0	**7.0**	**85**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.1 J	6.4 J	3.6 J	<5.0	<5.0	<10	<100	<0.20
MW-04B	11/16/07		<2.0	**6.8**	**61**	<0.50	<1.0	<2.0	0.38 J	1.7 MB,J	<1.0	**2.4**	<2.0	**2.8**	<1.0	<2.0	<2.0	2.8 MB,J	<0.20
MW-04B	02/20/08		<2.0	**6.0**	**60**	<0.50	<1.0	<2.0	0.39 J	**3.3**	<1.0	**3.2**	<2.0	0.49 J	<1.0	<2.0	<2.0	4.4 J	<0.20
MW-04B	05/20/08		<2.0	**5.2**	**60**	<0.50	<1.0	<2.0	0.30 J	**2.0**	<1.0	**3.0**	<2.0	**2.2 MB**	<1.0	<1.0	<2.0	15 J	<0.20

Table 30
Summary of Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
FDCC-W-20080520	05/20/08		**2.1**	**2.7**	**92**	<0.50	0.20 J	<2.0	0.49 J	**11**	0.87 J	**10**	**2.3**	0.89 J	<1.0	<1.0	**5.9**	16 J	<0.20
FDCC-E-20080520	05/20/08		**2.4**	**2.8**	**85**	<0.50	0.18 J	<2.0	0.53 J	**11**	0.34 J	**11**	**2.4**	1.0 J	<1.0	<1.0	**6.4**	13 J	<0.20
G-4	05/18/06		0.098 J	**2.3**	**43**	<0.50	<1.0	<2.0	0.89 J	2.9	<1.0	**2.7**	**3.1**	**2.7**	<1.0	<1.0	**8.8**	10 J	<0.20
G-4	08/21/06		0.10 J	<1.0	**44**	<0.50	0.039 J	<2.0	0.87 J	1.5 J	<1.0	**2.3**	**6.1**	**5.3**	<1.0	<1.0	**5.0**	2.1 J	<0.20
G-4	11/20/06		0.34 J	<1.0	**45**	<0.50	<1.0	<2.0	0.94 J	1.9 J	<1.0	**3.2**	1.3 J	**3.6**	<1.0	0.16 J	**8.0**	11 J	<0.20
G-4	03/01/07		0.075 J	**1.0 MB**	**35 CQ**	<0.50	0.051 J	<2.0	0.86 J	**4.3 MB**	<1.0	**2.9**	1.1 J	**2.6**	<1.0	<1.0	**8.2**	6.3 MB,J	<0.20
G-4	05/18/07		<2.0	**1.1**	**45**	<0.50	<1.0	<2.0	**1.0**	1.8 J	<1.0	**2.7**	**4.3**	**5.7**	<1.0	<1.0	**6.7**	<20	<0.20
G-4	08/24/07		<2.0	<1.0	**42**	<2.5	<5.0	<10	1.0 J	<10	<1.0	3.2 J	7.4 J	3.6 J	<5.0	<5.0	7.6 J	<100	<0.20
G-4	11/15/07		<2.0	0.94 J	**37**	<0.50	<1.0	<2.0	**1.2**	**2.6**	<1.0	**2.7**	<2.0	**3.2**	<1.0	<1.0	**8.3**	3.6 J	<0.20
G-4	02/20/08		<2.0	<1.0	**47**	<0.50	<1.0	<2.0	**1.1**	**3.6**	<1.0	**2.6**	<2.0	1.1 J	<1.0	<1.0	**7.8**	4.9 J	<0.20
G-4	05/19/08		<2.0	**1.2**	**67**	<0.50	<1.0	<2.0	**1.2**	**4.2**	<1.0	**2.4**	<2.0	**3.8 MB**	<1.0	<1.0	**7.2**	4.5 J	<0.20

Notes:
<# = Analyte was not detected above the Reporting Limit (#)
ND = Not Detected. This data was obtained from a summary table of a report not prepared by SECOR.
The actual laboratory reports are not available, thus MDL's can not be determined for this data.
CQ = analyte concentration greater than 10 times the blank concentration
J = Analyte was detected between the MDL and the RL
MB = Analyte present in Method Blank
µg/L = micrograms per liter
Results highlighted with **Bold** font indicate results > RL
Prior to the 2008 sampling event, dissolved metals was not tested for in surface water samples.
For safety and security reasons, the surface water sampling locations in the Dominguez Flood Control Channel (DFCC) have been re-located.

SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.
Prior to 2006, some table data was incorrectly represented in mg/L and has been updated to correctly reflect µg/L.

Table 31
Summary of Hydraulic Conductivity Testing
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Sample ID	Test Number	Hydraulic Conductivity Results										Geometric Mean		Average	
		Initial Slug Test		Point Dilution Tracer Test		Extraction Test		Drift Pumpback Tracer Test		Recovery Test					
		ft/day	cm/sec	ft/day	cm/sec	ft/day	cm/sec	ft/day	cm/sec	ft/day	cm/sec	ft/day	cm/sec	ft/day	cm/sec
MW-1A	1	1.1	3.9E-04	4.0	1.4E-03	0.34	1.2E-04	(a)	(a)	0.29	1.0E-04	0.81	2.9E-04	1.4	5.1E-04
MW-1B	1	1.3	4.6E-04	75	2.6E-02	0.27	9.5E-05	(b)	(b)	0.22	7.8E-05	1.55	5.5E-04	19	6.8E-03
MW-2A	1	5.4	1.9E-03	6.6	2.3E-03	1.8	6.4E-04	(a)	(a)	1.8	6.4E-04	4.47	1.6E-03	6.0	2.1E-03
	2	4.2	1.5E-03	17	5.8E-03	(c)	(c)	(c)	(c)	(c)	(c)				
MW-2B	1	6.4	2.3E-03	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	6.67	2.4E-03	8.2	2.9E-03
	2	7.2	2.5E-03	12	4.3E-03	2.5	8.8E-04	17	5.9E-03	3.7	1.3E-03				
MW-3A	1	0.7	2.5E-04	0.9	3.2E-04	(c)	(c)	(c)	(c)	(c)	(c)	0.79	2.8E-04	0.8	2.8E-04
MW-3B	1	(d)	(d)	27	9.6E-03	(e)	(e)	20	7.1E-03	(e)	(e)	23	8.2E-03	24	8.3E-03

Notes:

(a) Tracer did not fully exit well
(b) It appears that the lower conductivity water recovered during pump-back was a remnant in well casing
(c) Not performed
(d) Non-instantaneous emplacement
(e) Insignificant drawdown
ft/day feet per day
cm/sec centimeters per second

Table 32
Summary of Groundwater Gauging and Elevation Data
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-01A	24.19	05/11/94	15.22	39.00	8.97	--	175	0.0053	0.044	--	
MW-01A	24.19	10/22/99	14.02	37.20	10.17	1.20	160	0.00499	0.041	--	Gauged on either 10/22 or 11/4/99
MW-01A	24.19	04/03/01	12.82	37.40	11.37	1.20	158	0.00553	0.046	--	
MW-01A	24.19	06/12/01	13.12	37.40	11.07	-0.30	156.5	0.0036	0.030	--	
MW-01A	24.19	02/28/02	14.28	37.38	9.91	-1.16	159.5	0.00477	0.039	--	
MW-01A	24.19	01/06/05	--	--	--	--	--	--	--	--	Well inaccessible
MW-01A	24.05	02/16/06	13.12	37.30	10.93	1.02	146.5	0.0038	0.031	--	
MW-01A	24.05	05/17/06	12.74	37.25	11.31	0.38	149	0.00476	0.039	--	
MW-01A	24.05	08/21/06	13.08	37.57	10.97	-0.34	147	0.0047	0.039	--	
MW-01A	24.05	11/20/06	13.42	37.57	10.63	-0.34	147	0.0043	0.035	--	
MW-01A	24.05	03/01/07	13.76	NM	10.29	-0.34	192	NC	NC	--	Not calculated off site
MW-01A	24.05	05/17/07	13.99	37.17	10.06	-0.23	180	NC	NC	--	Not calculated off site
MW-01A	24.05	08/23/07	13.88	37.38	10.17	0.11	180	NC	NC	--	Not calculated off site
MW-01A	24.05	11/15/07	14.27	37.26	9.78	-0.39	180	NC	NC	--	Not calculated off site
MW-01A	24.05	02/19/08	13.40	NM	10.65	0.87	190	NC	NC	--	Not calculated off site
MW-01A	24.05	05/19/08	13.24	37.36	10.81	0.16	180	NC	NC	--	Not calculated off site
MW-01B	24.52	05/11/94	19.60	86.00	4.92	--	102.5	0.00557	0.207	0.076	
MW-01B	24.52	10/22/99	17.89	84.70	6.63	1.71	100	0.0056	0.208	0.067	Gauged on either 10/22 or 11/4/99
MW-01B	24.52	04/03/01	16.49	85.10	8.03	1.40	101	0.00617	0.229	0.063	
MW-01B	24.52	06/12/01	16.79	84.90	7.73	-0.30	100	0.0063	0.234	0.063	
MW-01B	24.52	02/28/02	17.62	84.90	6.90	-0.83	99.5	0.00549	0.204	0.057	
MW-01B	24.52	01/06/05	--	--	--	--	--	--	--	--	Well inaccessible
MW-01B	24.27	02/16/06	16.40	85.10	7.87	0.97	104	0.00462	0.171	0.058	
MW-01B	24.27	05/17/06	16.02	85.00	8.25	0.38	101	0.0053	0.197	0.058	
MW-01B	24.27	08/21/06	16.39	85.27	7.88	-0.37	103	0.0045	0.167	0.058	
MW-01B	24.27	11/20/06	16.61	85.27	7.66	-0.22	103	0.0042	0.156	0.056	
MW-01B	24.27	03/01/07	16.46	84.93	7.81	0.15	92.5	NC	NC	0.047	Not calculated off site
MW-01B	24.27	05/17/07	16.94	84.95	7.33	-0.48	97	NC	NC	0.052	Not calculated off site
MW-01B	24.27	08/23/07	17.04	85.23	7.23	-0.10	105	NC	NC	0.055	Not calculated off site
MW-01B	24.27	11/15/07	17.22	85.23	7.05	-0.18	103	NC	NC	0.052	Not calculated off site
MW-01B	24.27	02/19/08	16.47	NM	7.80	0.75	105	NC	NC	0.054	Not calculated off site
MW-01B	24.27	05/19/08	16.50	85.26	7.77	-0.03	102	NC	NC	0.057	Not calculated off site

Table 32
Summary of Groundwater Gauging and Elevation Data
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-02A	19.22	05/11/94	12.90	27.00	6.32	--	175	0.0053	0.044	--	
MW-02A	19.22	10/22/99	12.72	28.10	6.50	0.18	160	0.00499	0.041	--	Gauged on either 10/22 or 11/4/99
MW-02A	19.22	04/03/01	12.13	28.34	7.09	0.59	158	0.00553	0.046	--	
MW-02A	19.22	06/12/01	12.50	28.21	6.72	-0.37	156.5	0.0036	0.030	--	
MW-02A	19.22	02/28/02	12.87	28.20	6.35	-0.37	159.5	0.00477	0.039	--	
MW-02A	19.22	01/06/05	10.81	28.52	8.41	2.06	--	--	--	--	
MW-02A	19.15	02/16/06	12.70	28.25	6.45	-1.96	146.5	0.0038	0.031	--	
MW-02A	19.15	05/17/06	12.39	28.25	6.76	0.31	149	0.00476	0.039	--	
MW-02A	19.15	08/21/06	12.80	28.52	6.35	-0.41	147	0.0047	0.039	--	
MW-02A	19.15	11/20/06	12.76	28.52	6.39	0.04	147	0.0043	0.035	--	
MW-02A	19.15	03/01/07	12.96	25.50	6.19	-0.20	192	0.0034	0.028	--	
MW-02A	19.15	05/17/07	12.91	28.15	6.24	0.05	180	0.0038	0.031	--	
MW-02A	19.15	08/23/07	12.87	28.25	6.28	0.04	180	0.0044	0.036	--	
MW-02A	19.15	11/15/07	12.94	28.25	6.21	-0.07	180	0.004	0.033	--	
MW-02A	19.15	02/19/08	12.34	28.21	6.81	0.60	190	0.0048	0.040	--	
MW-02A	19.15	05/19/08	12.68	28.29	6.47	-0.34	180	0.0042	0.035	--	
MW-02B	19.49	05/11/94	21.11	83.00	-1.62	--	102.5	0.00557	0.207	0.132	
MW-02B	19.49	10/22/99	19.42	81.76	0.07	1.69	100	0.0056	0.208	0.107	Gauged on either 10/22 or 11/4/99
MW-02B	19.49	04/03/01	18.66	82.92	0.83	0.76	101	0.00617	0.229	0.104	
MW-02B	19.49	06/12/01	18.87	82.90	0.62	-0.21	100	0.0063	0.234	0.102	
MW-02B	19.49	02/28/02	19.00	82.91	0.49	-0.13	99.5	0.00549	0.204	0.098	
MW-02B	19.49	01/06/05	18.93	82.91	0.56	0.07	--	--	--	--	
MW-02B	19.36	02/16/06	17.62	82.95	1.74	1.18	104	0.00462	0.171	0.079	
MW-02B	19.36	05/17/06	17.33	82.85	2.03	0.29	101	0.0053	0.197	0.079	
MW-02B	19.36	08/21/06	17.50	83.16	1.86	-0.17	103	0.0045	0.167	0.075	
MW-02B	19.36	11/20/06	17.35	83.16	2.01	0.15	103	0.0042	0.156	0.073	
MW-02B	19.36	03/01/07	17.56	80.50	1.80	-0.21	92.5	0.0054	0.200	0.073	
MW-02B	19.36	05/17/07	17.71	82.79	1.65	-0.15	97	0.005	0.186	0.077	
MW-02B	19.36	08/23/07	17.80	83.00	1.56	-0.09	105	0.0045	0.167	0.079	
MW-02B	19.36	11/15/07	17.90	83.00	1.46	-0.10	103	0.0044	0.163	0.079	
MW-02B	19.36	02/19/08	17.32	83.02	2.04	0.58	105	0.0045	0.167	0.080	
MW-02B	19.36	05/19/08	17.43	83.05	1.93	-0.11	102	0.0045	0.167	0.076	

Table 32
Summary of Groundwater Gauging and Elevation Data
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-03A	25.54	05/11/94	20.31	28.50	5.23	--	175	0.0053	0.044	--	
MW-03A	25.54	10/22/99	19.98	28.36	5.56	0.33	160	0.00499	0.041	--	Gauged on either 10/22 or 11/4/99
MW-03A	25.54	04/03/01	19.47	28.45	6.07	0.51	158	0.00553	0.046	--	
MW-03A	25.54	06/12/01	19.76	28.45	5.78	-0.29	156.5	0.0036	0.030	--	
MW-03A	25.54	02/28/02	20.08	28.45	5.46	-0.32	159.5	0.00477	0.039	--	
MW-03A	25.54	01/06/05	19.32	28.42	6.22	0.76	--	--	--	--	
MW-03A	25.45	02/16/06	19.88	28.50	5.57	-0.65	146.5	0.0038	0.031	--	
MW-03A	25.45	05/17/06	19.61	28.45	5.84	0.27	149	0.00476	0.039	--	
MW-03A	25.45	08/21/06	20.02	28.67	5.43	-0.41	147	0.0047	0.039	--	
MW-03A	25.45	11/20/06	19.90	28.67	5.55	0.12	147	0.0043	0.035	--	
MW-03A	25.45	03/01/07	19.95	25.50	5.50	-0.05	192	0.0034	0.028	--	
MW-03A	25.45	05/17/07	20.03	28.40	5.42	-0.08	180	0.0038	0.031	--	
MW-03A	25.45	08/23/07	20.12	28.49	5.33	-0.09	180	0.0044	0.036	--	
MW-03A	25.45	11/15/07	20.12	28.47	5.33	0.00	180	0.004	0.033	--	
MW-03A	25.45	02/19/08	19.71	28.47	5.74	0.41	190	0.0048	0.040	--	
MW-03A	25.45	05/19/08	19.91	28.46	5.54	-0.20	180	0.0042	0.035	--	
MW-03B	25.60	05/11/94	27.20	84.00	-1.60	--	102.5	0.00557	0.207	0.112	
MW-03B	25.60	10/22/99	25.44	82.94	0.16	1.76	100	0.0056	0.208	0.089	Gauged on either 10/22 or 11/4/99
MW-03B	25.60	04/03/01	24.72	83.15	0.88	0.72	101	0.00617	0.229	0.085	
MW-03B	25.60	06/12/01	24.92	82.90	0.68	-0.20	100	0.0063	0.234	0.084	
MW-03B	25.60	02/28/02	25.02	82.89	0.58	-0.10	99.5	0.00549	0.204	0.080	
MW-03B	25.60	01/06/05	25.00	83.41	0.60	0.02	--	--	--	--	
MW-03B	25.51	02/16/06	23.71	83.10	1.80	1.20	104	0.00462	0.171	0.062	
MW-03B	25.51	05/17/06	23.45	83.00	2.06	0.26	101	0.0053	0.197	0.062	
MW-03B	25.51	08/21/06	23.60	83.31	1.91	-0.15	103	0.0045	0.167	0.058	
MW-03B	25.51	11/20/06	23.45	83.31	2.06	0.15	103	0.0042	0.156	0.057	
MW-03B	25.51	03/01/07	23.62	82.92	1.89	-0.17	92.5	0.0054	0.200	0.059	
MW-03B	25.51	05/17/07	23.79	82.97	1.72	-0.17	97	0.005	0.186	0.061	
MW-03B	25.51	08/23/07	23.95	83.20	1.56	-0.16	105	0.0045	0.167	0.062	
MW-03B	25.51	11/15/07	24.01	83.24	1.50	-0.06	103	0.0044	0.163	0.063	
MW-03B	25.51	02/19/08	23.48	83.15	2.03	0.53	105	0.0045	0.167	0.061	
MW-03B	25.51	05/19/08	23.54	83.20	1.97	-0.06	102	0.0045	0.167	0.059	
MW-04A	24.02	03/02/07	17.61	31.06	6.41	---	192	0.0103	0.085	--	New Well
MW-04A	24.02	05/17/07	17.68	31.08	6.34	-0.07	180	0.01	0.082	--	
MW-04A	24.02	08/23/07	17.65	31.20	6.37	0.03	180	0.0044	0.036	--	
MW-04A	24.02	11/15/07	17.71	37.18	6.31	-0.06	180	0.004	0.033	--	
MW-04A	24.02	02/19/08	17.30	31.30	6.72	0.41	190	0.0048	0.040	--	
MW-04A	24.02	05/19/08	17.47	31.20	6.55	-0.17	180	0.0042	0.035	--	

Table 32
Summary of Groundwater Gauging and Elevation Data
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-04B	23.99	03/02/07	20.71	88.30	3.28	---	92.5	0.0054	0.200	0.055	New Well
MW-04B	23.99	05/17/07	21.02	88.00	2.97	-0.31	97	0.005	0.186	0.059	
MW-04B	23.99	08/23/07	21.14	88.55	2.85	-0.12	105	0.0045	0.167	0.062	
MW-04B	23.99	11/15/07	21.23	88.40	2.76	-0.09	103	0.0044	0.163	0.062	
MW-04B	23.99	02/19/08	20.65	88.47	3.34	0.58	105	0.0045	0.167	0.059	
MW-04B	23.99	05/19/08	20.76	88.46	3.23	-0.11	102	0.0045	0.167	0.058	
G-1	24.08	12/87	19.20	NM	4.88	--	--	--	--	--	Well abandoned in 1987 or 1988
G-2	25.09	12/87	21.40	NM	3.69	--	--	--	--	--	Well abandoned in 1987 or 1988
G-3	25.06	12/87	21.60	NM	3.46	--	--	--	--	--	Well abandoned in 1987 or 1988
G-4	27.35	12/87	24.70	NM	2.65	--	--	--	--	--	
G-4	27.15	05/11/94	NM	NM	NM	--	--	--	--	--	
G-4	27.15	10/22/99	21.77	67.44	5.38	--	--	--	--	--	Gauged on either 10/22 or 11/4/99
G-4	27.15	04/03/01	21.32	67.95	5.83	0.45	--	--	--	--	
G-4	27.15	06/12/01	21.57	68.00	5.58	-0.25	--	--	--	--	
G-4	27.15	02/28/02	21.86	68.00	5.29	-0.29	--	--	--	--	
G-4	27.15	01/06/05	21.25	68.65	5.90	0.61	--	--	--	--	
G-4	27.12	02/16/06	21.69	NM	5.43	-0.47	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	05/17/06	21.38	NM	5.74	0.31	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	08/21/06	21.72	NM	5.40	-0.34	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	11/20/06	21.65	NM	5.47	0.07	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	03/01/07	21.67	NM	5.45	-0.02	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	05/17/07	21.76	NM	5.36	-0.09	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	08/23/07	21.87	NM	5.25	-0.11	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	11/15/07	21.84	NM	5.28	0.03	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	02/19/08	21.47	NM	5.65	0.37	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	05/19/08	21.63	NM	5.49	-0.16	--	--	--	--	2" well w/pump prevents TD measurement

Notes:
ft MSL = Feet Mean Sea Level
ft btoc = Feet below top of casing
NM = Not Measured
NC = Horizontal Groundwater Gradient & Velocity Not calculated off of Cooper Sump Site
-- = Not applicable / Not analyzed
Groundwater Monitoring Well Elevations, Surveyed by M.W. Holdings Inc., September 9, 2005 and March 1, 2007.
Groundwater velocity calculations based on an assumed average porosity (η) and hydraulic conductivity (K) of the upper and lower monitored zones of 0.34 and 2.8 f/d, and 0.458 and 17 f/d respectively.

References:

EEI, 1987: *Site Inspection Report Gardena Sumps, Gardena, California.*
DTSC, 2000 and 2001: *2002 Groundwater Sampling Report for Gardena Sumps.*
DTSC, 2002: *2002 Groundwater Sampling Report for Gardena Sumps.*
URS Consultants, Inc., 1994: *Groundwater Remedial Investigation Technical Memorandum, Gardena Sumps City of Gardena, California.*
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps City of Gardena, California.

Table 33
Summary of Volatile Organic Compounds Measured in Soil Gas Survey - Method 8260B
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:																						
8260B																						
Volatile	Notes	SVO1-VS-07 5/19/06	SVO2-VS-5 3/14/06	SVO2-VS-13 5/19/06	SVO3-VS-5 3/15/06	SVO3-VS-15 3/15/06	SVO4-VS-5 3/15/06	SVO4-VS-15 3/15/06	SVO6-VS-05 5/19/06	SVO6-VS-13 5/19/06	SVO7-VS-5 3/09/06	SVO7-VS-15 3/09/06	SVO8-VS-5 3/15/06	SVO8-VS-15 3/15/06	SVO9-VS-5 3/14/06	SVO9-VS-15 3/14/06	SV11-VS-5 3/14/06	SV11-2VS-5 3/14/06	SV11-VS-13 5/19/06	SV12-VS-5 3/15/06	SV12-VS-15 3/15/06
1,1-Difluroethane (LCC)	µg/l 8260B	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Propene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluromethane	µg/l 8260B	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chloromethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichloroterafluoroethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl chloride	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,3-Butadiene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromoethene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoroethane	µg/l 8260B	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Acetone	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,1,2-Trichlorotrifluoroetha	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Allyl choride	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene chloride	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon disulfide	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-Dichlorethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methyl tert-butyl ether	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl accetate	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-Butanone	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Hexane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethyl acetate	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tetrahydrofuran	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2-Dichloroethane	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzene	µg/l 8260B	**0.1**	<0.1	<0.1	<0.1	**0.1**	<0.1	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.1**	**0.2**	<0.1	<0.1	**0.1**
Carbon tetrachoride	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cyclohexane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2,4-Trimethylpentane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Heptane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2-Dichloropropane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,3-Dichloropropene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Methyl-2-pentanone	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	µg/l 8260B	**0.3**	<0.3	**0.4**	<0.3	**0.7**	<0.3	<0.3	**0.4**	**0.4**	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	**0.5**	<0.3	<0.3	<0.3	<0.3
1,1,2-Trichloroethane	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-Hexanone	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2-Dibromoethane (EDB)	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
m,p,-Xylene	µg/l 8260B	<0.2	<0.2	**0.2**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Styrene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Isopropylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromoform	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1,2-Tetrachloroethan	µg/l 8260B	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2,2-Tetrachloroethan	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
n-Propylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4-Ethyltoluene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-Trimethlybenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2,4-Trimethlybenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
sec-Butylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p-Isopropyltoluene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
n-Butylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Table 33
Summary of Volatile Organic Compounds Measured in Soil Gas Survey - Method 8260B
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:																						
8260B																						
Volatile	Notes	SVO1-VS-07 5/19/06	SVO2-VS-5 3/14/06	SVO2-VS-13 5/19/06	SVO3-VS-5 3/15/06	SVO3-VS-15 3/15/06	SVO4-VS-5 3/15/06	SVO4-VS-15 3/15/06	SVO6-VS-05 5/19/06	SVO6-VS-13 5/19/06	SVO7-VS-5 3/09/06	SVO7-VS-15 3/09/06	SVO8-VS-5 3/15/06	SVO8-VS-15 3/15/06	SVO9-VS-5 3/14/06	SVO9-VS-15 3/14/06	SV11-VS-5 3/14/06	SV11-2VS-5 3/14/06	SV11-VS-13 5/19/06	SV12-VS-5 3/15/06	SV12-VS-15 3/15/06
1,3-Dichlorobenzene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl chloride	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Freon 113	µg/l 8260B	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Napthalene	µg/l 8260B	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2,4-Trichlorobenzene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H2S	ppmv 631-X	**0.047**	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01	<0.015	<0.015	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01
Methane	ppmv FID	<10	<10	**12**	**160**	**77**	<10	**48**	<10	<10	<10	**26**	<10	<10	<10	<10	**53**	<10	<10	<10	<10

Notes:
<# = Analyte was not detected above the Reporting Limit (#)
-- = Not applicable / Not analyzed
µg/L = micrograms per liter
Results highlighted with **Bold** font indicate results > RL

Table 33
Summary of Volatile Organic Compounds Measured in Soil Gas Survey - Method 8260B
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method: 8260B																						
Volatile	Notes	SV13-VS-5 3/15/06	SV13-VS-15 3/15/06	SV14-VS-5 3/14/06	SV14-VS-15 3/14/06	SV15-VS-5 3/14/06	SV15-VS-10 3/14/06	SV16-VS-5 3/10/06	SV16-VS-13 3/10/06	SV17-VS-5 3/10/06	SV17-2VS-5 3/10/06	SV17-VS-10 5/19/06	SV17-2VS-10 5/19/06	SV18-VS-05 5/18/06	SV18-VS-13 3/10/06	SV19-VS-05 5/18/06	SV19-2VS-05 5/18/06	SV19-VS-10 5/19/06	SV21-VS-5 3/14/06	SV21-VS-15 3/14/06	SV22-VS-5 3/09/06
1,1-Difluroethane (LCC)	µg/l 8260B	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Propene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluromethane	µg/l 8260B	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chloromethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichloroterafluoroethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl chloride	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,3-Butadiene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromoethene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoroethane	µg/l 8260B	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Acetone	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,1,2-Trichlorotrifluoretha	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Allyl choride	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene chloride	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon disulfide	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-Dichlorethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methyl tert-butyl ether	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl accetate	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-Butanone	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Hexane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethyl acetate	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tetrahydrofuran	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2-Dichloroethane	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.1**	<0.1	**0.3**	**0.3**	**0.1**	<0.1	<0.1	<0.1	<0.1
Carbon tetrachoride	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cyclohexane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2,4-Trimethylpentane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Heptane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2-Dichloropropane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,3-Dichloropropene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Methyl-2-pentanone	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	µg/l 8260B	**0.4**	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	**0.4**	<0.3	**0.4**	<0.3	**2.2**	**2.0**	**0.8**	<0.3	<0.3	<0.3	<0.3
1,1,2-Trichloroethane	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-Hexanone	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2-Dibromoethane (EDB)	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.1	**0.3**	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1
m,p,-Xylene	µg/l 8260B	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**0.2**	<0.2	**1.0**	**0.7**	**0.2**	<0.2	<0.2	<0.2	<0.2
Styrene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1
Isopropylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromoform	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1,2-Tetrachloroethan	µg/l 8260B	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2,2-Tetrachloroethan	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
n-Propylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4-Ethyltoluene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-Trimethlybenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1
1,2,4-Trimethlybenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
sec-Butylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p-Isopropyltoluene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
n-Butylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Table 33
Summary of Volatile Organic Compounds Measured in Soil Gas Survey - Method 8260B
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method: 8260B																					
Volatile	Notes	SV13-VS-5 3/15/06	SV13-VS-15 3/15/06	SV14-VS-5 3/14/06	SV14-VS-15 3/14/06	SV15-VS-5 3/14/06	SV15-VS-10 3/14/06	SV16-VS-5 3/10/06	SV16-VS-13 3/10/06	SV17-VS-5 3/10/06	SV17-2VS-5 3/10/06	SV17-VS-10 5/19/06	SV17-2VS-10 5/19/06	SV18-VS-05 5/18/06	SV18-VS-13 3/10/06	SV19-VS-05 5/18/06	SV19-2VS-05 5/18/06	SV19-VS-10 5/19/06	SV21-VS-5 3/14/06	SV21-VS-15 3/14/06	SV22-VS-5 3/09/06
1,3-Dichlorobenzene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl chloride	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Freon 113	µg/l 8260B	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	**0.4**	**0.3**	**0.3**	<0.3	<0.3	<0.3	**0.4**	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Napthalene	µg/l 8260B	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2,4-Trichlorobenzene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H2S	ppmv 631-X	<0.01	<0.01	<0.01	<0.01	<0.01	**0.37**	<0.01	<0.01	<0.01	--	<0.015	<0.015	**2.1**	--	**5.1**	<0.015	**0.21**	<0.01	<0.01	<0.01
Methane	ppmv FID	<10	<10	<10	<10	**10**	<10	<10	**14**	**10**	--	<10	<10	<10	--	<10	<10	<10	<10	**14**	**28**

Notes:
<# = Analyte was not detected above the R
-- = Not applicable / Not analyzed
µg/L = micrograms per liter
Results highlighted with **Bold** font indicate

Table 33
Summary of Volatile Organic Compounds Measured in Soil Gas Survey - Method 8260B
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:																	
8260B																	
Volatile	Notes	SV22-VS-13 3/09/06	SV23-VS-05 5/18/06	SV23-VS-15 5/18/06	SV24-VS-5 3/09/06	SV24-VS-13 3/09/06	SV25-VS-5 3/14/06	SV25-VS-05 5/18/06	SV25-VS-13 3/14/06	SV25-VS-15 5/18/06	SV26-VS-5 3/09/06	SV26-VS-13 3/09/06	SV28-VS-05 5/18/06	SV28-VS-10 5/18/06	SV29-VS-05 5/18/06	SV29-VS-10 5/18/06	SV30-VS-05 5/18/06
1,1-Difluroethane (LCC)	µg/l 8260B	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Propene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluromethane	µg/l 8260B	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chloromethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichloroterafluoroethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl chloride	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,3-Butadiene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromoethene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoroethane	µg/l 8260B	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Acetone	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,1,2-Trichlorotrifluoroetha	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Allyl choride	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene chloride	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon disulfide	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-Dichlorethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methyl tert-butyl ether	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl accetate	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-Butanone	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Hexane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethyl acetate	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tetrahydrofuran	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2-Dichloroethane	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Carbon tetrachoride	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cyclohexane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2,4-Trimethylpentane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Heptane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2-Dichloropropane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dioxane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,3-Dichloropropene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Methyl-2-pentanone	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	µg/l 8260B	<0.3	<0.3	**0.3**	<0.3	<0.3	<0.3	<0.3	<0.3	**0.3**	<0.3	<0.3	**0.3**	<0.3	<0.3	<0.3	<0.3
1,1,2-Trichloroethane	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-Hexanone	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2-Dibromoethane (EDB)	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
m,p,-Xylene	µg/l 8260B	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Styrene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Isopropylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromoform	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1,2-Tetrachloroethan	µg/l 8260B	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2,2-Tetrachloroethan	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
n-Propylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4-Ethyltoluene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-Trimethlybenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2,4-Trimethlybenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
sec-Butylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p-Isopropyltoluene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
n-Butylbenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Table 33
Summary of Volatile Organic Compounds Measured in Soil Gas Survey - Method 8260B
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:																	
8260B																	
Volatile	Notes	SV22-VS-13 3/09/06	SV23-VS-05 5/18/06	SV23-VS-15 5/18/06	SV24-VS-5 3/09/06	SV24-VS-13 3/09/06	SV25-VS-5 3/14/06	SV25-VS-05 5/18/06	SV25-VS-13 3/14/06	SV25-VS-15 5/18/06	SV26-VS-5 3/09/06	SV26-VS-13 3/09/06	SV28-VS-05 5/18/06	SV28-VS-10 5/18/06	SV29-VS-05 5/18/06	SV29-VS-10 5/18/06	SV30-VS-05 5/18/06
1,3-Dichlorobenzene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl chloride	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	µg/l 8260B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Freon 113	µg/l 8260B	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	**0.3**	<0.3	<0.3	<0.3	<0.3	<0.3
Napthalene	µg/l 8260B	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2,4-Trichlorobenzene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	µg/l 8260B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H2S	ppmv 631-X	<0.01	<0.015	<0.015	<0.01	<0.01	<0.01	<0.015	<0.01	<0.015	<0.01	<0.01	**0.32**	**>50**	**0.054**	<0.015	<0.015
Methane	ppmv FID	**38**	<10	<10	<10	**92**	<10	<10	**23**	<10	<10	**26**	**220**	**99**	**16**	<10	<10

Notes:
<# = Analyte was not detected above the R
-- = Not applicable / Not analyzed
µg/L = micrograms per liter
Results highlighted with **Bold** font indicate

Table 34
Summary of Volatile Organic Compounds Measured in Soil Gas Survey - Method TO-15
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:															QA / QC					
TO-15																				
Volatile	Notes	SVO3-VS-15 3/15/06	SVO8-VS-05 3/15/06	SV09-VS-15 3/14/06	SV11-VS-05 3/14/06	SV11-VS-13 5/19/06	SV15-VS-10 3/14/06	SV16-VS-13 3/10/06	SV17-VS-05 3/10/06	SV19-VS-05 5/19/06	SV19-VS-10 5/19/06	SV24-VS-05 3/14/06	SV26-VS-13 3/9/06	SV29-VS-05 5/19/06	TRIP BLANK 3/9/06	TRIP BLANK 3/10/06	TRIP BLANK 3/14/06	TRIP BLANK 3/14/06	TRIP BLANK 3/15/06	TRIP BLANK 5/19/06
1,1-Difluroethane (LCC)	µg/l	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Propene	µg/m^3 Air	**6200**	**310**	**37**	**2500**	**30**	**360**	**650**	**300**	**440**	**24**	<10	**420**	**860**	<10	<10	<10	<10	<10	<10
Dichlorodifluromethane	µg/m^3 Air	<5.5	<5.5	<5.5	**6.1**	<5.5	<5.5	**6.3**	**5.6**	<5.5	<5.5	<5.5	**14**	ND	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5
Chloromethane	µg/m^3 Air	<5.0	<5.0	<5.0	**7.3**	<5.0	**6.7**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dichloroterafluoroethane	µg/m^3 Air	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	**9.7**	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5
Vinyl chloride	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Butadiene	µg/m^3 Air	<5.0	<5.0	**9.5**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroethane	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	**6.8**	<5.0	<5.0	<5.0	**11**	<5.0	<5.0	**12**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromoethene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichlorofluoroethane	µg/m^3 Air	<5.0	**6.4**	**5.3**	**11**	<5.0	<5.0	**5.6**	<5.0	<5.0	<5.0	<5.0	**10**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone	µg/m^3 Air	**150**	**160**	**270**	**230**	**98**	**290**	**150**	**130**	**1700**	<20	**110**	**170**	**290**	<20	<20	<20	<20	<20	<20
1,1-Dichloroethene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2-Trichlorotrifluoroethai	µg/m^3 Air	**30**	**18**	**11**	**140**	<6.0	<6.0	**20**	**26**	<6.0	<6.0	<6.0	**26**	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
Allyl choride	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methylene choride	µg/m^3 Air	**8.0**	**5.5**	<5.0	**25**	<5.0	<5.0	**8.1**	**8.4**	<5.0	<5.0	<5.0	**10**	**5.5**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Carbon disulfide	µg/m^3 Air	**130**	**32**	**28**	**110**	<5.0	**75**	**53**	**48**	**670**	**21**	<5.0	**170**	**67**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,2-Dichlorethene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl accetate	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Butanone	µg/m^3 Air	**16**	**8.7**	**29**	**51**	**20**	**120**	**38**	**22**	**960**	**31**	**7.0**	**26**	**19**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
n-Hexane	µg/m^3 Air	**230**	**43**	<5.0	**520**	**12**	**170**	**45**	**30**	**620**	**67**	<5.0	**58**	**230**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,2-Dichloroethene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethyl acetate	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroform	µg/m^3 Air	<5.0	<5.0	<5.0	**18**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**23**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Tetrahydrofuran	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,1-Trichloroethane	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloroethane	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzene	µg/m^3 Air	**39**	**45**	**17**	**200**	**15**	**77**	**35**	**23**	**260**	**68**	<5.0	**51**	**56**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Carbon tetrachoride	µg/m^3 Air	<5.5	<5.5	<5.5	**10**	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	**6.7**	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5
Cyclohexane	µg/m^3 Air	**190**	**59**	**310**	**110**	**66**	**140**	**75**	**68**	**910**	**920**	**27**	**170**	**2500**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,2,4-Trimethylpentane	µg/m^3 Air	**31**	**25**	**59**	**500**	**49**	<5.0	**38**	**21**	<5.0	<5.0	<5.0	**53**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
n-Heptane	µg/m^3 Air	**53**	**20**	**5.7**	**450**	**11**	**240**	**31**	**15**	**2100**	**160**	<5.0	**66**	**170**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichloroethene	µg/m^3 Air	<5.0	<5.0	<5.0	**9.8**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dioxane	µg/m^3 Air	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5
Bromodichloromethane	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**17**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,3-Dichloropropene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Methyl-2-pentanone	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	**45**	<5.0	<5.0	**110**	<5.0	<5.0	<5.0	**5.0**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,3-Dichloropropene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Toluene	µg/m^3 Air	**1600**	**71**	**64**	**910**	**62**	**150**	**140**	**72**	**2000**	**190**	**6.2**	**320**	**170**	<25	<25	<25	<25	<25	<25
1,1,2-Trichloroethane	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Hexanone	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dibromochloromethane	µg/m^3 Air	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5
Tetrachloroethene	µg/m^3 Air	<5.0	<5.0	**25**	**50**	<5.0	<5.0	<5.0	<5.0	<5.0	**19**	**5.5**	**15**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dibromoethane (EDB)	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chlorobenzene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene	µg/m^3 Air	**23**	**9.9**	**76**	**140**	**15**	**38**	**17**	**11**	**340**	**55**	<5.0	**59**	**47**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
m,p,-Xylene	µg/m^3 Air	**32**	**17**	**42**	**270**	**34**	**82**	**26**	**20**	**690**	**100**	**5.0**	**130**	**84**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Styrene	µg/m^3 Air	**5.6**	<5.0	**7.3**	**22**	<5.0	<5.0	**9.5**	<5.0	<5.0	**10**	<5.0	**12**	**11**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
o-Xylene	µg/m^3 Air	**22**	**12**	**66**	**120**	**37**	**56**	**17**	**14**	**450**	**67**	<5.0	**64**	**68**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromoform	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**5.2**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	µg/m^3 Air	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
4-Ethyltoluene	µg/m^3 Air	**5.1**	<5.0	**36**	**26**	**13**	**17**	<5.0	<5.0	**100**	**21**	<5.0	**19**	**24**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3,5-Trimethlybenzene	µg/m^3 Air	<5.0	<5.0	**5.2**	**54**	**35**	**30**	**6.3**	<5.0	**230**	**26**	<5.0	**32**	**46**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,4-Trimethlybenzene	µg/m^3 Air	**19**	**18**	**59**	**110**	**57**	**70**	**20**	**15**	**340**	**91**	**10**	**84**	**92**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Table 34
Summary of Volatile Organic Compounds Measured in Soil Gas Survey - Method TO-15
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:															QA / QC					
TO-15																				
Volatile	Notes	SVO3-VS-15 3/15/06	SVO8-VS-05 3/15/06	SV09-VS-15 3/14/06	SV11-VS-05 3/14/06	SV11-VS-13 5/19/06	SV15-VS-10 3/14/06	SV16-VS-13 3/10/06	SV17-VS-05 3/10/06	SV19-VS-05 5/19/06	SV19-VS-10 5/19/06	SV24-VS-05 3/14/06	SV26-VS-13 3/9/06	SV29-VS-05 5/19/06	TRIP BLANK 3/9/06	TRIP BLANK 3/10/06	TRIP BLANK 3/14/06	TRIP BLANK 3/14/06	TRIP BLANK 3/15/06	TRIP BLANK 5/19/06
1,3-Dichlorobenzene	µg/m^3 Air	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzyl chloride	µg/m^3 Air	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	µg/m^3 Air	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	µg/m^3 Air	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Napthalene	µg/m^3 Air	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	µg/m^3 Air	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Hexachlorobutadiene	µg/m^3 Air	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11

Notes:
<# = Analyte was not detected above the Reporting Limit (#)
-- = Not applicable / Not analyzed
µg/L = micrograms per liter
µg/m^3 Air = microgram per cubic meter (volume)
Results highlighted with **Bold** font indicate results > RL

Table 35
Results of In-Situ Air Permeability Tests

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

	Parameter	Injection						
SV-07	Barometric Pressure ("Hg)	30.14						
	Flow Rate (SCFM)	0.02	0.03	0.05	1	2	3	
	Vacuum/Pressure ("H_20)	0.39	0.75	1.2	83	173	235	Mean
	CA Air Permeability (cm^2)	1.87E-08	1.94E-08	1.70E-08	4.78E-09	4.17E-09	4.34E-09	7.60E-09
	XDD Air Permeability (cm^2)	1.81E-08	1.55E-08	1.38E-08	4.61E-09	5.05E-09	6.21E-09	7.40E-09

	Parameter	Injection				Extraction	
SV-11	Barometric Pressure ("Hg)	30.11				30.11	
	Flow Rate (SCFM)	0.017	0.02	0.037	0.05	0	
	Vacuum/Pressure ("H_20)	97	111	180	207	380	Mean
	CA Air Permeability (cm^2)	6.70E-11	6.90E-11	7.30E-11	8.40E-11	--	8.40E-11
	XDD Air Permeability (cm^2)	4.80E-11	7.30E-11	9.20E-11	8.60E-11	--	8.60E-11

	Parameter	Extraction
SV-18	Barometric Pressure ("Hg)	30.5
	Flow Rate (SCFM)	0.02
	Vacuum/Pressure ("H_20)	380
	CA Air Permeability (cm^2)	--
	XDD Air Permeability (cm^2)	--

	Parameter	Injection				Extraction			
SV-24	Barometric Pressure ("Hg)	29.9				29.9			
	Flow Rate (SCFM)	0.05	1	3	4.8	1	3	4.6	
	Vacuum/Pressure ("H_20)	0.07	2.45	7.66	11.25	2.15	6.16	11.25	Mean
	CA Air Permeability (cm^2)	3.10E-07	1.80E-07	1.70E-07	1.90E-07	2.00E-07	2.10E-07	1.80E-07	2.00E-07
	XDD Air Permeability (cm^2)	2.50E-07	1.40E-07	1.40E-07	1.50E-07	1.60E-07	1.70E-07	1.50E-07	1.60E-07

	Parameter	Injection				Extraction	
SV-28	Barometric Pressure ("Hg)	30.19				30.19	
	Flow Rate (SCFM)	0.02	1	2	2.5	0	
	Vacuum/Pressure ("H_20)	14.75	173	270	318	380	Mean
	CA Air Permeability (cm^2)	4.90E-10	2.10E-09	2.40E-09	2.50E-09	--	1.90E-09
	XDD Air Permeability (cm^2)	3.60E-10	2.50E-09	3.80E-09	4.40E-09	--	2.80E-09

Notes:
"Hg = inches in mercury
"H_2O = inches in water
SCFM = standard cubic feet per meter
cm^2 = centimeters cubed
-- = no data

Table 36
Summary of Air Pathways Surface Vapor Flux Analysis Data

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

COMPOUNDS	Ambient Air (ug/m^3)		Undisturbed Site (ug/m^2,min-1)		Disturbed Site (ug/m^2,min-1)		Infiltration (ug/ft,min-1)	
Methane ASTM D3416								
	1,200		**32**		**33**		**2.2**	
Odor ASTM E679-91 (D/T)								
	--		**6.3**		**13/14**		**0.064**	
Sulfur METHOD TO-14								
Hydrogen Sulfide	--		ND	U	**2.1**		ND	
Sulfur Dioxide	--		**25**		**26,000**		**0.17**	
Methyl Mercaptan	--		ND	U	ND		ND	U
Ethyl Mercaptan	--		ND	U	ND		ND	U
Dimethyl Sulfide	--		ND	U	0.25	J	ND	U
Carbon Disulfide	--		0.43	J	7.5	J	0.035	J
i-Propyl Mercaptan	--		ND	U	ND	U	ND	U
Ethyl Methyl Sulfide	--		ND	U	0.16	J	ND	U
n-Propyl Mercaptan	--		ND	U	ND	U	ND	U
Thiophene	--		ND	U	**9.5**		ND	U
Isobutyl Mercaptan	--		ND	U	ND	U	ND	U
Diethyl Sulfide	--		ND	U	ND	U	ND	U
t-Butyl Mercaptan	--		ND	U	ND	U	ND	U
n-Butyl Mercaptan	--		ND	U	ND	U	ND	U
Dimethyl Disulfide	--		**1.6**		0.77	J	ND	U
3-Methylthiophene	--		ND	U	0.21	J	ND	U
Tetrahydrothiophene	--		ND	U	ND	U	ND	U
2,5-Dimethylthiophene	--		ND	U	ND	U	ND	U
Diethyl Disulfide	--		ND	U	ND	U	ND	U
2-Ethylthiophene	--		ND	U	**1.6**		ND	U

Table 36
Summary of Air Pathways Surface Vapor Flux Analysis Data

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

COMPOUNDS	Ambient Air (ug/m^3)		Undisturbed Site (ug/m^2,min-1)		Disturbed Site (ug/m^2,min-1)		Infiltration (ug/ft,min-1)	
VOC METHOD TO-15 (GC/MS)								
Dichlorodifluoromethane	3.2	J	0.076	J	**0.85**		0.0058	J
Chloromethane	2.5	J	**0.67**/0.99		**0.69**		0.0064	J
Freon 114	ND		ND		**1.2**		ND	
Vinyl Chloride	ND		ND		**0.37**		ND	
Bromomethane	ND		**0.038**		0.43	J	0.0015	J
Chloroethane	ND		0.19	J	0.41		0.0017	J
Ethanol	16	J	0.16	J	**0.72**		ND	
Trichlorofluoromethane	1.4	J	0.045	J	**0.87**		0.0029	J
Acetone	**140**		**15**		**59**		0.035	
2-propanol	ND		**0.12**/0.17J	J	**0.97**		ND	
Methyl iodide	ND		ND		ND		ND	
1,1-Dichloroethene	ND		0.054	J	**0.58**		ND	
Acrylonitrile	ND		0.062	J	0.11	J	ND	
Freon 113	0.62	J	**0.013**		**1.4**		0.0016	J
Allyl chloride	ND		ND		ND		ND	
Dichloromethane	ND		**0.34**		0.5	J	0.0088	J
Carbon disulfide	22		**9.4**		**3.3**		0.061	
trans-1,2-Dichloroethene	ND		ND		ND		ND	
Methyl tert butyl ether	ND		ND		ND		ND	
Proplonitrile	ND		**0.29**		ND		ND	
1,1-Dichloroethane	ND		ND		**0.6**		ND	
Vinyl acetate	ND		0.018	J	**0.37**		0.0034	J
2-Butanone	**17**		**4**		**22**		0.013	
Hexane	6.2	J	**0.41**		**2**		**0.021**	
Bromochloromethane	ND		**0.087**		0.14	J	ND	
Tetrahydrofuran	ND		0.011	J	0.11	J	ND	
Isobutyl alcohol	ND		ND		ND		ND	
Methacrylonitrile	ND		ND		ND		ND	
cis-1,2-Dichloroethene	ND		0.028	J	0.51	J	ND	
2,2-Dichloropropane	ND		ND		ND		ND	
Chloroform	ND		0.11	J	**0.7**		ND	
1,1,1-Trichloroethane	ND		ND		**0.83**		ND	
1,2-Dichloroethane	ND		0.012	J	0.48	J	0.001	J
1,1-Dichloropropene	ND		ND		ND		ND	
Cyclohexane	0.43	J	**0.33**		**1.8**		**0.016**	
Benzene	1.9	J	**2.2**		**0.69**		**0.073**	
Carbon tetrachloride	0.71	J	0.014	J	**1.1**		0.0015	J
n-Heptane	2.8	J	**1.0**/1.5J	J	**2.5**		**0.02**	
1,2-Dichloropropane	ND		0.012	J	0.56	J	ND	
1,4 Dioxane	ND		0.018	J	ND		ND	
Dibromomethane	ND		ND		ND		ND	
Trichloroethene	3.2	J	0.063	J	0.73	J	ND	
Bromodichloromethane	ND		ND		ND		ND	
Methyl methacrylate	ND		ND		ND		ND	
Methyl Isobutyl Ketone	ND		0.77	J	**2.5**		0.0019	J
cis-1,3-Dichloropropene	ND		ND		0.37	J	ND	
Toluene	**30**		**2.8**		**5**		**0.16**	
trans-1,3-Dichloropropene	ND		**0.022**/0.026J	J	0.26	J	ND	
1,1,2-Trichloroethane	3	J	0.36	J	**1.7**		0.001	J
2-Hexanone	ND		**0.65**/1.0J	J	**2.2**		ND	
1,3-Dichloropropane	ND		ND		ND		ND	
Octane	ND		**0.75**		**2.9**		0.013	J
Dibromochloromethane	ND		ND		ND		ND	
1,2-Dibromoethane	ND		0.066		0.52	J	0.0058	J
Tetrachloroethene	18	J	**3.9**		0.72	J	0.0023	J
Chlorobenzene	ND		0.024	J	0.3	J	0.0016	J

Table 36
Summary of Air Pathways Surface Vapor Flux Analysis Data

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

COMPOUNDS	Ambient Air (ug/m^3)		Undisturbed Site (ug/m^2,min-1)		Disturbed Site (ug/m^2,min-1)		Infiltration (ug/ft,min-1)	
VOC METHOD TO-15 (GC/MS) Cont.								
1,1,1,2-Tetrachloroethane	ND		ND		ND		ND	
Ethylbenzene	2.2	J	**0.93**		**1.6**		**0.019**	
m & p-Xylene	**4.9**		2.7		**4.1**		**0.075**	
Styrene	ND		0.027	J	0.13	J	0.0018	J
Bromoform	ND		ND		ND		ND	
o-Xylene	1.7	J	0.95		1.6		**0.031**	
1,1,2,2-Tetrachloroethane	ND		ND		ND		0.00086	J
1,2,3-Trichloropropane	ND		ND		ND		ND	
t-1,4-Dichloro-2-butene	ND		ND		**2.6**		ND	
n-Propylbenzene	3.4	J	0.19	J	**0.89**		0.0059	J
Isopropylbenzene	ND		0.57		**1.3**		0.0012	J
4-Ethyltoluene	ND		0.46		**0.99**		0.0037	J
1,3,5-Trimethylbenzene	ND		0.41		**2.8**		ND	
Methylstyrene	ND		0.052	J	0.3	J	ND	
tert-butyl benzene	ND		0.18	J	2		0.0028	J
1,2,4-Trimethylbenzene	ND		1.2		2.3		0.016	J
sec-butylbenzene	ND		0.044	J	0.4	J	ND	
1,3-Dichlorobenzene	ND		0.11	J	ND		ND	
Isopropyltoluene	ND		**1.1**		0.37	J	0.0098	J
Benzyl chloride	ND		0.072	J	0.23	J	0.0064	J
1,4-Dichlorobenzene	ND		**23**		0.15	J	ND	
n-Butylbenzene	ND		0.064	J	0.13	J	ND	
1,2-Dichlorobenzene	ND		ND		ND		ND	
1,2-Dibromo-3-chloropropane	ND		ND		ND		ND	
Tetraethyl lead	ND		ND		ND		ND	
1,2,4-Trichlorobenzene	ND		ND		ND		ND	
Napthalene	ND		**8.4**		ND		ND	
Hexachlorobutadiene	ND		ND		ND		ND	

Table 36
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GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

COMPOUNDS	Ambient Air (ug/m^3)		Undisturbed Site (ug/m^2,min-1)		Disturbed Site (ug/m^2,min-1)		Infiltration (ug/ft,min-1)	
VOC METHOD TO-14 (GC/FID)								
Ethene	ND		**0.68**		0.12	J	ND	
Acetylene	ND		ND		ND		ND	
Ethane	ND		**0.81**		**1.3**		0.0057	J
Propene	2.2	J	**1.1**		**1.1**		0.006	J
Propane	9	J	**1.7**		**1.3**		0.17	
i-Butane	3	J	1.9		1.7		ND	
Methanol	**85**		18		16		0.081	J
1-Butene	ND		0.18	J	ND		ND	
1,3-Butadiene	ND		ND		ND		ND	
n-Butane	**3.3**/10J		**1.1**		**3.7**		ND	
t-2-Butene	ND		**1.5**		0.087	J	ND	
c-2-Butene	ND		**1.7**		0.11	J	ND	
Ethanol	**240**		0.21	J	6.7		ND	
3-Methyl-1-Butene	ND		ND		**21**		ND	
Acetone	**66**		**25**		**65**		0.024	J
i-Pentane	7.3	J	**5.1**		**1.2**		ND	
1-Pentene	ND		0.31	J	0.24	J	ND	
Isopropanol	ND		0.25	J	ND		0.007	J
2-Methyl-1-Butene	ND		0.16	J	ND		ND	
n-Pentane	5.1	J	**5.1**		1.1		0.011	J
Isoprene	ND		ND		ND		ND	
t-2-Pentene	ND		ND		ND		ND	
c-2-Pentene	ND		0.15	J	0.11	J	ND	
Tert Butyl Alcohol	ND		ND		0.44	J	ND	
2-Methyl-2-Butene	ND		ND		0.31	J	ND	
2,2-Dimethylbutane	ND		ND		0.13	J	ND	
Cyclopentene	ND		0.077	J	ND		ND	
n-Propanol	ND		**0.61**		0.17	J	ND	
Cyclopentane	ND		0.62		0.32	J	ND	
Methyl Tert Butyl Ether	ND		ND		ND		ND	
2,3-Dimethylbutane	ND		0.44	J	**0.56**		0.016	J
2-Methylpentane	ND		0.23	J	**1.1**		ND	
3-Methylpentane	13	J	**1.5**		**2.3**		ND	
1-Hexene	ND		0.25	J	ND		ND	
n-Hexane	6.9	J	0.67		**4**		0.019	J
Diisopropyl Ether	ND		0.22	J	**0.57**		ND	
3-Methylcyclopentene	ND		ND		**3**		ND	
Ethyl Tert Butyl Ether	ND		ND		ND		ND	
Methylcyclopentane	ND		**1.8**		**2.2**		0.021	J
2,4-Dimethylpentane	ND		0.23	J	0.18	J	ND	
Benzene	4.2	J	**2.4**		0.65		0.054	J
Cyclohexane	14	J	0.77		**2.2**		0.013	J
2-Methylhexane	7.6	J	0.47	J	0.56	J	ND	
2,3-Dimethylpentane	ND		**1.6**		**6.9**		ND	
3-Methylhexane	**7.7**	J	**2.3**		**1.2**		0.017	J
2-Methyl-1-Hexene	ND		0.28	J	**1**		ND	
Tert Amyl Methyl Ether	ND		0.26	J	ND		ND	
2,2,4-Trimethylpentane	ND		0.28	J	**1.4**		ND	
n-Heptane	ND		**0.79**		**2.7**		0.014	J
Methylcyclohexane	ND		**1.3**		**3.1**		ND	
2,5-Dimethylhexane	ND		0.29	J	**3.3**		ND	
2,4-Dimethylhexane	ND		ND		**1.3**		ND	
2,3,4-Trimethylpentane	ND		**0.9**		0.34	J	ND	
Toluene	**29**		3.5		**5.5**		**0.12**	
2,3-Dimethylhexane	ND		**1.4**		**5.1**		ND	
2-Methylheptane	ND		0.5	J	**4.5**		ND	

Table 36
Summary of Air Pathways Surface Vapor Flux Analysis Data

GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

COMPOUNDS	Ambient Air (ug/m^3)		Undisturbed Site (ug/m^2,min-1)		Disturbed Site (ug/m^2,min-1)		Infiltration (ug/ft,min-1)	
VOC METHOD TO-14 (GC/FID) Cont.								
4-Methylheptane	ND		**1.5**		**4.3**		ND	
3-Ethyl-3-Methylpentane	ND		0.39	J	**4.2**		ND	
3-Methylheptane	ND		ND		**1.3**		ND	
2-Methyl-1-Heptene	ND		**2.9**		**1.2**		ND	
n-Octane	ND		**0.96**		**2.5**		ND	
Ethylbenzene	**36**		**1.9**		**3.7**		0.014	J
m,p-Xylene	16	J	2.8		**6.3**		0.05	J
Styrene	ND		**0.50**/0.93		**1.2**		ND	
o-Xylene	4.4	J	0.97		2.4		0.021	J
1-Nonane	ND		0.42	J	**2.5**		ND	
n-Nonane	ND		0.8	J	**2.2**		ND	
i-Propylbenzene	ND		0.66	J	**1.7**		ND	
n-Propylbenzene	ND		0.32	J	**1.3**		ND	
a-Pinene	**26**		6.9		8.7		ND	
3-Ethyltoluene	16	J	0.69	J	**2**		ND	
4-Ethyltoluene	ND		0.83		**1.6**		ND	
1,3,5-Trimethylbenzene	ND		0.57	J	**2.5**		ND	
2-Ethyltoluene	ND		**6.2**		**2.2**		ND	
b-Pinene	**34**		**63**		**6.5**		**3.2**	
1,2,4-Trimethylbenzene	27	J	2.7		**3.7**		ND	
n-Decane	**52**		0.79	J	**2.8**		**0.13**	
1,2,3-Trimethylbenzene	ND		**3.6**		**4.4**		ND	
Indan	ND		**0.98**		**3.1**		ND	
d-Limonene	ND		1.1		**3.7**		**0.48**	
1,3-Diethylbenzene	ND		0.39	J	**1**		ND	
1,4-Diethylbenzene	ND		0.39	J	**3.7**		ND	
n-Butylbenzene	ND		0.52	J	**1.7**		ND	
1,4-Dimethyl-2-ethylbenzene	ND		ND		**2**		ND	
1,3-Dimethyl-4-ethylbenzene	ND		0.62	J	**1.3**		ND	
1,2-Dimethyl-4-ethylbenzene	ND		**3**		**1.7**		ND	
Undecane	ND		ND		**2.2**		ND	
1,2,4,5-Tetramethylbenzene	ND		**1.2**		**1.3**		ND	
1,2,3,5-Tetramethylbenzene	ND		ND		**1.2**		ND	
Napthalene	ND		**11**		1.9		ND	
Dodecane	ND		ND		**1.1**		ND	
TNMHC	550	J	**260**		**410**		6.1	

Notes:

Data shown in **BOLD** are equal to or greater than the Quality Control criteria and are above reporting limits
U = Less than method detection limit
J = Greater that method detection limit but less than reporting limit
ND = non-detect
ug/m^3 min-1 = micrograms per meters cubed per minute
ug/m^2 min-1 = micrograms per square meter per minute
ug/ft min-1 = micrograms per foot per minute

TABLE 37
Attenuation of Sludge Impacts, Cooper North and South Sumps
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Depth (ft bgs)	lab pH	Total Extractable Hydrocarbons (C13-C40) (mg/kg)				Chrysene (ug/kg)				Fluoranthene (ug/kg)				Comments
		Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	
CPB01	1.5	1.01	200,000	6000	1,200		170,000	7,700	773	VJ	160,000	7,700	773	VJ	
	5	0.39	160,000	7500	1,500		16,000	1,500	153	VJ	79,000	1,500	153	VJ	
	10	0.93	120,000	2500	500		110,000	7,300	728	VJ	100,000	7,300	728	VJ	
	15	4.33	23	5.0	1		<10	10	1		23	10	1	VJ	
	20	1.20	360	10	2	VJ	22,000	1,400	144	VJ	27,000	1,400	144	VJ	obtained 1.5 feet below sludge contact
	19	5.55	94	10	2	VJ	630	50	5	VJ	690	50	5	VJ	
	23	7.86	22	5.0	1		54	10	1	VJ	55	10	1	VJ	
CPB02	1.5	0.85	250,000	3000	600		160,000	19,000	1,860	VJ	<19000	19,000	1,860		
	5	1.39	18,000	250	50	VJ	17,000	1,200	125		13,000	500	50	VJ	obtained within 1.0 foot of sludge contact
	10	7.39	33	15	3		2,200	200	20	VJ	<200	200	20		
	14	7.32	60	30	6		85	10	1	VJ	78	10	1	VJ	
	18	7.06	30	15	3		150	10	10	VJ	120	10	1	VJ	
CPB03	1.5	1.38	99,000	3000	600		410,000	37,000	3,710	PI	450,000	19,000	1,860	PI	
	5	4.47	36,000	600	120		31,000	1,200	125	PI	<1200	1,200	125		obtained within 1.0 foot of sludge contact
	10	8.16	680	60	12		720	100	10	PI	<100	100	10		
	15	7.85	47	15	3		210	10	1	PI	170	10	1	PI	
	20	7.97	320	15	3		<10	10	1		<10	10	1		
	19	8.14	28	15	3		200	10	1	PI	170	10	1	PI	
CPB04	1.5	7.58	39	7.5	2	VJ	9	50	5	VJ	<50	50	5	DF	
	5	7.59	110	15	3	VJ	<100	100	10	DF	<100	100	10	DF	
	10	8.23	<7.5	7.5	2	DF	<10	10	1	VUJ	<10	10	1	VUJ	
	15	8.53	<7.5	7.5	2	DF	<10	10	1	VUJ	<10	10	1	VUJ	
	19	8.30	<7.5	7.5	2	DF	<10	10	1	VU	<10	10	1	VUJ	
	24	8.14	<7.5	7.5	2	DF	<10	10	1	VU	<10	10	1		
CPB05	1.5	1.66	43,000	1500	300		210,000	16,000	781	VJ	<7800	7,800	781		
	5	2.50	8,900	250	50		16,000	2,500	248	VJ	18,000	2,500	248	VJ	obtained within 1.0 foot of sludge contact
	10	7.75	5	5.0	1	VJ	51	10	1	VJ	45	10	1	VJ	
	15	7.83	<5.0	5.0	1		19	10	1	VJ	15	10	1	VJ	
	20	8.10	<5.0	5.0	1		2	10	1	VJ	<10	10	1	VUJ	
	19	8.31	<5.0	5.0	1		<10	10	1		<10	10	1		
CPB06	1.5	0.84	85,000	1200	240		430,000	38,000	3,830	VJ	370,000	38,000	3,830	VJ	
	5	6.52	6,700	150	30	VJ	100,000	7,200	721	VJ	76,000	7,200	721	VJ	
	10	7.40	1,100	30	6	VJ	1,400	100	10	VJ	980	100	10	VJ	obtained 4 feet below sludge contact
	11	7.04	270	15	3	VJ	1,600	100	10	VJ	240	100	10	VJ	
	15	7.62	7	15	3	VJ	56	10	1	VJ	9	10	1	VJ	
	19	7.29	<15	15	3	DF	14	10	1	VJ	2	10	1	VJ	
CPB07	1.5	1.62	73,000	600	120		410,000	19,000	1,860	PI	310,000	19,000	1,860	PI	
	1.5	1.36	160,000	3000	600		320,000	19,000	1,870	PI	320,000	19,000	1,870	PI	
	5	0.43	110,000	1500	300		240,000	19,000	1,890	PI	170,000	7,600	758	PI	
	10	8.11	14,000	480	96		6,100	500	50	PI	320	200	20	PI	obtained 3.5 feet below sludge contact
	15	8.14	7,000	60	12		4,300	200	20	PI	560	200	20	PI	
	19	7.99	170	15	3		240	10	1	PI	160	10	1	PI	

TABLE 37
Attenuation of Sludge Impacts, Cooper North and South Sumps
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Depth (ft bgs)	lab pH	Total Extractable Hydrocarbons (C13-C40) (mg/kg)				Chrysene (ug/kg)				Fluoranthene (ug/kg)				Comments
		Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	
CPB08	1.5	7.30	140	30	6		9,400	1,200	125	VJ	1,400	1,200	125	VJ	
	8	7.74	50,000	1900	375		160	50	5	VJ	32	50	5	VJ	obtained 6.5 feet below sludge contact
	10	8.62	11,000	750	150		6,000	1,000	100	VJ	<1000	1,000	100		
	15	8.33	79	7.5	2	VJ	220	10	1	VJ	<10	10	1		
	20	7.84	6,200	150	30	VJ	990	200	20	VJ	<200	200	20		
	23	7.62	7	7.5	2	VJ	<10	10	1	VU	<10	10	1		
	25	7.78	8	7.5	2	VJ	<10	10	1		<10	10	1		
	30	7.99	4	7.5	2	VJ	<10	10	1		<10	10	1		
CPB09	1.5	8.91	6	15	3	J,DX,DF	23	50	5	VJ	<50	50	5	VUJ	boring located on berm approximately 6 feet from sump boundary
	5	8.43	<7.5	8	2	DF	<10	10	1		<10	10	1		
	10	8.26	<15	15	3	DF	<10	10	1		<10	10	1		
	15	8.49	<15	15	3	DF	<10	10	1		<10	10	1		
	20	8.36	<15	15	3	DF	<10	10	1	VUJ	<10	10	1	VUJ	
CPB10	1.5	0.36	120,000	1500	300		170,000	7,200	721	PI	66,000	3,600	361	PI	
	5	0.43	110,000	1500	300		180,000	7,100	743	PI	300,000	7,400	743	PI	
	10	6.62	86	10	2		210	20	2	ET,PI	340	20	2	ET,PI	obtained 2.5 feet below sludge contact
	15	2.98	14	10	2		16	10	1	PI	6	10	1	J,DX	
	20	6.74	9	10	2	VJ	7	10	1	J,DX,PI	9	10	1	J,DX,PI	
CPB11R	1.5	0.63	150,000	1500	300		140,000	7,400	735	PI	91,000	3,700	368	PI	
	5	0.40	99,000	1500	300		80,000	3,800	375	PI	170,000	3,800	375	PI	
	10	7.39	10	10	2	VJ	<10	10	1		1	10	1	J,DX	obtained within 1.0 foot of sludge contact
	15	0.66	7,000	100	20		1,400	100	10	PI	2,100	100	10	PI	obtained 1 foot below sludge contact
	20	5.17	7	15	3	VJ	5	10	1	PI,J,DX	9	10	1	PI,J,DX	
CPB12	1.5	3.90	3,800	75	15	VJ	3	10	1	VJ	4	10	1	VJ	
	5	7.50	20,000	380	75		10	50	5	VJ	140	50	5	VJ	
	10	8.14	54	15	3		16,000	1,200	125	VJ	<1200	1,200	125		
	15	7.50	3,500	75	15	VJ	2,600	100	10	VJ	2,000	100	10	VJ	
	15	7.58	300	7.5	2	VJ	180	50	5	VJ	34	50	5	VJ	
	20	7.72	<15	15	3	DF	18	10	1	VJ	3	10	1	VJ	
CPB13	1.5	2.82	49,000	600	120		15,000	1,200	125	VJ	25,000	1,200	125	VJ	
	5	6.63	830	20	4		860	200	20	VJ	<200	200	20		
	10	4.55	1,500	30	6		12,000	500	50	VJ	<500	500	50		obtained 1 foot below sludge contact
	15	7.53	4,400	80	16		7,200	1,000	100	VJ	5,800	1,000	100	VJ	
	18	7.88	12	10	2		17	10	1	VJ	23	10	1	VJ	
	25	6.60	<15	15	3	DF	3	10	1	VJ	<10	10	1		
	28	7.77	6	10	2	VJ	10	10	1	VJ	14	10	1	VJ	
CPB14	1.5	0.81	120,000	1500	300		160,000	18,000	1,840		170,000	7,400	735	PI	
	5	4.42	410	10	2	VJ	150	50	5	PI	560	50	5	PI	obtained 1 foot below sludge contact
	10	6.97	50	10	2		32	10	1	PI	44	10	1	PI	
	15	6.96	25	10	2		6	10	1	J,DX,PI	6	10	1	PI,J,DX	
	19	7.36	12	10	2		7	10	1	PI,J,DX	8	10	1	PI,J,DX	

TABLE 37
Attenuation of Sludge Impacts, Cooper North and South Sumps
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Depth (ft bgs)	lab pH	Total Extractable Hydrocarbons (C13-C40) (mg/kg)				Chrysene (ug/kg)				Fluoranthene (ug/kg)				Comments
		Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	
CPB15	1.5	2.12	110,000	1500	1		<480000	480,000	10	DF	<480000	480,000	10	DF	
	5	6.14	2,400	20	1		<3300	3,300	5	DF	<3300	3,300	5	DF	
	9	8.42	70	10	1		<330	330	1		<330	330	1		
	11	8.40	56	10	1		<330	330	1		<330	330	1		obtained 1.5 feet below sludge contact
	14	7.56	340	10	1		3	10	1	VJ	<10	10	1	VUJ	
	20	7.45	21	10	1		<330	330	1		<330	330	1		
CPB16	2	4.29	510	15	3	VJ	120,000	15,000	1,490	VJ	140,000	15,000	1,490	VJ	
	1	3.69	600	30	6	VJ	2,400	200	20	VJ	280	200	20	VJ	
	5	7.46	14	15	3	VJ	4	10	1	VJ	3	10	1	VJ	obtained 2 feet below sludge contact
	9	8.02	<15	15	3	DF	75	50	5	VJ	13	50	5	VJ	
	15	7.77	<15	15	3	DF	2	10	1	VJ	<10	10	1		
	20	7.86	<15	15	3	DF	<10	10	1		<10	10	1		
CPB17	1.5	0.84	93,000	1500	300	VJ	96,000	7,300	728	PI	180,000	3,600	364	PI	
	1.5	0.85	110,000	1500	300	VJ	170,000	7,300	728	PI	270,000	7,300	728	PI	
	5	6.99	6	10	2	VJ	13	10	1	PI	11	10	1	PI	obtained 1.5 feet below sludge contact
	9	4.92	30	10	2		100	10	1	PI,LM,AY	120	10	1	PI,LM,AY	obtained within 1.0 foot of sludge contact
	13	7.21	<10	10	2	DF	<10	10	1		<10	10	1		obtained 4 feet below sludge contact
	19	7.55	<10	10	2	DF	<10	10	1		<10	10	1		
CPB18	1.5	1.68	110,000	1500	1		<990000	990,000	10	DF	<990000	990,000	10	DF	
	5	8.18	1,100	10	1	LN,AY	<1300	1,300	2	BF	<1300	1,300	2	BF	
	10	9.05	69	10	1		290	50	5	VJ	300	50	5	VJ	
	15	4.20	42	10	1		3	10	1	VJ	40	10	1	VJ	obtained 2 feet below sludge contact
	20	6.43	<10	10	1	DF	<330	330	1		<330	330	1		
	24	7.39	5	10	1	DF,J,DX	<330	330	1		<330	330	1		
CPB19	1.5	7.94	21,000	300	60		12	20	2	VJ	<20	20	2		obtained within 1.0 foot of sludge contact
	6	8.23	8,300	80	16	VJ	6,500	500	50		1,100	200	20	VJ	
	5	8.35	10	15	3	VJ	16	10	1	VJ	<10	10	1		
	10	8.25	<15	15	3	DF	5	10	1	VJ	<10	10	1		
	15	8.03	<15	15	3	DF	39	10	1	VJ	<10	10	1		
	20	7.79	7	10	2	VJ	<10	10	1		<10	10	1		
CPB20	1.5	6.79	310	15	3	VJ	130	100	10		<100	100	10		obtained within 1.0 foot of sludge contact
	5	8.54	<7.5	7.5	2	DF	5	10	1	VJ	<10	10	1		
	10	8.77	<7.5	7.5	2	DF	13	10	1	VJ	12	10	1	VJ	
	15	7.81	5	7.5	2	VJ	9	10	1	VJ	11	10	1	VJ	
	20	8.09	<15	15	3	DF	<10	10	1	VUJ	<10	10	1	VUJ	
CPB21	1	9.59	59	10	2	LM,AY	120	10	1	VJ	88	10	1	VJ	boring located on berm approximately 10 feet from sump boundary
	5	8.60	<7.5	8	2	DF	1	10	1	VJ	<10	10	1		
	10	8.27	4	8	2	J,DX,DF	<10	10	1		<10	10	1		
	15	8.20	<15	15	3	DF	<10	10	1		<10	10	1		
	20	8.01	<15	15	3	DF	<10	10	1		<10	10	1		

TABLE 37
Attenuation of Sludge Impacts, Cooper North and South Sumps
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Depth (ft bgs)	lab pH	Total Extractable Hydrocarbons (C13-C40) (mg/kg)				Chrysene (ug/kg)				Fluoranthene (ug/kg)				Comments
		Result	Result	RL	DF	Qual	Result	RL	DF	Qual	Result	RL	DF	Qual	
CPB22	1.5	7.49	34	15	3		610	100	10	PI	510	100	10	PI	boring located on berm approximately 10 feet from sump boundary
	5	8.37	7	15	3	VJ	<10	10	1		<10	10	1		
	10	7.77	9	15	3	VJ	<10	10	1		<10	10	1		
	15	8.18	6	15	3	VJ	<10	10	1		<10	10	1		
	20	8.14	7	15	3	VJ	<10	10	1		<10	10	1		
CPB23	1.5	7.97	430	10	2	VJ	58	100	10	VJ	<100	100	10	DF	boring located on berm approximately 8 feet from sump boundary
	5	8.49	42	5.0	1		79	50	5	VJ	<50	50	5		
	10	7.95	2	5.0	1	VJ	3	10	1	VJ	2	10	1	VJ	
	15	7.91	<5.0	5.0	1		<330	330	1		<330	330	1		
	20	7.39	<10	10	2	DF	3	10	1	VJ	<10	10	1		
CPB24	1.5	7.98	50	10	2	CQ	<20	20	2		<20	20	2		boring located on berm approximately 6 feet from sump boundary
	5	8.26	23,000	620	125		18,000	1,200	125	VJ	<250	250	25		
	10	8.43	9,800	250	50		4,800	500	50	VJ	1,300	50	5	VJ	
	15	8.48	11,000	250	50		3,900	250	25	VJ	<120	120	13		
	20	8.17	7	5.0	1		70	10	1	VJ	<10	10	1		
CPB28	6	3.89	10	5	1		<330	330	1		<330	330	1		sample obtained in soil between sludge layers
	10	5.07	6	5	1		<330	330	1		<330	330	1		
	14	6.33	8	5	1		<330	330	1		<330	330	1		
CPB30	9	8.19	14,000	250	50		1,600	2,700	8	J,DX	<2,700	2,700	8		
	19	8.14	<5.0	5	1		<330	330	1		<330	330	1		
	29	8.84	<5.0	5	1		<330	330	1		<330	330	1		
DPW01	1.5	4.24	430	15	3	VJ	130	100	10	VJ	<100	100	10		obtained within 1.0 foot of sludge contact
	5	8.02	210	10	2	VJ	<50	50	5	DF	<50	50	5	DF	
	10	8.08	<5.0	5.0	1		<10	10	1		<10	10	1		
	15	7.93	<7.5	7.5	2	DF	<10	10	1	VUJ	<10	10	1	VUJ	
	20	8.03	<7.5	7.5	2	DF	<10	10	1	VUJ	<10	10	1		
DPW02	2	5.87	120	10	2		1,300	100	10	VJ	4,700	100	10	VJ	
	5	8.2	1,400	20	4		<100	100	10	VUJ	<100	100	10	VUJ	
DPW03	1.5	3.79	280	10	2		580	100	10	VJ	490	100	10	VJ	
	5	4.02	340	10	2		580	100	10	VJ	460	100	10	VJ	
DPW04	2	0.88	11,000	150	30		8,900	1,200	125	VJ	13,000	1,200	125	VJ	
	5	6.5	370	10	2		440	100	10	VJ	71	100	10	VJ	
DPW05	5	8.04	5	10	2	VJ	<10	10	1		<10	10	1		

Gardena Sumps Site

Revised Draft
2006 Remedial Investigation Report

Southwest Corner of Artesia Boulevard and Normandie Avenue, Gardena, California

August 22, 2008

***Prepared For*:**

Atlantic Richfield Company
4 Centerpointe Drive
La Palma, CA

One Team. Infinite Solutions.

R E V I S E D D R A F T

2006 REMEDIAL INVESTIGATION REPORT

GARDENA SUMPS SITE
GARDENA, CALIFORNIA

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REVISED DRAFT REPORT - 2006 REMEDIAL INVESTIGATION

GARDENA SUMPS SITE
ATLANTIC RICHFIELD COMPANY
GARDENA CALIFORNIA

AUGUST 22, 2008

1.0 INTRODUCTION

On behalf of Atlantic Richfield Company (ARC), Stantec Consulting Corporation (Stantec) [formerly SECOR International Incorporated (SECOR)] has prepared this Revised Draft of the 2006 Remedial Investigation (RI) Report for Gardena Sumps. The Gardena Sumps (the Site) is located at the southwest corner of the intersection of Artesia Boulevard and Normandie Avenue in the City of Gardena, Los Angeles County, California (Figure 1). The RI response action was conducted pursuant to §VII-C of the Consent Decree for US District Court Case Number CV04-7882 AHM(JTLx). ARC signed this consent degree on June 16, 2004 with the California Department of Toxic Substances Control (DTSC). The Consent Decree was entered into the court records of the United States District Court for the Central District of California on November 4, 2004. This Revised Draft RI report includes data and information from previous submittals and responds to DTSC's Geological Services Unit (GSU) and Human and Ecological Risk Division (HERD) comments on these submittals to be incorporated in the final, agency approved, RI Report.

The purpose of this document is to present the results of Stantec's RI of the Site. The objective was to assess Site conditions, characterize the nature and extent of the Site's hazardous substance contamination, and provide data for use in a Feasibility Study (FS) to evaluate alternatives necessary to select a remedy appropriate for the Site. A list of acronyms and a glossary of terms used in this report is contained in Appendix A, and a list of references is contained in Appendix B.

This RI built upon and supplemented the previous studies and investigations conducted by others at the Site. Additional data necessary to evaluate current conditions at the Site were collected as part of the RI field investigations. The RI augmented the work reported by Metcalf & Eddy (1992 – the "Focused RI Report" cited in the June 18, 2004 compact disk), URS Corporation (URS - 1994), CalEPA (1994), and Tetra Tech (1995).

The RI fieldwork focused on three main data acquisition tasks in order to:

- Obtain detailed technical data on the sludge for a Feasibility Study of remedial alternatives and to update the Baseline Risk Assessment;
- Determine the depth and lateral and vertical extent of the sludge at the Site;
- Develop a groundwater monitoring program to, among other things, evaluate prior reported detections of dissolved metals (CalEPA, 2002); and

- Obtain data for use in the Updated Baseline Risk Assessment that will add to previous risk assessment evaluations using the more recently developed Johnson and Ettinger Model involving subsurface vapor intrusion into buildings (USEPA, 2003a).

This RI has been prepared in accordance with guidelines from the United States Environmental Protection Agency (USEPA) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (known as "Superfund"), as amended in 1986, by the Superfund Amendments and Reauthorization Act (SARA). These guidelines are contained in the USEPA documents "*Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*" (USEPA 1988a), and "*Data Quality Objectives Process for Superfund – Interim Final Guidance*", (USEPA 1993) and updates (USEPA 2000). The Treatability Study portion of this RI has been prepared in accordance with guidelines from "*Guide for Conducting Treatability Studies Under CERCLA, Final"* (USEPA 1992a).

2.0 SITE BACKGROUND AND PHYSICAL SETTING

The Site occupies approximately 6.5 acres and is subdivided into seven privately owned parcels. The largest of these, approximately 3.0 acres, is the Cooper property. The Haack property is approximately 2.6 acres. The southwestern portion of the Site consists of four residential parcels (referred to as Residences). The Site is partially bordered on the south by Los Angeles County Department of Public Works (LACDPW) property and the concrete-lined Dominguez Flood Channel (Figures 2A and 2B). Commercial and light industrial buildings exist to the north, east and west of the Site. Two sumps containing primarily petroleum refining wastes (in this RI report the wastes in the sumps are referred to as 'sludge') occupy over 80% of the Cooper property. These sumps are referred to as the Cooper North Sump and Cooper South Sump in this draft RI report. A smaller sump containing sludge underlies the northeastern portion of the Haack property and is referred to as the Haack Sump. There is also an area south of the Haack Sump that partially underlies a portion of the Haack Property and a small portion of the residential parcels that is referred to as the Haack Rework Area in this draft RI report. The Haack Rework area contains sludge material, brick and concrete debris and soil disturbed by excavation and replacement. These three sumps and the Haack Rework Area constitute the areas of concern of this RI (Figure 2A).

The boundaries of the areas shown on Figure 2A and 2B were modified from the boundaries originally identified in the RI/FS Workplan, which were delineated based on examination of aerial photographs (Figures C-3 through C-15 in Appendix C). Site topography is produced from an aerial survey of the Site conducted by ARC in 2005 (Figure 2B). The RI/FS Workplan identified three sumps on the Haack property. However, drilling results indicate that the 'central' and 'southern' Haack sumps constitute a single area that contains sludge material that has been partially disrupted by surface excavation and mixed with rubble and soil overburden. The Haack Rework Area is predominately at an elevation above the Cooper and Haack sumps. Therefore, it was deemed more appropriate to designate this area as the Haack Rework Area to reflect the disturbance of the area after sludge deposition had occurred.

2.1 SITE HISTORY

Historical use of the site relative to the RI appears to have begun in the late 1920's. A summary of the historical property ownership and use is presented at the end of this section. Chronological details of site use are presented below and are based on available site photographs.

Figures C-1 and C-2 in Appendix C show early topographic maps depicting the Site location with respect to the early regional surface water drainage pattern prior to 1930. These early topographic maps show that the eastern half of the Site was elevated, which suggests that an amount of clay material could have been extracted from pits at the Site above the current Site grade. Excavations at the Site then occurred below the elevation of the adjacent road and railroad track.

Figure C-3 in Appendix C is an aerial photograph from 1928 that shows the configuration of the excavations at the clay mining operation. The area of the two Cooper sumps is at a lower surface elevation than the future LACDPW land to the south and most of the Haack and Residences properties. The northwestern portion of the Cooper property has structures while most of the remaining Cooper property appears to be cultivated with row crops. The railroad tracks east of the Cooper property are elevated above the surface of the cultivated field. The apparent cultivated field suggests that clay mining at the Cooper property was completed by 1928. There is an obvious cut-bank into the bluff on the northern Haack property that suggests that clay-mining was occurring at this portion of the Haack property in 1928. Small structures exist on the southern Haack property, the Residence properties and the LACDPW property.

Figure C-4 in Appendix C is an aerial photograph from 1929 and shows increased excavation activities into the bluff on the northern Haack property. The southern portion of the Haack property (present Rework Area) shows an elevated scoured surface with slope cut. This elevated area slopes towards the surface of the southern Cooper property. Boring logs from RB-2 and RB-3 indicate that fill material (including brick and concrete debris, grass) extended to elevations of approximately 8 feet msl in portions of the Rework Area. Figure C-5 in Appendix C is an aerial photograph from May 24, 1938 and documents that creation of the disposal sumps at the Site had not yet begun.

Figure C-6 in Appendix C is an aerial photograph taken on March 6, 1941 after a major flooding event in the area. Both the Haack Sump and the Cooper South Sump are flooded. The margins of the Haack Sump are well delineated. The cut bank into the bluff on the northern Haack property has been extended eastward and marks the southern boundary of the sump. Both a northern and eastern berm had been constructed by this time with the eastern berm being located in the region of the removed Cooper property structures. An access road forms the western boundary of the Haack Sump, and a small depression occurs west of the road. The Cooper South Sump has berms along all four sides. There is no visual evidence that the Cooper North Sump has been constructed by this time. An elevated area exists between the Haack Rework Area and the Haack Sump. Sludge, apparently resulting from surface releases, exists on the eastward dipping surface of the Haack Rework Area. The sludge disposed in the Haack Rework Area does not extend into the Cooper South Sump. New structures are evident in the eastern portion of the Residence area. The LACDPW land structures still remain.

Figure C-7 in Appendix C is an aerial photograph taken on December 1, 1941. The eastern and northern berms of the Cooper North Sump have been constructed and initiation of sludge disposal in this sump has commenced within the center and eastern side of this sump. The excavation west of the Haack sump has been enlarged but does not show evidence of sludge disposal within it.

Figure C-8 in Appendix C is an aerial photograph taken on September 4, 1946. The Haack and two Cooper sumps have been filled with sludge, and vegetation is reclaiming the Haack Rework Area. Some excavation of soil has occurred to the bluffs west and south of the western portion of the Haack sump. There is no further development of the Haack and Cooper properties. The Residence and LACDPW properties do not appear to have changed much since March 1941.

West of the Site the Dominguez Channel has been constructed south of Artesia Boulevard but then crosses northward under Artesia Boulevard as a natural drainage. Due to scale this observation is not shown on Figure C-8.

Figure C-9 in Appendix C is an aerial photograph taken in December 1951. The western portion of the Haack Sump has been covered with dirt and converted to a parking lot. The eastern portion of the Haack Sump does not appear to have been altered. A significant portion of the bluff south and southwest of the Haack Sump has been excavated. Two structures have been constructed in the northwestern portion of the Haack property with a cut bank into the bluff south and southeast of the southern structure. The Haack Rework Area is still vegetated and has not been excavated. The Cooper South Sump has some surface water while the Cooper North Sump is submerged with water. The Residence Area has structures on all four lots and structures remain on the LACDPW land.

Figure C-10 in Appendix C is an aerial photograph taken on April 5, 1956. The Haack property appears as it had in 1951 although the bluff south and southeast of the southern structure is more vegetated than in 1951. The two Cooper sumps appear unchanged although there is no surface water present on them. Structures have been added to the western lots of the Residence Area and structures still remain on the LACDPW property. The Dominguez Channel has been extended under Artesia Boulevard into the natural drainage north of Artesia Boulevard. Due to scale this observation is not shown on Figure C-10.

Figure C-11 in Appendix C is an aerial photograph taken on January 17, 1958. The Dominguez Channel has been relocated and extended eastward south of the Site. A third structure (the “administrative building”) has been constructed on the Haack Property at the southern edge of the parking lot. The Cooper property and Residences area have not significantly changed since 1956. The structures on the LACDPW property have been removed due to the extension of Dominguez Channel. LACDPW as-built construction drawings of the Dominguez Channel south of the Site are presented in Appendix D.

Figure C-12 in Appendix C is an aerial photograph taken in November 1962. Significant changes have occurred on the Haack property. The remaining bluff immediately south of the “administrative building” had been excavated back to the present day cut-bank (located west of boring HPB11). This excavation expands the parking lot south of the “administrative building”. The parking lot on the Haack property appears to have been paved although the eastern portion of the Haack property remains a vegetated area immediately west of the Cooper North Sump. The Rework Area appears altered and may have received soil cover from the excavation activities that occurred immediately north of the area. No development has occurred on the property immediately west of the Haack property. The Cooper property remains unchanged.

Figure C-13 in Appendix C is an aerial photograph taken in 1994 after construction of the DTSC interim cover. Commercial buildings now occupy the former natural drainage area north of Artesia Boulevard.

The largest excavation during clay mining operations at the Site had occurred on the Cooper property by 1928. Historical aerial photos suggest that this large excavation was extended into the northern Haack property during 1928 and 1929. Excavation and backfilling of an excavation with soil and debris occurred west of the current Cooper South Sump prior to 1929. The large excavation within the Cooper property was developed into two sumps for sludge disposal between 1938 and 1941. The two Cooper sumps currently are capped by a geosynthetic material that was installed by OHM Corporation (OHM) in July 1993 as part of the DTSC's environmental program at the Site (OHM, 1994). The Haack Sump has been covered by a concrete slab and asphalt. Figure C-14 in Appendix C shows the Site in 2002, including surrounding current land use. There has been no known development of the Cooper property to date. The capped area is fenced, and signs indicating the hazardous nature of the Site are displayed.

Several structures have been constructed on the northern Haack property, which is covered with asphalt and concrete. Three buildings and numerous small trailer-type storage structures are present. The southern portion of the Haack property is exposed soil. The southeastern portion of the Haack property, which constitutes the Haack Rework Area, contains soil with rubble and sludge deposits. A fence currently separates the Haack and Cooper properties but the fence does not follow the property line. The Aircraft Magnesium Corporation (currently out-of-business) leased and operated a metal casting facility on the Haack property for some period of time. The Haack property is currently leased to various tenants who operate small businesses, including a U-Haul rental agency, a metal fabricating, sand blasting and painting company, and an auto body repair shop. Figure C-15 in Appendix C is an aerial photograph from 2004 that shows the Site with the cap installed and recent land use on the Haack Property.

The following history of property ownership has been generated from information in the DTSC's files (February 18, 1992 Booz Allen title search document). In November 1925, A.H. Vaughan and Florence Vaughan leased property containing the Site to George McGhee. In March 1926, George McGhee assigns this lease to the Moneta Brick Company. On May 17, 1939, A.H. Vaughan and Florence Vaughan grant the property currently consisting of the Haack, Cooper and Residential Area to Denys Goddard. On March 28, 1947, Denys Goddard grants to Wendell and Golda Hopkins the current Haack and Cooper properties and Goddard maintains ownership of the Residential Area. On January 3, 1948 the Hopkins grant their property to S&L Manufacturing Company. In 1953 Denys Goddard's will distributes the Residential Area property to various individuals. On May 22, 1957, Florence Vaughan grants property immediately south of the current Cooper and Residential Area properties to the Los Angeles Flood Control District. On May 16, 1958, S&L Manufacturing Company grants the current Haack and Cooper property to Charles Warfel. On January 26, 1959, Charles Warfel grants the current Cooper property to William Ward. On May 12, 1960, Charles Warfel grants the current Haack property to Clarence and Genevieve Haack. The Clarence Haack Living Trust currently owns this property. On July 5, 1966, William Ward grants the current Cooper property to Normandie-Artesia Property Company which grants back this property to William Ward on December 31, 1975. On December 14, 1977, William Ward grants the current Cooper property to Thomas Cooper.

2.2 PREVIOUS INVESTIGATIONS

This section provides a brief summary of previous investigations that have been conducted since the initial site investigation in 1981. Table 1 provides a summary of previous written reports that address the Site. However, in order to explain the entire body of data that has been collected by numerous investigators over the past two and a half decades, selected analytical data from these previous investigations are included in this report. Data from previous investigations will be clearly identified in the analytical data tables included in this report.

Environmental regulatory involvement began at the Site in early 1981, after a citizen complained to DTSC's predecessor agency (California Department of Health Services - CalDHS) about the condition of the sumps. The USEPA also became involved at that time. A preliminary investigation by CalDHS obtained and analyzed seven liquid and sludge samples from the two sumps on the Cooper Property (see locations JH01 – JH07 on Figure 3A), and identified several hazardous chemicals that warranted further investigation. During the CalDHS Site visit, it was noted that approximately fifty 55-gallon drums were located on the east-central portion of the Haack Property. These drums were removed from the site subsequent to that visit. However, Stantec has not been able to obtain any documentation pertaining to the contents or disposition of the drums. Adjacent to, and south of the area with the drums, an area with odors and burn marks on the surface was noted by CalDHS. The CalDHS investigation is summarized in Ecology and Environment, Inc. (EEI 1982).

As summarized in EEI (1982; 1986; 1987), the USEPA conducted three separate investigations at the Site during 1982. The first investigation, conducted in May 1982, was unsuccessful because the sampling and analysis methodology employed did not follow the protocol set forth by the USEPA Office of Technical Standards (Metcalf & Eddy, 1992). The USEPA Field Investigation Team then conducted a second investigation in May of the same year. Surface samples collected during this investigation were located on the eastern portions of the two sumps on the Cooper Property (labeled GS1 through GS4 - see Figure 3A), and were analyzed for organic compounds that again were deemed invalid due to laboratory quality assurance discrepancies. However, inorganic sample results were considered valid and indicated that high aluminum and iron concentrations were present in the solid samples collected from the surface of the two Cooper sumps. It appears that these inorganic analytical results were only described qualitatively in the summary reports (e.g. EEI, 1987) but the laboratory reports were not included in the documentation (cited only as "QA/QC reports on file").

The third USEPA investigation was conducted in the second half of 1982 when USEPA constructed four off-site groundwater monitoring wells (MW's), identified as G-1 through G-4, that were assumed to be hydraulically down gradient from the Site (Figure 3B). These wells were intended to monitor groundwater in shallow hydraulic zones adjacent to the Site. Groundwater samples were collected from the four wells (G-1 through G-4) on July 28 and 29, 1982. The water samples were analyzed for Volatile Organic Compounds (VOC's). All analytical data was deemed valid and no VOC's were identified in the water samples collected from the off-Site wells. Four grab samples of surficial material, two from the Cooper North Sump (GS-1 and GS-4 in Figure 3A) and two from the Cooper South Sump (GS-2 and GS-3 in Figure

3A), were also sampled during this investigation. Analytical results for the sump grab samples indicated the presence of trichloroethene (TCE), benzene, ethyl benzene, and toluene. Based on the three investigations, the Site was determined by the USEPA to pose no immediate threat to human health or the environment.

In addition to the investigations discussed above, the USEPA performed two geophysical surveys of the Site, which were a seismic refraction survey and an electrical resistivity survey. However, both geophysical surveys proved inconclusive due to the variable nature of the physical properties of the waste material.

DTSC conducted a follow-up investigation of the four groundwater monitoring wells (MW's) in 1987. The results of the follow-up investigation concluded that the local groundwater quality was not being significantly impacted by compounds found in the sumps. The subsequent development of commercial facilities on properties around the Site resulted in three of the groundwater MW's, constructed in 1982, being destroyed. The remaining well, G-4, is located on a LACDPW Property adjacent to the Dominguez Channel.

In 1992, DTSC contracted with Metcalf & Eddy to provide a focused RI at the Site (Metcalf & Eddy, 1992). The focused RI included four sludge borings on the Cooper Property, two borings on the Haack Property, and ambient and flux chamber air emission monitoring. Figures 3A and 3B show the locations of sludge and surface soil samples as well as the locations of the two hand-augured soil borings. The sludge samples from the Cooper Property confirmed results from earlier investigations on the chemical composition of the sludge, and the borings on the Haack Property identified that waste material existed beneath concrete, soil fill, and asphalt on the eastern portions of that property. The air monitoring and flux sampling determined that emissions from compounds contained in sludge in the sumps were not significant. Tables 2 through 4 contain analytical results for surface soil samples.

As shown in Table 2, surface samples GS-D2 and GS-D3 have very low pH values even though neither sample was obtained within sump boundaries (Figure 3A). DTSC indicated the low values are the result of sample contamination by oily waste (§8.2.4, DTSC, 1994). These samples are located in an area adjacent to and east of a slight topographic rise from the Cooper Property westward onto the Haack Property where small surface seeps of tar can be observed (September 21, 2004 Site visit by ARC, DTSC, and SECOR).

In the early 1990s, DTSC worked with the Site owners to mitigate the waste oil deposits that remained in the sumps. As a result, a geo-textile fabric cap was installed over the two Cooper sumps in July 1993. The cap significantly minimizes water infiltration from precipitation and runoff, and helps contain the material within the sumps.

URS conducted a groundwater RI at the Site in 1993/1994 to assess subsurface conditions along the Site perimeter. URS investigated subsurface stratigraphy and pore pressures using cone penetrometer test (CPT) methodologies, followed by installation of three clusters of groundwater MW's (i.e., one 30- or 40-foot deep A-series well and one 90-foot deep B-series well per cluster, designated MW-01A/B, MW-02A/B, and MW-03A/B). Figure 3B shows the

locations of the MW's and the CPT borings. Table 5 contains a summary of analytical results for soils sampled during drilling of these MW borings. Wells MW-01A/B through MW-03A/B were sampled by DTSC periodically through early 2002. During the sampling event in 1994, tetrachloroethylene exceeded the Maximum Contaminant Level (MCL) in one MW (G-4 with 17 µg/L), and total xylene isomers were detected at 17.8 µg/L in MW-03B. All other analytes were either non-detect or detected at concentrations less than the laboratory Method Detection Limits (MDL's).

During the same 1993/1994 period, DTSC investigated subsurface conditions (particularly soil and waste sludge) in borings on the Haack Property (see Figures 3A and 3B for boring locations), and obtained 15 surface soil samples around the sumps located on the Cooper Property (see Figure 3A for surface sample locations labeled GS#, GS-##, and JH##, excluding GS-1 through GS-4, generated during the 1982 EPA FIT program).

Table 6 contains information showing the location and depths of waste sludge determined from soil borings. Tables 7 through 9 contain analytical results for VOC and SVOC compounds, and inorganic analyses from soil samples. DTSC confirmed the presence of the sumps on the Haack Property, and found the waste to be viscous, soft to hard, black organic sludge interbedded with soil layers. The sludge contained high concentrations of polynuclear aromatic hydrocarbon (PAH) compounds and exhibited low pH with locally elevated concentrations of metals.

In 1995, DTSC contracted with Tetra Tech, Inc. (Tetra Tech) to perform a Baseline Human Health Risk Assessment (BHHRA – Tetra Tech, 1995). The purpose of the BHHRA was to estimate the potential chronic health hazards posed by substances found to occur in soil and sludge, groundwater, and air at the Site during previous investigations. Tables 10 through 12 list the Contaminants of Potential Concern (COPC) identified by the BHHRA in air, soil, and sludge at the Site. The BHHRA considered industrial and residential property use and accounted for potential exposure by eight pathways:

1. Soil ingestion;
2. Dermal contact with soil;
3. Sludge ingestion;
4. Dermal contact with sludge;
5. Ingestion of equal portions of soil and sludge;
6. Dermal contact with equal portions of soil and sludge;
7. Inhalation of vapors emitted by soil or sludge; and
8. Inhalation of vapor emitted by volatiles in groundwater.

The BHHRA indicated that risks to current workers from soil and sludge are minimal because of the fencing and cover on sumps located on the Cooper Property, and the asphalt/concrete over the sumps on the Haack Property.

The BHHRA also indicated that, if the fence and geo-membrane cap on the Cooper Property and the asphalt cover on the Haack Property are not maintained, future exposures to soil and sludge could potentially result in cancer risks that exceed $1x10^{-6}$ or a Hazard Index (HI) equal to

1.0. The principal contaminants associated with both soil and sludge cancer risks include the PAH's chrysene, benzo(b)fluoranthene, and benzo(a)pyrene. The principal contaminant associated with air emission cancer risk is benzene. The BHHRA found that potential exposure by potential future Cooper Property residents to indoor air containing hydrogen sulfide gas could result in an air emission hazard exceeding 1.0. Inhalation exposures were shown to not present a hazard to off-Site receptors for either current or future conditions. Of particular note, the BHHRA found that future groundwater exposures did not pose a cancer risk or a hazard.

On December 13, 2000, a geophysical contractor hired by Mr. Cooper performed a ground penetrating radar (GPR) investigation of the sumps located on the Cooper Property (Earth Imaging Geologic Services, December 21, 2000). A total of ten GPR profiles were collected across the sumps on the Cooper Property (Figure 4). The contractor interpreted the reflector characteristics of the GPR profiles to indicate that the base of the sump body lies at approximately six to nine feet bgs. The GPR Report is included as Appendix E.

In 2000, 2001, and 2002, DTSC supervised groundwater sampling of the seven existing groundwater MW's. Groundwater samples obtained on February 28, 2002, contained detectable concentrations of antimony (MW-02B, MW-03A, MW-03B, and G-4 with 10 to 15 µg/L), lead (MW-03A, MW-03B, and G-4 with 15 to 19 µg/L) and thallium (MW-02B, MW-03A, and G-4 with 15 to 21 µg/L) that were above MCL's. Prior to the 2000 and 2001 sampling events, analytes investigated for groundwater samples were found at non-detect or below their MCL's.

In a January 15, 2003 letter to DTSC, Mr. Cooper outlined two remedial alternatives for cleanup of the Gardena Sumps. Mr. Cooper stated sampling of the sump material has yielded properties for petroleum characteristics including American Petroleum Institute (API) gravity of approximately ten, flash point of 400+^{o}F, and pour point of 150+^{o}F. In addition, Mr. Cooper noted that pH is around 2.0 and ascribes the low pH value to a two-phase mixture of oil and water. Mr. Cooper acknowledges slightly elevated levels of certain metals, and ascribes the elevated lead concentrations to the proximity of the Site to a major highway, which resulted in automobile exhaust emissions (with lead as a component) impacting the Site. Mr. Cooper estimates the volume of sludge in the two Cooper sumps to be approximately 15,000 cubic yards, based upon a sump depth of four to six feet bgs. One remedial alternative proposed by Mr. Cooper calls for excavation and off-site transport of sludge to a facility that could process the sludge into a material that could be recycled as a commercially acceptable product.

2.3 GEOLOGIC SETTING

The following discussion is based on California Department of Water Resources (CalDWR) Bulletin No. 104, Planned Utilization of the Ground-water Basins of the Coastal Plain of Los Angeles County, Appendix A—Ground Water Geology, dated June 1961, reprinted April 1988 (CalDWR, 1961) and discussions contained in reports from previous investigations (CalEPA 1994 and URS 1994).

The Site is located in the Los Angeles Coastal Plain and is underlain by a thick sequence of marine and continental sediments that were deposited in a board synclinal depression. This depression is generally referred to as the Los Angeles Basin. The Los Angeles Basin is bisected by the northwest trending Newport-Inglewood uplift, which divides the Coastal Plain into two smaller synclinal troughs. The Site is located in the West Coast Basin, which constitutes the southwest portion of the Los Angeles Basin.

The Site is located near the junction of the Torrance Plain and the Dominguez Erosion Gap. The Torrance Plain runs west of and parallel to the hills of the Newport-Inglewood uplift from the Ballona Gap southeast to the Dominguez Gap. The Plain is a broad featureless area only slightly dissected locally by the Dominguez Creek (Dominguez Channel). The Plain is immediately underlain by fine-grained materials that are overlain by recent alluvium.

According to boring logs in the EEI (1986), Metcalf and Eddy (1992), CalEPA (1994) and URS (1994) reports, sediments underlying the Site, to the maximum explored depth of 92 feet bgs, consist primarily of a mixture of clays and silts with small lenses of sand. Copies of the available boring logs from these previous studies are contained in Appendix F, and summarized in Table 13. This stratigraphy correlates in general with the observed conditions in borings completed in conjunction with this RI, which reached a maximum depth of 100 feet bgs.

2.4 HYDROGEOLOGIC SETTING

The following discussion is based on CalDWR Bulletin No. 104, Planned Utilization of the Ground-water Basins of the Coastal Plain of Los Angeles County, Appendix A - Ground Water Geology, dated June 1961, reprinted April 1988 (CalDWR, 1961) and discussions contained in reports from previous investigations (CalEPA 1994 and URS 1994).

The Site is centrally located in what is known as the West Coast Groundwater Basin. This basin is hydraulically isolated from other, larger groundwater basins in the Coastal Plain by the regional Newport-Inglewood Fault. The Site is underlain by Holocene and late-Pleistocene Age alluvial and marine deposits, which include the Bellflower Aquiclude at the ground surface, and the Gardena and/or Gage Aquifers of the Lakewood Formation beneath the aquiclude. Major underlying aquifers (beneath the Lakewood Formation) are the Lynwood and the Silverado Aquifers of the San Pedro Formation. The relationships of the regional hydrogeologic units are shown in Figure 5, which is a generalized hydrostratigraphic cross section located about 4,000 feet north of the Site adapted from Plate 6B in CalDWR (1961).

The uppermost defined unit within the basin, and the unit that the Site is located in, is the Bellflower Aquiclude. Regionally, the Bellflower Aquiclude contains interfingered zones of permeable and impermeable sediments. The zones with modest to relatively high hydraulic conductivity consist of coarse sand and gravel, silty sand, and silt. These materials vary in thickness from 10 to 60 feet, are not laterally continuous. However, in some areas these zones may contain significant amounts of water. Little beneficial use is made of water in these shallow, discontinuous hydraulic zones because well yields tend to be low and water quality

generally poor. Coarse grained, highly permeable units of significant lateral extent were not identified beneath the Site during Stantec's field investigations.

The more prevalent fine-grained sediments, interbedded with the more permeable zones, have relatively low hydraulic conductivity. The clay and silty clay of these zones generally impede downward percolation of water. The combined thickness of the Recent alluvium and the Bellflower Aquiclude is in excess of 90 feet in the vicinity of the Site.

In the vicinity of the Site, the Gardena, Gage, Lynwood, and Silverado Aquifers underlie the Bellflower Aquiclude (Figure 5). The Gardena Aquifer is an incised ancestral river channel with its axial trace oriented west-southwest to east-northeast. It is an elongate deposit that extends inland from Redondo Beach beneath the City of Gardena and State Highway 91 (Artesia Boulevard), across the Newport-Inglewood uplift and into the Central Basin to the City of Lynwood. In the Site vicinity, the Gardena Aquifer is incised into, and merges with the Gage Aquifer.

The lithology of the Gardena Aquifer is coarse sand and gravel with discontinuous lenses of sandy silt and yellow to blue clay with gravel sizes ranging from pea-size to cobbles three to four inches in diameter and sand ranging from fine to coarse. In the vicinity of the Site, the contact between the base of the Bellflower Aquiclude and the top of the Gardena Aquifer lies at approximately -100 feet mean sea level (fmsl), or at approximately 125 feet bgs. Generally, the Gardena Aquifer is 40 to 100 feet thick in the area of the Site. The Gardena and Gage Aquifers are hydraulically connected. The composition of the Gage Aquifer in the West Coast Groundwater Basin is a fine to medium sand with variable amounts of gravel, sandy silt, and clay. The Gardena and Gage Aquifers are underlain by the San Pedro Formation (CalDWR, 1961).

The lower Pleistocene age San Pedro Formation is of marine origin. In the Site area, it includes two main aquifers, the Lynwood and the Silverado. Formation thickness in the immediate area is approximately 950 feet.

The uppermost aquifer of the San Pedro Formation is the Lynwood Aquifer, historically referred to as the "400-foot gravel." In the Site area, the Lynwood Aquifer is composed of sand and silty sand, has a thickness ranging from 50 to 100 feet, and is under confined conditions. The upper contact of the Lynwood Aquifer lies at a depth of approximately -250 fmsl, or at approximately 275 feet bgs, in the Site vicinity. Groundwater from this aquifer is being used for both domestic and industrial uses (CalDWR, 1961).

Deposits of the Silverado Aquifer, which is the lower aquifer of the San Pedro Formation, consist of fine- to coarse-grained blue-gray sands and gravels that are several hundred feet thick. This unit is continuous over a large area, but it is interbedded in some places with discontinuous layers of relatively impermeable sandy silts, silts, and clays. In the vicinity of the Site, the upper contact of the Silverado Aquifer is approximately 525-feet beneath the surface (CalDWR, 1961).

The Gardena/Gage, Silverado, and Lynwood Aquifers are all capable of storing or conveying groundwater in significant quantities and constitute major sources of groundwater in the West Coast Groundwater Basin. The Lynwood and Silverado Aquifers are primary sources for domestic water supply, while the Gardena and Gage Aquifers are a secondary domestic water supply source. Neither the Gardena nor Gage Aquifers are currently pumped for domestic use. The intervening finer-grained aquitards have not been named. These aquitards, including those that separate the Gardena and Gage Aquifers from the Lynwood Aquifer and the Lynwood Aquifer from the Silverado Aquifer, are discontinuous in nature and absent in some areas.

Figure 6 shows the regional groundwater elevation contours for the deep aquifer system (including the Lynwood and Silverado Aquifers) as compiled by the Water Replenishment District of Southern California (WRD) for Fall 2006 (WRD, 2007). According to Figure 6, in the vicinity of Gardena, groundwater in the deep aquifer system (Silverado Aquifer) flows regionally towards the northeast with an average groundwater elevation of -50 fmsl. The Dalton well, located immediately northwest of MW-01A/B, produces from the Silverado Aquifer. Groundwater elevation contour maps for the shallower Gage/Gardena Aquifers are not compiled for publication by WRD, however three monitoring wells within a three mile radius from the Site had groundwater elevations ranging from -27.49 up to -9.93 fmsl (Gardena #1 = -13.29 fmsl; Carson #2 = -27.49 fmsl; and PM-3 Madrid = -9.93 fmsl) during September 2006 (WRD, 2007). These groundwater elevations indicate that, in general, the merged Gardena/Gage Aquifer in the region around the Site is under confined conditions.

Locally, the area surrounding the Site is urbanized, with surface waters that drain via storm drains into the Dominguez Channel. The Dominguez Channel is a concrete-lined flood-control structure that lies approximately 100 to 200 feet south of the Site. The upstream portion of modern day Dominguez Channel originates several miles west-northwest of the Site, and it drains surface water to the southeast where it discharges to the Cerritos Channel of the Los Angeles Harbor. Surface water at the Site generally drains towards the north and east following Site topography, and is intercepted by a flood control storm drain located at the northeast corner of the Site adjacent to the intersection of Artesia Boulevard and Normandie Avenue.

Historically, the Dominguez Channel flowed along a natural channel bed located approximately several hundred feet north and east of the Site where it flowed into Laguna Dominguez and then emptied again into a natural channel bed flowing to the southeast (see historical topographic maps C-1 and C-2, and historical air photo C-5 in Appendix C). This led EEI (1986) to speculate that during the early 1960's shallow groundwater flow would have been to the northeast in the Site vicinity prior to the concrete-lining and diversion of the Dominguez Channel from north and east of the Site to south and southeast of the Site.

In early 1981, the CalDHS and the USEPA became the first regulatory agencies to address the environmental issues at the Site. In 1982, four off-site groundwater monitoring wells (G-1 through G-4) were constructed by the USEPA beyond the perimeter of the Site (Figure 3B). The wells were installed in saturated portions of the Bellflower Aquiclude. Sampling and analytical results for organic compounds indicated that no significant concentrations of contaminants were present in the groundwater. Continued groundwater monitoring of these

wells by regulatory agencies yielded similar results. Three of these wells (G-1, G-2, and G-3) have subsequently been destroyed during development of the area surrounding the Site.

In 1993/1994, three well clusters (MW-01A/B, MW-02A/B, and MW-03A/B) were installed to monitor two different hydraulic zones beneath the Site. The depths to these hydraulic zones, designated Zone A (upper) and Zone B (lower) in this RI are at approximately 25 and 80 feet bgs. Beneath the Site these hydraulic zones are not sediments capable of yielding commercially viable quantities of groundwater. Well construction details for these six wells, and four previously installed USEPA wells are summarized in Table 14. These wells are screened within sediments of the Bellflower Aquiclude.

The monitoring wells were periodically sampled from 1994 through 2002. Analytical results of these samples supported the findings of earlier investigators. Trace amounts of a few VOC's were found in samples obtained from several wells in 1994, immediately after the wells were installed. However, during the next 14 years, none of these VOC compounds were subsequently detected in any of the monitoring wells. It is likely that the 1994 VOC detections were the result of cross-contamination during well installation.

During 2000, 2001, and 2002, the DTSC, which is the successor agency to CalDHS, supervised groundwater monitoring and sampling of the seven existing monitoring wells. Groundwater samples obtained on February 28, 2002, contained detectable concentrations of Antimony (MW-02B, MW-03A, MW-03B, and G-4 with 10 to 15 µg/L), Lead (MW-03A, MW-03B, and G-4 with 15 to 19 µg/L) and Thallium (MW-02B, MW-03A, and G-4 with 15 to 21 µg/L) that were above the MCL, as defined in Title 22 CCR §64431. With a very few exceptions, prior to and after the 2002 sampling event, analytes tested in groundwater samples were either not-detected (ND) or found below the Reporting Limit (RL).

Quarterly groundwater monitoring and sampling was agreed to as part of a CD entered into between DTSC and ARC, which became effective November 4, 2004 (§VIIC, paragraph 2, lines 2-3). Stantec, working on behalf of ARC initiated quarterly monitoring activities in January 2006. At present, nine MW's are included in the monitoring program (MW-01A/B, MW-02A/B, MW-03A/B, MW-04A/B and G-4). The monitoring program was initiated in the first quarter of 2006. To date monitoring, sampling, and analytical activities for ten successive calendar quarters have been completed. This draft RI report presents the findings from these ten monitoring events.

2.5 WELL RECEPTOR SURVEY

Several well receptor surveys have been documented for the Site vicinity since 1982 (EEI, 1982; 1986; Metcalf & Eddy, 1992; URS, 1994), and Stantec recently reviewed groundwater production data available for the period July 1, 2003 through June 30, 2004 (CalDWR, 2004). Table 15 and Figure 1 show details and locations for the identified wells within or close to a one-mile radius of the Site.

The closest active public supply well is located approximately 1,000 feet northwest of the Site. This well is identified by EEI (1986) and CalDWR (2004) as 3S/14W-25P04S, owned by American States Water Company. This well is also known as the "Dalton Well". EEI (1986)

indicates that well P04S had a production rate of approximately 600 acre-feet between July 1, 1984 and June 30, 1985 (an average annual pumping rate of approximately 372 gallons per minute [gpm]). CalDWR (2004) indicates that well P04S had a production rate of approximately 586 acre-feet between July 1, 2003 and June 30, 2004. American States Water Company informed Stantec that well P04S operated continuously at an average flow rate of 490 gpm from August to October 2007. The active public well P04S is located up-gradient of the Site based on groundwater elevations observed since 2006. In addition, the production well is screened at a depth several hundred feet deeper than the screened intervals of the Site MW's. The other wells listed in Table 15 were identified as inactive or low-flow producers by EEI (1986).

An additional well in the same general location was identified by URS (1994) as 3S/14W-25P05 ("Dalton" Well) but is not listed by CalDWR (2004) and was not identified in EEI (1982). URS (1994) stated that well P05 produces groundwater from the Silverado Aquifer at a depth of approximately 550 to 650 feet bgs. It is likely that the URS (1994) well P05 is actually well P04S.

The only other active production well listed in CalDWR (2004) and by EEI (1986) is well 03S/13W-30A10S with ownership listed as Fujimoto in CalDWR (2004). This well had an annual production rate of 7.84 acre-feet between July 1, 2003 and June 30, 2004. It is located approximately one mile east of the Site, thus placing it down-gradient from the deeper Site groundwater zone which has an easterly flow direction.

All other production wells listed in Table 15 from the original EEI (1986) report are not listed as active production wells in CalDWR (2004).

2.6 EARLY RESPONSE ACTIONS

Two early response actions were specified in the November 4, 2004 CD.

- Repair and maintain the existing Site fencing, and post warning signs at the easterly portion of the Site (see CD); and

- Repair and maintain the interim cover system that DTSC installed on the easterly portion of the Site (see CD).

In addition to completing these two early response actions required by the CD, ARC and Stantec have also completed inspection, development, and gauging of existing groundwater MW's prior to initiating quarterly sampling.

2.7 PRELIMINARY CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) is a representation of the relationship between contaminant sources, release mechanisms, environmental transport, exposure pathways, and receptors. American Society for Testing and Materials International (ASTM 1995) expands this description by listing the following six basic activities associated with developing a CSM:

1. Identification of Contaminants of Potential Concern (COPC);
2. Identification and characterization of the source(s) of COPC;
3. Delineation of potential migration pathways through environmental media, such as groundwater, surface water, soils, sediment, biota, and air;
4. Establishment of background concentrations of contaminants for each contaminated medium;
5. Identification and characterization of potential environmental receptors (human and ecological); and
6. Determination of the limits of the study area or system boundaries.

The Preliminary CSM prepared by Stantec prior to initiation of RI fieldwork is presented in §2.8 to §2.13 to provide the reader a detailed conceptual framework for interpreting the results of the RI. An updated CSM, based on field data obtained during this RI is presented in §4.0 of this report.

A list of previous investigations, the parties who conducted each investigation, the type of data collected, and the date(s) of each investigation are included in Table 1. Information pertaining to previous Site investigations, described in the following sections, was primarily obtained from the following documents:

- Results from Focused Remedial Investigation at Gardena Sumps (Metcalf & Eddy, 1992);
- Groundwater Remedial Investigation Technical Memorandum (URS, 1994);
- Soils/Waste Sludge Remedial Investigation Report (CalEPA, 1994);
- Baseline Human Health Risk Assessment (BHHRA): Gardena Sumps (Tetra Tech, 1995);
- 2000 and 2001 Groundwater Sampling Results for Gardena Sumps (CalEPA, 2001a); and
- 2002 Groundwater Sampling Results for Gardena Sumps (CalEPA, 2002).

Figure 7 depicts a CSM Block Diagram that shows the conceptual relationship between sumps, shallow soil and groundwater and deeper groundwater zone. Changes to some aspects of the Preliminary CSM have been made as a result of field investigations performed by Stantec for this RI. The updated CSM is presented in §4.0 of this report. However, since the CSM depicted in Figure 7 was used to design the field sampling program and because one of the main goals of this program was to obtain subsurface data from directly beneath the Site to better characterize the material at the Site, the preliminary CSM is included here. Using the Preliminary CSM presented in Figure 7 represents a logical starting point for the geologic and

hydrologic discussions that follow. While the revisions to the Preliminary CSM are hydrologically significant, they have no impact on the COPC, the potential sources of contaminants, background concentrations of contaminants, potential receptors, or the limits of the study area. The revisions to the Preliminary CSM do have an impact on potential migration pathways.

Figure 8 shows the relationship between the Preliminary CSM, future land use conditions and potential exposure scenarios to be used as a framework for risk assessment activities. Figures 7 and 8 can serve as conceptual graphical aids in discussions in the following sections. Based on previous work, the on-Site future use scenario was assumed to be an industrial/commercial worker scenario. An off-Site Residential scenario may be delineated in the updated Baseline Human Health Risk Assessment (BHHRA) for certain exposure pathways should the on-Site scenarios show significant risks. The Preliminary CSM is described below and depicted in Figures 7 and 8.

2.8 CONTAMINANTS OF POTENTIAL CONCERN

To identify COPC at the Site, Stantec relied on information for the three environmental media that have been sampled at the Site:

- soil/sludge;
- groundwater; and
- air.

2.8.1 Soil and Sludge

Prior to the initiation of this RI fieldwork the soil and sludge at the Site had been characterized based on 51 samples obtained at the Haack Property and 38 samples obtained at the Cooper Property. The sludge contains elevated concentrations of SVOC's, in particular, PAH's. In addition, the sludge has low pH (i.e., acidic) ranging from 1.3 to 3.7. Elevated concentrations of metals were found in some samples of the sludge. VOC's were either present at low concentrations or were not detected in soil and sludge. The sludge also contained sulfides, residual sulfuric acid, and entrained sulfur dioxide gas. Several compounds and metals were detected in soil and sludge samples including: anthracene, benzene, chromium, copper, hydrogen sulfide, lead, methyl anthracene isomers, methyl ethyl benzene, methyl fluorine, nickel, phenanthrene, pyrene, sulfur dioxide, toluene, trimethylbenzene, and trimethylnaphthalene isomers.

The principal contaminants associated with potential future risk from exposure to soil and sludge that were identified in Tetra Tech's 1995 BHHRA are:

- chrysene;
- benzo(b)fluoranthene; and
- benzo(a)pyrene.

The potential future risk was based on a scenario where the cap/cover and fencing at the Cooper Property and the concrete/asphalt/soil cover at the Haack Property are not maintained or are removed to expose the sludge and impacted soil. Other COPC's identified by the BHHRA for soil and sludge are listed in Tables 11 and 12.

As part of this RI more than 300 soil and/or sludge samples were analyzed to better characterize the soil and sludge at and beneath the Site.

2.8.2 Groundwater

In the years 1987, 1994, 2000, 2001, and 2002, the DTSC oversaw groundwater monitoring of both on- and off-Site wells. During 1987, groundwater samples were analyzed for VOC's, SVOC's, Pesticides, Polychlorinated Biphenyls (PCBs), and inorganic metals. During 1994, groundwater samples were analyzed for VOC's, SVOC's, filtered and unfiltered metals and pH. During the 1994 through 2002 monitoring events, field parameter measurements of pH, specific conductance, and temperature were obtained. Groundwater samples from the on- and off-Site wells were analyzed for metals, Gasoline-Range Organics (GRO), Diesel Range Organics (DRO), SVOC's, total sulfides, and reactive sulfides as described in EEI (1987), URS (1994), and CalEPA (2001a, 2002). Based on the analytical results the BHHRA did not find any exposure risk to potential receptors from groundwater at the Site, therefore, no COPC are identified in the shallow groundwater beneath the Site.

2.8.3 Air

COPC's in air are based on 1) historical sludge process knowledge; and 2) ambient air monitoring and flux chamber measurements obtained during the focused RI (Metcalf & Eddy, 1992). Table 10 lists the COPC's as defined in the BHHRA in both vapor and dust at the Site. According to the BHHRA, the key potential vapor airborne compounds with respect to potential future risk exposure in a scenario where the cover and fencing is not maintained on the Cooper Property and cover is not maintained on the Haack Property were:

- benzene; and
- hydrogen sulfide.

Ambient air monitoring during the focused RI was conducted over a three-day period using one upwind sampler and two downwind samplers (Metcalf & Eddy, 1992). The air monitoring measured detectable quantities of methane (1.7 to 3.5 µg/L-vapor), xylene isomers (1.2 to 220 µg/L-vapor), ethylbenzene (2.4 to 1300 µg/L-vapor), tetrachloroethylene (0.56 to 0.82 µg/L-vapor), toluene (15 to 69 µg/L-vapor), trichloroethene (0.79 to 2.5 µg/L-vapor), benzene (2.2 to 10 µg/L-vapor), 1,1,1-trichloroethane (3.7 to 8.0 µg/L-vapor), and methylene chloride (9.1 to 370 µg/L-vapor). Results were inconclusive with respect to source of the detectable compounds since both upwind and downwind samplers yielded detectable results with no clear pattern. In addition, the Site is located at a busy intersection with high potential for vapor emissions from automobiles.

Surface vapor emissions from the sump area on the Cooper Property and portions of the Haack Property were measured during the focused RI by sampling the gas stream mixed with surface

emissions in a dynamic flux chamber (Metcalf & Eddy, 1992). For detectable vapors, the annual surface emission flux was measured at 1.4 pounds per year (lb/yr) for methylene chloride, 2.7 to 18.1 lb/yr for 1,1,1-trichloroethane, 2.1 to 11.8 lb/yr for benzene, 4.5 to 58.8 lb/yr for toluene, 1.7 to 6.3 lb/yr for tetrachloroethylene, 1.8 to 58.8 lb/yr for ethylbenzene, 1.4 to 49.8 lb/yr for xylenes isomers, and 38.9 to 67.5 lb/yr for hydrogen sulfide. In general, the highest flux values were obtained from "disturbed" sump sample locations where a 0.5-foot deep zone was excavated prior to placement of the dynamic flux chamber. The lower range values came from measurements taken on undisturbed sump sampling locations.

2.9 POTENTIAL SOURCES OF CONTAMINANTS

The primary source of contaminants at the Site is an acidic petroleum sludge typically referred to in the petroleum industry as acid sludge. This sludge is a byproduct of a process that involves mixing oil with concentrated sulfuric acid to remove impurities from the oil. The process is primarily used to remove asphaltines from oil. Asphaltines are high molecular weight hydrocarbons that have a polar charge. The acid treatment neutralizes the asphaltines so they can coagulate from the oil as tar.

Sludge was primarily disposed in three sumps created by excavations resulting from earlier clay mining activities during the 1920s (see discussion in §2.1 and Figure 2A). Two sludge sumps cover approximately 80 percent of the 3.0-acre Cooper Property. Another sludge sump, located on the northern Haack Property, covers approximately one fifth of the 2.6-acre Haack Property. The Residential area in the southwest portion of the Site consists of four 0.23 acre parcels located immediately south of the Haack Property (Figure 2A). Historical photographs indicate that a portion of the southern Haack Property and part of the Residential area may contain an area of mixed soil, debris, and sludge material. Prior to this RI no surface or subsurface sampling had been conducted to evaluate if the Residential area contains sludge material.

The former Aircraft Magnesium plant was located in the northern portion of the Haack Property and may also be a source of contamination. A memo from Karen O'Regan of the Hazardous Material Section to Sue Stack of the DOHS Abandoned Site Project team on September 11, 1981, indicated that the former Aircraft Magnesium plant stored hot slag and incinerator waste next to the sumps. The presence of drums and burned areas were also documented by notes taken during the February 1981 Site visit by CalDHS (EEI, 1982) and confirmed by SECOR during their initial site visit in 2004. These practices may have contributed a proportion of heavy metal contaminants to the Site since heavy metals are often associated with foundry operations and incinerator wastes.

2.10 POTENTIAL MIGRATION PATHWAYS

To identify potential pathways for migration of contaminants from the sludge to groundwater, Stantec reviewed the soil, soil gas, and groundwater data for the Site based primarily on information presented in the references cited in §3.1.

The primary pathways for potential migration of Site contamination include:

(1) leaching of contaminants in soil/sludge to groundwater;
(2) mobilization of vapors and/or contaminant-bearing dust from soil/sludge by wind dispersion and volatilization; and
(3) seepage of sludge to the ground surface.

Figure 8 depicts pathways for potential migration. Currently, the concrete/asphalt/soil cover on the Haack Property and the geo-membrane cap on the Cooper Property minimize contaminant mobility by these chemical transport mechanisms and minimize surface runoff of contaminants. Minimization of migration pathways at the Site depends on maintaining the integrity of the covers and cap at the Site (Tetra Tech, 1995).

2.11 BACKGROUND CONCENTRATIONS

Background concentrations for COPC's present at the Site fall into three main categories based on the media:

- groundwater,
- ambient air, and
- soil.

There is no background concentration for the sludge since it is not a native material and was placed into the sumps at the Site by past waste disposal operations (see discussion in §2.1).

Background concentrations in groundwater for dissolved-phase metal can be considered non-detect based on the sampling results for 1987 through 2002, in groundwater MW's associated with the Site. Although dissolved silver and beryllium were detectable in 1987 in groundwater from the area several hundred feet northeast and cross-gradient from the Site these results have not been repeated, suggesting that the data may be of suspect quality. Background concentrations in groundwater for VOC's and SVOC's can be considered non-detect based on the VOC sampling results from 1982 for several of the nearby water supply wells producing from the deeper aquifers (EEI, 1986; Tetra Tech, 1995), and the results from relatively shallow MW's associated with the Site (VOC's and SVOC's have been uniformly non-detect over time with the exceptions noted in §4.3.4 between 1987 and 2002 in up-gradient and cross-gradient MW's).

Background concentrations for VOC's in ambient air are based on analytical results from ambient air sampling conducted in upwind samplers more than 14 years ago (Metcalf & Eddy, 1992). It is most probable that there are detectable concentrations of benzene and other fuel hydrocarbon VOC's in air due to the proximity of multiple, high-traffic streets in the immediate vicinity of the Site. The range of VOC concentrations in the upwind sampler (including benzene concentrations between 2.2 and 6.0 µg/L-vapor) may represent background concentrations. In addition, ambient air sampling determined the background concentration for hydrogen sulfide

gas is non-detect. One purpose of this RI is the collection of data to update the Baseline Risk Assessment of the site. Additional background ambient air samples were collected as part of the vapor flux investigation. The findings of these ambient air samples are discussed in detail in section 3.13.4 of this report. In general, ambient air samples collected as part of this RI range from non-detect to 0.24 to µg/L-vapor. The ambient air samples do not show elevated levels of hydrogen sulfide and detections of VOCs on the Haack property are most likely related to industrial activities on the property and not from undisturbed surface emissions from the nearby sumps.

The background concentrations for VOC's and SVOC's in soils are considered non-detect based on soil samples obtained during the drilling and installation of groundwater MW's MW-01A/B; MW-02A/B; and MW-03A/B (URS, 1994). The background values for soil pH from the well installation samples ranged from 7.1 to 9.0.

The initial estimates of background concentrations for inorganic metals in soils were also based upon analyses performed on soil samples obtained from the shallow boring drilled during the well installation for MW-03A. Soil sample data from MW-02A was not considered because the well is located immediately adjacent to and down-gradient from the sumps on the Cooper Property, and soil sample analyses were not available for up-gradient well MW-01A. In soil samples from MW-03A, Barium was detected at concentrations ranging from 87 milligrams per kilogram (mg/kg) to 400 mg/kg. Vanadium was detected in soils at concentrations up to 96 mg/kg, and Zinc was detected at concentrations up to 76 mg/kg. Silver, Arsenic, Cobalt, Chromium, Copper, Molybdenum, Nickel, Lead, Antimony, and Thallium were not detected in the MW-03A installation soil samples in concentrations greater than 50 mg/kg. Beryllium and Cadmium were not found in concentrations greater than 5.0 mg/kg. Selenium was not detected in concentrations greater than 10 mg/kg.

2.12 POTENTIAL RECEPTORS

Potential receptors for the Site have been addressed in the BHHRA (Tetra Tech, 1995), and are updated herein to reflect pre-RI conditions in both on- and off-Site areas (see Figure 8). The Cooper Property is currently unoccupied. Human exposure to sludge or COPC on the Cooper Property is minimal under current conditions, due to the geo-membrane cap and the perimeter fence. Per the CD, ARC has made repairs to the cover to contain the underlying sludge. Additionally, the fences surrounding the sumps on the Cooper Property were replaced or repaired thereby reducing potential exposure by controlling access to the property.

The Haack Property is currently used for several commercial ventures with up to 11 short- and long-term tenants including a U-Haul Rental facility and several other small businesses. Under DTSC direction, a concrete cap was installed on a the northeastern corner of the Haack Property, which along with asphalt paving and a portion of the geo-membrane cover also minimizes potential human exposure.

Currently, groundwater monitored in upper and lower hydraulic zones of the Bellflower

Aquiclude, beneath and in the immediate vicinity of the Site, is not used for drinking water, irrigation, or any other purposes. Consequently, there are currently no receptors associated with groundwater from the water-bearing sediments in the upper 90 feet beneath the Site. The nearest off-Site water supply well is well P04S (Dalton well), located approximately 1,000 feet northwest and up-gradient from the Site (Figure 3B and Table 15). Well P04S produces groundwater from the Silverado Aquifer, which is between 550 and 650 feet bgs in the vicinity of the Site. The next closest groundwater production well (A10) is more than a one mile distance of the Site (CalDWR, 2004). Only P04S is considered a potential receptor based on a conceptual exposure pathway where:

a) acid-sludge contaminants leach to shallow groundwater, and

b) there is some hydraulic connectivity between up-gradient water supply well P04S and the shallow groundwater beneath the Site.

All other water production wells listed in CalDWR (2004) and located in the down-gradient direction from the Site (east to southeast), are located at distances greater than three miles east of the Site and more than four miles southeast of the Site. None of these wells are considered a potential receptor by this pathway due to the large distance from the Site.

2.13 LIMITS OF THE STUDY AREA

The Gardena Sumps Site occupies approximately 6.48 acres located at the southwest corner of Artesia Boulevard and Normandie Avenue in the City of Gardena, California. A legal description of the Site is provided as Exhibit A of Consent Decree CV04-7882 AHM (JTLx). The Site is described in detail in §2.0. Briefly, the sludge occurrence at the Site includes two sumps in the Cooper property, one sump in the northern Haack property, the Haack Rework Area that encompasses the southeast portion of the Haack property and a small area in the northeast portion of the residential property. Figure 2A shows the approximate lateral extent of the sludge occurrence at the Site.

3.0 REMEDIAL INVESTIGATIONS

The goal of the RI at the Garden Sumps Site was to update and fill data gaps from previous investigations. The primary goal was to provide characterization data of the physical and chemical properties of the sludge, surrounding soil, groundwater and surficial vapor emissions, to determine extent and depth of the sumps, and to determine treatability characteristics of the sludge. The collected data would be used for future evaluation of potential migration and exposure pathways, assessment of potential risk to human health and the environment, evaluation of feasible remedial options.

The phases of remedial investigations are discussed in the following sections:

Sludge and Soil

- 3.1 Sub-Surface Sludge and Soil Investigation
- 3.2 Micro-Cone Penetrometer Testing (CPT) Soundings
- 3.3 Deep Stratigraphy and Hollow-Stem-Auger Investigations
- 3.4 Geotechnical Samples – Physical Properties Testing
- 3.5 Background Inorganic Concentrations in Soil

Groundwater

- 3.6 Hydropunch™ - Groundwater Sampling – CPT Pore Pressure Dissipation Test
- 3.7 Single Well Hydraulic Conductivity Testing
- 3.8 Groundwater Monitoring Well Installation
- 3.9 Groundwater Monitoring Program
- 3.10 Surface Water Sampling

Soil Vapor

- 3.11 Active Soil Gas Investigation
- 3.12 In-Situ Air Permeability Testing
- 3.13 Surface Vapor Flux Investigation

3.1 SUB-SURFACE SLUDGE AND SOIL INVESTIGATION

Based on the review of historical data, a number of data gaps were identified in the approved RI/FS Workplan (SECOR, 2005). The following data gaps associated with the emplaced sludge material and surrounding sediments were identified in the Workplan:

- Lateral and vertical extent of sludge in sumps located on the Cooper Property including areas where sludge may have migrated off site onto public right-of-ways, and the lateral extent of sludge sumps located on the Haack Property; and

- Treatability properties of the sludge including acidity, neutralization and stabilization parameters, vapor evolution, density and strength, contaminant mobilization and leachability, geotechnical and thermal properties.

Remedial investigations were conducted to better define the nature and extent of sludge within and around the sumps and to determine if there are impacts to the adjacent sediments from the sludge. These investigations targeted the sludge and shallow soil to determine the extent and depth of the sumps, evaluate impacts from the potential leaching of sludge constituents, and focused on obtaining sludge samples to determine characteristics of the material and evaluate treatability options. Figure 9A presents a site map showing sample locations for this RI.

The sludge and soil investigation addressed the following:

Chemical characterization of the sludge and soil
- Chemical analysis of the sludge and adjacent soil
- Impacts of organic constituents from the sludge to the soil and groundwater
- Impacts of inorganic constituents from the sludge to the soil and groundwater
- Impacts of acidity from the sludge to the soil and groundwater

Delineation of the Sumps and Sludge
- Lateral extent of the sludge in place at the Site
- Vertical extent of the sludge in place at the Site
- Volume of the sludge in place at the Site
- Undisturbed versus disturbed native soil at the Site

Properties and Treatability of Sludge
- Treatability analysis of sludge for neutralization and stabilization (bench test).

3.1.1 RI/FS Workplan Scope [§ 5.3.1 // 5.3.2 // 5.3.2.1 pg 34-38]

The intent for subsurface soil and sludge samples and borings was to determine the extent of the sumps and the extent of the near surface sludge deposits in the area of the sumps on the Haack and the Cooper Properties, including the depths of the sumps on the Cooper Property. This investigation included surface and shallow sampling where sludge may have migrated off

site onto public right-of-ways at the eastern edge of the Site and where the former drum storage area was located on the Haack Property (east-central portion of that property – see EEI, 1982).

Data proposed for collection during the drilling investigation included:

- Feasibility of use of proposed sampling equipment on the sumps on Cooper Property;
- Boring logs, including depth and thickness of intervals of sludge occurrence;
- VOC, SVOC (with PAH confirmation as necessary), GRO, WORO, TOC, metal concentrations and pH in soil/sludge.

The data from the soil and sludge borings was to be used to:

- Estimate the lateral and vertical extent, depth and volume of the sumps at the Site, and determine whether surficial sludge has migrated onto public right-of-ways at the eastern edge of the Site;
- Describe the chemical nature and distribution of sludge, further refine the Conceptual Site Model (CSM) especially the contact between acid sludge and native soil beneath the sumps, and provide stratigraphic information useful for evaluating hydrostratigraphic units;
- Investigate potential impacts due to former drum storage in the east-central portion of the Haack Property (EEI, 1982);
- Augment the existing data for inorganic metals (including aluminum, iron, and hexavalent chromium) in shallow soils at the Site in order to help establish background concentrations for metals in soils;
- Provide input to the Baseline Risk Assessment especially for risk evaluations involving the direct-contact exposure pathway for contaminated soil or sludge material with potential receptors; and
- Provide bulk samples of acid-sludge material for bench-scale testing in the Treatability Study (see Section 5.7).

The Workplan described proposed sampling at specific areas of the Site as follows:

Eastern LACDPW Easement: Five shallow surface samples (within the upper two feet bgs) were to be obtained by hand-auger methods on the LACDPW easement east of the Site in the areas shown on RI/FS Workplan Figure 13 (DPW1 through DPW5). These shallow samples were to be tested for shallow surficial off-Site migration of sludge, especially in the vicinity of the storm drain on the LACDPW easement adjacent to the northeast corner of the Cooper Property.

Samples were to be analyzed for VOCs, SVOCs, inorganic metals (including aluminum, iron, and hexavalent chromium), gasoline range organic compounds (GRO), waste oil range organic compounds (WORO), total organic carbon (TOC) and pH. As with all soil/sludge samples collected at the Site, these samples were to be field preserved for VOCs using option 2A of EPA Method 5035.

Former Drum Storage Area: In addition, sample locations HPB3, HPB4, HPB5 and HPB6 (Figure 9A) are located in the general area mapped by CalDHS as drum storage in 1981 (EEI, 1982), and therefore, shallow samples in these boring locations were to be useful for investigating potential impacts to surface and shallow soil due to drum storage including investigating high iron and aluminum concentrations that have been previously reported at the site (see Workplan Section 2.2, and sampling description below).

Sludge Surface Samples: Five of the boring locations (CPB2, CPB3, CPB5, CPB7 and CPB15) listed in Table 16 and shown on Figure 9A are in close proximity to locations from previous investigations (see Workplan Section 2.2, and locations JH01-JH-07; GS1-GS4 shown on Workplan Figure 3A) where high aluminum and iron concentrations were indicated. Samples from these borings were to be used in an attempt to determine if high arsenic, antimony and possibly thallium concentrations owe their elevated concentrations to analytical interference from aluminum in the soil matrix (DTSC communication in September 21, 2005 memorandum to Joseph Cully from Bryan Eya).

Sump Perimeter: The original RI/FS Workplan proposed that if any of the borings intended to verify the lateral boundaries of the sump pits encountered near surface sludge, then additional "step out" borings could be advanced 10 to 20 feet further out from the sump pit being investigated with locations chosen in consultation with DTSC representatives. In that event, shallow hand-auger borings may be advanced to further investigate any shallow acid-sludge occurrence.

Off-site Adjacent Residential Properties: Boring locations RB-1 through RB-3 are located on residential properties at either 1440 Artesia Boulevard or 1452 Artesia Boulevard. As described in Table 16, these boring locations were proposed to help determine the southern extent of sludge on the Haack property (i.e., Haack Rework Area) (see RI/FS Workplan Figure 13).

3.1.2 Deviation from the RI/FS Workplan

Deviations from proposed sludge and soil assessment methods of the RI/FS Workplan include:

- Pilot boring (CPB18) was drilled to evaluate the viability of the drilling and sampling methodologies proposed in the RI/FS Workplan. The original sample collection device consisted of a 2-inch diameter by 4-foot long stainless steel core barrel with acetate liner

and open-ended, beveled drive shoe. This configuration resulted in the viscous sludge closing in from the sidewalls of the borehole and entering the sampling device as it was advanced through deeper sampling intervals. It was determined that the core barrel sampling method could: a) result in possible cross-contamination of sediments interbedded within or located below the sludge; b) result in the apparent mixing or repeat sampling of material from previous sampled intervals as the viscous material closed the borehole between sampling and c) result in an overestimate of sludge thickness. Boring CPB11 was redrilled and resampled (CPB11R) for this reason.

The issue was resolved by replacing the originally proposed core barrel sampling device with a continuous core piston barrel sampler equipped with an inter-locking pin end-cover. This end-cover was locked in the closed position at the surface and when the desired sampling depth was reached the locking device was released and the end-cover retracted so a representative sample could be collected at the correct depth interval. The continuous core piston barrel is approximately 2-inchs in diameter by 4-feet in length.

- Boring designation HPB05 was relocated from the location proposed in the RI/FS Workplan to an area approximately 90 feet to the southeast. An additional boring designated as HPB11 was drilled in the original location for HPB05. Adding an assessment boring and modifying the locations was to provide additional data to delineate the sludge located on the southeast portion of the Haack Property.

- Addition of boring CPB26 and CPB27 to test for the separation of the Cooper North Sump and the Haack Sump were completed at the request of the DTSC.

- Collection of pH data in the field was performed for comparison with laboratory pH analysis for the soil and sludge samples. Stantec used an electronic pH meter with a ceramic probe to obtain pH readings from the field samples. Approximately 7.3% of the soil and sludge samples from the Cooper (CPB), Haack (HPB) and residential borings (RB) were obtained for pH comparison.

- Organic analysis of the sludge by conventional USEPA Methods 8260 and 8270 was hindered by the high petroleum hydrocarbon concentration of the material. For many sludge samples dilution of the sample raised the detection limits high enough to mask the quantitative result for individual analytes. Methods used to overcome this limitation included SVOC analyses by USEPA Method 8310 and filtering the extract to eliminate matrix interference.

- The RI/FS Workplan (SECOR, 2005) referred to surface samples as samples collected within 1.0 to 1.5 feet bgs for soil and or sludge by hand auger. For the purpose of the RI Report, all soil and sludge samples are referred to as subsurface samples.

3.1.3 RI Execution

Sludge and soil samples were obtained successfully from within, around and beneath the sumps. Sludge samples were also obtained for treatability testing. The QAPP and FSP (see Appendices A and B of the RI/FS Workplan) describe SOPs for this work, including sampling protocols, chain-of-custody procedures, QA/QC protocols, laboratory analytical testing and decontamination activities, along with investigation-derived waste (IDW) disposal procedures. Field data sheets documenting the field activities of the RI are included in Appendix G.

Drilling Methods

Prior to embarking on a full-scale drilling and sampling program at the Site, it was necessary to test the feasibility of drilling techniques. The sludge material located in the sumps on the Cooper Property in general has the consistency of tar and the viscosity of this material decreases or increases with fluctuations in ambient temperature. There are reports in DTSC files of excavation equipment sinking into the acid-sludge material due to the inability of the acid-sludge material to support weight under low-viscosity conditions.

Stantec developed a drilling technique that could allow for safe access and mobility of drilling equipment onto the Cooper Property sumps. The main elements of this drilling technique were:

- Installation of temporary road technology platforms (SOLOCO's Dura-Base® Composite Mat System)
- Use of direct-push drilling technology (Rhino M5T Wide Track Rig)
- Soil/acid-sludge samples were collected using continuous acetate-encased core

The Dura-Base® Composite Mat System is a portable HDPE inter-locking roadbed platform that can support vehicles such as military helicopters or tracked vehicles such as the Bradley Fighting Vehicle. Each 8-foot by 14-foot mat section is 4 ¼-inches thick, and has a nominal weight of approximately 1,050 pounds. The mat is constructed with overlapping upper and lower lips incorporating 16-pinholes for linking the mats together to form a drilling platform or road bed on the covered sump material at the Site.

A fork lift vehicle was used to extend a road bed created out of the inter-linking Dura-Base® mats out from solid native soil ground onto the covered sump to a proposed drilling location where a temporary platform was constructed of Dura-Base® Composite Mats. A Rhino M5T Wide Track drill rig was mobilized to the test sampling location (boring CPB-18, see Figure 9A and Table 16) on the covered sump. Boring CPB-18 was chosen as a test location because it is located in an area where the thickness of the sludge was assumed near the maximum depth of the pit, and also because CPB-18 is located conveniently close to one equipment staging area (southern LACDPW Property).

The Rhino M5T rig weighs approximately six tons and is propelled by wide rubber tracks. Under ideal conditions, a Rhino rig is capable of advancing a sampling core barrel approximately 50

feet bgs with direct-push technology, and 150 feet bgs with hollow stem augers. It can install a two-inch diameter well to a nominal depth of approximately 120 feet bgs, and install a four-inch diameter well to approximately 100 feet bgs. The Rhino rig has dimensions of approximately 12-feet in length, six-feet in width and a height of approximately 12 feet with mast extended. One key feature of this rig is that it has a bearing pressure of approximately eight pounds per square inch (pers. comm., Mr. Patrick Keating, Gregg Drilling & Testing, Inc.). However, the Dura-Base® Composite Mat System reduces the sludge surface bearing pressure of the Rhino rig by spreading the rig weight over a large area of matting.

After it was determined that the above-described combination of direct-push and Dura-Base® Composite Mat System technologies was feasible, approximately 35 additional borings were advanced at locations shown on Figure 9A. Table 16 contains a description of the rationale for each boring location. In many cases, where boring locations were outside the Cooper Property covered sumps, the Dura-Base® Composite Mat System was not employed and the rig operated under standard conditions sitting on a stable ground surface.

Sludge/Soil Sampling

A core barrel lined with an acetate core liner was tested, and proved effective, as a means of collecting samples of native soils and sludge by direct-push methods. This was also the primary means of obtaining sludge samples for use in the Treatability Study (see RI/FS Workplan Section 5.7). The acetate core barrel liners were utilized to minimize VOC gas release and potential cross-contamination from sludge to native soil (drag-down). Once these cores were recovered, the core barrel acetate liner and enclosed core was removed and placed on a sample preparation table. The outside of the acetate liner was cleaned with a disposable towel, and then a 1-inch wide strip of the acetate liner running the length of the core was cut using a specially designed safety-knife and removed so the core material could be observed. A putty knife was then used to split the core lengthwise, in half, for geologic logging and sample collection.

Approximately five gallons of sludge material was collected for use in the Treatability Study. With a 1.5-inch diameter core barrel, the core obtained from each boring will yield approximately 1.8 gallons of acid sludge per 20-foot core interval, or approximately 0.1 gallons per linear foot of core. Boring locations that provided samples for the Treatability Study are identified in Table 16.

The stratigraphy of the sump, including contacts between fill soil, native soil and sludge was noted and logged by the field geologist. The depth of each sump was estimated based on the observed occurrence of native soil overlain by sludge material, as distinguished from contacts between acid sludge and artificial fill materials.

In addition to core samples, shallow samples of soil and sludge were collected at each boring location. These samples were collected within the 1.0-feet and 1.5-feet bgs for soil and/or sludge by hand auger using appropriate sample containers such as sealed and labeled brass

sleeves or glass jars. Shallow hand-auger samples underwent the same field handling and analyses as core samples.

Field Analyses

Field screening was conducted for health and safety monitoring to protect workers within the exclusion zone where sampling was being conducted and at the Site perimeter where vapors and gases could potentially by detected. Field screening was also used for preliminary characterization of samples for VOCs, H2S, SO2, and pH. Ambient air and headspace monitoring for volatile petroleum hydrocarbons was conducted using a Photoionization Detector (PID) calibrated for hexane in air. Potential hydrogen sulfide and sulfur dioxide gases in air were monitor for using a MultiRAE meter from Rae Systems. Workers in the exclusion zone also wore personal H2S detectors on their clothing near the breathing zone.

Per the RIFS Workplan, Values for pH of soil and sludge samples were to be determined by off-site laboratory analysis. As a QA/QC check on laboratory pH data, twenty-seven soil and sludge samples obtained from the Cooper (CPB), Haack (HPB) and residential borings (RB) had their pH value determined in the field with an electronic meter (IQ150, IQ Scientific Instruments, Inc.) having a non-glass probe with silicon chip sensors and two point calibrations.

Chemical Analyses

Soil and sludge samples were collected and submitted for analysis to TestAmerica Laboratories, a certified environmental laboratory. Samples analyzed for VOCs were field preserved following procedures outlined by DTSC for EPA method 5035, option 2A [CalEPA 2004a]. Samples were analyzed in the laboratory for VOCs, SVOCs, GRO, WORO, TOC, Metals (including aluminum, iron, and hexavalent chromium where appropriate) and pH using standard methods described in the QAPP (Appendix A of the RI/FS Workplan).

When SVOC analyses indicate that concentrations of PAHs were detected by EPA Method 8270C near the detection limit, reported as non-detect, or reported as non-detect at a high MDL, then a subset of the analytical results were confirmed using USEPA Method 8310 with further confirmation of very low concentrations by the LCMSMS method if necessary.

Data Validation

Per the RIFS Workplan, a minimum of ten percent of the analytical data would be validated by a third-party. ITSI, of Phoenix Arizona, reviewed the majority of the TestAmerica reports and qualified the data with EPA qualifier notations. Validated results are summarized in the report data tables. ITSI reports and markups are included in Appendix I-1.

Sludge Sampling for Treatability Analyses

Representative sludge samples were collected during the investigation for a treatability study of the sludge. Sludge samples were collected from the north and south Cooper sumps and from

the Haack Rework Area at borings CPB-14, -15, -18; CPB-02, -06, -07; and HPB-05, respectively. Samples were prepared by sectioning the acetate core liner and sealing the material in the acetate liner for transport. Samples were tested to characterize the physical and chemical properties of sludge at the Site, and to evaluate potential stabilization and neutralization methods for the sludge.

Investigation Derived Waste

Soil cuttings were minimized during the investigation by the use of direct push and CPT sampling methods. Investigation derived waste (IDW) included excess core, decontamination water and impacted PPE. IDW were drummed, characterized, and disposed under appropriate manifest and documentation (Appendix H).

3.1.4 Findings

3.1.4.1 SITE STRATIGRAPHY

Boring logs from this RI and previous assessments (RI/FS Workplan Appendices G and H, respectively) and interpretive CPT logs (Section 3.2 and 3.3) allow for the interpretation of a generalized stratigraphy beneath the Site. Sediments investigated to a depth of 100 feet bgs in this RI are part of the region-wide Bellflower Aquiclude. Laterally continuous marker beds across the Site were not observed. The occurrence of clay, silty clay, clayey silt, sandy silt and silty sand extend from the ground surface to approximately -5 feet msl. From approximately -5 feet msl to approximately -45 feet msl, the sediments are primarily comprised of silty clays to sandy silts. At approximately -30 feet msl some sediment layers contain shells and shell fragments, which is indicative of an estuarine to marine depositional environment. Between approximately -45 feet and approximately -70 feet msl the sediments consist of silty sand to sand with silt to silty clay interbeds. From approximately -70 to -80 feet msl the sediments are predominantly clay to clayey silt (Figures 10A through 10F). The stratigraphy observed in this RI is similar to the stratigraphy observed by URS (1994) (Table 13). Table 16 lists a synopsis for each of the borings complete during this phase of the RI.

3.1.4.2 SOIL / SLUDGE SAMPLE ANALYTICAL RESULTS

Prior to this study, the sludge chemistry was based upon disturbed grab samples on the Cooper property and a few samples collected at depth from the Haack sump. The results of these samples are presented in Tables 2 through 9A. Based on these earlier findings, the sludge contained chrysene and phenanthrene levels in the raw samples of about 150 and 200 mg/kg respectively. The sludge contained benzo(b)fluoranthene levels of about 50 mg/kg. These three compounds are the primary PAH or SVOC analytes for sludge characterization for this RI. Fluoranthene and pyrene were also present in the earlier sludge samples.

As part of this RI, Stantec collected over 300 subsurface soil and sludge samples from all three sumps and adjacent areas, including the Haack Rework Area. Representative analytical results of these samples are presented in Tables 17, 18, and 19. These tables are color coded by row to indicate the sample classification used to interpret the analytical data. A green row indicates

the sample consisted of sludge. A blue row indicates: a) the soil sample was obtained within 0.5 feet of a sludge deposit or b) the soil sample was obtained from soil that is mixed with brick, concrete or sludge debris. Blue row samples are considered in this RI as 'reworked' soil. Non-colored rows indicate the soil sample was obtained from undisturbed, native soil.

More extensive data can be found in the complete laboratory analyses contained in Appendix I. Appendix I contains both laboratory analytical results that have gone through an extensive, third-party data QA/QC validation process (Appendix I-1) and analytical results where the analytical laboratory performed their own internal data QA/QC validation (Appendix I-2).

A review of organic and inorganic analytical results and acidity is provided below. A significantly higher percentage of non-detect results occurred for organic compounds.

Organic Constituents

Organic compounds analyzed were volatile fuel hydrocarbons (VFH, C4-C12) by GC/MS (CA LUFT), total extractable hydrocarbons (TEH, C13-C40) by CADHS/8015 Modified, volatile organic compounds (VOC) by GC/MS analyses by USEPA Method 8260B (Table 17), semi-volatile organic compounds (SVOC) by GC/MS analyses by USEPA Method 3545/8270C and polynuclear aromatic hydrocarbons (PAH) by EPA Method 3545/8310 (Table 18).

When analyzing sludge material for SVOCs and PAHs, detection limit problems were encountered when using EPA methods 8270 and 8310. These analytical processes require that the sample undergoes extensive dilution in order for the laboratory instruments to be able to measure the quantity of an analyte in a sample. The dilution factor is listed in all three analytical summary tables (column labeled "DF"). As a result of this dilution, non-detect results are reported for analytes that are most likely present in elevated concentration in the sample. Dilution factors of 1:2,000 or 1:3,000 are not unusual (Tables 17 and 18). The impact of this dilution effect can be clearly seen in Tables 17 and 18. A significant majority of CPB designated samples collected at depths of 1.5 feet are sludge samples. However, typically about two-thirds of these samples are either non-detect or "J" flag data. Concentrations qualified by a "J" flag are estimated values detected at a level below the quantifiable method RL and above the Method Detection Limit (MDL).

The breakdown between VFH and TEH compounds indicate that the heavier hydrocarbon compounds predominate in the sludge. The ratio of TEH concentration to VFH concentration was rarely less than 1,000 for a sludge sample. Most commonly detected VOCs within the sludge, at concentrations of a few mg/kg or less, were ethylbenzene, p-isopropyltoluene, naphthalene, toluene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and m-,o- and p-xylene compounds (Table 17). Concentrations of VOCs in sludge were typically much lower than those for PAHs. Non-PAH SVOCs were typically not detected in sludge samples due to the dilution effects discussed above. PAH compounds in sludge that were commonly detected at higher concentrations include benzo(a)-pyrene, benzo(b)-fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene (Table 18).

In this investigation, it was anticipated that three key analytes: chrysene, benzo(b)fluoranthene and phenanthrene, would yield results for differentiating sludge in one sump from sludge contained in another sump. Fluoranthene and pyrene were also expected to provide additional data for differentiating sludge from individual sumps however it was not possible to differentiate between the sludge contained in any of the sumps or the Haack Rework Area on the basis of chemical analysis. The results of the chemical analysis from the treatability study (see §3.1.4.6) support this conclusion.

Inorganic Constituents

Title 22 Metals were analyzed by EPA Method 6020, mercury was analyzed by EPA Method 7471A and chromium VI was analyzed by EPA Method 7196A. Unlike the organic data, there is a large quantity of analytical data for metals, as the dilution problem was not encountered for these analytical methods.

Table 26 illustrates the concentration range of Title 22 metals commonly detected in samples from: a) the background borings (DPW6 through DPW15), b) the native, non-reworked soil and c) the sludge. The range of concentration values for native soil can represent background concentrations. Table 26 also lists a metal's sample analytical result that was outside the listed range for that metal. Thirty-six of 2,144 metal analyses, or 1.7%, of the analyses are outside the listed range for a particular metal. The range of detected metals concentrations from the background borings were within the range of detected metals concentrations from the native soils for all Title 22 metals. A comparison of the range of detected metals concentrations between the native soil and sludge showed differences between the two sample categories. The range of detected antimony, barium, cadmium, vanadium and zinc were lower in sludge. The range of detected lead and molybdenum were higher in sludge. The range of detected arsenic and thallium were similar for the native soil and sludge. The range of detected copper in sludge was wider, both the high and low values, than in native soil.

The analytical outliers listed in Table 26 provided the following observations:

- Arsenic is found at concentrations greater than it's native soil concentration range at depths exceeding -35 feet msl (borings MW04B and HPB12)
- Cadmium, thallium and zinc is found at concentrations outside their native soil concentration range at -68 feet msl
- Barium, lead, vanadium and zinc were found at concentrations below their native soil concentration range at a depth of 2 feet bgs in boring DPW-6
- Arsenic, barium, lead and zinc were found at concentrations above their native soil concentration range at a depth of 8 feet bgs in boring CPB-8
- Background borings DPW11, DPW12, DPW13 and DPW14 all had lead found at concentrations above their native soil concentration range at a depth of 2 feet bgs.

Arsenic was detected at a concentration of 82 mg/kg in boring DPW10 at a depth of 2 feet. This concentration is approximately ten times the value of the next highest arsenic concentration detected in this RI. Table 26 illustrates that, outside of a few samples, arsenic concentrations from background borings, native soil samples and sludge samples have a similar range of

concentration. The exceedingly high concentration of 82 mg/kg is a data gap will be evaluated in a subsequent soil sampling event.

Chromium VI and total chromium in soil analytical results were reviewed. Chromium VI results are included in Table 19b. The range of concentrations for chromium VI and total chromium in sludge ranges from <0.026 to 0.73 mg/kg and 0.55 to 4.7 mg/kg respectively. The range of concentrations for chromium VI and total chromium in native soil ranges from <0.026 to 1.3 mg/kg and 6.0 to 28 mg/kg respectively.

The occurrence of total iron and total aluminum is discussed in past assessment reports from the 1980's, but is not well documented. The 1986 report prepared for CalDHS by EEI indicated that analysis for iron and aluminum in 1982 showed "high" results for the metals with no discussion of the concentrations or sample locations. Results for iron and aluminum analyses could not be found in earlier available reports (EEI, 1982; EEI, 1983). Additionally iron and aluminum were not evaluated in later assessments of the 1990's and are not identified as COPCs in the 1995 Baseline Human Health Risk Assessment, (Tetra Tech, 1995).

An objective of this investigation is to confirm or eliminate iron and aluminum as concern, therefore, based on the discussion in the historical reports it was proposed in the RI/FS Workplan to analyze for total iron and aluminum in the sludge at the Cooper property and from the Haack property where "barrels" may have been stored from ongoing Magnesium Aircraft operations at that time. The analyses were erroneously eliminated for the Haack property samples. The analyses from the sludge and underlying soil from the Cooper sumps indicated that iron and aluminum are not constituents of the sludge.

Iron and lead analyses were performed on sludge samples from borings CPB-02, CPB-03 and CPB-07. Iron and lead analyses were performed for soil samples from borings CPB-02, CPB-03, CPB-07, CPB-11R at 20 feet, and CPB-24. The borings were predominately located in the northern to central portions of the Cooper sumps (Figure 9A) and CPB-24 was advance through the Cooper sump berm on the northern edge of the sump. Results from sludge samples show the concentrations for iron and aluminum ranging from 43 to 370 mg/kg and 8.6 to 68 mg/kg, respectively. These concentrations are much lower than the results from the native soils for iron and aluminum which range from 5,400 to 21,000 mg/kg and 3,700 to 23,000 mg/kg, respectively (see Table 19b). None of the results exceed the PRGs for residential or industrial screening levels. Based on these results the underlying soils appear to reflect the background concentration range for these metals.

Acidity

The borings on the Cooper property were utilized to determine the effects of sludge on the soil pH beneath the sludge and in adjacent berms. Thirty-two borings (CPB01 to CPB24, CPB28 to CPB30 and DPW01 to DPW05) extending to a maximum depth of 30 feet bgs were reviewed. Table 20 presents pH values of soil samples collected on the Cooper property. EPA Method 9045C was utilized by the laboratory for determining sample pH. Twenty-six sludge samples (green rows) and 106 native soil samples (non-colored) were collected from the Cooper property for chemical and pH analysis. The pH of the sludge samples averaged 2.22 with a median value of 1.19. The pH of the native soil averaged 6.57 with a median value of 7.86.

Sixteen soil/sludge samples had pH values measured in both the field and laboratory (Table 21). Fourteen of the 16 had field and laboratory values within a range of 3 pH units. The average pH difference of these 14 samples was 1.2 pH units. The average pH difference for all 16 samples was 1.9 pH units (Table 21). Seventy-five percent of the samples had field pH value being less than its laboratory pH value. Either of the two pH analysis methods, field or laboratory, were adequate to differentiate sludge pH from native soil pH.

A review of the attenuation of sludge impacts (including pH) to surrounding soils was done for the two Cooper sumps (Table 37). It was observed that low pH values (<4 units) was associated with the presence of sludge. Soil impacted with total extractable hydrocarbons (TEH) > 100 mg/kg and chrysene and/or flouranthene, the two most common PAHs in the sludge, > 1.0 mg/kg commonly had pH values ranging from 6.5 to 8.5. This suggests that migration of sludge constituents in soil is more aerially extensive than alteration of soil pH by the sludge. Sludge impact to adjacent soils is better identified by concentrations of TEH and PAH concentrations in the soil than by pH values.

3.1.4.3 DELINEATION OF SUMPS AND SLUDGE OCCURRENCE

Previous investigations suggest there have been five sumps identified at the Site. Two sumps on the Cooper Property and three sumps located on the Haack Property. This demarcation of the sumps has been primarily based on air photo interpretation with limited boring data to substantiate the delineation of the sumps (Fig. C-7, Appendix C). Based on the results of Stantec's drilling program the southern-most two previously identified sumps on the Haack Property should be considered as a single unit. Post-1946 surface grading and reworking of soil has significantly altered this area (the Haack Rework Area, Figure 2A). The Haack Rework Area is an area where some sludge has been mixed with soil and other debris to create an area of reworked material. The boring information from this RI does not suggest any significant changes to the extent of the Haack sump located in the northeast portion of the Haack property or the two Cooper sumps. However, borings do suggest that near-surface deposits and surface sludge layers extend beyond the eastern berm of the North and South Cooper sumps, closer to the Cooper Property fence line.

Based on the results of continuous coring from more than 88 borings the detailed three-dimensional configuration of the sludge was determined. Figures 13, 14, and 15 depict the depth beneath the ground surface to the top of the sludge, the thickness of the non-sludge interbedded material within the sumps and the total sludge thickness at each boring or microcone location, respectively. Figure 16 depicts selected isopachs of sludge thickness presented in Figure 15. Figures 17A through 17H present a series of north-south and east-west cross sections across the Site that illustrates the morphology between the ground surface and the sludge in the Haack sump and the two Cooper sumps. Figures 10E and 10F are cross sections across the Haack Rework Area that illustrates the morphology of sludge beneath the ground surface in this area.

A description of the Cooper North and South sumps, the Haack sump and Haack Rework Area follows:

Cooper South Sump

The Cooper South sump was constructed after May 1938 and prior to March 1941. The surface elevation of this sump is approximately 20.5 feet msl. A review of boring logs drilled within this sump suggests the following development of the Cooper South sump. The sump area was used for planting row crops in the late 1920s (Figures C-3 and C-4, Appendix C). It is inferred that the ground surface of the cultivated field was approximately 11.5 to 12 feet msl based upon observations of roots in boring logs CPB14, CPB15 and CPB17. This ground surface was excavated into in the eastern portion of the sump (CPB11R and CPB18); most likely to generate material for the sump's northern and eastern berms. A layer of sludge was placed into these excavations at depths ranging from approximately 12 to 13.5 feet bgs (7 to 8 feet msl). Soils were placed over these sludge deposits to an approximate elevation of 10.5 to 11.5 feet msl. A second layer of sludge, approximately one foot thick, was placed over these soils (CPB11R, CPB15, CPB18). Most of the western portion of the Cooper South sump was at an elevation above 11.5 feet msl which corresponds to the elevation of the former cultivated field. Reworked soils were then placed in the central portion of this sump to an elevation of 15 to 16 feet msl (4.5 to 5.5 feet bgs) which resulted in a relatively level surface to place approximately five feet of sludge across the breadth of the Cooper South sump.

Attenuation of sludge impacts (TEH < 100 mg/kg, chrysene and/or flouranthene < 1.0 mg/kg) to the soils beneath the Cooper South sump typically ranged from 1.5 to 3 feet beneath the sludge (CPB10, CPB11R, CPB14, CPB15, CPB17, CPB18 of Table 37). The southern berm borings CPB21 and CPB22 did not exhibit any impacts above the concentrations listed above. The borings had concentrations of TEH (<15 mg/kg) and chrysene and/or flouranthene (<10 ug/kg) at depths of five feet bgs and below. These borings are located approximately 10 feet south of the sump and indicate that lateral migration of sludge constituents was negligible.

Cooper North Sump

The Cooper Nouth sump was constructed between March and November 1941 (Figures C-6 and C-7, Appendix C). The surface elevation of this sump is approximately 19.8 feet msl. Figure C-6 documents the varied terrain the base of the Cooper North sump during its construction and infilling of sludge. A review of boring logs drilled within this sump suggests the following development of the Cooper North sump. The sump area was developed with buildings and two elongated structures in the late 1920s (Figures C-3 and C-4, Appendix C). These buildings most likely supported the clay excavation and agricultural operations occurring nearby. It is inferred that the ground surface of the developed area was approximately 13 to 14 feet msl based upon observations of roots in boring logs CPB03, CPB06 and CPB07. Much of the soil generated to construct this sump's north and east berm was obtained from a deep excavation dug in the northwest corner the sump.

Boring CPB01, located in the northwest corner of the Cooper North sump, documents sludge disposal to a depth of 17.5 feet bgs (approximately 2.3 feet msl) in this area. Approximately 5 to six feet of silty soil was placed over the sludge in this area (approximate elevation between 3.8

and 9.3 feet msl). Approximately four feet of reworked soil containing sludge fragments were then laid over the silty soil in this area which brought the sump's surface elevation to approximately 13 to 13.5 feet msl. This was the approximate surface elevation prior to excavation in this area. Reworked brick debris and soil was noted at elevations between 13.3 feet and 15 feet msl in northern borings of this sump (CPB02 and CPB03). The basal elevation of much of the Cooper North sump ranges from approximately 12.3 feet to 13.8 feet msl. Sludge deposits of approximately 6 to 7.5 feet in thickness were placed above this basal surface with few sediment interbeds present (CPB03A).

Attenuation of sludge impacts (TEH < 100 mg/kg, chrysene and/or flouranthene < 1.0 mg/kg) to the soils beneath the Cooper North sump typically ranged from approximately 5 to 7.5 feet beneath the sludge (CPB01, CPB02, CPB03, CPB05, CPB06 of Table 37). An exception of attenuation depth occurred at boring CPB07 where chrysene attenuation from 240 mg/kg to less than 1.0 mg/kg occurred over approximately 11 feet. The northern berm boring CPB23, located approximately 8 feet from the sump did not exhibit PAH impacts above the concentrations listed above. The northern berm boring CPB24, located approximately 6 feet from the sump did exhibit TEH and PAH impacts above the concentrations listed above to depths of 15 feet bgs. Boring CPB23 indicates that lateral migration of sludge constituents was negligible at its location. Boring CPB24 consisted of a black silty sand having with approximately 70% brick fragments between 5 and 8 feet bgs. It is possible that this berm material was previously contaminated by sludge constituents prior to berm construction and may not provide valid information to evaluate attenuation of sludge impacts at this location.

Haack Sump

The Haack sump was constructed after May 1938 and prior to March 1941. The surface elevation of this sump is approximately 19.5 to 22.5 feet msl. Boring logs drilled within the Haack sump during this RI and the investigation performed by the DTSC (1994) were reviewed. Inconsistency between surveyed elevations between the two investigations resulted in approximate sludge elevations within this sump. The boring log reviews as well as a review of Figure C-8, Figure C-9 and Figure C-12 of Appendix C suggest two interpretations for the development of the Haack sump.

A total of twelve borings having lithologic logs have been drilled in the Haack sump since the mid-1980s. Review of these boring logs by themselves allow for a strict interpretation of the sump stratigraphy; that the Haack sump consists of discontinuous sludge layers that vary in thickness and elevation of occurrence. This interpretation suggests that there are no sludge layers that extend across the breadth of the Haack sump, unlike the continuity observed within the upper four to five feet of two Cooper sumps.

The second interpretation is that there is a crude sludge stratigraphy across the Haack sump but that the continuous sludge layers have been disrupted by reworked material, possibly as a result of creation of the Haack parking lot between 1946 and 1951. Figure C-8 is a picture of the Site that shows the outline of the Haack sump in September 1946. Figure C-9 is a picture of the Site that shows the development of the Haack property in December 1951. The western portion of the Haack sump has been covered with dirt and converted into a parking lot while the eastern

portion of the Haack sump has not been significantly altered as of 1952. Figure C-12 is a picture of the Site that shows the development of the Haack property in November 1962. The eastern portion of the Haack sump remains vegetated. Borings SV05, SV10, HPB01, HPB02 and HPB09 of this RI and boring B-4 of the 1994 DTSC investigation all are located within the area of the converted parking lot. A generalized stratigraphy of approximate sludge layer thickness and elevations within this sump follows:

Haack Sump				
Sludge	Western Area		Central & Eastern Area	
Horizon	elevation (feet, msl)	thickness (ft)	elevation (msl)	thickness (ft)
A	16.5 to 17.5	1.0	18 to 20	2.0
B	12.5 to 15.5	3.0	12.7 to 15.2	2.5
C	11 to 13.5	2.5	9.5 to 11.5	2.0
D	8.0 to 8.5	0.5		

The following table lists the sump boring location and the existing and missing sludge horizons:

Boring	Location in Sump	Existing Sludge Layers	Sludge Layer(s) missing
SV05	Western	D	A, B, C
SV10	Central	B, C	A
HPB01	Western	C	A, B
HPB02	Central	C	A, B
HPB09	Central	C	A, B
B-4	Central	C	A, B
HA-1	Western	B	
HPB08	Western	A, C	
B-3	Western	A, C	
B-9	Eastern	A, B, C	
B-10	Eastern	A, B, C	
B-11	Eastern	A, B	

Borings HPB08 and B-3 are located in close proximity to the Haack sump's western boundary and the B sludge layer may not have extended to these locations. Boring HA-1 is located in close proximity to the sump's southwestern boundary and the A sludge layer may not have extended to this location.

Boring logs for HPB01 and SV05 strongly suggest that the western and central areas of the Haack sump have been reworked, thereby disrupting the shallow sludge layers. Boring SV05 consists of a silty sand containing approximately 10% tar clasts from immediately beneath the surface cap to a depth of 11.5 feet bgs. This boring also encountered the deepest occurrence of sludge in this sump at a depth of 13.8 to 14.6 feet bgs. Boring HPB01 consisted of silty sand with fragments of iron and brick debris from immediately beneath the surface cap to a depth of 10.0 feet bgs. Both borings HPB-01 and SV05 have nearby borings that encountered either the A or B layer, again suggesting that the A and B sludge layers were disrupted in the area of these two borings.

Haack Rework Area

The Haack Rework Area occupies the southeastern portion of the Haack property and the northernmost portion of the eastern two residential lots. The Haack Rework Area has been altered by human activity a number of times over the past 90 years. This activity has resulted in a number of modifications in the ground slope of the area. Much of the sludge deposited in the Haack Rework Area is presently covered by re-deposited soil.

A total of 19 borings have been drilled within and in the immediate vicinity of the Haack Rework Area, nine by the DTSC in 1994 and 10 during this RI. Inconsistency between surveyed elevations between the two investigations did not allow for combining the stratigraphic information from the boring logs of the two investigations. However, stratigraphic information from each investigation independently generates a similar sludge morphology for the Haack Rework Area.

Figure C-4 in Appendix C is an aerial photograph from 1929 that shows an elevated scoured surface with slope cut in the southern portion of the Haack property (the present Haack Rework Area). This elevated area slopes towards the surface of the southern Cooper property. Boring logs from RB-2 and RB-3 drilled during this RI indicate that fill material (including brick and concrete debris, grass) extended to depths of 28 feet bgs (elevations of approximately 8 feet msl). Apparently portions of the Rework Area had been excavated into and then backfilled with waste soil and debris prior to 1929. Figure C-6 in Appendix C is an aerial photograph taken on March 6, 1941 and an elevated area exists between the Haack Rework Area and the Haack Sump. Sludge, apparently resulting from surface releases, exists on the eastward dipping surface of the Haack Rework Area. This sludge did not extend into the Cooper South sump as it is apparently blocked by the access road on the west side of the Cooper South sump.

Figures 10E and 10F are cross sections across the Haack Rework Area that illustrates the morphology of sludge beneath the ground surface in this area. These two cross-sections were generated from boring logs of this RI. These two cross-sections compare favorably with cross-section D-D' generated from the DTSC investigation (DTSC 1994). The thickness of sludge in the western portion of the Haack Rework Area is thinner and occurs at a higher elevation than at the eastern edge of the Haack Rework Area. The constructed access road on the west side of the Cooper South sump is elevated a few feet above the Cooper South sump and acted as a dam to prevent flow of the sludge into the Cooper South sump. The upper surface of sludge in the easternmost portion of the Haack Rework Area occurs at an elevation of 25.2 feet msl (boring CPB13) and is approximately 4.2 feet thick. The surface elevation of the Cooper South sump east of CPB13 is 20.5 feet msl. Surface seeps of sludge can be observed at the edge of the western access road and the Haack Rework Area.

Figure C-7 in Appendix C is an aerial photograph taken on December 1, 1941. The photograph shows a small sludge sump located between the southern portion of the Haack sump and north of the Haack Rework Area. This small sump is elevated above the Haack sump. Figure C-6 taken on March 6, 1941 shows the initial construction of this sump. Figure C-9 taken in December 1951 shows that soil excavation appears to have removed much of the sludge at the location of this sump. Borings HPB06 and HPB11 from this RI and borings B-7, B-8 and HA-2

from previous DTSC investigations have been drilled in the area of this small sump. In the DTSC 1994 report boring B-8 was listed as having a sludge thickness of two feet and is the greatest thickness observed from the five borings. Borings HPB06 and B-7 had no evidence of sludge.

The ground surface of the Haack Rework Area has been disrupted and modified several times since the deposition of sludge occurred in this area in the early 1940s.

3.1.4.4 VOLUME OF SLUDGE CONTAINED IN SUMPS

An important question at the onset of this RI was to develop an accurate and precise determination of the volume of sludge contained in the sumps on the Site. Mr. Cooper had previously suggested that the quantity of sludge in the two Cooper sumps on his property was about 15,000 cubic yards, assuming a sludge thickness of four to six feet. Prior to this investigation a geophysical contractor performed a GPR investigation of the sumps located on the Cooper Property (Earth Imaging Geologic Services, December 21, 2000)(Figure 4). The contractor interpreted the reflector characteristics found in the GPR profiles to indicate that the base of the sump body lies at approximately six to nine feet bgs.

As a part of this RI detailed measurement of sludge thickness across the sumps was accomplished, and §3.3 of this report provides a description of how this was done. Stantec's calculation to determine the total quantity of sludge is based primarily on physical measurements of sludge recovered in continuous core samples obtained during this investigation. Figure 15 is an isopach map of the total sludge thickness across the entire site. The thickness of non-sludge interbed material is not included in the thickness calculations for this map. Figure 16 presents individual slices of the 1, 2, 3, 4, 5, 6, and 7-plus feet thickness layers through the Site.

Table 22 presents a summary of the calculated sludge thickness in the various sumps situated at the Site. The majority of the sludge is contained in the Cooper North and Cooper South sumps (17,279 cubic yards). The Haack sump contains about 2,873 cubic yards of sludge, and the Haack Rework Area contains the least amount of sludge (about 1,214 cubic yards). Based on Stantec's interpretation of the drilling program conducted as part of this RI, Stantec estimates the total quantity of sludge at the Site to be approximately 21,370 cubic yards.

3.1.4.5 SPECIFIC AREA SAMPLING RESULTS

The Workplan described proposed sampling at specific areas of the Site. The results of the specific area sampling are presented below:

Eastern LACDPW Easement: Five shallow borings were to be drilled on the LACDPW easement east of the two Cooper sumps (borings DPW01 through DPW05). These borings were to determine if shallow or surficial off-Site migration of sludge had occurred onto the LACDPW property. Safety issues associated with drilling on the slope on the LACDPW property resulted in Secor drilling the five shallow borings east of the Cooper sump's eastern berm but

west of the LACDPW – Cooper fence. All five borings encountered sludge within six inches of the ground surface. Maximum thickness of the surface deposits was 2.8 feet (boring DPW04). Deeper layers of sludge, at 3.4 to 3.6 feet bgs and 4.0 to 4.5 feet bgs, were encountered in borings DPW04 and DPW03 respectively. This remains a data gap and will be addressed in a forthcoming drilling event.

Former Drum Storage Areas: Sample locations HPB3, HPB4, HPB6 and HPB11 (Figure 9A) were located in the general area mapped by CalDHS as drum storage in 1981 (EEI, 1982). A review of Table 19a was performed to determine if metal concentrations from soil samples obtained in these four borings were above the metals native soil concentration range as shown in Table 26. Lead, at a depth of 1.5 feet, was above it's native soil concentration range in all four borings but was within it's native soil concentration range at a depth of five feet (exception was HPB11 which had sludge at five feet bgs). Boring HPB06, at a depth of 1.5 feet, was above its native soil concentration range for antimony, arsenic, copper and molybdenum but was within the metal's native soil concentration range at a depth of five feet. The only chromium VI analytical outlier of 4.3 mg/kg occurred at boring HPB06 at a depth of 5 feet bgs. Total iron and aluminum analysis on soil samples from these borings were unintentionally not performed.

Sludge Surface Samples: Five of the boring locations (CPB2, CPB3, CPB5, CPB7 and CPB15) listed in Table 16 and shown on Figure 9A were drilled in close proximity to surface sample locations JH01-JH-07 and GS1-GS4 from previous 1982 investigations(Figure 3A). The 1982 samples indicated high aluminum and iron concentrations were present at surface sludge in these locations. Soil samples obtained at 1.5 feet bgs from the CPB borings were to be used to determine if high arsenic, antimony and possibly thallium concentrations detected in 1982 owed their elevated concentrations to analytical interference from aluminum in the soil matrix (DTSC communication in September 21, 2005 memorandum to Joseph Cully from Bryan Eya).

Antimony, arsenic and thallium were not detected in sludge samples obtained at 1.5 feet from borings CPB2, CPB3, CPB5, CPB7 and CPB15 with the exception of antimony at 0.030 to 0.042 mg/kg from boring CPB07 (Table 19a). Aluminum and iron were analyzed from sludge samples obtained at 1.5 feet from borings CPB2, CPB3, and CPB7. Aluminum ranged from 8.6 to 22 mg/kg and iron ranged from 43 to 150 mg/kg (Table 19b). The lack of antimony, arsenic and thallium in the sludge samples from these CPB borings suggest that the 1982 data is not valid.

Sump Perimeter: The RI/FS Workplan proposed that if any of the borings intended to verify the lateral boundaries of the sump pits encountered near surface sludge, then additional "step out" borings could be advanced 10 to 20 feet further out from the sump pit being investigated with locations chosen in consultation with DTSC representatives. Near surface sludge was encountered adjacent to sump boundaries in borings DPW01 to DPW05 (discussed above) and in borings HPB08 and SV10 during this investigation. Borings HPB08 and SV10 as well as B-10, which was drilled during the DTSC 1994 investigation, are located near the Haack property northern property line. These three borings encountered near surface (within six feet of the ground surface) sludge layers and suggest that the Haack sump is not defined to the north. This remains a data gap and will be addressed in a forthcoming drilling event.

Off-site Adjacent Residential Properties: Boring locations RB-1 through RB-3 were located on residential properties at either 1440 Artesia Boulevard or 1452 Artesia Boulevard. These boring locations were drilled to determine the southern extent of sludge of the Haack Rework Area. All three borings encountered sludge and require step-out borings to the south. This remains a data gap and will be addressed in a forthcoming drilling event.

3.1.4.6 CHARACTERIZATION AND TREATABILITY OF SUMP MATERIAL

The complete text of the treatability study is contained in Appendix J. The objectives of the study were to characterize the physical and chemical properties of sludge at the Site, and to evaluate potential stabilization and neutralization methods for the sludge. The treatability study also evaluated the properties of sludge to determine the potential for beneficial reuse as asphaltic cement or roofing material. A total of 138 samples (118 sludge samples and 20 soil samples) were obtained from seven borings at the Site and used for chemical and physical analyses as part of the treatability study. The borings were CPB02, CPB06, CPB07, CPB14, CPB15, CPB18 and HPB05. The treatability study focused on characterizing the sludge in terms of the following parameters:

- Acidity,
- Wet density,
- Moisture content
- Viscosity, and
- Softening Point.

The study also focused on testing and evaluating various neutralization and stabilization methods and environmental factors including:

- Impact of a soil additive,
- Thermal treatment of sludge,
- The moisture/density relationship for treated sludge,
- Treatment costs,
- Testing for asphaltic properties,
- Vapor evolution,
- Heavy metal and organic mobilization,
- Long-term leaching analysis, and
- Permeability.

Table 23 presents a summary of the analytical results from sludge samples collected from the two Cooper sumps and the Haack Rework Area. Table 24 presents a summary of the analytical results from untreated composite sludge samples collected from the two Cooper sumps. In addition, Table 25 presents a summary of the analytical results from composite sludge samples collected from the two Cooper sumps that were treated with a mix of calcium hydroxide and calcium carbonate. The entire treatability study report as well as data tables for all analytical

results reported as part of the study can be referenced in Appendix J. A brief summary of the treatability study follows.

The testing showed that the acidity of the sludge ranged from 6.1 to 20.8 percent by weight. The Cooper South Sump had the highest acidity with an average value of 19 percent by weight. Wet density of the sludge ranged from 65.7 lb/ft3 to 74.9 lb/ft3. In addition, average moisture of the sludge at the seven boring locations ranged from 9.8 to 22.3 percent.

The sludge is highly viscous, ranging from 1.7E6 to 2.5E6 centipoises at a reference temperature of 140^0F. The sludge softening point ranges from 158^0F to greater than 210^0F. The high viscosity and softening point cause the sludge to exhibit solid-like properties, but it exhibits viscoelastic flow when placed under stress. These properties can be reduced by solidification treatment. Solidification may be achieved by soil amendment using bituminous stabilization where the sludge serves as bitumen for cementation of soil particles.

Testing showed that the sludge can be neutralized by treatment using 25 percent treatment reagent addition by weight where the treatment reagent is comprised of 50 percent hydrated lime and 50 percent calcium carbonate fines. Approximately 10 percent water addition was also required to help activate the lime and carbonate reactions. The addition of 50 percent soil by weight during this mixing will also effectively solidify the waste so it is no longer susceptible to viscoelastic deformation. This treatment also effectively fixates lead, as demonstrated through long-term leaching tests, and neutralizes acid gases such as hydrogen sulfide and sulfur dioxide.

The treatability testing also identified concerns associated with the potential on-Site treatment of the sludge. First, the sludge will release entrained sulfur dioxide and hydrogen sulfide gases if disturbed for treatment. In its current state, the sludge is highly impermeable, but treatment would increase its permeability. Finally, the cost for treatment would be very high, primarily because of abatement of sulfur dioxide and hydrogen sulfide. Most of the costs are associated with vapor capture and treatment systems for sulfurous gases during construction activities.

Based on an average bulk wet density of 70.3 lb/ft3 and a volume of 21,370 cubic yards, approximately 20,278 tons of sludge would require treatment. Estimates of treatment costs will be determined as part of the Feasibility Study.

Testing for asphalt qualities of the sludge indicate that the sludge will be unsuitable for use as recycled asphalt for road construction or roofing since it has high viscosity, high solids content, and no ductility.

3.1.5 Interpretation Summary by Sump

General Interpretation

- Based on the chemical analyses of more than 300 sludge and soil samples leaching and migration of COPC's in soil is minimal. While there are a few isolated areas where some

leaching of COPC's may have occurred, the migration of the inorganic COPC's in soil is limited to a distance of a few feet or less from the soil/sludge contact. The migration of the organic COPC's in soil is limited to a distance of 5 to 10 feet or less from the soil/sludge contact.

- The concentrations of various metals observed in the native soil beneath and around the sumps are of similar magnitude to the quantities observed in the sludge. The level of arsenic in the sludge at the site is slightly below the level of arsenic observed in the native soil.

- The amount of arsenic on one of the background soil samples was more than one order of magnitude greater then arsenic levels in other surrounding soil samples. Additional testing will be performed to resolve questions regarding the validity of this result.

- The three-dimensional configuration of the sludge at the Site was determined based on the results of continuous coring from more than 88 borings.

- The total quantity of sludge at the Site to be approximately 21,370 cubic yards.

- The sludge can be effectively neutralized and stabilized, but treating the sludge to accomplish this will require disturbing the sludge, which will result in the release of large quantities of hydrogen sulfide and sulfur dioxide gases.

Two Cooper Sumps

- Sludge in the southern sump is more viscous than in the northern sump.

- Sludge thickness in the northern sump is typically five to seven feet thick while the thickness of sludge in the southern sump is typically four to six feet thick. There is a larger quantity of interbedded soil within the southern sump.

- Testing for asphaltic qualities of the sludge indicates that it will be unsuitable for use as recycled asphalt for road construction or roofing since it has high viscosity, high solids content, and no ductility.

Haack Sump

- The western and central portion of the sump appear to have been disrupted to a depth of eight to ten feet. This disruption results in a lack of continuous sludge layers across this area of the sump. Laterally continuous sludge layers occur in the eastern portion of the sump.

- The Haack sump was determined to be a separate pit from the Cooper North sump divided by a berm on the property and fence line in that area. This determination is

supported by borings CPB-26 and -27 that were advanced along the fence line from the Cooper property and from aerial photographs (Appendix C) which show a defined berm between the two sumps.

- The northern extent of the Haack sump has not been definitively defined toward Artesia Boulevard. The most northern borings are four to five feet south of the sidewalk and still encounter sludge layers.

Haack Rework Area

- The thickness of sludge in the western portion of the Haack Rework Area is thinner and occurs at a higher elevation than at the eastern edge of the Haack Rework Area.

- The constructed access road on the west side of the Cooper South sump is elevated a few feet above the Cooper South sump and acted as a dam to prevent flow of the sludge into the Cooper South sump.

- The upper surface of sludge in the easternmost portion of the Haack Rework Area is approximately 4.2 feet thick.

- Surface seeps of sludge can be observed at the edge of the western access road and the Haack Rework Area.

3.1.6 Data Gaps

Delineation of the sludge east of the Cooper property, south of the Haack Rework Area on the Residence properties and north of the Haack Sump has not been accomplished. Additional field work will be required to delineate these areas. The drilling program of this RI provided comprehensive and detailed data that enabled accurate delineation of the vertical and lateral extent of sludge deposits across the Site and accurate calculation of sludge volumes. However, the exact delineation of surface-spilled sludge, pinching out of thin sludge layers, and reworked impacted soil at some locations have not been accomplished.

The eastern boundary of the Cooper sumps show evidence of past over spillage to topographic lows and rework from installation of the interim cover. Near surface sludge was encountered adjacent to sump boundaries in borings DPW01 to DPW05. Supplemental borings will be drilled in order to positively identify the extent of sludge east of the Cooper North and South sumps.

Borings RB01, RB02 and RB03 along the southern boundary of the Haack Rework Area exhibited thin layers of stained soils and localized sludge deposits on the former surface topography. In order to positively identify the southern extent of the Haack Rework Area supplemental borings will be performed within the residential properties.

The northern boundary of the Haack Sump approaches the public sidewalk along Artesia Boulevard. The northern assessment borings in this area are four to five feet south of the sidewalk and still encounter sludge layers. In order to positively identify the northern extent of the Haack North Sump supplemental borings will be performed either along the fence-line in the Haack property or along the sidewalk in the CalTrans' right-of-way.

3.1.7 Response to DTSC Comments on Subsurface Sludge and Soil Investigation

DTSC comments regarding the subsurface sludge and soil investigation and ARC responses are provided:

GC-5. The lateral and vertical extent of low pH values in soil has not been determined (see Table 20). This should be identified as a data gap and included as a recommendation for further investigation.

ARC response: A review of the attenuation of sludge impacts (including pH) to surrounding soils was done for the two Cooper sumps (Table 37). It is evident that low pH values (<4 units) are associated with the presence of sludge. pH values a few feet away from the presence of sludge were typically in the range of 6 to 9 units. Soil impacted with total extractable hydrocarbons (TEH) > 100 mg/kg and chrysene and/or flouranthene (the two most common PAHs in the sludge) > 1.0 mg/kg commonly had pH values ranging from 6.5 to 8.5. This suggests that migration of sludge constituents in soil is more areally extensive than alteration of soil pH by the sludge. Sludge impact to adjacent soils is better identified by concentrations of TEH and PAH concentrations in the soil than by pH values. For this reason, ARC does not believe that delineation of soil pH at the Site is a data gap.

SC-1a. We assume the text is referring to the samples identified as DPW01 through DPW15. We note that locations DPW01 trough DPW05 lie within the Site property line (see Figure 10) and boring logs report detections of sludge. No off-site samples have been collected along the eastern property boundary to define the lateral extent of contamination.

ARC response: ARC will prepare a forthcoming work plan to address data gaps in this RI. Additional investigation east of the Cooper property line will be included in this work plan.

SC-11. Section 3.3.2, Subsurface Soil and Sludge Sampling and Analysis, pages 23 through 25.

11a) Where is the ten percent QA/QC check data comparisons presented?

ARC response: The laboratory analytical data that underwent an independent QA/AC evaluation as outlined in Section 5.3 of the workplan are discussed in Section 3.1.3 and the validator reports are presented in Appendix I-1. In Tables 17, 18, and 19, if the analytical data was submitted to external QA/QC then only the validated results are presented in the summary tables.

11b) We note that there are significant, discrepancies between field and laboratory pH values.

ARC response: Variations in field and laboratory obtained pH values for soil are discussed in section 3.1.4.2 of the revised draft RI report (Tables 20 and 21). Sixteen soil / sludge samples had both field and laboratory pH values measured. Fourteen of the 16 had field and laboratory values within a range of 3 pH units. The average pH difference of these 14 samples was 1.2 pH units (Table 21). The laboratory pH of the Cooper sludge samples averaged 2.22 with a median value of 1.19. The laboratory pH of the Cooper native soil averaged 6.57 with a median value of 7.86. This suggests that either laboratory or field pH measurements can be used to delineate sludge from native soil. Variations in field and laboratory obtained pH values for groundwater are discussed in section 3.9 of the revised draft RI report.

SC-16. Section 4.2, Soil/Sludge Sample Analytical Results, pages 35 through 37

16a) It is not clear why this section is limited to a discussion of "select" analytes. There should be a discussion of all contaminants detected including the risk drivers such as benzo(a)pyrene.

ARC response: Selected SVOC analytes in the data summary tables were chosen to present because extensive dilution was required in order for the laboratory instruments to measure the quantity of an analyte in the sludge samples. As a result of the dilutions, a large percentage of SVOC compounds had non-detect results. The “select” SVOC analytes were those that most often had reportable concentrations. The results of all chemical analyses were reviewed in preparation of this report. Benzo(a)pyrene is discussed in section 3.1.4.2 of the revised draft RI report and it’s analytical results are included in Table 18 of the revised draft RI report.

16b) The text indicates that in general the level of arsenic is higher in soil samples obtained from the DPW borings outside the southern boundary of the Site than in soil samples beneath the sludge. We note that the concentrations of arsenic in DPW borings, other than DPW10, are less than 3.4 mg/Kg.

ARC response: Arsenic concentrations in soil & sludge samples are discussed in section 3.1.4.2 of the revised draft RI report. ARC found that the range of detected arsenic concentrations were similar for both the native soil and sludge.

16d). The text acknowledges that only a single sludge sample was collected from the Haack North Sump. This appears to be a data gap.

ARC response: Eight sludge samples from five borings were obtained from the Haack north sump during the DTSC’s 1993 investigation of the Haack property. The DTSC investigation adequately evaluated the chemistry of the sludge and depth of the Haack sump. The collection of two sludge samples from boring SV-10 resulted in a total of ten sludge samples from this sump that underwent chemical analysis.

SC-22. Section 4.4, Sumps and Sump Material, pages 42 and 43

22a) Include a discussion of the determination of lateral boundaries. It appears that full delineation has not been performed and should be identified as a data gap and included as a recommendation for further investigation.

ARC response: A discussion of the lateral boundaries of the three sumps and the Rework Area has been included in section 3.1.4.3 of the revised draft RI report. Delineation of the sludge east of the Cooper property, south of the eastern Residence Properties and north of the Haack Sump has not been accomplished. Additional field work will be required to delineate these areas.

SC45. Appendix M (Boring Logs)

45d) Boring logs for SV-02 and SV-07 indicate staining and/or strong odors. The source for these observations should be described in the text. No samples were collected from these intervals to evaluate potential contamination associated with these observations.

ARC response: The site history section has been revised in section 2.1 of the revised draft RI report. The location of boring SV-02 was excavated to the approximate current surface grade between September 1946 and December 1951 (see Figures C-8 and C-9, Appendix C) at which time the Haack Sump had been covered with soil and used as a parking lot. The approximate current surface grade of SV-07 was excavated to between January 1958 and November 1962 (see Figures C-11 and C-12, Appendix C). By November 1962 the northern Haack property (including the boring locations of SV-02 and SV-07) had been covered by pavement or concrete. The upper few feet of both boring locations consist of artificial fill (containing debris and stained soil). A soil sample was obtained beneath the artificial fill in each boring at a depth of five feet. No VOCs or SVOCs were detected above the analytical reporting limit from the two soil samples. ARC interprets the artificial fill at the northern Haack property to represent surface material prior to the emplacement of the concrete or asphalt surface cover.

DTSC-4) Field measured pH values for soil and sludge should be included in the tables and the results discussed in the text.

ARC response: Field measured pH values for soil and sludge have been included in Tables 19a, 20 and 21 of the revised draft RI report. Variations in laboratory and field pH values of soil are discussed in sections 3.1.4.2 of the revised draft RI report.

DTSC-5) The text should be corrected in reporting that sludge was encountered in both CPB-28 and CPB-29. We also note that sludge was encountered in boring CPB30. This finding indicates that the Haack and Cooper North Sump are connected at depth.

ARC response: ARC does not believe that the Haack and Cooper North Sump are one contiguous sump connected at depth. Borings CPB28, CPB29 and CPB30 were drilled to investigate if these two sumps were contiguous. All three of these borings encountered discrete, thin sludge layers (<1.0 feet thick) within the upper 5.0 feet of the ground surface. These sludge

layers are interbedded with reworked fill which consists of a mixture of silt, brick debris and sludge fragments. ARC's interpretation is that sludge layers represented surficial deposits which were then buried with reworked fill materials as the height of the berm was increased. In boring CPB28, a 2 inch thick sludge layer occurs at a depth of approximately 6.5 feet bgs. ARC interprets this sludge to represent an indentation in the preexisting berm that later was filled when the Cooper North Sump was being filled. Figure C-7 of Appendix C shows the Haack - Cooper North Sump berm in 1941 prior to the construction of the Cooper North Sump.

DTSC-6) Include a discussion of metal analytical results, including hexavalent chromium and arsenic, in the text.

ARC response: A discussion of metal analytical results, including hexavalent chromium and arsenic is found in section 3.1.4.2 of the revised draft RI report.

3.2 MICRO- CONE PENETROMETER TESTING (CPT) SOUNDINGS

In the approved RI/FS Workplan, Stantec proposed to test investigative techniques that could allow for safe access and mobility of drilling equipment onto the Cooper Property sumps in order to define the vertical and horizontal extent of the sludge. One of the main elements of this approach was the testing of Micro-Cone Penetrometer Testing (CPT) gear deployed from a light-weight, limited-access, drilling rig that could operate on top of the sumps from the DuraBase™ mats.

3.2.1 RI/FS Workplan Scope [§ 5.3.2.2 pg 35, 36, 38]

Stantec proposed 20 micro-CPT boring locations on and around the northern and southern sumps on the Cooper property. The micro-CPT was employed to attempt to "sound" the bottom of the sludge deposits and estimate lithology at the sample boring locations shown on RI/FS Workplan Figure 13. The feasibility criteria for successful use of the micro-CPT gear included the ability to distinguish between soil and sludge in the output log, as well as time- and cost-effective decontamination of the micro-CPT probe and rod materials. Boring CPB-18 was the pilot test location to test the micro-CPT performance.

3.2.2 Deviation from the Workplan

Due to the efficient execution of planned micro-CPT work, micro-CPT testing locations were added between a number of planned borings with the objective of gathering additional data on the spatial distribution of sludge within the two Cooper sumps and the adjacent sump berms. The change of plan was made in the field based on the observed field conditions and successful operation of the equipment. The additional micro-CPT test locations are designated with the letter "A" (e.g., CPB-11A).

3.2.3 RI Execution

The micro-CPT system operates in a fashion similar to normal CPT systems by measuring pressure and friction at the tip (the cone) of a direct-push rod. Computer software then translates these parameters into interpreted lithology based on soil observations matched with variations in the parameters. The Microcone™ (MCP7) is attached to a coiled rod that is straightened and pushed into the subsurface. The coiled nature of the unit allows for a continuous deployment of the system without requiring an extensive equipment staging area. The pressure transducer readings obtained with this system can be correlated with lithology from soil samples from adjacent direct push assessment borings (Section 3.1, Appendix K).

The micro-CPT was employed at 30 locations on the Cooper Property (Figure 9A). Five additional deep micro-CPT borings were performed to document subsurface conditions at depths greater than 30 feet. These five borings are discussed in Section 3.3 and their locations depicted in Figure 9A.

3.2.4 Findings

A total of 30 shallow micro-CPT borings were advanced on the Cooper Property. Friction, pressure, and interpreted lithology data were collected as planned. Decontamination of the coiled probe was completed during extraction and between testing locations. No soil or sludge cuttings or other investigation derived waste was generated. Micro-CPT boring information is summarized in Table 16, their test locations are shown on Figure 9A, and their boring logs are included in Appendix K.

3.2.5 Interpretation

The micro-CPT technique provided good results in differentiating sludge from soil. The operation of the equipment and data collection was successful due to the compact, maneuverable, and light-weight rig used with the Dura-Base planking. There were no issues penetrating through the fabric cover or the impounded sludge and into the underlying sediments. The ability of the CPT software to differentiate the sludge material from native sediments based on friction and pressure measurements was more precise within the first seven feet from the ground surface.

The micro-CPT software interpreted the sludge as “stiff fine grained sand” or “cemented sand” in CPT logs due to the high pressure coefficient. However, beyond a depth of 10 feet, micro-CPT interpretations of “stiff fine grained sand” or “cemented sand” did not correlate to sludge. Also, the micro-CPT interpreted thin layers of fine-grained sediments where the visual boring log identified sludge. In the Cooper South Sump, the base of the sludge appeared to require increased force to penetrate into the native soil indicating a firmer material composition at the sludge boundary. Comparison logs between micro-CPT interpretations and visual observations from direct-push geoprobe sampling are provided in Appendix K-2.

3.2.6 Data Gaps

No gaps in the data obtained by the micro-CPT technique were noted and no alternate assessment methods are recommended for additional data collection.

3.2.7 Response to DTSC Comments on Microcone CPT Soundings

DTSC comments regarding Microcone CPT soundings and ARC responses are provided:

There were no specific DTSC comments concerning the Microcone CPT soundings.

3.3 DEEP STRATIGRAPHY AND HOLLOW-STEM-AUGER INVESTIGATIONS

In 1994, URS completed 15 CPT test borings to depths ranging from 36 to 70 feet bgs in accessible areas around the perimeter of the Site (URS, 1994; RI/FS Workplan Figure 5). The additional data collected from this RI's deep stratigraphy investigation on the Haack and Cooper properties complements the interpreted Site stratigraphy from the previous URS investigation. The data obtained from this RI characterized the occurrence of petroleum hydrocarbon compounds and metals beneath the Site to depths up to approximately 100 feet bgs. This phase of soil assessment was conducted in conjunction with assessment of the shallow water-bearing units (Sections 3.6, 3.7, and 3.8).

3.3.1 RI/FS Workplan Scope [§ 5.3.2.2 // 5.3.2.6]

Stantec proposed to assess the sediments between the Haack and Cooper sludge deposits by advancing five direct-push CPT borings utilizing a 25-ton CPT truck at the locations shown on RI/FS Workplan Figure 14. The purpose of the proposed CPT borings was to obtain stratigraphic profiles of the subsurface sediments within the upper 100 feet bgs and to collect depth-discrete groundwater and soil samples. Pore pressure dissipation tests (PPDT) to measure hydrostatic pore pressure were to be performed at relatively permeable soil horizons indicated by the real-time CPT data in these intervals.

Data from the five CPT locations were intended to investigate if sludge related compounds had leached from the sumps to the underlying sediments and water-bearing zones of the Bellflower Aquiclude (Section 3.6 and 3.9) and to evaluate the sedimentary characteristics of the Site's two monitored water bearing zones (Section 3.4). In addition, the investigation was intended to check for the presence of any potential DNAPL which may be associated with the sumps.

The approved scope of work included: i) vertical profiling of soil lithology by micro-CPT methods to approximately 100 feet bgs at five CPT locations (CPB09, CPB25, CPB26, CPB27, and HPB10) and ii) laboratory analysis of soil samples, obtained at five-foot intervals from a 25-ton CPT direct-push rig, for VOCs, SVOCs (with PAH confirmation by USEPA Method 8310 as necessary), inorganic metals (including aluminum, iron, and hexavalent chromium), GRO, WORO, TOC, and pH.

3.3.2 Deviation from the Workplan

On September 15, 2006, DTSC approved the Request to Amend the RI/FS Workplan (Appendix L) which proposed a modified drilling method, a modification of the soil sampling plan, and installation of a fourth cluster of groundwater monitoring wells (Section 3.8). The following deviations from the RI/FS Workplan were executed for the deep soil sampling investigation:

- Soil samples were collected using hollow-stem-auger (HSA) drilling equipment from a standard HSA drilling rig and not from the 25-ton CPT, direct push rig;

- The soil sampling intervals for the deep soil sampling investigation was reduced from sampling at five-foot intervals at five soil locations to sampling at approximately 10-foot intervals at two of the five boring locations (MW-04A/B and HPB12);

- At the request of DTSC, borings CPB-28 and CPB-29 were advanced between the Haack sump and Cooper North Sump to investigate if these two sumps are connected;

- The pilot boring for installing MW-04A was completed as exploratory soil boring CPB-30 to a total depth of 30-feet when two separate layers of sludge were encountered within three feet of the ground surface during drilling; and

- The location of boring HPB12 (proposed in the Workplan as HPB10) in the northern Haack property was moved adjacent to boring location HPB04 due to access issues caused by tenant-stored vehicles on the Haack property (Figure 9A).

- Two boring locations (MW-4A and MW-4B) were converted to two groundwater monitoring wells, one screened in the upper water bearing zone (A) and one screened in the lower water bearing zone (B) (Section 3.8).

The following table summarizes the revised boring locations and sampling scheme.

Summary of Soil Sampling and Well Installation Modifications

CPT Sounding Location	Proposed Boring Location	Proposed Soil Samples and Chemical Testing (feet bgs)	Proposed Physical Properties Testing (feet bgs)	Proposed Monitoring Well Installation (screen interval feet bgs)
CPB09	MW-04A	MW-04A / 10' to ~30' @ 10' intervals	None	MW-04A (18'-28')
CPB25 CPB26	MW-04B	MW-04B / 30' to ~90' @ 10' intervals	21, 54, 76, 90	MW-04B (75'-80')
CPB27	None	none	None	none
HPB10	HPB12	5' to 90' @ 10' intervals	55, 71	none

3.3.3 RI Execution

CPT Investigated Stratigraphy – Five CPT borings (CPB-09, CPB-25, CPB-26, CPB-27 and HPB-10) were drilled to depths ranging from 95 feet bgs to 100 feet bgs (Figure 9A). The CPT vendor provided on-site data during the investigation and printed graphical data logs that summarize the CPT activities. Included in the report are charts depicting tip resistance and sleeve friction plotted versus depth. The data depicted in the charts is then used to generate the soil type classifications. CPT logs are presented in Appendix K.

HSA Soil Sampling –Six HSA borings were advanced (Table 16) and soil samples were collected from boring locations CPB28, CPB29, CPB30, HPB12, MW-04A and MW-04B (Figure 9A). Borings CPB28 and CPB29 were drilled to depths of 16.7 feet bgs and 11.5 feet bgs, respectively to investigate the stratigraphy between the Haack sump and the Cooper North Sump. Borings CPB30 and MW-04A were drilled to approximately 30 feet bgs. Borings HPB12 and MW-04B were drilled to approximately 90 feet bgs. Soil samples were collected at depths that correlate with groundwater well screen intervals in saturated portions of the upper (A zone, borings CPB30 and MW-04A) and lower (B zone, borings HPB12 and MW-04B) monitored zones. In addition, two soil samples per boring were collected from a clay layer that separates the upper and lower monitored zones and one soil sample per boring was collected from a clay layer at the base of the lower monitored zone from borings HPB12 and MW-04B.

The borings for MW-04A and MW-04B were both converted into groundwater monitoring wells, screened in the upper (A) and lower (B) monitored zones, respectively (Section 3.8). Well construction conforms to the previously existing MW network (Table 14).

Soil borings were initially cleared to a depth of 5-feet bgs using a hand auger. An 8-inch diameter, continuous flight hollow-stem auger (CFHSA) was then used to advance the boring to total depth. Soil sampling was accomplished using a California Modified split spoon core barrel to collect 2-inch diameter by 2-foot long lithologic cores. A drop hammer was used to advance the split-spoon sampler through the CFHSA. An organic vapor meter will be used to screen soil samples for hydrocarbon vapor concentrations. After the core was extracted from the split-spoon sampling device it was placed on a specially designed sampling table. The core was visually examined to identify lithology and approximate moisture content.

Samples were then extracted for various types of analyses. Samples that were going to be tested for VOC's and GRO were extracted using an Encore® sampling device per EPA Method 5035. Samples for other tests were placed in brass rings and the ends of the sample were cut vertically, at a 90 degree angle to the longitudinal axis. Any burrs created during cutting were removed; the sample was sealed with heavy duty flexible Teflon squares, capped with plastic end caps, and then taped tightly with clear acetate tape to produce a vapor tight seal. Samples for metals analysis were placed in glass jars, and samples destined for geotechnical analysis were placed in sealed brass ring containers.

Samples were analyzed in the laboratory for VOC's, SVOC's, GRO, Waste Oil Range Organics (WORO), Total Organic Carbon (TOC), metals (including aluminum, iron, and hexavalent chromium) and pH using standard methods described in the QAPP (Appendix A of the RI/FS Workplan). Values for pH of soil and sludge samples were determined by off-Site laboratory analysis.

3.3.4 Findings

Six borings (designated CPB-28, CPB-29, CPB-30, HPB-12, MW-04A, and MW-04B) were advanced by HSA (a total of 286.5 linear feet of sediments) at the Site. Table 16 provides a summary of individual borings and samples collected from each boring. The locations of these borings are plotted on Figure 9A. Boring CPB-30 was initially planned as the pilot boring for

MW-04A. However, within three feet of the ground surface two separate layers of sludge were encountered during drilling of this boring. To reduce the possibility of cross-contamination in MW-04A and MW-04B, CPB-30 was completed as a soil exploratory boring to a total depth of 30-feet. MW-04A and MW-04B were relocated to the berm separating the Cooper North and South sumps, immediately west of CPB-09 (Figure 9A). Boring HPB-12, originally designated HPB-10A in the amended workplan approved by DTSC, was moved adjacent to boring location HPB04 due to access issues caused by tenant-stored vehicles on the Haack property (Figure 9A).

A total of 21 soil and/or sludge samples were collected from borings CPB-28, CPB-29, CPB-30, HPB-12, MW-04A, and MW-04B for chemical analysis, four soil samples were collected for geotechnical analysis, and the laboratory analyses of these four samples are included in Appendix M. Detailed lithologic logs based on drilling returns and split-spoon samples are included in Appendix L.

Haack / Cooper North Sump Boundary – CPT borings CPB25-GW and CPB-26-GW and HSA borings CPB28, CPB29 and CPB30 were advanced between the Haack sump and Cooper North Sump to investigate if these two sumps are connected. No sludge was apparent in the CPT logs in either CPT boring. Sludge layers a foot or less thick were encountered within the upper three feet bgs in boring CPB30 and within the upper 5 feet bgs in borings CPB28 and 29. These sludge layers are interpreted to represent overflow deposits which breached the eastern Haack sump berm. This interpretation is based on the following information:

- Boring CPB29 consists of artificial fill or sludge from approximately 12.3 feet msl to 20.3 feet msl. This artificial fill is interpreted to represent berm material. The deeper of the two sludge layers encountered in this boring has a basal elevation of approximately 15.3 feet msl.
- Boring CPB28, south of CPB29, consists of artificial fill or sludge from approximately 15.4 feet msl to 20.2 feet msl. A sludge layer encountered in this boring has a basal elevation of approximately 15.4 feet msl.
- Boring CPB30, south of CPB28, consists of artificial fill or sludge from approximately 17.5 feet msl to 20.5 feet msl. The deeper of the two sludge layers encountered in this boring has a basal elevation of approximately 17.5 feet msl.
- The aerial photograph taken on December 1, 1941 (Appendix C-7) shows the initial sludge disposal in the Cooper North Sump. The Haack / Cooper North Sump berm is clearly shown with sludge occupying the Haack sump east of the berm and no sludge present in the Cooper North Sump west of the berm.

It is interpreted that the Haack / Cooper North Sump's berm was periodically raised with native and reworked soil after situations occurred when sludge overflowed the top of the berm. This interpretation suggests that the Haack sump and Cooper North Sump are not one large sump and is supported by the aerial photography from 1941 (Appendix C-7). A two inch thick sludge sample was encountered at a depth of 6.5 feet in boring CPB28. The occurrence of the sludge at this depth is interpreted as either an overflow deposit with a basal elevation of approximately 13.5 feet msl or sludge obtained from the sidewall of the Cooper North Sump. Boring CPB01,

located approximately 50 feet west of CPB28, documented sludge that extends to an elevation of approximately 2.3 feet msl.

Subsurface Geology – The subsurface geology to a depth of approximately 100 feet across the Site consists of interbedded marine sediments. The deep CPTs that were performed at the Site by URS in 1994 and this RI illustrate the interbedded nature of these sediments. The sediments underlying the sumps predominantly consist of a mixture of clays and silts in the upper 50 feet of the surface of the sumps. Relatively coarser-grained sediments (fine-grained sand and silty sand) occur as discontinuous lenses within the upper 50 feet of the surface. The depth interval of 50 to 100 feet beneath the sumps also consist of a mixture of clays and silts but with an increased quantity of silty sand to sand sediments. The depth interval extending from approximately 60 feet to 80 feet beneath the sumps consists of a predominantly silty sand to sand horizon that appears to be laterally continuous across the Site. However, these sands exhibit low permeability characteristics for a water-bearing unit (Section 3.4).

The extremely variable spatial distribution of the grain size and lateral extent of individual sediment layers is confirmed by the lack of laterally continuous marker beds. Some sediment layers contain shells and shell fragments at approximately 50 feet bgs, are indicative of an estuarine to marine depositional environment, but these layers do not appear to be laterally continuous across the Site. Figures 10A through 10D depict various shallow and deep geologic cross-sections through the central portion of the Site. The boring logs contained in Appendix L illustrate how generalized these cross-sections are with respect to variations in grain-size distribution and other physical parameters observed in the borings.

Soil Analytical Results – An additional 21 subsurface soil samples were collected from the HSA borings to confirm the vertical distribution of potential chemicals of concern at the Site. Representative analytical results of these samples are presented in Tables 17, 18, and 19, and more extensive data can be found in the complete laboratory chemical analyses contained in Appendix I. Reported concentrations qualified by a “J” flag are estimated values detected at a level below the quantifiable method Reporting Limit (RL) and above the Method Detection Limit (MDL).

The Haack / Cooper North Sump berm was investigated by borings CPB28 and CPB30; no soil analytical data was obtained at boring CPB29. No PAH compounds were detected above the RL from these two borings. Total Extractable Hydrocarbons (C13-C40) were detected in soil samples from boring CPB28 ranging from 6 mg/kg to 10 mg/kg and from the nine foot sample from boring CPB30 (14,000 mg/kg). The two deeper soil samples from boring CPB30 (19 and 29 feet bgs) did not contain Total Extractable Hydrocarbons (C13-C40) above the RL of 5 mg/kg.

Of the samples collected from depths greater than 30-feet bgs, VOC and SVOC compounds were not detected. Trace amounts of TPH as Total Extractable Hydrocarbons (C10-C40) were detected less than or very near the RL. Total Extractable Hydrocarbons (C13-C40) detections above the RL occurred at boring MW04B (9 mg/kg at 38 feet, 21 mg/kg at 89 feet) and at boring HPB12 (8 mg/kg at 90 feet). The three primary hydrocarbon compounds associated with the known sludge chemistry at the site (chrysene, phenanthrene and pyrene) were not detected above the reporting limit in any of the soil samples analyzed as part of this phase of

investigation. No DNAPL's were identified in any of the soil samples collected, or in any of the core samples obtained during drilling.

3.3.5 Interpretation

The continuous stratigraphy data from CPT soundings was consistent with HSA borings logged during this RI and previously collected CPT data obtained by URS. CPT logs for CPB09, CPB26 and HPB10 were compared with their associated visual boring log (Appendix K-2). There was very good correlation between the CPT and visual logs. The few differences were associated primarily with the ratio of silt to sand. A comparison of laboratory analyzed particle size, CPT and visual log interpretation from the two borings which have all three parameters is provided below. The preponderance of interbedded finer grained sediments (clays, silts, silty sands) present a stratigraphy within the Bellflower Aquiclude that is not traceable or continuous across the Site vicinity. Generally, relatively more permeable sediments (silty sands to sands) were observed that correlate with the upper and lower water bearing zones which are monitored as Zones A and B, respectively.

Boring Number	Lab Gradation	CPT Description	Visual Description
MW-04A/B, CPB09			
at 21.0 feet	75.4% sand, 19.6% silt	silty sand / sand	Interbedded sandy silt and silty sand
at 54.5 feet	49.8% silt, 49.3% clay	Clayey silt	fat clay
at 76.0 feet	85.6% fine sand, 12.4% silt	silty sand / sand	Interbedded sandy silt and silty sand
at 90.0 feet	54.8% clay, 44.4% silt,	Silt	fat clay
SV-18, CPB26			
at 5.5 feet	49.9% silt, 36.5% sand	silty sand / sand	sandy silt
at 14.5 feet	54.0% sand, 33.2% silt	silty sand / sand	sandy silt

The three identified COPC's were not measured in quantities greater than the RL. No DNAPL's were identified in any of the soil samples collected, or in any of the core samples obtained during drilling. Based on chemical analytical data from deep soil samples there is no indication that constituents from the overlying sludge impoundments impacts soils to the maximum depth of 90 feet bgs.

3.3.6 Data Gaps

The CPT data collected to depths of 100 feet bgs adjacent to and between the sumps infill the data gaps from previous CPT boring locations. No remaining gaps in the data were noted and no alternate assessment methods are recommended for additional data collection for CPT soundings or deep soil samples based on the results of this portion of the investigation.

3.3.7 Response to DTSC Comments on Deep Stratigraphy & HSA Investigation

DTSC comments regarding deep stratigraphy and the HSA investigation and ARC responses are provided:

SC11. Section 3.3.2, Subsurface Soil and Sludge Sampling and Analysis, pages 23 through 25.

11d) The text indicates that the results of soil samples obtained from MW04A/B will be provided as an addendum to this document. We request that the data be included in the revised version rather than an addendum.

ARC response: The results of soil samples obtained from MW04A/B are discussed in section 3.3 and presented in Tables 17, 18 and 19 of this revised draft RI report.

SC43. Figure 25

43a) There are several discrepancies on this figure which require reconciling. For example: CPB-28, 29, and 30 boring logs report 1 foot or more of sludge.

ARC response: ARC interprets the sludge occurrences in these borings to have been surficial deposits which overflowed the berm. All three of these borings encountered discrete, thin sludge layers (<1.0 feet thick) within the upper 5.0 feet of the ground surface. These sludge layers are interbedded with reworked fill which consists of a mixture of silt, brick debris and sludge fragments. ARC's interpretation is that sludge layers represented surficial deposits which then were buried with reworked fill materials as the height of the berm was increased. In boring CPB28, a 2 inch thick sludge layer occurs at a depth of approximately 6.5 feet bgs. ARC interprets this sludge to represent an indentation into the preexisting berm that was filled when the Cooper North Sump was being filled. ARC decided to illustrate the sump boundaries and thickness contours within the sumps and reworked area in this figure.

The DTSC's geologist also has the following comments on the Addendum:

DTSC-2) Include side-by-side soil boring and CPT logs and include a discussion of how each CPT log compares to its' continuously cored soil boring companion.

ARC response: Side-by-side soil boring and CPT logs are provided for borings HPB12 & HPB10, SV18 & CPB26 , and MW04A/B & CPB09 are found in Appendix K-2 of the revised draft RI report. A discussion of how the CPT logs compares to its' continuously cored soil boring companion has been included in section 3.3.5 of the revised draft RI report.

DTSC-5) The text should be corrected in reporting that sludge was encountered in both CPB-28 and CPB-29. We also note that sludge was encountered in boring CPB30. This finding indicates that the Haack and Cooper North Sump are connected at depth.

ARC response: ARC does not believe that the Haack and Cooper North Sump are one contiguous sump connected at depth. Borings CPB28, CPB29 and CPB30 were drilled to investigate if these two sumps were contiguous. All three of these borings encountered discrete, thin sludge layers (<1.0 feet thick) within the upper 5.0 feet of the ground surface. These sludge layers are interbedded with reworked fill which consists of a mixture of silt, brick debris and sludge fragments. ARC's interpretation is that sludge layers represented surficial deposits which were then buried with reworked fill materials as the height of the berm was increased. In boring CPB28, a 2 inch thick sludge layer occurs at a depth of approximately 6.5 feet bgs. ARC interprets this sludge to represent an indentation in the preexisting berm that later was filled when the Cooper North Sump was being filled. Figure C-7 of Appendix C shows the Haack - Cooper North Sump berm in 1941 prior to the construction of the Cooper North Sump.

DTSC-9) The text should discuss the elevated detection of petroleum hydrocarbons in boring CPB-30 at a depth of ten feet below the ground surface.

ARC response: The detection of Total Extractable Hydrocarbons (C13-C40) of 14,000 mg/kg in boring CPB-30 at a depth of ten feet below the ground surface results from the observed staining of the soil in the depth interval of 8 to 10 feet. The staining is likely hydrocarbon in origin as this boring location is within a few feet of the eastern boundary of the Haack sump. No Total Extractable Hydrocarbons were detect (at <5 mg/kg) in this boring at depths of 20 and 30 feet bgs.

DTSC-10) The text should discuss the detection of naphthalene in boring MW-04 at depths of 80 and 90 feet below ground surface.

ARC response: Naphthalene was not detected in boring MW-04 at depths of 80 and 90 feet bgs at concentrations above the laboratory's EPA Method 5035/8260B reporting limit of 5.7 µg/kg. Naphthalene was detected at an estimated concentration (J-flag) of 1.3 µg/kg at a depth of 80 feet bgs and 3.3 µg/kg at a depth of 90 feet bgs. The detection at 80 feet was at the laboratory's EPA method analytical detection limit of 1.3 µg/kg. The detection value at 90 feet is suspect because naphthalene was present in the laboratory method blank. The apparent detections of naphthalene at 80 and 90 feet bgs are not above regulatory action levels.

3.4 GEOTECHNICAL SAMPLES – PHYSICAL PROPERTIES TESTING

Stantec collected soil samples for measurement of the physical properties of the sediments beneath the Site during two scopes of work in this investigation:

1. During the hydropunch groundwater investigation, soil samples were collected from well boring MW-04B (Section 3.3) between the depths of 21 and 90 feet bgs. These samples were obtained from saturated sediments of the Bellflower Aquiclude.

2. During the active soil gas investigation, soil samples were obtained at approximately 5 and 15 feet bgs to characterize properties of the **vadose zone** sediments. These characteristics of these soils will be used in evaluating potential vapor intrusion to the surface (Section 3.11).

3.4.1 RI/FS Workplan Scope [§ 5.3.2.2 pg 38, 39-40]

Saturated Zone: The revised scope of work for the CPT – continuous stratigraphy and subsequent installation of monitoring wells MW04A and MW04B proposed vertical profiling of soil lithology to approximately 100 feet bgs at five CPT locations shown on RI/FS Workplan Figure 14. Soil samples were to be collected at 10-foot intervals to the bottom of the boring (see Section 3.3). Approximately ten percent of the subsurface soil samples obtained to the total depth of 100 feet bgs were also to be prepared and sealed in suitable containers for analysis by a geotechnical laboratory in order to test the physical properties of the subsurface soils, especially the fine-grained silts and clays. The samples were to be analyzed for bulk density, grain density, total porosity, grain size distribution, moisture content, and fraction of organic carbon using standard methods summarized in the QAPP (Appendix M).

Vadose Zone: During the logging and soil sample collection at the active soil gas survey locations (see Section 3.11), approximately 10 percent of subsurface soil samples were to be prepared and sealed in a suitable container for analysis by a geotechnical laboratory in order to test the physical character of the subsurface soils per DTSC's request (2005). The samples were to be analyzed for bulk density, grain density, total porosity, grain size, moisture content, and fraction of organic carbon using standard methods described in Appendix M of DTSC (2005) and summarized in Appendix A of the QAPP.

Selected samples were also to be analyzed for air permeability by laboratory method API RP40. Air permeability of the soil in the immediate vicinity of soil vapor borings were to also be estimated by in-situ air permeability testing at approximately ten percent of the soil vapor boring locations following extraction of vapor samples (see Section 3.12). If these measured in-situ air permeabilities were to fall outside the range expected for the soil type based on comparison with those listed on the Johnson and Ettinger Model "intercalc sheet", then the laboratory air permeabilities obtained from method API RP40 would be used to provide Site-specific geotechnical input to the Baseline Risk Assessment for vapor intrusion into indoor air modeling.

3.4.2 Deviation from the Workplan

Saturated Zone: Soil samples from the deep borings were collected using a hollow-stem-auger rig rather than a CPT Rig for technical feasibility reasons. This investigative approach was more effective and allowed for the installation of additional GW monitoring wells (MW-04A/B; see Section 3.3.2). Based on earlier RI findings, it was proposed and DTSC approved, that the deep soil sampling program be reduced from sampling at five-foot intervals in five CPT soil locations to sampling at ten-foot intervals at three of the CPT boring locations: CPB09, near CPB25 & CPB26, and HPB10; install cluster wells MW-04A and MW04B; and collect physical samples at depths that correlate with groundwater well screen intervals and depth-discrete groundwater sampling locations. The cluster well installation was moved away from the vicinity of borings CPB25 and CPB26 due to the shallow sludge layers encountered in these borings. Physical property testing was conducted on four samples obtained from well boring MW-04B.

3.4.3 RI Execution

Saturated Zone: A total of four subsurface saturated soil samples were collected from boring MW04B and submitted for analysis to a geotechnical laboratory, BTC Laboratories of Ventura, California, to test the physical properties of the subsurface soils from the saturated sediments of the Bellflower Aquiclude.

Soil samples were collected at depths that correlate with:

- groundwater well screen intervals in saturated portions of the upper (A) and lower (B) hydraulic zones,
- a fine-textured layer that separates the upper and lower hydraulic zones, and
- a fine-textured layer at the base of the lower hydraulic zone.

Samples were collected from the pilot boring for MW-04B at depths of 21, 54.5, 76, and 90 feet bgs. Two of the samples were taken from sediments and depths representative of the approximate screened intervals of the upper (21-feet) and lower (76-feet) hydraulic zones. Two of the soil samples were taken from sediments and depths representative of the silt-clay layer between the upper and lower hydraulic zones (54.5-feet), and the silt-clay layer beneath the lower hydraulic zone (90-feet).

Hydraulic zone soil samples were analyzed for:

- Dry Bulk Density — ASTM D 2216,
- Specific Gravity — ASTM D 854,
- Porosity — API RP40,
- Natural Moisture Content — ASTM D 2216,
- Grain Size Distribution — ASTM D 422, and
- Total Organic Carbon or TOC — EPA 9060A Mod.

Vadose Zone: Eight soil samples were collected from active soil gas survey borings SV02, SV07, SV18, and SV28 (Figure 9A) and submitted to a geotechnical laboratory, PTS Laboratories of Santa Fe Springs, California, to test the physical properties of the shallow

subsurface sediments at the Site. Samples were collected at approximately 5 and 15 feet bgs from these borings and correspond to depths where the active soil gas survey was conducted. Of these borings, SV07, SV18, and SV28 were tested for in-situ permeability (Section 3.12).

Vadose zone soil samples were analyzed for:

- Dry Bulk Density — ASTM D2937,
- Specific Gravity — ASTM D854,
- Total Porosity — ASTM D2937 calculated,
- Natural Moisture Content — ASTM D 2216,
- Grain Size Distribution — ASTM D422 / D4464M,
- Total Organic Carbon or TOC — Walkley-Black, and
- Permeability to Air — API RP40

3.4.4 Findings

Saturated Zone: Physical properties testing of the coarser-grained samples collected from the upper (A) and lower (B) hydraulic zones of the Bellflower Aquiclude at the Site indicate that both zones consist predominantly of fine-grained sand and silt, with a porosity of approximately 52-percent and moisture content of approximately 42-percent. The material of the upper (A) hydraulic zone consists of a non-uniform, poorly graded silty sand. The material of the lower (B) hydraulic zone is uniform, well-graded silty sand to fine-grained sand (Appendix M).

The physical properties testing results for the fine-grained sediment samples obtained at 54.5 feet bgs from the sediments separating the upper and lower hydraulic zones and the sediments at 90 feet bgs beneath the lower hydraulic zone are a silty clay based on grain-sized analysis. Moisture content within these silty clays ranged from 21 to 29-percent.

The silty clay sample from a depth of 90-feet bgs had a detectable concentration of Total Organic Carbon (TOC). The source of the TOC is most likely minute quantities of wood fibers and shell fragments observed in this layer and the concentration is within the background levels measured in the shallower vadose zone sediments (Appendices I-1 and I-2). These organic materials were observed in other core samples of both clay and silty sand at the Site. For example the description of the clay at 88 feet in boring HPB-12 indicates a trace of shell and wood fragments. The sample hold time of 28 days for TOC was exceeded for the four samples. This has no impact on the physical characteristics of the samples that were tested but it may have had an impact on the TOC concentrations.

Vadose Zone: Physical properties testing of the vadose soil samples indicate that the sediments at approximately 5 and 15 feet bgs are predominantly silt to fine sand. This is consistent with the visually logged sample descriptions of the four borings. TOC concentrations ranged from 630 to 18,700 mg/kg.

Moisture content in the shallow vadose zone soils ranged from about 11 to 24-percent. Testing for permeability to air by Method API RP40 yielded results for effective air permeability ranging from 0.015 to 91.0 millidarcy (2^{-12} to 9^{-9} cm^2). This wide range of effective air permeability

results does not correlate to the observed soil types, which are classified as silt to fine sand based on the mean grain-size distribution. This is due to the effect of moisture content of the soil when performing the test. The greater the moisture content the lower the effective permeability. Soils with a moisture content less than 20-percent exhibited much greater permeability. See Appendix M for analytical results and grain-size distribution charts.

3.4.5 Interpretation

Physical property testing of Site soils was an objective of both the hydropunch groundwater investigation and the active soil-gas investigation. The data generated from the physical property testing of the saturated soils would aid in updating the CSM with delineation of impermeable layers below the sumps (page 40 of the Workplan) and testing of the unsaturated soils would provide Site specific geotechnical input into the baseline risk assessment (BRA) for vapor intrusion into indoor air modeling.

Saturated Zone: The results of geotechnical laboratory testing of the saturated soils are consistent with interpretations from the continuous stratigraphy data from CPT soundings and visually logged descriptions of soil borings. The relatively more coarse-grained sediments (fine sand to silt) within the Bellflower Aquiclude that correlate with the upper and lower hydraulic zones that are monitored at the Site (zones A and B, respectively), suggest that the hydraulic conductivities of these two zones is poor to moderate for sustainable groundwater production. This interpretation is supported by the single-well hydraulic conductivity results from the existing cluster wells indicated conductivities of 10^{-3} to 10^{-4} cm/sec in the hydraulic zones (Section 3.7).

Vadose Zone: The results of geotechnical laboratory testing for the vadose zone soil samples are consistent with the visual descriptions logged from the soil borings. However, the air permeability results did not correlate to the variations in sand-silt-clay percentages obtained from grain-size analysis. The air permeability correlation with variation in moisture content suggests interference in the air permeability results are due to the moisture content of the shallow soils. The low laboratory derived air permeability results are not consistent with the in-situ air permeability measurements. The in-situ air permeability tests provided inconsistent data and are interpreted as having “water seals” due to high moisture content. (see Section 3.12, Appendix T).

3.4.6 Data Gaps

Saturated Zone: The physical parameter data collected from the MW-04B borehole sediments produced results that correlate with the pore pressure dissipation testing, depth-discrete groundwater sampling, CPT stratigraphy interpretation, and visual descriptions of the hydraulic zone obtained from the other Site soil borings. The hydraulic zone between depths of 21 and 90 feet bgs at the Site has been adequately characterized.

Vadose Zone: The physical parameter data collected at approximate depths of 5 and 15 feet bgs in the active soil gas survey borings provide acceptable Site-specific results for input to vapor intrusion modeling. In-situ air permeability test results are not believed to be

representative of typical site conditions due to induced moisture into the pore spaces when the testing was performed. The laboratory derived air permeabilities obtained by method API RP40 should be compared to default or expected values for the soil types encountered between 5 and 15 feet to determine if they fall outside the range for use in the Johnson and Ettinger Model.

3.4.7 Response to DTSC Comments on Physical Properties Testing

DTSC comments regarding geotechnical physical properties testing and ARC responses are provided:

There were no specific DTSC comments concerning the geotechnical physical properties testing.

3.5 BACKGROUND INORGANIC CONCENTRATIONS IN SOIL

The need for additional near-surface soil samples to augment inorganic background metals concentrations for soils (including aluminum, iron, and hexavalent chromium) was identified as a data gap in the RI/FS Workplan (SECOR, 2005). Resolution of this data gap is expected to provide information on what, if any, metals concentrations in sludge or soil from past operations exceed naturally occurring concentrations in the native soil at the Site.

3.5.1 RI/FS Workplan Scope [§5.3.2.1 pg 37 // §3.5 pg 19 // §3.8 pg 21]

In addition to the RI assessment sampling of soil and sludge, a suite of ten near-surface soils samples were to be collected for inorganic metals analyses to augment the background values for metals at the Site as discussed in the RI/FS Workplan Section 3.5. The locations of this proposed suite of near-surface soil samples for background metals concentrations are shown on RI/FS Workplan Figure 13 (sample locations DPW6 through DPW15). The samples were to be obtained in the depth interval between three and five feet bgs. These ten shallow soil samples were to be collected by hand auger methods.

Prior to sampling, the locations were to be reviewed by Stantec and DTSC representatives to help determine whether the background sample locations are in native soil or fill material. Alternative locations were to be sought if, in conjunction with DTSC, it was found that the proposed locations were characterized by fill material from surface to 5 feet bgs. In addition to the sample obtained between the three to five-foot bgs depth interval, a soil sample was also to be obtained at ten feet bgs at each of locations DPW6 through DPW15. The ten-foot depth samples were to be analyzed if the shallower sample contained metals concentrations that were above health-protective levels or if fill material was encountered in the shallower sampling zone (SECOR, 2005).

3.5.2 Deviation from the Workplan

Due to extensive historical and ongoing industrial activities on the properties at the Site, no undisturbed area of native soils or sediments could be identified with certainty. Therefore, an accessible off-Site sampling location for background samples had to be identified. DTSC personnel checked records for nearby public school sites for potential background analytical data, but found no applicable sites (DTSC, 2005). The LACDPW parcel, located south of the residential parcels and the Cooper South Sump, and north of the Dominguez Channel (Figures 2A and 9A) was selected as the closest land available for background sampling. The Workplan proposed to obtain ten background sample borings on the LACDPW parcel in a line from near the eastern property to near the western property line of the LACDPW parcel (RI/FS Workplan Figure 13). Upon further field reconnaissance the original locations for borings DPW10 through DPW15 were moved eastward, as illustrated in Figure 9A of the revised draft RI report, because of vegetative cover and that the LCDPW land south of the four residential lots had been fenced off; apparently by the private landowners, some who had imported substantial quantities of surface fill soil. This prevented Stantec from gaining access to the western portion of the LACDPW property. Borings locations for DPW6 thru DPW8 were moved westward due to the presence of an ingress & egress driveway into this parcel. As a result, the locations of the ten LACDPW borings (DPW6 through DPW15) were adjusted to provide a greater level of detail for

the area between the Cooper South Sump and the Dominguez Flood Control Channel (Figure 9A).

In the RI/FS Workplan, the background samples were described as surface samples but were proposed as shallow near-surface samples collected from depths between three and five feet bgs. The shallow soil samples collected during the RI from boring locations DPW6 through DPW15 were obtained at two feet bgs and at 10 feet bgs. Due to field conditions and equipment availability, the background samples were collected using direct-push methods with a Geoprobe™ and not by hand auger.

3.5.3 RI Execution

Ten near-surface soil samples (DPW6 through DPW15) were obtained from LACDPW Property south of the Cooper property using the direct-push sampling methods. The purpose of collecting these samples was to test for background level inorganic metals from undisturbed native soils. The results of these analyses were compared to sludge and soil samples collected for assessment of the extent and characterization of the sludge and surrounding soils.

The surface elevations of borings DPW6 through DPW15 were approximately 5.3 feet to 9.8 feet greater than the surface elevation of the southern portion of the Cooper South Sump. Historical air photos from the 1940s indicate that the LACDPW property was not utilized by waste disposal operations. These two conditions suggest that the vicinity of DPW6 through DPW15 can be considered as background areas.

3.5.4 Findings

The pre-RI determination of background concentrations for inorganic metals in soils was based upon analyses performed on shallow soil samples obtained from the boring drilled during the well installation for MW-3A in January 1994. This determination was due to the well boring's location on LACDPW property south of the Cooper property. Soil samples from MW-2A were not considered because the well's location is located immediately adjacent to and down-gradient from the sumps on the Cooper Property. Soil sample analyses were not available for up-gradient well MW-1A.

In soil samples from well boring MW-3A, barium was detected at concentrations ranging from 87 mg/kg to 400 mg/kg. Vanadium was detected in soils at concentrations up to 96 mg/kg, and Zinc was detected at concentrations up to 76 mg/kg. Silver, Arsenic, Cobalt, Chromium, Copper, Molybdenum, Nickel, Lead, Antimony, and Thallium were not detected in the well MW-3A installation soil samples in concentrations greater than 50 mg/kg. Beryllium and Cadmium were not found in concentrations greater than 5.0 mg/kg. Selenium was not detected in concentrations greater than 10 mg/kg.

Nineteen soil samples were collected from background borings DPW6 through DPW10 south of the Cooper South Sump. These samples provided data to compare metals concentrations present in the shallow subsurface in this "background" area with shallow soil samples obtained in "native" soil and from sludge samples obtained elsewhere at the Site. Native soil in this RI is

defined as soil that does not contain debris or sludge. A comparison of the metals concentrations between these three sample populations is provided Table 26.

Table 26 illustrates that soil concentrations of metals obtained from the background DPW borings were within the range of native soil concentrations obtained from borings obtained elsewhere at the Site. Analytical results from these background DPW borings did have outlier data beyond the range of values in Table 26. Boring DPW6 at a depth of 2 feet did not have detectable concentrations of barium, lead, vanadium and zinc. Boring DPW10 at a depth of 2 feet was elevated in arsenic (82 mg/kg). Boring DPW11 at a depth of 2 feet was elevated in cadmium and lead. Borings DPW12, DPW13 and DPW14 at a depth of 2 feet were elevated in lead.

3.5.5 Interpretation

The eastern portion of the narrow strip of LACDPW property south of the two Cooper sumps was the only adjacent land considered likely to provide shallow undisturbed, native sediments for evaluation of background concentrations in soil. Based on review of aerial photographs (Appendix C) this area appeared to have been undisturbed by the extensive industrial activities and development in the surrounding area and is on the slope of the topographic high that has not been graded or reworked during excavation of the two Cooper sumps or the flood control channel to the south. No evidence of sludge, buried debris, fill material or reworking of soil has been observed in the field work reconnaissance or subsurface sampling of this area.

Inorganic analyses from samples collected from the MW-3A borehole and at 10 feet bgs from borings DPW6 to DPW15 do not fit the Workplan criteria for background sample analysis (sample depth of 3 to 5 feet bgs) due to the depths sampled. However, the DPW6 to DPW15 ten foot samples have results comparable to the native soil metals obtained elsewhere across and under the site. Samples obtained at two feet from DPW11 through DPW14 have abnormally high lead levels and may represent nonnative shallow soil.

In this RI assessment, a total of 215 background and native soil samples were analyzed for arsenic. Nine samples had arsenic concentrations exceeding 3.8 mg/kg. Of these nine samples, five samples were obtained at a depth exceeding 50 feet bgs and suggest that soil that exceeds this depth are not representative of shallow background soil. Three samples contained Total Extractable Hydrocarbons (C13-C40) exceeding 20 mg/kg and are not representative of shallow background soil. Boring DPW10 at a depth of 2 feet had an elevated arsenic concentration of 82 mg/kg and was obtained from apparently undisturbed native soil having no detectable hydrocarbons.

3.5.6 Data Gaps

The anomalously high result of 82 mg/kg for arsenic in background soil sample DPW10-02' could be due to laboratory error, cross contamination, variation in background concentration at the sampling location, or a localized impact. Three additional sample locations are proposed to evaluate this outlier data point of arsenic at DWP10 and to confirm that the LACDPW sampling locations are representative of background concentration for metals. Three borings will be

advanced to two or three feet bgs to sample the area surrounding DPW10 and soil samples will be analyzed for metals by EPA Method 6020, including iron and aluminum.

3.5.7 Response to DTSC Comments on Background Soils

DTSC comments regarding background soils and ARC responses are provided:

SC-8. Section 2.11, Background Concentrations, page 18
Soil samples collected during drilling of MW-3A cannot be considered representative of background concentrations since this well is located adjacent to and down-gradient from the sumps.

ARC response: Page 20 of the RI/FS Workplan states: The background concentrations for VOC and SVOC COCs in soils are considered non-detect based on soil samples obtained off-Site during the drilling and installation of groundwater MWs MW-1A,B; MW-2A,B; and MW-3A,B (URS, 1994). The initial estimates of background concentrations for inorganic metals in soils also are based upon analyses performed on soil samples obtained from the shallow boring drilled during the well installation for MW-3A. In soil samples from MW-3A, barium was detected at concentrations ranging from 87 milligrams per kilogram (mg/kg) to 400 mg/kg. Vanadium was detected in soils at concentrations up to 96 mg/kg, and Zinc was detected at concentrations up to 76 mg/kg. Silver, Arsenic, Cobalt, Chromium, Copper, Molybdenum, Nickel, Lead, Antimony, and Thallium were not detected in the well MW-3A installation soil samples in concentrations greater than 50 mg/kg. Beryllium and Cadmium were not found in concentrations greater than 5.0 mg/kg. Selenium was not detected in concentrations greater than 10 mg/kg. Additional soil metals data from this area is provided in Table 19a and 19b of the revised draft RI report.

SC-10. Section 3.2, Deviations from RI/FS Workplan, pages 20 through 22
Where were the "originally planned locations for six LACDPW surface sample borings (DPW 10 through DPW15)"?

ARC response: The original locations for borings DPW 10 through DPW15 are illustrated in Figure 13 of the RI/FS Workplan. These six locations were moved eastward, as illustrated in Figure 9A of the revised draft RI report because the LCDPW land south of the four residential lots had been fenced off, apparently by the private landowners some who had imported substantial quantities of surface fill soil. This prevented access to the western portion of the LACDPW property.

SC-12. Section 3.3.3, Surface Soil and Sludge Sampling and Analysis, page 25
Background samples are typically collected from shallow near-surface depths. Samples collected from depths greater that 2 feet should not be considered representative of background conditions.

ARC response: ARC complied with the approved RI/FS Workplan directions for obtaining background soil sample data. The second paragraph on page 37 of the RI/FS Workplan states

that: “a suite of ten soil surface soil samples will be collected for inorganic metals analyses to augment the background values for metals at the Site…(sample locations DPW6 through DPW15) … will be obtained in the depth interval between three and five feet bgs”. Later in the paragraph the Workplan also states that: “In addition to the sample obtained between three to five feet bgs depth interval, a soil sample will also be obtained at ten feet bgs at each of locations DPW6 through DPW15”.

SC-15. Section 4.1.2, Surface Samples, page 34.
We note that the elevated arsenic concentration detected from location DPW10 was reportedly collected from a depth of 2 feet below the ground surface, not from the surface. The source of this anomalous result should be identified. Is this area in or adjacent to fill?

ARC response: ARC agrees that HERD is correct in stating that the arsenic result (82 mg/kg) from the 2 foot sample at location DPW10 is anomalous. The arsenic concentrations obtained from 2 foot samples from borings DPW06 to DPW09 and DPW11 to DPW15 ranged from 1.3 to 3.4 mg/kg while the arsenic concentrations obtained from the 10 foot samples from borings DPW06 to DPW09 and DPW11 to DPW15 ranged from 1.3 to 3.0 mg/kg. It is not believed that the location of DPW10 is in fill. ARC plans to resample in the area of DPW10 to resolve this data gap.

SC-16. Section 4.2, Soil/Sludge Sample Analytical Results, pages 35 through 37.

16c) The result showing arsenic detected from DPW10 at 2 feet appears to be an outlier and may be more reflective of fill material, or erosion from a topographically higher area.

ARC response: ARC agrees with DTSC that the arsenic concentration detected from DPW10 at 2 feet is an outlier. The arsenic concentrations obtained from 2 foot samples from nearby borings DPW06 to DPW09 and DPW11 to DPW15 ranged from 1.3 to 3.4 mg/kg while the arsenic concentrations obtained from the 10 foot samples from nearby borings DPW06 to DPW09 and DPW11 to DPW15 ranged from 1.3 to 3.0 mg/kg. ARC believes that the arsenic concentration detected from DPW10 at 2 feet is erroneous and does not reflect the existence of fill or erosion from a topographically higher area.

3.6 HYDROPUNCH™ – GROUNDWATER SAMPLING AND CPT PORE PRESSURE DISSIPATION TESTING

A 'Hydropunch™ Groundwater Investigation' was proposed in order to assess groundwater conditions in the subsurface beneath the acid sludge sumps to approximately 100 feet bgs. Groundwater sampling at discrete-depths was intended to investigate whether COPCs from the acid-sludge have leached to the more permeable hydraulic zones of the Bellflower Aquiclude. In addition, the investigation was intended to check for the presence of potential DNAPLs which may be associated with the sumps.

3.6.1 RI/FS Workplan Scope [§ 5.3.2.2 pg 38 // § 2.4.2]

Per the approved RI/FS Workplan, assessment of groundwater quality in the subsurface beneath the acid sludge sumps included testing from five direct-push borings at the locations shown on RI/FS Workplan Figure 14. The groundwater investigation for sampling depth-discrete groundwater and performing pore-pressure dissipation tests (PPDT) was to be conducted in conjunction with CPT soil soundings (Section 3.3), soil sampling (Section 3.1), and soil physical properties testing (Section 3.4).

The scope of work proposed for depth-discrete groundwater investigation consisted of the following tasks:

- The hydraulic zones were to be tested by pore-pressure dissipation tests to determine whether groundwater samples could be obtained. It was anticipated that no more than three to five groundwater samples were to be obtained per CPT boring, but a minimum of three were proposed at depths corresponding with the existing monitoring well system screen intervals (see WP Section 2.4.2); (Section 3.8)

- Collection of depth-discrete groundwater samples at the five CPT locations. The groundwater samples were to be collected within saturated horizons of higher permeability between surface and approximately 100 feet bgs using direct-push methods;

- Laboratory analysis of depth-discrete groundwater samples for VOCs, SVOCs (with PAH confirmation by USEPA Method 8310 as necessary), and inorganic metals (including hexavalent chromium) (filtered and unfiltered), along with field analysis of pH; and

- Surveying of the CPT boring locations to an established benchmark relative to mean sea level elevation and tied into the existing on-Site monitoring well network;

Five CPT borings were to be advanced to approximately 100 feet bgs using direct-push methods with a 25-ton CPT truck at the proposed locations (see Section 3.3). A minimum of three and up to five depth-discrete groundwater samples were to be collected near the five CPT boring locations. Groundwater samples were to be obtained from permeable zones down to a total depth of approximately 100 feet bgs. The number and vertical interval of the depth-discrete groundwater samples were to be based on the lithology indicated by the CPT logs, and PPDT performed during CPT advancement. Depth-discrete groundwater samples were to be

obtained using a Hydropunch™ sampler with a two to three-foot screened interval and a stainless steel bailer.

The QAPP and FSP (see RI/FS Workplan Appendices A and B) describe SOPs for this work, including sampling protocols, chain-of-custody procedures, QA/QC protocols, laboratory analytical testing and decontamination activities.

The data from the CPT borings proposed to:

- Evaluate groundwater quality to see whether acid-sludge contamination has leached to shallow groundwater in the central area enclosed by the perimeter monitoring well system, including a depth profile of groundwater quality from shallow to deeper depths;
- Explore for evidence of the presence of DNAPLs in the vicinity of the sumps;
- Provide a more complete CSM with respect to the upper 100 feet bgs including delineation of any impermeable layers below the sump horizon; and
- Provide information to further evaluate vertical flow potential for shallow groundwater;

3.6.2 Deviation from the Workplan

There were no deviations from the basic plan for this phase of groundwater assessment.

3.6.3 RI Execution

From January 23 to 25, 2006 and on February 23, 2006, GREGG In-Situ, of Signal Hill, California operated a 25-ton, CPT Rig to test and sample at boring locations CPB-09, CPB-25, CPB-26, CPB-27, and HPB-10. A California Professional Geologist directed the field work, reviewed the real-time stratigraphic data, and identified the depth intervals for pore pressure dissipation tests and depth-discrete groundwater sampling in the field. PPDT and groundwater sampling depths are summarized in the following table. CPT sampling locations are shown on Figure 9A. The CPT Sounding Logs and Pore Pressure Dissipation Plots are provided in Appendices K-1 and N.

CPT Sounding Location	Depth-Discrete Groundwater Samples (ft. bgs)	Pore Pressure Dissipation Tests (PPDTs) (ft. bgs)	CPT Vertical Sounding Total Depths (ft. bgs)
CPB09	29, 53, 80	21.0, 41.7, 51.5, 75.6, 94.0	97
CPB25	28,52,80	21.3, 43.8, 50.2, 74.3	100
CPB26	29, 55, 80	28.7, 50.2, 76.1	98
CPB27	25, 52, 78	26.4, 58.1, 74.2	100
HPB10	55, 71	36.4, 53.7, 84.6, 95.1	95

3.6.4 Findings and Interpretations

Pore pressure dissipation tests were conducted in borings CPB-09, CPB-25, CPB-26, CPB-27, and HPB-10 as a means of obtaining some independent confirmation of groundwater elevations across the Site and confirming saturated conditions. PPDT depths were selected based on the CPT vertical profiling of stratigraphy at the five CPT locations. Review of CPT Sounding's at the five locations confirms the local stratigraphy described in the RI/FS Workplan based on previous assessment by CPT. The results show unconsolidated interbedded silt, silty-sand, sand, and silty-clay layers from surface to the total depth of boring.

Confirmation of the stratigraphic interpretation of the CPT sounding data was obtained by direct correlation with visual observation of continuous core from soil borings (Figure 9A). An approximately five-foot thick zone of acid sludge (0-5 ft. bgs) was identified in CPB26. Beneath the sludge interval, interbedded layers of silt, silty-sand and sand are encountered to a total depth of investigation of 20 feet bgs. No interbedded sludge layers were observed beneath the impoundment or the berm in these borings. Boring logs are provided in Attachment M-1 and M-2.

In general, results from all five borings suggest that upper and lower hydraulic zones of the Bellflower Aquiclude have different hydrogeologic properties. The PPDT data confirms a downward vertical hydraulic gradient from the upper Bellflower Aquiclude to the lower Bellflower Aquiclude. The upper PPDTs indicate a static water level of about 15 feet bgs and the deeper PPDTs (depth greater than 75 feet bgs) indicate a static water level of about 20 feet bgs. These data generally correlate with static water levels observed in existing groundwater monitoring wells at the Site (Section 3.9). Appendix N contains the results of individual pore pressure dissipation tests.

Depth-discrete groundwater samples obtained by Hydropunch™ from the CPT rig were analyzed for VOCs, SVOCs, and inorganic metals (including hexavalent chromium) (unfiltered), along with field analysis of pH. Depth-discrete groundwater results are summarized below. Tables 27 through 30 present the results of analyses based on the analytes and complete analytical reports are included in Appendix I-4. The collection of the Hydropunch water samples resulted in samples with high turbidity, which is caused by small clay particles suspended I the water. The high turbidity did not impact the GRO, VOC, SVOC, and PAH analyses. Metal ions are often sorbed to clay particles. As a result Hydropunch samples had metal concentrations (non-dissolved phase) that were elevated when compared to non-dissolved phase metal concentrations detected in groundwater samples collected from adjacent water wells that were purged prior to sampling (e.g. CPB09 and MW-04A/B) (Table 29).

Summary of Depth-Discrete Groundwater Screening Sampling Results

CPT Sounding Location/Depths	VOC's 8260B SVOC's 8270C	PAH's 8310	Inorganic Metals (by descending depth) (µg/L)		pH
CPB09 29, 53, 80	ND	NA	Antimony Lead	1.2, 3.2, 7.5 230, 81, 190	7.40*
CPB25 28, 52, 80	ND	NA	Antimony Lead	1.2, 2.8, 6.6 190, 42, 570	7.31*
CPB26 29, 55, 80	ND	NA	Antimony Lead	3.5, 3.4, 7.0 160, 98, 310	7.49*
CPB27 25, 52, 78	ND	NA	Antimony Lead	0.58, 0.35, 3.7 0.87, 2.0, 14	7.48*
HPB10 55, 71	ND	NA	Antimony Lead	ND<0.1, 2.7 67, 110	7.38*

ND = Non Detected NA = Not Analyzed – Insufficient Sample
* = Average between samples collected at location

The findings show that no interbedded sludge layers were encountered directly beneath the berm area west of the two Cooper sumps and no concentrations of potential sludge-derived constituents, including DNAPL or leachate, were detected in the saturated sediment underlying central sump area to total investigation depths of approximately 100 feet bgs.

3.6.5 Data Gaps

This phase of investigation satisfied the goals and objectives of assessing conditions in the hydraulic zone to depths of 100 feet bgs near the base of the Bellflower Aquiclude. No data gaps were identified. No additional investigations by current or alternative assessment means are recommended at this time.

3.6.6 Response to DTSC Comments on Hydropunch Sampling and CPT PPDTs

DTSC comments regarding Hydropunch sampling and CPT pore pressure dissipation tests and ARC responses are provided:

SC#11C Were depth-discrete groundwater samples collected from the CPT and/or Hydropunch locations that did not correspond to the well screen intervals of the existing groundwater monitoring well network?

ARC response: Depth discrete groundwater samples were collected at five CPT or Hydropunch sampling locations (CPB09, CPB25, CPB26, CPB27 and HPB10). These groundwater samples were obtained at approximate depth ranges of -4 to -8.5 feet msl, -31 to -34.5 feet msl, -57 to -59.5 feet msl and one sample obtained at -49.5 feet msl. On-site A-zone groundwater wells are screened from approximately 2 to -8 feet msl (MW-02A), 8 to -2 feet msl (MW-03A) and from approximately 6 to -4 feet msl (MW-04A). On-site B-zone groundwater wells are screened from approximately -58.5 to -63.5 feet msl (MW-02B), -53 to -58 feet msl (MW-03B) and from approximately -51 to -56 feet msl (MW-04B). Well G-4 is screened from approximately -20 to

-30 feet msl. Depth-discrete groundwater samples correspond to the screened intervals of MW-02A, MW-02B and MW-03B.

SC#20D The text should include a discussion of analytical results from Hydropunch and CPT sampling.

ARC response: A discussion of analytical results from Hydropunch and CPT groundwater sampling has been included in Section 3.6.4 of the revised draft RI report.

3.7 SINGLE-WELL HYDRAULIC CONDUCTIVITY TESTING

Hydraulic conductivity testing of the two hydraulic zones monitored in the cluster well network (zones A and B) were conducted in order to provide data for fate and transport calculations involving groundwater velocity such as may be performed in the Baseline Risk Assessment (see RI/FS Workplan Section 5.6).

3.7.1 RI/FS Workplan Scope [§ 5.3.2.5 pg 45]

Single-well testing was proposed using the 2005 groundwater monitoring well network. The proposed single-well methodologies were intended to minimize or avoid problems associated with a) performing hydraulic testing via large-scale pumping of wells adjacent to potentially contaminated areas, b) the alteration of vertical groundwater gradients and c) the occurrence of low-conductivity fine-grained sediments beneath the Site.

Field techniques for estimating hydraulic characteristics in the vicinity of a groundwater well include slug, tracer and pumping tests. The "slug" test technique consists of measuring the recovery of fluid head in a well after a near-instantaneous change in head has been induced by either adding or removing a volume of water or a solid object that displaces water (i.e., the slug). Slug testing measures hydraulic conductivity in a very localized area in the vicinity of the tested well. In contrast, groundwater tracer tests provide direct information regarding aquifer hydraulic conductivity, and are considered to yield better information regarding large-scale groundwater flow (Freeze and Cherry, 1979). Pumping tests also provide reliable estimates of large-scale hydraulic characteristics (in addition to information regarding well performance).

Stantec proposed to conduct single-well tracer tests combined with hydraulic slug tests in all of the MW-1 through MW-3 series of wells at the Site to estimate the hydraulic conductivity and groundwater flow velocities of the upper (A) and lower (B) hydraulic zones beneath the Site (see RI/FS Workplan Section 2.4.2). Single-well tracer testing was proposed for all the above-mentioned wells to provide enough spatial coverage of the Site to evaluate potential heterogeneities of the subsurface sediments. Stantec proposed to use clean, distilled, water as the tracer. The standard method of hydraulic slug testing was proposed to estimate hydraulic conductivity.

There are two types of single well tracer tests: 1) a point dilution test; and 2) a drift pumpback test. Both tests were used to estimate the hydraulic conductivities at the Site and are described on pages46 to 48 of §5.3.2.5 of the RI/FS Workplan.

For these tracer tests distilled water was injected as the tracer and the tracer breakthrough curve was characterized by measuring the return to background specific conductivity of the ground water. As indicated in Table 31, specific conductance in groundwater at the Site ranges from 382 microsiemens per centimeter (µs/cm) in off-site well MW-1B (which is anomalous compared to other data from this well and other wells at the Site) to 6,170 µs/cm in well MW-2B. Specific conductance in groundwater at the Site averages 2,150 µs/cm. Groundwater monitoring since 2006 has shown that specific conductance in the Site wells exceeds 1,000 µs/cm. The specific conductance of readily available distilled water is typically about 8 to 20

µs/cm. Given two to three orders of magnitude difference between the distilled water tracer and the ground water, the specific conductance breakthrough curves were anticipated to be easily detected.

Data collected during the single-well tests included:

- Times-series measurements of hydraulic head using pressure-sensitive downhole transducer prior to, during and following slug injection in both shallow and deeper well pairs; and

- Time-series measurements of specific conductivity using a down-hole meter prior to, during and following slug injection and along with the drift-pumpback testing.

The data collected during single-well testing was used to:

- Estimate hydraulic conductivities around shallow and deeper MWs via analysis of the hydraulics of slug testing and the specific conductivity changes from clean water slug injection and drift-pumpback.

- Provide input for fate and transport portion of the BRA (Section 5.6).

3.7.2 Deviation from the Workplan

No deviations in the procedures of the planned work were instituted. Minor variations in the implementation of the test procedures were made due to variations in conditions at some wells and the variations are detailed in the Hydraulic Conductivity Testing Report included in Appendix O. The low hydraulic conductivity of the hydraulic zones prevented accurate data from being collected during some tests, particularly the drift pumpback tests. Thus, a number of these tests could not be completed.

3.7.3 RI Execution

Stantec performed aquifer testing activities in the on- and off-Site nested wells MW-01A/B, MW-02A/B, and MW-03A/B during April 2006. The purpose of the aquifer testing was twofold:

- To assess the hydraulic properties of the upper and lower hydraulic zones monitored in the cluster well network, and

- To assess the degree of connection between the upper and lower hydraulic zones.

The primary aquifer testing method performed was point dilution/drift pump-back tracer testing. Additionally the tracer testing included hydraulic components that were used to perform slug test and pumping test analyses. A detailed description of the hydraulic conductivity testing performed at the Site is contained in Appendix O. The discussion below is based on that report.

The first goal of the tracer test was to identify formation hydraulic properties. Thus, all aspects of the tracer testing activity were considered in light of their hydraulic implications. The near-instantaneous distilled water tracer delivery was considered to be a slug-in test. The monitoring of the tracer diffusing out of the well was a point dilution test. The pump-back portion of the tracer test was considered both as an aquifer pumping test and as a tracer recovery test. Finally, the well was monitored after the pump-back was complete, providing pumping test recovery data. By monitoring and analyzing all phases of the test in this manner, a more accurate assessment of the subsurface material's actual hydraulic properties could be achieved.

The second goal of the tracer test was to assess the degree of connectivity between the upper and lower hydraulic zones. Hence, the tests were conducted to ensure that shallow and deep well pairs were tested nearly simultaneously, with the tracer delivery or pumping in one well corresponding with monitoring in the other well. Thus, it would be possible to observe the lower hydraulic Zone B response to stress in the upper hydraulic Zone A, and likewise the response of the upper hydraulic Zone A to hydraulic stress applied to the lower hydraulic Zone B. In addition water level measurements were gathered at the Site to characterize the hydraulic gradients and potentiometric surfaces of the two hydraulic zones during the aquifer testing time period.

3.7.4 Findings

Table 31 summarizes the results of hydraulic conductivity testing. The hydraulic conductivity of the lower hydraulic Zone B is higher overall than the upper hydraulic Zone A. As indicated in Table 31, the hydraulic conductivity in the Zone A wells ranged from 0.29 to 17 ft/d, (0.0001 to 0.006 cm/sec) with an average of 2.8 ft/d (0.0009 cm/sec). The hydraulic conductivity in the Zone B wells ranged from 0.22 to 75 ft/d (0.000077 to 0.026 cm/sec), with an average of 17 ft/d (0.006 cm/sec). The hydraulic conductivity results correlate well with the results of particle size analysis, pore dissipation tests, CPT stratigraphy interpretation and visual descriptions from soil borings with respect to comparative hydraulic properties of the two hydraulic zones. Hydraulic conductivity values of both hydraulic zones fall within the expected range of silty sediments (Freeze & Cherry, 1979). Silt to fine-grained sand is confirmed as the predominant sediment types in the monitored hydraulic zones by physical properties testing (see Section 3.4).

3.7.5 Interpretation

The results of the tracer tests suggest that the hydraulic connection between the upper and lower hydraulic zones is minimal. The tracer tested wells experienced large changes in hydraulic head with their associated paired well did not experience significant hydraulic head changes. This observation is indicative of poor connectivity between the two hydraulic zones. Furthermore, the upper hydraulic Zone A has a consistently higher hydraulic head than the lower hydraulic Zone B by several feet. This hydraulic head difference would be expected to dissipate if there were a significant hydraulic connection between the two hydraulic zones.

3.7.6 Data Gaps

The employed methodology provided definitive data to evaluate the hydraulic conductivity of the two zones monitored in the cluster well network and to evaluate the connectivity of the two zones. No further testing or alternative methods to evaluate these hydraulic characteristics are necessary.

3.7.7 Response to DTSC Comments on Single-Well Hydraulic Conductivity Testing

DTSC comments regarding Single-Well Hydraulic Conductivity Tests and ARC responses are:

SC-30. Table 21
Provide an explanation why some tests were not conducted [see footnote (c)] and whether this represents a data gap.

ARC response: Two slug tests were performed at wells MW-2A and MW-2B thereby resulting in two rows for these wells. All other tests were performed at least once in these two wells. The Extraction, Drift Pumpback Tracer and Recovery tests were not performed in well MW-3A due to the low hydraulic conductivity in the well as determined by the results of the Slug and Point Dilution Tracer tests. Hydraulic conductivity tests were performed in the other two zone A wells which provided reliable results. The two hydraulic conductivity tests performed on Well MW-3A resulted in similar values which were less than the hydraulic conductivity values of Wells MW-1A and MW-2A.

The results of the tests from the six wells document that the hydraulic B zone has a greater hydraulic conductivity than the hydraulic A zone. ARC does not believe that the lack of not conducting the Extraction, Drift Pumpback Tracer and Recovery tests in well MW-3A represents a data gap.

3.8 GROUNDWATER MONITORING WELL INSTALLATION

The option to expand the existing groundwater monitoring network was proposed to the DTSC in the *Request to Amend the Remedial Investigation / Feasibility Study (RI/FS) Workplan*, dated August 3, 2006, following the collection and review of CPT and depth-discrete groundwater sampling data from the hydraulic zone (see Sections 3.6). Well cluster MW-04A /-04B was installed in the center of the Site near the Cooper and Haack Property line (Figures 2A and 9A).

3.8.1 RI/FS Workplan Scope

No well installation was planned in the RI/FS Workplan. Per the request to amend the RI/FS Workplan, borings MW04A and MW04B were to be converted to a groundwater monitoring well cluster, screened in the upper (A) and lower (B) hydraulic zones. Well construction and screen intervals were proposed to conform to the existing monitoring well network (Section 3.9).

Stantec proposed that the new well cluster be installed between the CPT locations: CPB25 and CPB26, because the area is accessible for drilling activities and the ongoing quarterly groundwater monitoring program. The proposed location is down-gradient of the Haack property and up-gradient of the sumps on the Cooper property.

Soil boring MW-04A was to be converted into a 4-inch diameter PVC groundwater well and a second soil boring MW-04B was also to be converted to a 4-inch diameter PVC groundwater well. These two wells were to have total completed well depths of approximately 25 feet and 85 feet bgs, respectively. Soil samples were only collected from the deeper boring, and surface completion of both wells would be with a monument casing. The wells would then be developed per the RI/FS Workplan procedures and added to the quarterly groundwater monitoring program for gauging and sampling.

3.8.2 Deviation from the Workplan

Following completion of fieldwork for shallow sampling for the RI, additional borings remained to be completed to assess the soil conditions at depths greater than 30-feet beneath the surface and correlate with deep CPT stratigraphy data of the hydraulic zone. A proposed change in drilling equipment and change of scope to include additional groundwater monitoring wells modified the scope of the investigation.

Stantec proposed, and the DTSC approved on September 15, 2006, that the well cluster designated MW-04A /-04B be installed on the berm separating the Cooper North and South sumps, near the location of RI soil borings CPB-09, CPB-25, and CPB-26 (Appendix P). Boring CPB-30 was initially planned as the pilot boring for MW-04A. However, within seven feet of the surface two separate layers of sludge were encountered during drilling. To reduce the possibility of cross-contamination in monitoring wells MW-04A and MW-04B, CPB-30 was completed as a soil exploratory boring to a total depth of 30-feet bgs and backfilled. MW-04A and MW-04B were relocated to the berm separating the Cooper North and South sumps, immediately west of CPB-09 (Figure 9A).

3.8.3 RI Execution

The pilot soil boring for MW-04A was drilled to 30 feet and converted into a 4-inch diameter groundwater monitoring well (zone A) on March 1, 2007. A second soil boring MW-04B was drilled to approximately 90 feet and converted to a 4-inch diameter groundwater monitoring well (zone B) on March 2, 2007. Boring logs are presented in Appendix L. Cluster well construction conforms to the existing network of cluster wells MW-01A/B through MW-03A/B. Screen intervals were selected based on CPT sounding data (CPB09, 25 and 26) and samples from the pilot holes (Table 16). Appendix Q-2 contains combined lithologic logs and the well completion diagrams for MW-04A and MW-04B. Well construction specifications are summarized in Table 14.

Wells MW-04A and MW-04B have total completed depths of approximately 25 feet and 85 feet bgs, respectively. Wells were constructed of Schedule 40 PVC. Soil samples were only collected from the deeper boring (MW-04B). A monument casing and concrete pad were installed as surface completion for both wells. The wells were developed per the RI/FS Workplan procedures and they have been added to the quarterly groundwater monitoring program for gauging and sampling. The initial groundwater sampling event was conducted on March 2, 2007 (Table 32).

Copies of the well development logs for MW-04A and MW-04B are contained in Appendix Q-1. Quarterly groundwater monitoring of these wells is ongoing and future groundwater analytical results will be included with their respective quarterly groundwater reports.

3.8.4 Findings and Interpretation

Initial groundwater sampling data from the new well cluster were non-detect for GRO, VOCs and SVOCs (Tables 27 and 28). Total metals concentrations for zinc and hexavalent-chromium were detected at 77 µg/L and 40 µg/L, respectively in well MW04A. However these two metals also occurred in the method blank and matrix interference was indicated by low matrix spike recovery (Tables 29 and 30). This QC data indicates probable laboratory cross contamination. Ongoing monitoring and sampling continuing from March 2007 through May 2008 have shown no detections for both organic constituents and inorganic constituents within background concentration ranges for total and dissolved analyses.

The sample results for six quarters from monitoring well cluster MW-04A/ -04B, when included with results from additional assessment of the hydraulic zone below the sumps and the sampling from the monitoring well network, supports the conclusion that the impounded sludge is not impacting the underlying groundwater of the Bellflower Aquiclude.

3.8.5 Data Gaps

No data gaps are associated with the installation of the additional well cluster. Quarterly data from the ongoing monitoring of the new wells adds needed sample locations to monitor for constituents of potential concern directly beneath the areal extent of the sumps where impact to groundwater could first occur.

3.8.6 Response to DTSC's Comments to GW Monitoring Well Installation

There were no DTSC comments regarding groundwater monitoring well installation**.**

3.9 GROUNDWATER MONITORING PROGRAM

The groundwater monitoring program at the Site was initiated by the USEPA in the 1980's and modified with a multi-depth monitoring well network that was installed by DTSC in the 1990's and sampled intermittently through 2002. A quarterly groundwater monitoring and sampling program was initiated in the First Quarter of 2006 as part of the Consent Decree and the RI. Initially, groundwater monitoring activities focused on existing DTSC and USEPA monitoring wells at the Site (MW-01A/B, MW-02A/B, MW-03A/B and G-4). A fourth well cluster (MW-04A/B) was added as part of the RI (see Section 3.8).

As part of the Groundwater Monitoring Program, the following scopes of work were conducted:

Quarterly monitoring and sampling of groundwater monitoring wells,

Dalton well study to evaluate for potential communication between the monitored hydraulic zones in the Bellflower Aquiclude and deeper groundwater supply aquifers penetrated by the nearby Dalton Well (3S/14W-25P04S or P04S), and

Water quality testing to evaluate general groundwater chemistry and the potential interaction between waters of the two monitored hydraulic zones (A and B) within the Bellflower Aquiclude.

3.9.1 RI/FS Workplan Scope *[§ 5.3.2.6 pg 48 // 2.4.2]*

Quarterly Monitoring: The monitoring activities were to be started pending completion of any well rehabilitation activities identified during the Early Response Actions (see RI/FS Workplan Section 2.6). The groundwater monitoring activities were to be conducted on a quarterly basis and a groundwater sampling report was to be submitted to DTSC by the 15th of the month following the end of the quarter (for example: January 15th, April 15th, July 15th and October 15th).

Prior to the first quarter sampling event, Stantec was to survey, inspect, and re-develop the existing groundwater wells. The existing wells were to be used to better define the nature and extent of groundwater contamination at the Site, particularly any dissolved metals. After evaluating two quarters of groundwater sampling data and the depth-discrete Hydropunch™ sampling data (see Section 3.6), and in consultation with DTSC, it was to be determined whether there is a need to drill and install any additional monitoring wells to further define nature and extent of any potential groundwater contamination (see Section 3.8). The potential interaction of groundwater with surface water in the adjacent Dominguez Channel was also to be evaluated (see Section 3.10)

Data that was to be collected and frequency of data collection from the existing monitoring wells includes:

- Depth to groundwater (quarterly);

- VOC, SVOC (with PAH confirmation by USEPA Method 8310 as necessary), and metal (including hexavalent chromium) concentrations, and pH (quarterly – GRO, DRO and/or WORO were to be added at a later date if site conditions warrant, based on results of the proposed drilling and sampling); and

- Oxidation/Reduction parameters such as dissolved oxygen, ferrous and total iron, sulfate and bisulfide, and methane concentrations, as well as, oxidation/reduction potential (ORP) were to be collected annually during the first quarter of sampling until DTSC and Atlantic Richfield agree to stop sampling for these parameters.

Uses of data from monitoring wells include:

- Fluid level measurements from existing wells were to be used to estimate and monitor the groundwater flow direction and gradient for the shallow and deep hydraulic zones;

- Fluid level measurements in the shallow screened monitoring wells were to be compared with the surface water level measurements from sample locations in Dominguez Channel;

- Water quality data from existing wells were to be used to monitor the nature and extent of any potential groundwater contaminants from the Site; and

- Oxidation/Reduction parameters in groundwater were to be used to evaluate the fate and transport of dissolved contaminants such as metals (including hexavalent chromium) or VOCs;

The groundwater monitoring program was to be conducted using standard depth gauging equipment, and a micro-purge sampling technique similar to that described in Puls and Barcelona (1995). Field samples for inorganic metals were to be both filtered (dissolved metals) and unfiltered (total metals). A description of procedures for well development and the collection and analysis of samples from existing wells is included in the RI/FS Workplan, the Field Sampling Plan (FSP – Appendix B of the RI/FS Workplan) and the Quality Assurance Project Plan (QAPP – Appendix A of the RI/FS Workplan).

Dalton Well Study: Down-well transducer data was to be used to evaluate whether pumping from the nearby (<1 mile) water production wells (P04S – Dalton Well and A10S) has any influence on groundwater elevation in the shallow and deeper hydraulic zones in the Bellflower Aquiclude (see RI/FS Workplan Section 2.4.2) that could potentially influence any vertical groundwater flow gradients at the Site. Other water productions wells listed in the West Coast Basin by CalDWR (2004) are more than three to four miles down-gradient from the Site (Table 15) and thus too far from the Site to cause measurable short-term fluctuations in water levels.

Two weeks of continuous groundwater elevation data collection was to be conducted, as measured by down-well pressure-sensitive transducers in conjunction with the operation of local water production wells P04S and A10S (see RI/FS Workplan Figure11). The continuous groundwater elevation monitoring was to be conducted by submerging pressure sensitive transducers that collect and store electronic water level data on a continuous basis for two weeks in the Site monitoring wells. In addition, a barometric pressure sensor was to be suspended above the static groundwater levels in the Site's monitoring wells to correct for daily changes in barometric pressures in wells. The data from the transducers was to be plotted as hydrographs and be compared with pumping rate schedules for the water supply well (P04S), pending agreement by the water supply company to provide their pumping schedules. In addition, the data would be compared with pumping rate schedules for down-gradient well A10S (see RI/FS Workplan Figure 11), pending agreement by the well owner to provide the pumping schedules. If possible, for both wells, Stantec was to attempt to coordinate with the owners to have the two-week period of monitoring coincide with pumping schedules such that the monitoring begins following a brief "quiet" period of no pumping, with both supply wells activated early in the monitoring period.

Water Quality Testing: Water quality testing for general groundwater chemistry or "general minerals" occurred during the Fourth Quarter 2006 sampling event. No formal Workplan for the scope of work was prepared prior to the sampling because the additional sampling was conducted as part of the ongoing monitoring program.

3.9.2 Deviation from the RI/FS Workplan

Quarterly Monitoring: No deviations from the basic monitoring protocols and analytical testing program proposed in the approved RI/FS Workplan have occurred. Reactive sulfide analysis by EPA Method 9030B was conducted for the four quarterly sampling events of 2006 and then discontinued because the EPA rescinded the Method 9030B protocol, and an approved alternative analytical method does not exist.

Dalton Well Study: The Dalton Well (P04S) study was extended to 85 days rather than two weeks, as initially proposed in the RI/FS Workplan. The automated data collection and memory capabilities of the data-loggers allowed for an extended period of data collection.

The RI/FS Workplan discussed conducting hydraulic monitoring at the more distant A10S well (Figure 1), but this evaluation was dropped from this study due to well A10S distance from the Site and the lack of evidence for communication between the Site's two hydraulic zones measured by monitoring wells MW-01A/B and the deeper production zones of the Dalton Well.

Water Quality Testing: Water quality testing for general groundwater chemistry was conducted a second time in the Second Quarter of 2008 based on DTSC input to expand the data set and further evaluate the findings from the Fourth Quarter 2006 results.

3.9.3 RI Execution

Quarterly Monitoring: Four pre-sampling activities were performed prior to initiating the quarterly monitoring program. The existing groundwater monitoring wells were surveyed, visually inspected, developed, and fitted with dedicated sampling pumps. The visual inspection was performed to determine the condition of the wells, confirm well construction details, and ensure that collected groundwater data would be representative of subsurface conditions.

Pre-Sampling Activities:
On September 27, 2005, the existing wells were re-surveyed by W.M. Holdings Incorporated. Groundwater monitoring well elevation measurements are presented in Table 32.

On December 15, 2005, a well inspection survey was conducted using a down-hole video log recorder. Groundwater Monitoring wells MW-01A/B, MW-02A/B, MW-03A/B, and G-4 were logged. The purpose of the survey was to evaluate current well conditions, confirm well construction details, and identify areas of mineral or biological growth that could impact well efficiency. Appendix R contains the details of these video logs.

Between December 30, 2005 and January 20, 2006, development of the groundwater monitoring wells was performed. The Monitoring wells were developed by surging, bailing, and pumping. Surging was accomplished using a surge block across five-foot sections of each screened interval. Sediment was bailed from each well before and after surging. Following surging and bailing each well was purged using a stainless steel Grundfos Redi-Flo™ electric submersible pump. During the purging activity water quality parameters including electrical conductivity (EC), pH, temperature, dissolved oxygen (DO), oxidation-reduction potential (ORP), salinity, and turbidity were monitored with a Horiba U-10 Water Quality Checker, and LaMotte 2020 turbidity meter. Purging continued until at least three well volumes of groundwater were removed, and water quality parameter measurements had stabilized to within 10 percent. Copies of the well development logs are provided in Appendices Q-1. In addition, purge water generated during testing was sampled and the results are contained in Appendix Q-1. Waste material generated during development activities and subsequent drilling and field investigation activities was properly disposed of in accordance with SOP's outlined in the RI/FS Workplan. Waste disposal manifest documentation is contained in Appendix H.

Following well development activities the wells were allowed to return to steady state conditions. Dedicated, QED low-flow gas actuated submersible bladder pumps were then installed in the middle of the screened interval of each well. These QED Well Wizard™ submersible bladder pumps were constructed with a stainless steel outer sleeve and a Teflon-lined internal bladder. Each Well Wizard measured 3.5 feet in length with a 1.5 inch outer diameter (OD). The inlet of each Well Wizard™ pump is located at the base of the pump. The pumps are positioned with the base inlet situated at the center of the well screen interval. Teflon® tubing is installed to convey purge and sample water from the pump outlet to the surface, and as a gas-actuation line to operate the bladder.

Groundwater Sampling Procedures: On February 16, 2006, quarterly groundwater monitoring and sampling was initiated and existing groundwater monitoring wells (MW-01A/B, MW-02A/B, MW-03A/B, and G-4) were gauged for depth to groundwater, and total depth from designated measuring points at the top of the PVC well casings. These same seven groundwater monitoring wells have been gauged for depth to groundwater and total depth during each subsequent quarter while RI field work was being performed and they continue to be gauged on a quarterly basis as a condition of the Consent Decree (Table 32). A Solinst Model 101 electric water level indicator, with one-one-hundredth foot accuracy, was used to gauge water level.

Purging and sampling was accomplished in accordance with ASTM Method D6771 using low-flow techniques. A purge rate of approximately 0.13 gpm (500 ml/min) was used for each well. During purging activity water quality parameters including EC, pH, temperature, DO, ORP, and turbidity were monitored with a Horiba U-22XB Water Quality Checker and a LaMotte 2020 turbidity meter. In addition, water levels were recorded regularly for groundwater stability. Purging continued until at least three tubing/bladder volumes of water were removed, and water quality parameter measurements had stabilized.

All groundwater sampling procedures followed the protocol outlined in the QAPP and the FSP, which are included as Appendices A and B, respectively of the RI/FS Workplan. Groundwater samples were collected using dedicated gas actuated submersible bladder pumps. Samples were discharged directly into containers provided by the laboratory that were appropriate for the analysis to be performed. The containers were secured with caps, labeled, and placed on ice for transport to Test America Laboratories of Irvine, California (Test America), a State certified laboratory, for analysis. Strict chain-of-custody procedures were followed during sample handling. Chain-of-custody records were maintained for all samples collected. Laboratory analytical reports and chain-of-custody records for each quarterly sampling event are contained in quarterly groundwater monitoring reports, which are submitted under separate cover. In addition to samples obtained form the Monitoring wells, field blanks prepared in the field, and laboratory-prepared trip blanks were analyzed. Also one duplicate sample taken from various Site wells was included with the samples to verify the integrity of the field and laboratory procedures. The duplicate samples alternated between the shallow and deeper hydraulic zones each quarter.

Purge water generated during development and sampling activities was temporarily stored on-site in DOT approved containers. When the storage capacity was reached the fluid was shipped to an approved disposal facility. Disposal records and shipping manifests are provided in the quarterly groundwater reports, which are submitted under separate cover.

Per the RI/FS Workplan all groundwater samples were analyzed for the following analytes, employing the USEPA methods indicated.

Analytes	USEPA Method	Notes
Gasoline range organics (GRO; hydrocarbon range C4 through C12, inclusive)	8015B	This analysis has been identified in historic reports for the Site as Total Petroleum Hydrocarbons modified for gasoline (TPHg) (by GC/MS (CA LUFT)) EPA Method 8015 modified for gasoline.
Volatile organic compounds (VOC's)	8260B	Acetone was not analyzed. Complete analytical results are presented in the quarterly groundwater monitoring reports.
Semi-Volatiles (SVOC's)	8270C	
Polynuclear Aromatic Hydrocarbons (PAH's)	8270C	During the First Quarter 2006 only on-Site wells were analyzed for PAH's. However, during subsequent quarters all wells were analyzed for PAH's.
Chromium VI	7196A	
Mercury	7470A and 7470A-Dissolved	Samples were analyzed for both suspended and dissolved Hg.
Other Metals	6020 and 6020-Dissolved	Both suspended and dissolved metals were analyzed.
pH	9040B	
Total sulfide	376.2	
Total reactive sulfides	SW846 9030B	In 2007 the EPA rescinded the analytical protocol for this analyte, and no alternative methodology has been approved.
General Chemistry	200.7 and 300.0	Analyzed 4Q - 2006 & 2Q - 2008

Dalton Well Study: Per the RI/FS Workplan, Section 5.3.2.6 a pressure sensitive transducer test was conducted to continuously monitor groundwater levels of the upper and lower monitored hydraulic zones for at least two weeks and compare these groundwater levels to pumping rate schedules for municipal water supply well (P04S), which is commonly known as the "Dalton Well" and is the closest municipal supply well to the site (Figures 23A and 23B). The purpose of this test was to evaluate the influence that production pumping from the Dalton Well would have on groundwater levels in the upper and lower monitored hydraulic zones in the vicinity of the Site. Because monitoring wells MW-01A (upper) and MW-01B (lower) are situated closest to the Dalton Well (approximately 224 feet to the southeast) these wells were chosen for the test.

This test was originally conducted during the Second Quarter 2007, from March 28 to May 16, 2007. However, an equipment malfunction resulted in erroneous data being collected. The

faulty equipment was repaired during the Third Quarter and the test was subsequently performed and reported in the Fourth Quarter 2007.

On August 23, 2007 two In-Situ Level TROLL™ 700 pressure transducers, which have continuous barometric pressure equalization, were placed in monitoring wells MW-01A (upper) and MW-01B (lower) located off-Site in Gateway Plaza (Figure 9A). These pressure transducers were left in place, continuously monitoring the depth to groundwater below the top of casing (T.O.C.) of these two wells at two hour intervals for 85 consecutive days. The top of casing for both MW-01A and MW-01B are 0.5 feet below ground completions. On the morning of November 15, 2007 the test was terminated, the data were downloaded from the transducers and the transducers were removed from the wells.

Water Quality Testing: On November 20 and 21, 2006, general groundwater chemistry samples were collected and analyzed as part of the Fourth Quarter 2006 monitoring event. A second sampling event was conducted on May 19 and 20, 2008 as part of the Second Quarter 2008 monitoring event. The purpose of these analyses was to evaluate the potential for and nature of hydraulic interconnection, if any, between the upper and lower hydraulic zones monitored for the Site.

3.9.4 Findings and Interpretation

As discussed previously, there are two primary hydraulic zones monitored within the Bellflower Aquiclude in the vicinity of the Site, the shallow hydraulic A zone and the deeper hydraulic B zone. The hydraulic A zone is monitored by wells MW-01A, MW-02A, MW-03A and MW-04A. The hydraulic B zone is monitored by wells MW-01B, MW-02B, MW-03B and MW-04B. Well G-4 monitors groundwater in less permeable sediments between the A and B hydraulic zones. Data obtained from the RI's groundwater monitoring events, the Dalton Well study and general groundwater chemistry analysis resulted in the following observations:

Zone A Groundwater Depth and Flow Direction: Table 32 is a summary of groundwater gauging and elevation data for Site wells. Groundwater within the hydraulic A zone is partially confined (Figures 10A and 10B). Figure 18 illustrates the elevation of groundwater observed during the Second Quarter 2008 sampling event in monitoring wells completed in the hydraulic A zone. The groundwater gradient in the upper hydraulic A zone was estimated at 0.0042 towards the Southeast during the Second Quarter 2008. Figure 19 is a Rose diagram that illustrates the ranges of groundwater flow direction and gradient in the upper hydraulic A zone during the past ten quarters of monitoring. The groundwater flow direction has ranged from 147 to 192 degrees azimuth and the groundwater gradient has ranged from 0.003 to 0.005 since February 2006. These values for groundwater gradient and flow direction are similar to those calculated from sampling events prior to 2006.

The monitoring wells MW-01A, MW-02A, MW-03A and MW-04A are not all screened across the regional water table. Well screen interval information and groundwater elevations since February 2006, from Tables 14 and 32 respectively, were reviewed. The water table at Well

MW-01A, located upgradient of the Site, has ranged from 12.8 to 14.3 feet above the top of the well's screened interval. For contaminant impacts this fact is not critical because the well is upgradient of the Site. The water table at Well MW-02A, located immediately east of the Cooper South sump, has ranged from 4.3 to 4.9 feet above the top of the well's screened interval. The water table at Well MW-03A, located downgradient of the Cooper sumps, has ranged from 2.2 to 2.7 feet beneath the top of the well's screened interval. The water table at Well MW-04A, located within the center of the Site, has ranged from 0.3 to 0.7 feet above the top of the well's screened interval.

Well screens that intersect the water table are important if LNAPL is present floating on the water table. Numerous borings extended through and beneath the water table of the hydraulic A zone during this investigation. LNAPL was not identified in any of the borings. Well MW-03A, having a screened interval that does intersect the A zone water table and is downgradient of the two Cooper sumps, does not have LNAPL floating on the water table, strongly suggesting that LNAPL is not present beneath the Cooper sumps.

Zone B Groundwater Depth and Flow Direction: Table 32 is a summary of groundwater gauging and elevation data for Site wells. Groundwater within the hydraulic B zone is confined. Figure 20 illustrates the elevation of groundwater observed during the Second Quarter 2008 sampling event in monitoring wells completed in the hydraulic B zone. The groundwater gradient in the lower hydraulic B zone was estimated at 0.0045 towards the East-Southeast during the Second Quarter 2008. Figure 19 is a Rose diagram that illustrates the ranges of groundwater flow direction and gradient in the lower hydraulic B zone. The groundwater flow direction has ranged from 93 to 105 degrees azimuth and the groundwater gradient has ranged from .004 to .005 since February 2006. These values for groundwater gradient and flow direction are similar to those calculated from sampling events prior to 2006.

The gradients in the two hydraulic zones are different from each other. Groundwater within the upper hydraulic Zone A flows in a southeast direction, while groundwater within the lower hydraulic Zone B flows in an east-southeast direction. Review of previous data sets indicates that these differing flow directions are internally consistent within each hydraulic zone over time, and the actual water level elevations are consistently different by several feet. These data indicate that these two hydraulic zones are not hydraulically connected in the immediate vicinity of the Site.

Hydraulic Head Difference between Hydraulic A and B Zones: The four multi-depth well clusters allow for the evaluation of vertical groundwater gradient within the Bellflower Aquiclude (Figure 21). The hydraulic head of groundwater in the upper A zone has been greater than that observed in lower hydraulic B zone (Figures 10C, 18, 20, and 21). This suggests that a downward vertical gradient of approximately 0.06 exists beneath the site. Although the vertical hydraulic gradient between the two hydraulic zones beneath the Site is downward, the vertical hydraulic conductivity of the fine grained sediments separating the two hydraulic zones is extremely low (Sections 3.4 and 3.7) and may restrict downward migration of groundwater from the A zone to the B zone. The contact between the base of the Bellflower Aquiclude and the top of the Gardena Aquifer lies at an elevation of approximately -100 feet msl in vicinity of the Site,

which is about 115 feet beneath the base of the two Cooper sumps (California Department of Water Resources, 1961). There is no analytical data indicating that COPCs from the overlying sludge are impacting the hydraulic zones of the Bellflower Aquiclude and therefore, no evidence of any COPCs migrating toward the Gardena or deeper groundwater supply aquifers.

In addition, due to the presence of a geosynthetic membrane, concrete, and asphalt capping at the Site; and the extremely low permeability of the sludge, surface infiltration through the Site, which could move soluble constituents, is reduced. Surface water infiltration is confined to exposed soil at the Site perimeter and the higher topographic areas with little pavement or structures.

Between May 1994 and April 2001, groundwater elevations in the upper hydraulic Zone A, rose approximately 2.4 ft at MW-01A. They also rose approximately 0.5 ft along the eastern boundary of the Site at MW-02A. Subsequently, through February 2002, Zone A groundwater elevations fell approximately 1.19 ft in the west and approximately 0.35 ft in the eastern portion of the Site. Since then, groundwater levels have continued to rise in both Zone A and Zone B. However, Zone B has exhibited a greater increase in head than Zone A (Figure 10C).

The irregular groundwater elevation changes that do not track from well to well over time, both across the investigation area and between the upper and lower hydraulic zones, support the conclusion that the monitored hydraulic Zones A and B can be characterized as hydrologically independent. This lack of measurable hydrologic interaction between the upper and lower Bellflower Aquiclude is indicative of stratigraphy that could be described as a complex interbedding of discontinuous, slightly permeable to impermeable layers of clay, silt, and very fine to fine-grained sand.

Groundwater Analytical Results: The analytical results for the second quarter 2008 groundwater sampling event is representative of the previous nine quarterly monitoring events performed during this RI. These results, being the most recent, are summarized in this draft RI report. Complete analytical reports from analytical laboratories and chain-of-custody documentation are provided in the previously submitted quarterly groundwater monitoring reports. Analytical results for principle analytes are compiled in Tables 27 through 30; and are summarized below. Concentrations in the tables qualified by a "J flag" are estimated values detected at a level below the quantifiable method Reporting Limit (RL) and above the Method Detection Limit (MDL). Groundwater monitoring well construction specifications for the wells in the sampling program are provided in Table 14.

GRO and VOC results: GRO and VOC compounds were not detected above the laboratory's reporting limit for these compounds in the second quarter 2008 groundwater sampling event (Table 27). These compounds have also not been detected above the laboratory's method reporting limit during the previous nine sampling events of this RI investigation with the exception of a concentration of 290 micrograms per liter from well MW-02B on August 24, 2007. The field blank from this sampling event also contained GRO and both GRO detections were qualified by the laboratory with: "due to sample matrix effects, the surrogate recovery was outside of acceptance limits". These two GRO detections are considered questionable.

Additionally, GRO has not been detected in well MW-02B during the previous thirteen years of monitoring or in the three succeeding quarterly sampling events after August 2007.

Low level detections of VOCs including benzene, toluene and xylenes as well as PCE (at 17 micrograms per liter) were identified in most of the then existing seven wells during the May 11, 1994 sampling event. No detections of VOCs have occurred during the ten sampling events performed during this RI.

SVOC and PAH results: SVOC and PAH compounds were not detected above the laboratory's reporting limit for these compounds in the second quarter 2008 groundwater sampling event. These compounds have also not been detected above the laboratory's reporting limit during the previous nine sampling events of this RI investigation.

Total Sulfides and Chromium VI results: Total Sulfides and Chromium VI were not detected above their method reporting limit of 100 and 25 micrograms per liter, respectively, in the second quarter 2008 groundwater sampling event. These compounds have also not been detected above the laboratory's method reporting limit during the previous nine sampling events of this RI investigation with the exception of a Chromium VI concentration of 77 micrograms per liter from well MW-04A on March 2, 2007. This detection was qualified by the by the laboratory with: "the MS &/or the MSD were below acceptance limits due to sample matrix interference." This detection is considered questionable. Additionally, Chromium VI has not been detected in well MW-04A in the five succeeding quarterly sampling events after March 2007. Reactive sulfides were monitored at the site during 2006, but monitoring of this compound was discontinued in 2007 when the EPA rescinded their approved method of analysis without approving an alternative method of analysis.

Inorganic (metals) results: Both total and dissolved metals analysis have been analyzed for the ten groundwater monitoring events of this RI. Dissolved metal concentrations were similar to total metal concentrations in groundwater at individual monitoring wells for each sampling event. Barium was the only metal that consistently had a concentration that exceeded 10 micrograms per liter (Tables 29 and 30).

Total metals data collected from well MW-01A indicate that the hydraulic A zone had background barium concentrations at less than 100 micrograms per liter, and background molybdenum and vanadium concentrations of less than 10 micrograms per liter. Hydraulic A zone wells MW-02A had slightly higher concentrations of copper (<10 ppb) than background well MW-01A. Well MW-04A had slightly higher concentrations of arsenic (< 5 ppb), nickel (<10 ppb), selenium (<15 ppb) and vanadium (< 15 ppb) than background well MW-01A. There was not an exceedance of any metal's MCL in the hydraulic A zone during this RI investigation. Elevated metal concentrations detected during the February 28, 2002 sampling event from well MW-03A were not reproducible during this RI.

Total metals data collected from well MW-01B indicate that the hydraulic B zone had background barium concentrations ranging between 250 to 500 micrograms per liter with background molybdenum and selenium concentrations of less than 5 micrograms per liter.

Vanadium was not detected at less than 2 micrograms per liter in the hydraulic B zone. Hydraulic B zone wells MW-02B, MW-03B and MW-04B had lower barium concentrations (<125 ppb) than background well MW-01B. Wells MW-02B and MW-03B had slightly higher concentrations of arsenic (< 5 ppb), copper (<5 ppb) and nickel (<5 ppb) than background well MW-01B. Well MW-04B had slightly higher concentrations of arsenic (< 15 ppb), molybdenum (<8 ppb) and selenium (<8 ppb) than the other hydraulic B zone wells. The total arsenic value of 13 ppb from Well MW-04B on August 23, 2007 was the only exceedance of any metal's MCL in the hydraulic B zone during this RI investigation. Elevated metal concentrations detected during the February 28, 2002 sampling event from wells MW-01B, MW-02B and MW-03B were not reproducible during this RI.

Well G-4, screened between the hydraulic A and B zones, had barium and vanadium concentrations similar to the hydraulic A zone and selenium concentrations similar to the hydraulic B zone. Molybdenum concentrations were similar to background concentrations.

The 2006, 2007, and 2008 data from this RI suggest that the elevated metals concentrations observed in May 1994 and February 2002 are anomalous due to irregularities in the sampling or analysis procedures.

pH values in groundwater: The pH levels have remained relatively constant since Stantec began sampling in the first quarter of 2006. The anomalously high pH levels reported for the 1994 and 2002 sampling events have not been observed during the past ten quarters of continuous sampling. The pH levels reported since 1994 to present are provided in Table 28 and are illustrated in Figure 22. Field pH levels compared to laboratory pH values during the ten groundwater monitoring events of this RI are as follows:

Well Number	Field pH Range	Laboratory pH Range
MW-01A	5.40 to 6.93	7.05 to 7.53
MW-01B	6.88 to 7.50	7.32 to 7.73
MW-02A	5.62 to 6.91	6.86 to 7.45
MW-02B	6.70 to 8.47	7.09 to 7.59
MW-03A	5.29 to 6.81	6.56 to 7.34
MW-03B	7.10 to 9.09	7.48 to 8.09
MW-04A	5.50 to 6.80	7.01 to 7.29
MW-04B	6.42 to 9.22	7.05 to 7.45
G-4	6.60 to 7.71	7.09 to 7.97

Only four field groundwater pH readings of less than 6.0 have been recorded during the ten sampling events of this RI. All four were obtained during the May 17 and 18, 2007 sampling event from the wells screened in the upper hydraulic A zone. The May 18, 2007 pH value of 5.40 in up-gradient well MW-01A would suggest that the low pH values from this sampling event are not due to the presence of sludge at the Site. Field pH values greater than 10.0, as recorded prior to 2006 in wells MW-01B and MW-02B, have not been observed during the groundwater sampling for this RI.

Summary: The absence of organic constituents in groundwater above reporting limits suggest that organic compounds within the sludge are not impacting the groundwater beneath the Site. The absence of elevated levels of inorganic constituents in down-gradient wells, particularly metals in suspended or dissolved phases, suggests that metals are not being leached from the sludge at the Site. The neutral groundwater pH, ranging from 6.0 to 9.0 in the field, indicate that the acidity of the sludge and sludge impacted sediments do not adversely affect the shallow groundwater quality beneath the Site.

Dalton Well Study: The Dalton Well (State Well Number 3S/14W-25P04S) pumps 24 hours a day, 7 days a week at an approximate rate of 487 gallons per minute from screened intervals within the Silverado Aquifer at depths of 544-555, 581-662 and 699-734 feet below ground surface (Dr. Toby Moore, Golden State Water Company, 2007). The well is operated by Golden State Water Company in Anaheim, California and is the closest municipal supply well to the site. For comparison, wells MW-01A and MW-01B are screened at 27-37 feet bgs and 80-85 feet bgs respectively. The Dalton Well is occasionally shut down for a period of approximately fifteen minutes to record water levels. These "off" periods do not allow for full recovery of the water level. This study was performed to test if the Dalton well production zone (~534-734 feet bgs), located in the Silverado Aquifer, was in hydraulic communication with the two Bellflower hydraulic zones beneath the Site. If hydraulic communication exists, then a change in production of the Dalton Well would have resulted in a change of the groundwater level of the lower hydraulic B zone and possibly in the upper hydraulic A zone.

The Dalton Well production data is presented in Figure 23A. The MW-01A and MW-01B transducer data for the 85 day period beginning August 23, 2007 is provided in Figures 23A and 23B. The transducer data is presented as depth to groundwater below top of casing (TOC). The data collected during this study did not indicate that a hydraulic connection or hydraulic influence exists between the Dalton Well and either the upper A or lower B hydraulic zones. Additionally, on October 15, 2007, the Dalton Well production rate dropped to 48 gpm for an unspecified period of time, and was reported to be at 497 gpm the following day, October 16, 2007. Groundwater levels in MW-01A and/or MW-01B should have increased during, or shortly following this change in production of the Dalton Well if there were a hydraulic connection between the Silverado Aquifer and the two monitored hydraulic zones within the Bellflower Aquiclude. No increase in groundwater level was observed during this time period in either monitoring well.

The precipitation data for the testing period from October 1, 2007 to December 31, 2007 (http://dpw.lacounty.gov/wrd/Precip/alert_rain/raindata.cfm?id=315) indicate that increases in groundwater levels may be due to precipitation events that occurred October 12th and 13th, 2007 (Figure 23B). The change in the groundwater level observed in the upper hydraulic A zone (MW-01A) supports this conclusion. The general lack of response in the lower hydraulic B zone (MW-01B) is a result of the greater depth below ground surface and the low permeability of the unit that separates the upper and lower hydraulic zones..

Water Quality Testing: The purpose of these general groundwater chemistry analyses was to evaluate if there were differences in water chemistry between the upper hydraulic A zone and

the lower hydraulic B zone in the vicinity of the Site. Substantial differences in groundwater chemistry would not be supportive of a direct hydrologic interconnection between the upper and lower hydraulic zones at the Site. The detailed analytical results are presented in Tables 27 through 30. Figure 24 presents a Piper Diagram that depict the relationships between the major cation and anion species in groundwater samples collected from monitoring wells completed in the upper and lower hydraulic zones during the Fourth Quarter 2006 and the Second Quarter 2008.

The chemical compositions represented in the Piper Diagram (Figure 24) indicates distinct geochemical differences between water samples from the upper and lower hydraulic zones. The upper hydraulic Zone A is predominantly bicarbonate water with elevated calcium and magnesium. The lower hydraulic Zone B water can be classified as having no dominate water type, but having slightly elevated sodium, potassium, and chloride concentrations relative to the upper A zone.

Overall, these geochemical differences between the groundwater from the two zones suggest that there is no direct or rapid vertical mixing occurring between these two hydraulic zones in the vicinity of the Site. This lack of substantial interconnection between the two hydraulic zones is also indicated by the different flow direction and hydraulic head measurements of groundwater between zone A and zone B. Thus, there does not appear to be any substantive hydraulic interaction between the two zones in the vicinity of the Site.

3.9.5 Data Gaps

Ten quarters of continuous quarterly groundwater monitoring and sampling has found no evidence of impacts to shallow groundwater by COPCs identified in the overlying sludge. Inconsistencies in data, such as groundwater pH, from past sampling events have not been reproduced during the sampling activities conducted as part of the RI, or during continued sampling activities conducted in accordance with the Consent Decree. However the DTSC has expressed a concern regarding the adequacy of the current monitoring well network.

A review of the spatial distribution of the monitoring wells and groundwater flow directions within the upper hydraulic A zone and the lower hydraulic B zone suggests that:

a) for potential impacts from the Site to the hydraulic A zone:
- Well MW-2A measures groundwater quality to the east of the Cooper North sump and northern portion of the Cooper South sump;
- Well MW-3A measures groundwater quality downgradient of the two Cooper sumps;
- Well MW-4A measures groundwater quality downgradient of the western portion of the Cooper North sump and measures groundwater quality east of the Haack sump.
- Well G-4 measures groundwater quality within the sediments in between the two hydraulic zones and may be either downgradient or side-gradient of the Cooper South sump.

b) for potential impacts from the Site to the hydraulic B zone :

- Well MW-2B measures groundwater quality downgradient of the northern portion of the Cooper South sump;
- Well MW-3B measures groundwater quality south of the Cooper South sump;
- Well MW-4B measures groundwater quality downgradient of the southern portion of the Haack sump.

The quality of groundwater flowing immediately beneath the two Cooper sumps in the hydraulic A zone is effectively monitored by Wells MW-2A, MW-3A and MW-4A. There are no groundwater wells in the monitoring well network to effectively monitor the groundwater quality downgradient of the Haack sump. This is a data gap. The fact that the screened interval of wells MW-2A and MW-4A are submerged is not a data gap because LNAPL was not observed in any of the borings drilled at the Site. The hydraulic B zone groundwater south of the Haack and Cooper South sumps is effectively monitored by MW-3B and MW-4B. Well MW-2B effectively monitors groundwater in the B hydraulic zone immediately downgradient of the Cooper South sump.

There remains a question as to the existence of perched water above the hydraulic A zone. In-situ air permeability testing at soil vapor location SV-18 (depth of 5.5 to 6 feet bgs) could not be performed because four inches of standing water existed at the bottom of the vapor probe prior to testing. In-situ air permeability testing at soil vapor location HPB-04 (depth of 5.5 to 6 feet bgs) was also not successful due to high moisture. ARC will evaluate the presence of possible perched zone water by installing a temporary well point screened across this 5.5 to 6 feet bgs depth interval at locations SV-18 and HPB-04 to determine if perched groundwater exists at this location.

Production from the Dalton Well does not appear to influence groundwater levels observed in either shallow hydraulic zone monitored by wells MW-01A or MW-01B. Groundwater mineral data from the two monitored hydraulic zones of the Bellflower Aquiclude show different intrinsic properties in the mineral content between groundwater sampled from the two hydraulic zones. Periodic monitoring of the groundwater chemistry over time at one to two year intervals would allow for evaluation of possible changes in the groundwater character over an appropriate time interval. Therefore, no additional testing for communication between the A and B hydraulic zones is warranted.

3.9.6 Response to DTSC Comments on the GW Monitoring Program

DTSC comments regarding the groundwater monitoring program and ARC responses are:

GC6. The number, location, and design of the existing groundwater monitoring well network are inadequate. This should be identified as a data gap and the proposal to install multilevel wells included as a recommendation for further investigation.

ARC response: A discussion regarding the adequacy of the groundwater monitoring well network at the Site is discussed in section 3.9.5 of the revised draft RI report.

SC14. Section 3.7.2, Sampling Procedures, pages 32 and 33

The text erroneously indicates the wells were gauged on November 20, 2007

ARC response: The text of the revised draft RI report has been updated with the dates that the monitoring wells were sampled.

SC17. Section 4.3.1, Groundwater Occurrences, page 37

17a) This section begins with a discussion of the sump dimensions and refers to Figure 19 however, this figure does not support the text.

ARC response: Discussion of groundwater occurrences is included in section 3.9 of the revised draft RI report and in responses to DTSC's comments in section 3.9.

17b) The boring logs and figures indicate saturated conditions exist in many of the locations investigated and these conditions occur at various depths. The text should acknowledge this finding and discuss its significance regarding the adequacy of the existing groundwater monitoring network.

ARC response: During the subsurface investigation phase of the RI (predominantly December 2005 through March 2006) saturated conditions observed in boring soil samples most often occurred below the three sumps within silty sand (SM) deposits. Groundwater elevations beneath the three sumps between May 1994 and February 2008 have ranged from 6.2 feet to 8.4 feet msl in well MW-2A, 5.2 to 6.2 feet msl in well MW-3A and 6.3 feet to 6.7 feet msl between March 2007 and February 2008 in well MW-4A. Observed saturated conditions noted in the logs from the 39 borings drilled within the sumps noted wet or saturated conditions at depths below seven feet msl in 33 of these borings. Saturated conditions between seven and eight feet msl were observed four other borings and are within the range of known groundwater fluctuations. Thus, 37 of the 39 borings drilled within the sumps encountered groundwater conditions within the range known groundwater fluctuations. Saturated conditions at elevations greater than nine feet were only observed in borings CPB11R and CPB14. Wet conditions in boring CPB11R occurred in clayey silt (ML) layer between two sludge layers. Permeability testing of untreated sludge resulted in a permeability value of less than 1.0E-08 cm/sec indicating that the sludge is impermeable and may restrict water movement out of soil interbeds. Wet conditions in boring CPB14 occurred in a 2-inch thick sand (SP) interbedded among ML deposits and in sand (SM) layers interbeds within ML deposits at a deeper depth.

17c) The text should discuss the exceptions, rather than the "general" findings.

ARC response: Discussion of groundwater occurrences has been included in section 3.9 of the revised draft RI report.

SC18. Section 4.3.2, Hydraulic Conductivity, pages 38 and 39 18

The text acknowledges that the upper Zone A has a higher hydraulic head than the lower Zone B by several feet, which indicates a downward vertical gradient and a strong potential for

spreading of contamination. We also note that well G-4 was not included in the aquifer testing, and no explanation is provided. In addition, Table 21 reports that some tests were not performed in some wells, without providing an explanation.

ARC response: The upper Zone A does have a higher hydraulic head than the lower Zone B by several feet. The spreading of contamination, if any, by vertical groundwater flow could occur if Zone A and Zone B are interconnected. A discussion of the hydraulic connection between the two hydraulic zones is provided in section 3.9.4 of the revised draft RI report.

The RI/FS workplan states that single well hydraulic conductivity tests would be performed on the MW-1 through MW-3 series of wells (page 46). Well G-4 is screened at a depth interval between Zone A and Zone B. An explanation of why some tests were not performed in some wells is included in section 3.7.2 of the revised draft RI report. Certain tests were not performed on Well MW-3A due to the slow equilibrium response of the well during the well's slug test. Hydraulic conductivity tests were performed in the other two zone A wells which provided reliable results. The two hydraulic conductivity tests performed on Well MW-3A resulted in similar values which were less than the hydraulic conductivity values of Wells MW-1A and MW-2A.

SC19. Section 4.3.3, Groundwater Flow, pages 39 and 40

19a) Presentation of the vertical gradient should be included in the text.

ARC response: Discussion of groundwater gradients has been revised in section 3.9 of the revised draft RI report.

19b) The text indicates that the groundwater level beneath the site is lower than the base of sumps, but saturated conditions were noted in the boring logs from elevations higher than the base of the sumps. Was groundwater collected and analyzed from these perched zones?

ARC response: Groundwater elevations beneath the three sumps between May 1994 and February 2008 have ranged from 6.2 feet to 8.4 feet msl in well MW-2A, 5.2 to 6.2 feet msl in well MW-3A and 6.3 feet to 6.7 feet msl between March 2007 and February 2008 in well MW-4A. The vast majority of the sludge occurs at elevations above 10 feet msl. The saturated conditions above 9 feet msl occurred in borings CPB11R and CPB14 and are discussed in ARC response to specific comment 17b. Groundwater was not collected from these two groundwater occurrences which appear to be of limited extent.

19c) The text erroneously, states that there is an upward vertical gradient in the saturated zones beneath the Site.

ARC response: This statement has been corrected in the discussion of groundwater gradients in section 3.9 of the revised draft RI report.

SC20. Section 4.3.4, Groundwater Analytical Results, pages 40 and 41

20a) The text states that "no abnormal pH levels" were observed. Please describe the variations between field and laboratory pH values. We consider field measured pH, when performed with a properly calibrated instrument, to be more representative than laboratory measured values.

ARC response: Discussion on the variations between field and laboratory pH values in groundwater has been included in section 3.9.4 of the revised draft RI report.

20b) Include a discussion of total metals, as well as dissolved.

ARC response: Discussion of both the dissolved and total metals in groundwater has been included in section 3.9.4 of the revised draft RI report.

20c) The text should acknowledge that well G-4 is down-gradient in addition to being off-site. The text should acknowledge that shallow Zone A wells are not all screened across the regional water table (see Figure 21) and describe how this may affect the interpretation of analytical results.

ARC response: The revised draft RI report states that well G-4 is south of the Cooper sumps. The revised draft RI report also states that the shallow Zone A wells are not all screened across the regional water table and discuss how this may affect the interpretation of analytical results in section 3.9.4.

20e) General groundwater chemistry data from more than one (1) round of sampling is needed to make interpretations and conclusions regarding the mixing between saturated zones beneath the Site.

ARC response: A second set of general groundwater chemistry was collected during the May 2008 groundwater sampling event at the Site. This data was presented in the Second Quarter 2008 Groundwater Monitoring Report for the site. The data is also included in Section 3.9 of the revised draft RI report.

3.10 SURFACE WATER SAMPLING

Pursuant with a request made by the DTSC, surface water quality data from the Dominguez Channel were collected to evaluate what, if any, impact the acid-sludge impoundments could have on the surface waters in the Dominguez Channel. The Dominguez Channel is a concrete lined flood control channel that parallels the southern border of the Site.

3.10.1 RI/FS Workplan Scope [§ 5.3.2.6 pg 48-49]

The surface water sample collection was to consist of one grab sample obtained from Dominguez Channel at a point located east of the eastern edge of the Site (up-stream sample) and one grab sample obtained immediately down-stream from the entrant location of storm drain surface water run-off from the Site in the Dominguez Channel.

Data that was to be collected from the two surface water sample locations in the Dominguez Channel included:

> VOC, SVOC (with PAH confirmation by USEPA Method 8310 as necessary), and metals (including hexavalent chromium) concentrations, and pH (GRO, DRO and/or WORO will be added at a later date if Site conditions warrant, based on results of the drilling and sampling proposed in RI/FS Workplan Section 5.3.2.1).

3.10.2 Deviation from the Workplan

Surface water sampling was considered for quarterly monitoring and sampling, but due to the initial analytical results, access issues, and safety concerns with entering the channel for sampling of the surface water, only one sampling event was conducted during the initial RI field work in the first quarter of 2006. A second round of analysis was conducted in the second quarter of 2008 for data comparison.

3.10.3 RI Execution

Two surface-water samples were collected from the Dominguez Channel with the assistance of LACDPW during the First Quarter 2006 sampling event. Samples were collected by entering the Dominguez Channel with a LACDPW escort and driving to the sampling location south of the Site. Sampling locations are shown on Figures 9A and 9B. The down-stream sample was designated as DG-CHAN-02162006 and the up-stream sample was designated UG-CHAN-02162006.

During the Second Quarter 2008 sampling event two surface-water samples were collected from the Dominguez Channel from beneath the street overpasses crossing the channel at both Normandie Avenue and Western Avenue. A down-stream sample (FDCC-E-20080520) was collected at Normandie Avenue and an up-stream sample (FDCC-W-20080520) was collected at Western Avenue. Surface water samples were collected by lowering a weighted bailer from the overpass down into the channel. Sampling locations are shown on Figure 9B.

Surface water sample elevations were estimated from surface elevation mapping completed by photographic aerial mapping the Site and vicinity in 2004. Topographic contours presented on Site base maps (Figures 2B and 9A) were measured by this survey method**.** Elevations within the Dominguez Channel were confirmed from surveyed as-built diagrams obtained from the LA County Department of Public Works (LACDPW) (Appendix D; Figures D1 through D3).

3.10.4 Findings

Two surface water samples collected from the Dominguez Channel were analyzed for the same suite of analytes as the groundwater samples collected during the First Quarter 2006. One sample (UG-CHAN-02162006) was obtained upstream of the Site and the downstream sample (DG-CHAN-02162006) was obtained adjacent to the Site's southeastern boundary (Figure 9A). At the time of sampling the surface water level was visually estimated to be 1-foot above the base of the channel. Channel flow was not measured. Appendix I-3 contains the analytical results of both surface water samples obtained in February 2006.

Both of the surface water samples obtained in 2006 had GRO levels of 58 µg/l. There were no SVOC's observed in either of the two surface water samples. Unlike the groundwater samples obtained from the Site, two VOC's, tetrachloroethene and trichloroethene were observed in both 2006 surface water samples. The concentrations of tetrachloroethene and trichloroethene in the up-stream sample were 23 µg/l and 19 µg/l respectively. The concentrations of tetrachloroethene and trichloroethene in the down-stream sample was 15 µg/l and 14 µg/l respectively, (Stantec, 2008)

The level of barium in surface water was approximately twice the concentration of barium measured in any of the soil/sludge samples taken from the Site. Copper, lead, and vanadium were observed in both surface water samples but at concentrations that were well below the average background levels measured in soil from the Site. (Tables 19, 29, and 30).

Two surface water samples collected from the Dominguez Channel were analyzed for the same suite of analytes as the groundwater samples during the May 2008 sampling event. One sample (FDCC-W-20080520) was obtained upstream of the Site at Western Avenue and the downstream sample (FDCC-E-20080520) was obtained from the eastern side of the Normandie Avenue channel crossing which is east of the Site's southeastern boundary (Figure 9B). At the time of sampling the surface water level was visually estimated to be 1-foot above the base fo the channel. Channel flow was not measured. Appendix I-3 contains the analytical results of both surface water samples obtained in May 2008.

Both of the surface water samples obtained in May 2008 did not contain GRO levels at a reporting limit of 50 µg/l. There were no SVOC's or PAH's detected in either of the two surface water samples. Two VOC's, tetrachloroethene and trichloroethene, were detected in both 2008 surface water samples. The concentrations of tetrachloroethene and trichloroethene in the up-stream sample were 19 µg/l and 12 µg/l, respectively. The concentrations of tetrachloroethene and trichloroethene in the down-stream sample was 8.7 µg/l and 5.7 µg/l, respectively (Stantec,

2008). These VOC results are similar to those observed in 2006. Dissolved metals concentrations approached their total metal concentrations in both upstream and downstream samples with the exception of lead and zinc which had a much lower dissolved metals to total metals percentage in both surface water samples.

3.10.5 Interpretation

Interpolation of the range of the groundwater elevations (as measured from 2006 thru 1Q08) from the upper monitored groundwater Zone A with elevations from the as-built drawings of the Dominguez Channel (Appendix D), indicates that it may be possible for the inner channel to be in hydraulic communication with groundwater from the upper hydraulic zone. Weep holes in the sidewalls of the inner channel allow for water movement in and out of the channel. If groundwater at the channel exceeds an elevation of approximately 4 feet msl the groundwater could enter the concrete lined channel through the weep holes. Figure 10A shows the relationship of the potentiometric surface of the confined upper hydraulic zone with respect to the channel in cross section. In high water storm drainage events, the channel south of the Site could lose water to the subsurface. In typical low flow channel drainage conditions, the channel south of the Site might gain water from the subsurface. Flow direction in the upper hydraulic A zone beneath the Site could be affected by the Dominguez Channel if the groundwater elevation was consistently above approximately 4 feet msl.

Analytical data from surface water samples collected from the inner channel of the Dominguez Channel showed elevated concentrations of GRO and VOC analytes in contrast to the non-detections for those analytes in groundwater monitored at the Site. Based on the organic chemical parameters, the Site is not impacting surface water quality in the channel. Overall, the observed concentrations of metals in surface water adjacent to the Site support the same conclusion, that the Site groundwater conditions are not impacting surface water quality. Both upstream and downstream surface water samples were elevated in barium and copper concentrations compared to groundwater at the southern boundary of the Site.

3.10.6 Data Gaps

No data gaps are identified for the results from surface water sampling from the Dominguez Channel. Furthermore, based on the analyte concentrations detected in samples collected from the Dominguez Channel, additional surface water sampling will not contribute to the characterization of monitoring of Site conditions, as upstream contributions to the surface drainage exceed the concentrations in groundwater at the Site.

3.10.7 Response to DTSC Comments on Surface Water Sampling

DTSC comments regarding surface water sampling and ARC responses are:

SC19d. Include a discussion of the effect the Dominguez Channel has on groundwater recharge, discharge, and flow direction.

ARC response: The Dominguez Channel does not appear to have an effect on groundwater recharge beneath the Site. The channel may receive discharge from groundwater beneath the Site if the groundwater beneath the channel exceeds an elevation of approximately 4 feet msl. In this situation the groundwater could enter the concrete lined channel through the channel's weep holes. Flow direction in the upper hydraulic A zone beneath the Site could be affected by the Dominguez Channel if the groundwater elevation was consistently above approximately 4 feet msl. Discussion of surface water in the Dominguez Channel has been included in section 3.10 of the revised draft RI report.

SC21. Section 4.3.5, Surface Water Analytical Results, pages 41 and 42

21a) The elevation of the channel bottom should be confirmed using survey techniques rather than by making a visual estimation.

ARC response: The elevation of the channel bottom was confirmed using the Los Angeles County Flood Control District as-built drawings for the channel south of the Site (Appendix D). The channel bottom elevation south of the residence lots is approximately 4.7 feet msl and the channel bottom elevation beneath the railroad track crossing above the channel is approximately 3.2 feet msl. The elevation of the weep holes in the Dominguez Channel south of the residence lots is approximately 5 feet msl and beneath the railroad track crossing above the channel the weep holes are at approximately 3.5 feet msl. Aerial topographic survey techniques were also used to map the Site and boundary properties (see Figure 2B).

21b) Describe the groundwater elevation in relation to the channel bottom and whether groundwater can enter the channel via weep holes.

ARC response: Figure 10A illustrates the Dominquez Channel (LACFCD STA 578+00) at the projection of this figure's A-A' cross-section. The water table at these borings were estimated from the A-zone groundwater contour map from water levels obtained from Site monitoring wells on November 20, 2006 and is projected towards the Dominquez Channel. The water table since monitoring was reinitiated in 1Q2006 has fluctuated less than 0.5 feet from the November 2006 elevations. A discussion of surface water occurrence in the channel and its effect on groundwater has been included in section 3.10 of the revised draft RI report.

21c) Describe how general mineral analysis compares between surface water and groundwater.

ARC response: General mineral analysis of the surface water was not performed during this RI. A comparison of GRO, VOC and metals between surface water and groundwater has been included in section 3.10 of the revised draft RI report.

21d) Indicate whether the barium concentrations mentioned were dissolved or total levels.

ARC response: Analysis for total and dissolved metals in the surface water was performed in May 2008. There is relatively little variation between dissolved and total concentrations of metals in the surface water samples with the noticeable exception of lead and zinc which are at lower concentrations in the dissolved state.

3.11 ACTIVE SOIL GAS INVESTIGATION

The purpose of the active soil gas investigation is to evaluate subsurface concentrations of VOCs, hydrogen sulfide and methane at multiple locations across the site. The data generated will be used for input in an updated Baseline Risk Assessment, which will target vapor intrusion into an indoor air environment for future site redevelopment

In association with the active soil gas survey, soil samples from some of the borings were analyzed for VOCs, SVOCs, GRO, WORO, TOC, and pH, and inorganic metals (see Section 3.1). Approximately 10 percent of subsurface soil samples from survey locations were prepared for geotechnical laboratory analysis in order to test the physical properties of the soils (see Section 3.4). Additionally, air permeability of the vadose zone was estimated by in-situ air permeability testing (see Section 3.12).

3.11.1 RI/FS Workplan Scope [§ 5.3.2.3 pg 40]

Per the RI/FS Workplan approved by the DTSC, the proposed active soil gas investigation follows guidelines found in the DTSC's January 28, 2003 *"Advisory: Soil Gas Investigations"* and the February 25, 1997 *"Interim Guidance for Active Soil Gas Investigations"* prepared by the California Regional Water Quality Control Board, Los Angeles Region (CRWQCB-LAR). The assessment was intended to assess the subsurface concentrations of VOCs, hydrogen sulfide and methane at the Site. The data generated during this assessment will be used for the evaluation of risk to human health for potential vapor intrusion into the indoor air environment for future site redevelopment (see the RI/FS Workplan Section 5.6).

The advancement of 30 temporary direct-push soil gas survey borings was proposed at locations shown on RI/FS Workplan Figure 15. The soil gas survey direct-push locations were chosen to provide as wide a coverage as possible in areas where the subsurface conditions would allow vapor sampling, and close enough to acid-sludge sump boundaries to detect any influence of acid-sludge on subsurface vapor VOC concentrations in the vicinity of the sumps. The rationale for selecting each of the proposed temporary soil gas survey locations is described in RI/FS Workplan Table 16. The locations of the temporary soil gas probes shown in RI/FS Workplan Figure 15, where a building is currently present, were as close to the building as practical, given potential access difficulties such as dismantled cars, trailers, accumulated materials and density of tenant use.

At each direct-push location, soil vapor samples were collected from temporary installed probes with sealed vapor sampling tubing to target depths of approximately 5 and 15 feet bgs. It was correctly anticipated that these depths would provide coverage to the approximate depth of the Cooper Property sumps. The soil vapor samples were analyzed for VOCs, hydrogen sulfide, and methane.

The following sampling protocol was employed during the performance of the soil vapor investigation:

1. After placement of the temporary soil vapor survey points, hydrated bentonite was to be placed around each probe to prevent ambient air intrusion from occurring;

2. At each sampling location, samples were to be obtained after approximately 20 minutes following installation to allow subsurface conditions to approach steady state equilibrium;

3. A purge volume test was to be conducted following DTSC's guidelines to determine the appropriate purge volume for soil gas sample collection. Since there likely is similar lithology above 15 feet bgs at the sampling locations, a single purge test would be performed with the collection of sample volumes at 1, 3 and 7 times the volume of sample tubing and probe annular space. The remaining soil gas survey points would then be purged using the purge volume obtained from this test with the highest VOCs, hydrogen sulfide and methane concentrations. If the analyzed soil gas from the purge volume test is non detect, then the default three-volume purge rate would be used;

4. A leak test of the bentonite seal would be conducted at each soil gas survey point using isobutylene or other suitable volatile compound such as is found in "off-the-shelf" shaving cream;

5. Purging and sampling was to be conducted at a rate between 100 to 200 milliliters per minute. At each location/target depth, the appropriate number of calculated "dead space" vapor-probe volumes (depending on the results of the purge volume test) of soil gas would be purged, and a soil vapor aliquot contained in an appropriate sample container would be extracted from the point and transported to an on-site mobile laboratory for chemical analysis;

6. Soil gas samples for VOC (USEPA Method 8260B), hydrogen sulfide and methane analysis were to be collected using syringes, and all appropriate chain-of-custody and sample handling protocols followed;

7. At an approximate 20% level of effort, soil gas sample locations and depths that were found to contain VOC concentrations less than the detection limit for a particular COC analyte by USEPA Method 8260B, would be re-sampled with an additional soil gas sample using a laboratory-certified clean micro-Summa™ canister, and analyzed using Method TO14A to extend the lower detection range at a fixed laboratory off-Site. In addition, at an approximate 10% level of effort, soil gas samples having the highest VOC concentrations of detectable chlorinated hydrocarbons, an additional micro-Summa™ canister sample would be obtained and analyzed with Method TO14A to quantify potentially detectable vinyl chloride vapor concentrations.

8. Appropriate QA/QC samples were to be collected and analyzed as outlined in the DTSC guidance document. One duplicate soil gas sample was to be collected per day for QA/QC purposes;

9. Soil gas probes were to be removed and properly disposed of once sampling was completed, and the borehole would be properly backfilled with bentonite grout.

Soil vapor samples were to be analyzed by a California Certified Environmental Laboratory for VOCs in accordance with EPA Method 8260B and in certain cases, Method TO14A. Hydrogen sulfide and methane would be analyzed using field instruments that meet DTSC guidelines as outlined in DTSC (2005). A detection limit of at least 0.1 micrograms per liter-vapor (µg/l-vapor) would be used for targeted VOC analytes. Lists of target analytes for the active soil gas investigation are provided in the QAPP (Appendix A of the Workplan).

The QAPP and FSP (Appendices A and B of the Workplan) describe SOPs for this work, including sampling protocols, chain-of-custody procedures, QA/QC protocols, laboratory analytical testing and decontamination activities. Health and safety monitoring activities are described in the Site-specific Health and Safety Plan (HASP).

3.11.2 Deviation from the Workplan

While many of the active soil gas investigation boring locations were adjusted in the field because of surface obstructions or drill site configuration limitations, only nine of the locations were moved more than 5-feet from the RI/FS Workplan proposed locations. Borings SV01, SV04, SV7, SV10, SV12, and SV21 were relocated because of access restrictions associated with the original locations. Borings SV13, SV19, and SV30 were relocated to provide more uniform coverage of data across the Site.

No air samples were collected at SV-05, SV-10, SV-20, and SV-27 due to excessive moisture content in the shallow soil. Only one soil gas sample was collected from locations SV-01 and SV-30 due to moisture content and/or inadequate borehole seals at the second sample depth.

Approximately two hours were allowed to elapse prior to soil vapor sample collection at each location to allow subsurface conditions to approach steady state. This time period varies from the proposed 20 minutes in the Workplan.

Soil gas sample locations and depths that were found to contain VOC concentrations less than the detection limit for a particular COPC analyte by USEPA Method 8260B, were re-sampled with an additional soil gas sample using a laboratory-certified clean micro-Summa™ canister, and analyzed using Method TO15 rather than TO14A.

3.11.3 RI Execution

On March 9, 10, 14, 15, and May 18 and 19, 2006, Stantec collected soil vapor samples from the temporary direct-push soil gas survey borings at the locations shown on Figures 9A and 25

and in accordance with the sampling protocol outlined in the Workplan. Target depths were determined based on the findings of the sub-surface soil and sludge boring assessment phases for the Haack and Cooper Properties (Section 3.1). Detectable concentrations of H_2S, and CH_4, and selected VOC's are displayed in Figure 25.

Sample tubing was installed at two depths in each location, at 5- and 10-feet bgs, 5- and 13-feet bgs, or 5- and 15-feet bgs. The sampling depths were generally in sandy silt or sand based on the lithologic log of the boring compiled during installation (Appendix L). Vapor samples were collected at two locations from beneath sludge, SV-18 and SV-28. Sample locations adjacent to acid-sludge sump boundaries were placed as close as possible to the respective sumps. However, these locations were also dependant on subsurface conditions and/or access. Sample locations adjacent to buildings were as close to the building as practical given aforementioned site limitations.

Because there was little variation in lithology between the ground surface and 15 feet bgs at the sampling locations, only a single purge volume test was performed. Sample location SV-28-10', adjacent to the eastern side of the Cooper North Sump, was selected for this test because of the presence of sludge encountered by the boring within 2-feet of the surface increased the likelihood of detecting VOCs from the adjacent impounded sludge. Soil vapor samples were collected after purge volumes of one, three and seven times the volume of the sample tubing and probe annular space. The purge volume test resulted in all three samples being non-detect for VOCs. Therefore, three purge volumes was utilized as a default standard per the Workplan. The remaining soil gas survey points were then purged using this volume.

Soil gas samples were collected using syringes and delivered to an on-site mobile laboratory, H&P Mobile Geochemistry, a California Certified Environmental Laboratory, for VOC (USEPA Method 8260B and in certain cases, Method TO-15, as outlined in the workplan), hydrogen sulfide and methane analysis. Tedlar bags were used to collect soil gas samples that were tested by an off-site laboratory for methane, to provide greater data accuracy and precision. All appropriate chain-of-custody and sample handling protocols were followed.

For the purpose of QA/QC, one duplicate soil gas sample was collected per day for four of the six days and analyzed as outlined in the DTSC guidance document (DTSC, 2005a). Locations re-sampled for TO-15 analysis were considered adequate QA/QC for the other two days of sampling.

Following the approved Workplan, soil gas probes were removed and properly disposed of upon sampling completion. The boreholes were properly backfilled with bentonite grout.

3.11.4 Findings

The soil gas sample analytical results for VOCs (Method 8260B), hydrogen sulfide, and methane are presented on Table 33. The four specific duplicate samples for QA/QC display "2VS" following the sample location identifier. The two samples utilized for QA/QC that were analyzed by TO-15 were collected on 3/9/06 and 5/19/06. Analytical results for samples found

to contain VOC concentrations less than the detection limit for a particular COPC analyte by Method 8260B were subsequently analyzed by Method TO-15 and are presented on Table 34. Natural moisture content in the soil prevented the collection of soil gas at four locations (SV-05, SV-10, SV-20, and SV-27) and at depth for two others (SV-01 and SV-30). Figure 25 shows locations and concentrations of compounds detected during the active soil gas investigation.

Constituent concentrations reported above the detection limit for targeted VOCs (0.1 µg/l-vapor; Method 8260B) include benzene, toluene, ethylbenzene, m,p,-xylenes, o-xylene, 1,3,5-trimethylbenzene, and Freon 113. Concentrations ranged from non-detect (<0.1 µg/L-vapor) to 2.2 µg/L-vapor (toluene). Of the reported concentrations, benzene is generally chosen as a target compound of potential concern for human health risk assessments because of its carcinogenic nature and ability to be transported in the vapor phase; therefore, the results for benzene are summarized below. Additionally, hydrogen sulfide and methane were identified to be constituents for future risk analyses.

Benzene concentrations in the soil vapor samples ranged from non-detect (<0.1 µg/L vapor) to 0.3 µg/L-vapor (SV-19-05') by Method 8260B and from non-detect (<0.005 µg/L-vapor) to 0.260 µg/L-vapor (SV-19-05') by Method TO-15. Most of the soil vapor samples collected from throughout the investigation area exhibited less than or equal to 0.1 µg/L-vapor concentrations of benzene except for two sample locations, one in the northeast-central portion of the Haack Property (SV-11-05') and one in the west-central portion of Cooper Property (SV-19-05'). In these two locations, the 5-foot bgs samples were reported to contain benzene concentrations of 0.2 µg/L-vapor and 0.3 µg/L-vapor (Method 8260B), respectively. The associated deeper sample concentrations were less than 0.1 µg/L-vapor for each location (13-foot bgs and10-foot bgs, respectively).

Hydrogen sulfide concentrations in the soil vapor samples ranged from non-detect (<0.01 or <0.015 ppmv) to 5.1 ppmv (SV19-05') except for one sample location with the results of greater than 50 ppmv (SV-28-10'). Most of the soil vapor samples collected from throughout the investigation area exhibited less than or equal to 0.015 ppmv concentrations of hydrogen sulfide except those in a limited area in the west-central (SV-18 and SV-19) and east-central (SV-28 and SV-29) portions of the two Cooper sumps, a location in the southwest portion of the Haack sump (SV-01), and a location in the southwest portion of the Haack re-work area (SV-15).

Methane concentrations in the soil vapor samples ranged from non-detect (<10 ppmv) to 220 ppmv (SV28-05'). The soil vapor samples with concentrations greater than non-detect consisted of 7 shallow (5 feet bgs) and 11 deep (10, 13, or 15 feet bgs) sample intervals and were below 50 ppmv in 13 of the 18 samples. Copies of the analytical laboratory reports and chain-of-custody forms are included in Appendix I-5.

3.11.5 Interpretation

The results from the active soil gas sampling are to be used for future input to a Baseline Risk Assessment and are not intended to be interpreted alone. Thus, no evaluation has been performed with respect to attenuation or biodegradation of vapor phase components.

Overall, the data set does suggest that the areas with elevated vapor concentrations (benzene > 0.2 µg/L-vapor, methane > 50 ppmv, hydrogen sulfide > 50 ppmv) is limited to three locations, SV-11, SV-19, and SV-28. The reported benzene concentrations for all but two sample locations were within a comparably narrow range of non detect (<0.005 µg/L-vapor) to 0.1 µg/L-vapor, thus it is unlikely that benzene vapors will represent a potential human health risk at this site. Other reported VOCs are generally not considered target compounds of potential concern for human health risk and therefore the reported concentrations should not be considered a concern. Given the reported data set, only two locations (SV-03 and SV-28) had significantly elevated methane concentrations with respect to the other locations. The location of SV-03 is not near the locations of past sludge disposal. Only SV-28 was reported to have a hydrogen sulfide concentration (>50 ppmv) of potential concern.

3.11.6 Data Gaps

Since the preponderance of sludge has been documented through assessment activities to not extend deeper than 15 feet bgs, no additional temporary vapor probes are recommended at deeper depths than those already installed.

Natural moisture content in the soil limited the collection of soil gas at four locations and at depth for two others. However, this missing data is not believed to be a data gap.

3.11.7 Response to DTSC Comments on Active Soil Gas Investigation

DTSC comments regarding the active soil gas investigation and ARC responses are:

GC#3. We are unable to locate a section in the document which describes the findings from the soil gas sampling investigation.

ARC response: Findings from the soil gas sampling investigation are presented in section 3.11 of the revised draft RI report.

SC#13. Section 3.4, Active Soil Gas Investigation, pages 26 through 28

13a) The text should indicate whether soil gas samples were collected from between interbedded sludge layers and from, locations which reported elevated PID readings.

ARC response: Soil gas sample locations are discussed in section 3.11 of the revised draft RI report. Target depths were determined based on the findings of the sub-surface soil and sludge boring assessment and as near to the prescribed RI/FS Workplan depths of five feet and fifteen feet. Sample tubing was installed at two depths in each location, at 5- and 10-feet bgs, 5- and 13-feet bgs, or 5- and 15-feet bgs. The sampling depths were generally in sandy silt or sand based on the lithologic log of the boring compiled during installation or a nearby, previous drilled boring. Sample locations adjacent to acid-sludge sump boundaries were placed as close as possible to the respective sumps. Soil gas sample SV17-VS-05 was located between two

sludge layers. Soil gas samples SV19-VS-05 and SV29-VS-05 were located in sludge. Soil gas samples from soil having a Headspace PID value greater than 25 ppm were SV01-VS-07, SV11-VS-13, SV17-VS-05, SV24-VS-05, SV24-VS-13 and SV29-VS-05. Soil gas sample analytical results are presented in Tables 33 and 34.

13b) The text should indicate where the purge volume test was performed and provide the rationale for choosing that location.

ARC response: The purge volume test was performed at SV-28 at 10 feet. Rationale for this test location is discussed in section 3.11.3 of the revised draft RI report.

13c) The text indicates that all samples showed non-detect for the purge volume test. The location for performing this test was therefore not correctly identified.

ARC response: The location for the purge volume test was SV-28 at a depth of 10 feet. Soil vapor samples were collected after purge volumes of one, three and seven times the volume of the sample tubing and probe annular space. The purge volume test resulted in all three samples being non-detect for VOCs. Therefore, three purge volumes was utilized as a default standard per the Workplan. The remaining soil gas survey points were then purged using this volume.

13d) The text indicates that only one round of soil gas sampling was performed since all soil gas probes were removed once sampling was completed. We expected these probes to remain in place to allow additional sampling to evaluate temporal trends. We also note that the surface vapor flux investigation included two (2) rounds at each location (see Section 3.5) to "evaluate potential variations related to time of day, change in weather, and other ambient factors". Additional soil gas sampling will be necessary and should be included as a recommendation for further investigation.

ARC response: ARC complied with the approved RI/FS Workplan directions for performing the soil gas investigation. The first paragraph on page 41 of the RI/FS Workplan states that: “Secor proposes to advance 30 temporary direct-push soil gas survey borings at the locations shown on RI/FS Workplan Figure15”. The seventh bullet on page 41 of the RI/FS Workplan states that: “Soil gas probes will be removed and properly disposed of once sampling is completed, and the borehole will be properly backfilled with bentonite grout”. The RI/FS Workplan’s intent was for the soil gas investigation to be a single investigation. ARC does not believe that additional soil gas sampling is necessary or that it should be included as a recommendation for additional investigation.

3.12 IN-SITU AIR PERMEABILITY TESTING

In-situ measurements of the air permeability of shallow soils of the vadose zone were collected in conjunction with the active soil gas survey (Section 3.11) and were intended to provide site-specific data for input in an updated Baseline Risk Assessment that will target potential vapor intrusion into indoor air environment for future site redevelopment.

3.12.1 RI/FS Workplan Scope [§5.3.2.3 pg 41]

Per the approved Workplan, air permeability of the soil in the immediate vicinity of soil gas survey borings was proposed to be measured by in-situ air permeability testing at approximately ten percent of the soil vapor boring locations. In-situ testing was requested by DTSC's Human and Ecological Risk Division (HERD) toxicology unit during RI/FS Workplan review and approval (DTSC 2005a). In-situ air permeability testing was to be conducted as outlined in Appendix I of DTSC (2005b). If measured in-situ air permeabilities fell outside the range expected for the soil type based on comparison with those listed on the Johnson and Ettinger Model "intercalc sheet", then laboratory air permeabilities would be evaluated via laboratory method API RP40 (see Section 3.4).

3.12.2 Deviation from the Workplan

In-situ air permeability testing was conducted by Xpert Design and Diagnostics, LLC (XDD) through H&P Mobile Geochemistry. XDD recommended testing using a two-dimensional analytical airflow model, in addition to the standard analytical method presented by the State of California in their Vapor Intrusion Guidance Document (DTSC 2005b). The primary concerns with using the methodology recommended in the State of California Vapor Intrusion Guidance Document for air permeability testing and analysis are:

- The limitations of using an injection only test procedure, and
- The use of a water flow model to interpret data when testing a low permeability soil.

The issue of using an injection only approach is that the testing can result in the determination of an effective air permeability that does not exist. Per XDD, soil that is saturated with water would be a significant deterrent to vapor migration. When using an injection only test, however, air can be pushed through the saturated pores, which would indicate that air permeability exists. During the extraction portion of the testing, the soil pore water can be drawn towards the sand pack, creating a "water seal". The water seal can result in high measured vacuums (greater than 28 inches of mercury) and low extraction rates (less than one cubic foot per hour). This is the primary reason why XDD's recommended test procedure includes both injection and extraction of air. If the soil moisture is not a significant factor in the movement of vapors through the soil then the results of the extraction and injection testing are expected to provide a very similar air permeability value.

The second issue is that the equation to determine the effective air permeability as presented in the State of California Vapor Intrusion Guidance Document is amended from a water flow

equation that assumes an incompressible fluid. This assumption can cause a poor estimate of the effective air permeability for less permeable or wet soils as it does not account for the compressibility of gas in the smaller soil pores.

3.12.3 RI Execution

On March 13, 2006 five point permeability tests were performed at five of the active soil vapor probe locations, SV-07, SV-11, SV-18, SV-24, and SV-28. The probes were screened from 5.5 to 6 feet bgs (Appendix L). Both injection and extraction testing were planned for all five test locations but were only successful at three of the five locations. An extraction test was not performed at SV-07 as bubbling was observed at the top of the surface seal during the injection portion of the test indicating short circuiting within the well borehole. No injection testing was performed during the testing of SV-18 as the extraction test demonstrated that a water seal had been created resulting in a very high vacuum (28-inches of mercury) and an associated very low extraction rate (0.02 cubic feet per minute). SV-18 also contained four inches of standing water at the bottom of the vapor probe prior to testing.

Prior to the testing, complete head loss measurements for all combinations of flow rates and injections/extraction scenarios were completed on-Site as outlined in XDD's SOP (Appendix T). At each location the point permeability test system was connected to the vapor probe via tubing and fittings. The pump was then turned on with the flow valve completely open and the system was allowed to stabilize; air flow rates and pressures were measured and recorded under these conditions. Pending the flow and vacuum readings, variable results were changed by adjusting the flow control valve. Where possible, three readings were attempted at each location.

Soil samples were collected and analyzed at four locations, SV-02, SV-07, SV-18, and SV-28 as part of the physical properties (geotechnical) analysis prior to in-situ sampling via method API RP40. Samples were collected at two sample depths, approximately 5 and 15 feet bgs, at each location for analysis (see Section 3.4).

3.12.4 Findings

The results of the point permeability analysis for the five test locations (SV-07, SV-11, SV-18, SV-24, and SV-28) are presented in Table 35. Both injection and extraction testing were performed at all but two (SV-07 and SV-18) of the five test locations. Injection air permeability values were calculated for SV-07, SV-11, SV-24, and SV-28. Extraction air permeability values were calculated only for SV-24. Results obtained at SV-07 should be considered suspect because of the potential short circuiting discussed above. The soil pores in SV-18 are considered saturated and the air permeability is essentially zero based on the field conditions described in the previous section.

Mean air permeability values by injection from locations SV-07, SV-11 and SV-28 were approximately 7.5E-09 cm^2, 8.5E-11 cm^2 and 2.4E-09 cm^2, respectively. Under extraction testing the induced vacuum at locations SV-11, SV-18 and SV-28 pegged at its maximum value with no measurable air flow, which would suggest that in these test locations the soil pores were

saturated with water. Geotechnical analysis of the shallow (approximately 5 to 6 feet bgs) soil samples from locations SV-07, SV-18 and SV-28 contained between 63% to 85% silt and clay particles and had moisture contents ranging from 11% to 24% (Appendix M).

One location, SV-24, demonstrated a reliable of 85 percent silt and clay particles and had moisture contents ranging between 11 to 24 percent (Appendix T). The analytical results for laboratory air permeability testing by Method API RP40 for SV-07 (at 6.4 feet bgs) and SV-28 (at 5.7 feet bgs) was 70.3 millidarcy (6.9E-10 cm^2) and 0.088 millidarcy (0.8E-12 cm^2). Two other shallow soil laboratory air permeability measurements had values of 2.8E-10 cm^2 and 9.0E-10 cm^2 (Appendix T). The in-situ air permeability values by injection provided a slightly greater value than those obtained by the laboratory air permeability testing (Section 3.4). and comparable response to both injection and extraction testing with a calculated mean permeability between 1.6E-7 to 2.0E-7 cm^2 (Table 35). Based on discussion with Site personnel the description of the soils in SV-24 was from a sandy material to variable silts and sands. Though SV-24 was not logged, the nearby CPB24 log reported sand and brick debris at the screened interval of the probe (5.5 - 6 feet bgs).

3.12.5 Interpretation

Based on the air permeability testing results for three of the four valid locations (SV-07 results considered questionable due to potential short circuiting), at the time of testing it appears that the soil pores contained abundant soil moisture to possible saturation with water at locations SV-11, SV-18, and SV-28. A review of the boring logs for the soil vapor probe locations that were logged revealed that moist soil was visually documented at the 5.5 - 6 foot interval on all logs, which further supports the finding that water is present in the soil pores.

Only the test data from SV-24 showed a validated air permeability value (10E-7 cm^2) representative of unsaturated sandy soils. The measured in-situ air permeability was comparable to the soil type observed in the field and logged in adjacent boring (CPB26). Thus, it would appear that the SV-24 result, being obtained from coarser grained material (primarily sand with brick fragments), would represent the greatest air permeability when considering vapor migration at the Site.

During this investigation the predominant sandy silts were found to be moist in the majority of the borings and the air permeability results for a sample collected in the moist sandy silt, SV-18, was indicative of saturated soil pores. The presence of moisture documented on the boring logs in conjunction with no flow rates for the extraction testing in three of the four sampling locations suggests that soil pores have high moisture content at these locations. If the moisture is representative of overall Site conditions potential vapor migration would be severely reduced. The moist soil content may likely be perennial as the result of seasonal surface infiltration since much of the property is uncovered and seasonal rains had occurred prior to the sampling dates. Vapor sampling had been postponed throughout the spring months due to storms and standing water on the Site. The moist soil conditions in shallow soil samples were not indicative of perched groundwater, but more likely represent the infiltration of precipitation runoff from the impermeable caps over the sumps and tenant areas on the Haack property.

The results from the two methods of analysis, in-situ air permeability from SV-24 and laboratory air permeability testing, are in general agreement with the soil type present beneath the Site (Section 3.4). These findings are further supported by the visual descriptions logged in the boring logs.

3.12.6 Data Gaps

In-situ and laboratory results for air permeability can have variable results and in some instances accurate and precise measurements of air permeability can not be made due to the natural moisture content of the sediments. Samples submitted to the laboratory for physical properties testing also had results influenced by moisture when the water content rose above 20 percent by weight. The presence of moisture in soil pores of the fine-textured sediments of the vadose zone is most likely a result of infiltration from seasonal rains that had occurred prior to the RI field activities.

The very moist to potentially saturated condition at 5.5 to 6 feet below grade, as suggested by the soil vapor in-situ permeability study, does not indicate perched groundwater based on other evidence. Boring logs from boring (SV07, HPB04, SV18, and SV28) adjacent to four test locations indicated moist silt (ML) at 5.5 to 6 feet below grade, while the fifth location (SV24) indicated silt (ML) with 70 percent brick fragments. Location SV24 was the only location to provide a valid air permeability test. HERD, on page 3 of their March 4, 2008 comment letter, recommended that soil physical property laboratory measurements be used for the Johnson and Ettinger Model because in HERD's experience in-situ soil vapor permeability values fall outside the range expected for the soil type. However, in-situ air permeability testing at soil vapor location SV-18 (depth of 5.5 to 6 feet bgs) could not be performed because four inches of standing water existed at the bottom of the vapor probe prior to testing. ARC will evaluate the presence of this possible perched zone by installing a temporary well point screened across this depth interval at location SV-18 to determine if perched groundwater exists at this location.

Due to the comparable data from both the in-situ and the laboratory results, laboratory testing is sufficient for future analysis and no further in-situ testing is recommended. Physical properties testing in the laboratory also provide critical data such as specific moisture content and saturation values.

3.12.7 Response to DTSC Comments on In-Situ Air Permeability Testing

DTSC comments regarding the in-situ air permeability testing and ARC responses are:

SC23. Section 4.5.1, Soil Vapor and Air Pathway Analysis, pages 45 through 47

23a) The text indicates that four (4) of the five (5) test locations yielded questionable or unusable air permeability results due to either short circuiting or saturated conditions at the sampling depth of 5.5 to 6 feet below grade. The finding of saturated or perched groundwater conditions is also very important and should be discussed in section 5.0 of the document which

details the updated conceptual site model. Also, monitoring and analysis of the perched zones should be identified as a data gap and included as a recommendation for further investigation.

ARC response: ARC believes that the "saturated" conditions (perched groundwater) at 5.5 to 6 feet below grade as suggested by the soil vapor permeability study does not occur at the Site. Boring logs from borings (SV07, HPB04, SV18 and SV28) adjacent to four test locations indicated moist silt (ML) at 5.5 to 6 feet below grade, while the fifth location (SV24) indicated silt (ML) with 70% brick fragments. Location SV24 was the only location to provide a valid air permeability test. HERD in their March 4, 2008 comments (page 3) recommended that soil physical property measurements be used for the J&E model because in HERD's experience in-situ soil vapor permeability values fall outside the range expected for the soil type.

23b) The possible occurrence of shallow perched groundwater is a data gap that will need to be addressed.

ARC response: In-situ air permeability testing at soil vapor location SV-18 (depth of 5.5 to 6 feet bgs) could not be performed because four inches of standing water existed at the bottom of the vapor probe prior to testing. ARC will evaluate the presence of this possible perched zone by installing a temporary well point screened across this depth interval at location SV-18 to determine if perched groundwater exists at this location.

3.13 SURFACE VAPOR FLUX INVESTIGATION

One of the exposure pathways identified in the BHHRA was outdoor inhalation of vapors emitted by acid sludge or contaminated soil (Tetra Tech, 1995).

3.13.1 RI/FS Workplan Scope [§ 5.3.2.4 pg 43]

As part of the approved RI/FS Workplan (SECOR, 2005) scope, Dr. C. E. Schmidt conducted an Air Pathway Analysis (APA) for project-specific VOCs and hydrogen sulfide related to compounds found in the subsurface on-Site. The APA consisted of measuring the surface flux of VOCs, hydrogen sulfide and methane at 24 sample locations shown on RI/FS Workplan Figure 16. These locations test flux at diverse surfaces including:

- Exposed, undisturbed acid sludge on the Cooper Property;
- Exposed, disturbed acid sludge on the Cooper Property;
- Soil on both the Cooper and Haack Properties; and
- Asphalt and concrete-slab covered soil on the Haack Property.

A detailed and robust field program was to be conducted and flux measurements were to be made using the USEPA recommended surface flux chamber. The surface flux chamber testing was to be conducted at the 24 locations shown on RI/FS Workplan Figure 16. Table 16 of the RI/FS Workplan contains a description of the rationale for each flux chamber sample location. Two rounds of flux sampling were proposed at each location to investigate potential variations related to time of day, change in weather and other ambient factors. Ambient levels of COPCs in air at the Site were to be determined based upon collection of ambient air samples in Summa Canisters at approximately ten percent of the flux sample locations (see discussion in this section, below).

Flux sample test locations were selected based on historic Site characterization data and data gaps in previous studies. Flux tests were proposed on open soil over the subsurface sumps on the Haack Property and directly on acid-sludge material in the Cooper Property sumps in an attempt to obtain maximum or ”worst-case” surface emission locations. Where measurements are made directly on acid-sludge material, 50% of the sample population was to be from “undisturbed” sludge, while 50% was to be from both “undisturbed” and “disturbed” sludge in the same location in an effort to provide data relevant to any future remedy involving in-situ processing and treatment of sludge. Prior to sampling both “undisturbed” and “disturbed” sludge, a portable covered plywood sampling platform (described in Metcalf & Eddy, 1992) was to be emplaced, and for “disturbed” samples, the sludge was to be prepared as described in Metcalf & Eddy (1992). In addition to characterizing the emissions from the sumps by testing outdoor open soil, testing was proposed to be conducted at likely infiltration points on a limited amount of exposed asphalt and concrete slab at the Haack Property.

Ambient levels of COPCs were to be determined by collection of ambient air samples. Along with the outdoor flux chamber testing, a limited number of outdoor ambient air data was to be collected to provide a comparison of actual, screening level air quality to calculated air quality using the flux data. These ambient air samples were to be collected at approximately 10% of the flux locations using Summa Canisters. Table 16 of the RI/FS Workplan identifies the locations for ambient air samples. Samples were to be analyzed for the same analytes as the flux samples. The proposed flux chamber data collection was designed to provide measured Site area source emission characterization data assessing the maximum or 'worst-case' and representative potential surface emissions of VOCs for conducting health risk assessments considering the outdoor inhalation pathway of exposure.

Quality Control (QC) testing was proposed for both flux chamber testing and ambient air testing. Flux chamber quality control testing was to include two flux chamber system blank tests, three replicate flux tests, two open soil background flux tests, and two slab infiltration background flux tests. Ambient air quality control testing was to include two media blank tests (applicable also to the flux quality control data set) and one replicate sample. Flux chamber measurements were to be performed following the USEPA flux chamber protocol and ambient air measurements were to be collected as eight-hour integrated air samples. All surface flux and ambient air samples were proposed to be shipped off-Site for detailed analysis following USEPA Method TO-14/ gas chromatography mass spectroscopy (GC/MS) operated in the Selective Ion Mode (SIM) for a list of project specific VOCs (see QAPP, Appendix A). QC data was be used to determine acceptable laboratory (lab blank, lab replicate, and matrix recovery data) and field (system blank) data. All field data was proposed to be qualified using the method blank, field blank, and field background QA/QC data.

The goal for collecting open soil flux data was to study the source of potential exposure to people using future structures such as an outdoor parking lot over the subsurface sump area assuming a possible scenario of "no treatment or removal" of acid sludge and to establish a possible pathway for infiltration. The open soil flux data would be compared to project QC data (lab blanks and field blanks) and background open soil and infiltration flux data (away from the sumps but affected by ambient air). Data above the flux determined for the QC data set would be considered related to the sumps. An evaluation of these data would be made to evaluate whether measurable levels of study compounds are found above QC qualifying limits relative to the acid-sludge source, including: benzene and hydrogen sulfide at locations tested both on- and off-Site on neighboring property.

The open soil flux levels for these compounds were proposed to be used in calculating an estimate exposure outdoors (RI/FS Workplan §5.6). Open soil flux adjacent to the building slab, or at any on-Site location, would be used as input for risk assessment models for calculation of outdoor air, endpoint concentration.

The infiltration flux data was to be compared to project QC data (lab blanks, media blanks, field blanks, and infiltration background data) and any uncracked slab flux data. Data above the QC data set would be considered related to the acid sumps. The infiltration flux data and an

estimate of linear feet of seam per surface area will be used to calculate estimated exposure indoors using the model (USEPA, 2003a).

3.13.2 Deviation from the Workplan

Olfactory screening for 20 of the 24 locations was performed by the Odor Science & Engineering, Inc. Olfactory Laboratory located in Bloomfield Connecticut. This was an additional task performed which was not included in the RI/FS Workplan.

3.13.3 RI Execution

An air pathway analysis was conducted on the Site for the purpose of assessing air impact potential from the Site in its current undisturbed, covered site condition and from a disturbed surface site condition. The technical approach to the project included a single field trip with ambient air testing (screening level), undisturbed waste Site emissions testing, disturbed waste emissions testing, soil gas infiltration emission testing through a slab-on-grade structure (slab over waste and asphalt surrounding a structure) located on the Haack Property, and 'Olfactory' odor analyses. The ambient air data set, although limited, can be used to verify modeled air concentrations from the Site using the undisturbed condition flux data or to demonstrate current ambient air levels of compounds known or suspected to be related to the waste materials on-Site. The air pathways analysis data set can be used to estimate air emissions from the Site in the undisturbed state (open soil flux data- undisturbed condition), from various waste excavation and waste handling scenarios (open soil flux data- disturbed condition) and from soil gas infiltration through cracks/seams in slab-on-grade structure (infiltration flux data). The 'Olfactory' odor data can be a useful parameter for site remediation investigation work and may come into play regarding allowable site odor emissions during site disturbance activities.

The air pathway analysis included open soil flux chamber and odor testing on the facility property at a total of 20 identified surface locations, ambient air testing at four collocated test locations, and infiltration flux testing at four surface locations (Haack Property only). Open soil flux chamber testing was performed on the undisturbed surface of the sumps on 20 of the Site locations, infiltration testing was performed on four of these locations (surface coverings-cement slab), and then nine of the open soil locations were tested as disturbed waste material (surface waste removed and fresh waste tested). The total flux testing for the program included testing on 24 locations, nine of which were disturbed; plus background, control point, replicate, and system blank samples for a total of 61 samples. Collection of samples for odor analyses was from flux and infiltration locations. The odor samples were collected during the four days of field activities and included blanks, background, and recheck samples, too. Outdoor ambient air samples (8-hour integrated ambient air samples) were collected at approximately five feet above the ground surface at four selected locations plus blank samples and a replicate sample for a total of seven samples. Test data representing the variability in flux as related to time-of-day and day-to-day variability was also collected. These data can be used to establish confidence in the emissions estimates and provide data qualification regarding data use. A total of 61 samples were collected. The analytical methods used in the air pathways analysis included:

- ASTM Method D-3416 for methane,
- ASTM Method E679-04 (D/T) and E-544-99 for Odor,
- EPA Method TO-14 (GC/flame ionization detection- FID) for petroleum related VOC's,
- EPA Method TO-14 for speciated, reduced sulfur compounds including hydrogen sulfide, mercaptans, and thiophene and sulfur dioxide, and
- EPA Method TO-15 (GC/mass spectroscopy operated in the selective ion mode- SIM) for selected VOC's.

Table 36 summarizes the data collected during the air pathway analysis and presents the highest measured value for each compound listed for the ambient air testing, undisturbed waste site emissions testing, disturbed waste emissions testing, and soil gas infiltration emission testing. The complete text and analytical results for the vapor flux investigation conducted at the Site is located in Appendix U. The TO-14 GC-FID method provided a "total non-methane hydrocarbon" (TNMHC) summation value.

3.13.4 Findings

The laboratory and field quality control data indicate acceptable sampling method performance during the testing.

Ambient Air: Methane and select VOC's were reported above the QC criteria and/or reporting limit in the four ambient air samples collected. The detected analytical results are summarized in Table 4-2 of the report in Appendix U. A table listing the top six detections per analytical method is shown below:

Compounds	Maximum Detection (µg/m3)	Location of Maximum Detection
Methane ASTM D3416	1,200	CPB-11
VOC METHOD TO-15 (GC/MS)		
Acetone	140	CPB-2
Toluene	30	HPB-6
2-Butanone	17	HPB-6
M & p-Xylene	4.9	HPB-6
VOC METHOD TO-14 (GC/FID)		
Ethanol	240	HPB-6
Methanol	85	HPB-6
Acetone	66	CPB-2
n-Decane	52	CPB-17
Ethylbenzene	36	HPB-6
b-Pinene	34	CPB-2

Undisturbed: The 20 open (undisturbed) soil flux samples were reported to have specific compounds above the QC criteria and/or reporting limit. The analytical results for the detected concentrations are summarized on Table 5-2 of the report in Appendix U. A table listing the top six detections per analytical method is shown below:

Compounds	Maximum Detection (µg/m2,min-1)	Location of Maximum Detection
Methane ASTM D3416	32	CPB-3
Odor ASTM E679-91 (D/T)	6.3	CPB-17
Sulfur METHOD TO-14		
Sulfur Dioxide	25	CPB-14
Dimethyl Disulfide	1.6	HPB-11
VOC METHOD TO-15 (GC/MS)		
Acetone	15	CPB-5
Carbon disulfide	9.4	CPB-18
Napthalene	8.4	RB-3
Chloromethane	6.7	CPB-3
2-Butanone	4.0	CPB-5
Tetrachloroethene	3.9	HPB-6
VOC METHOD TO-14 (GC/FID)		
TNMHC	260	CPB-5
b-Pinene	63	CPB-5
Acetone	25	CPB-5
Napthalene	11	RB-3
2-Ethyltoluene	6.2	CPB-2
i-Pentane	5.1	CPB-12

Disturbed: The nine disturbed flux samples were reported to have specific compounds above the QC criteria and/or reporting limit. The analytical results for the detected concentrations are summarized on Table 6-2 of the report in Appendix U. A table listing the top six detections per analytical method is shown below:

Compounds	Maximum Detection (µg/m2,min-1)	Location of Maximum Detection
Methane ASTM D3416	33	CPB-11X
Odor ASTM E679-91 (D/T)	14	CPB-5X
Sulfur METHOD TO-14		
Sulfur Dioxide	26,000	CBP-17X
Dimethyl Disulfide	25	CPB-12X
Thiophene	9.5	CPB-12X
Hydrogen Sulfide	2.1	CPB-12X
2-Ethythiophene	1.6	CPB-12X

VOC METHOD TO-15 (GC/MS)		
Acetone	59	CPB-2X
2-Butanone	22	CPB-2X
Carbon disulfide	9.4	CPB-18
Toluene	5.0	CPB-17X
M & p-Xylene	4.1	CPB-17X
1,3,5-Trimethylbenzene	2.8	CPB-3X
VOC METHOD TO-14 (GC/FID)		
TNMHC	410	CPB-5X
Acetone	65	CPB-2X
b-Pinene	63	CPB-5X
3-Methyl 1-Butene	21	CPB-14X
2,3-Dimethylpentane	6.9	CPB-17X
m,p-Xylene	6.3	CPB-5X

Infiltration: Specific compounds were detected above the QC criteria and/or reporting limit for each of the infiltration flux samples; reported concentrations are summarized in Table 7-2 of the report in Appendix U. A table listing the top six detections per analytical method is shown below:

Compounds	Maximum Detection (µg/ft,min-1)	Location of Maximum Detection
Methane ASTM D3416	2.2	HPB-1
Odor ASTM E679-91 (D/T)	0.064	HBP-2
Sulfur METHOD TO-14		
Sulfur Dioxide	0.17	HPB-2
VOC METHOD TO-15 (GC/MS)		
Toluene	0.16	HPB-3
M & p-Xylene	0.075	HPB-3
Benzene	0.073	HPB-3
o-Xylene	0.031	HPB-3
Hexane	0.021	HPB-3
n-Heptane	0.020	HPB-3
VOC METHOD TO-14 (GC/FID)		
b-Pinene	3.2	HPB-3
d-Limonene	0.48	HPB-3
Toluene	0.12	HPB-3

3.13.5 Interpretation

The data sets resulting from the undisturbed, disturbed and infiltration sampling can be used to estimate specific variables independently or collectively to evaluate the potential air pathways as related to existing and/or future property uses. The air emissions in the undisturbed site condition can be used to provide baseline air emission estimates from the current condition of the Site which may be used to support remedial alternatives. The disturbed flux data set can be

used to estimate air emissions as related to the shallow disturbance of sludge in sumps on the Cooper Property and Haack Property. The infiltration flux data findings can be used in conjunction with other known variables to indicate air emissions to the atmosphere or into a structure with similar slab integrity. This data can be used to estimate a slab attenuation factor in conjunction with the undisturbed or disturbed flux data from the material below the slab. The data will be considered in the CSM presented in Section 4.0.

Ambient Air: Detected methane levels are typical of global, outdoor ambient air. Detections of VOC's on the Haack property are most likely related to industrial activities on the property and not from undisturbed surface emissions from the nearby sumps. The VOC's detected on the Cooper Property may be related to the the presence of sludge in the sumps.

Undisturbed: The undisturbed condition can be generally characterized as having low to moderate area source emissions with the Cooper property locations generally having more compounds detected and higher emissions than the Haack property locations. The Haack property locations generally have more compounds detected and emissions higher than the Residential property locations. The Cooper property locations occurring over sludge generally had higher air emissions and more compounds detected as compared to the locations on the berms around the two Cooper sumps.

Disturbed: The disturbed condition can be generally characterized as having moderate to high area source emissions as compared to the undisturbed condition, with many compounds showing high emissions compared to low or no emissions in the undisturbed condition. Note the high sulfur dioxide emissions, higher reduced sulfur compound emissions and elevated hydrocarbon compound emissions, in particular the oxygenated compounds, as compared to the maximum detected compounds for the undisturbed condition. Odor analyses confirmed the potential for sulfuric compounds from disturbed sludge to create nuisance odors to people in the area or down wind of the disturbed sludge.

Infiltration: The flux chamber was used to test the air emissions through seams and cracks in the slab and on asphalt around the structures at four locations on the Haack property. Compounds having the maximum detections represent a different mixture of sulfur and hydrocarbon compounds as detected in the undisturbed state indicating that the compound emissions are greatly affected by the surface coverings and slab.

Ambient air levels and odor analyses data sets are limited and subjective, respectively, and thus the interpretation of the limited data set or use in estimations should be limited.

3.13.6 Data Gaps

No data gaps or requirements for further collection of surface vapor flux data are noted.

3.13.7 Response to DTSC comments on the Subsurface Vapor Flux Investigation

There were no DTSC comments regarding the subsurface vapor flux investigation.

4.0 UPDATED CONCEPTUAL SITE MODEL

The Site had been investigated by various parties for more than 25 years prior to the initiation of field investigations for this RI. There were three stated goals for this RI in order to build on work performed in previous studies of the Site. These goals were:

- Determine the depth and extent of sumps on the Haack and Cooper properties;
- Conduct groundwater monitoring; and
- Gather data for updating the 1995 Baseline Risk Assessment.

The data gathered to achieve these three goals was also used to update the Conceptual Site Model (CSM). A CSM is a representation of the relationship between contaminant sources, release mechanisms, environmental transport, exposure pathways, and receptors. American Society for Testing and Materials International (ASTM 1995) expands this description by listing the following six basic activities associated with developing a CSM:

1. Identification of Contaminants of Potential Concern (COPC);
2. Identification and characterization of the source(s) of COPC;
3. Delineation of potential migration pathways through environmental media, such as groundwater, surface water, soils, sediment, biota, and air;
4. Establishment of background concentrations of contaminants for each contaminated medium;
5. Identification and characterization of potential environmental receptors (human and ecological); and
6. Determination of the limits of the study area or system boundaries.

The Preliminary CSM was prepared by Stantec prior to initiation of RI fieldwork and is presented in section 2.7 to section 2.13 to provide the reader a detailed conceptual framework for interpreting the results of this RI.

During the execution of the RI field investigations and subsequent analysis of field and analytical data it became evident that the Site specific lithologic, stratigraphic, and hydraulic data do not support the Preliminary CSM presented in section 2.7 of this report. While the changes to the CSM are hydraulically significant, they have no impact on the potential sources of contaminants, background concentrations of contaminants, potential migration pathways, potential receptors, or the limits of the study area.

The updated CSM has the same COPC's as the preliminary CSM. A detailed discussion of the COPC's is given in section 2.8. The principal contaminants associated with potential future risk from exposure to soil and sludge that were identified in Tetra Tech's 1995 BHHRA are:

- chrysene;
- benzo(b)fluoranthene; and
- benzo(a)pyrene.

The field data collected from more than 300 soil and sludge samples as part of this RI have confirmed the following about COPC's identified in section 2.8.

- The sludge contains elevated concentrations of SVOC's, in particular, PAH's.
- The sludge has low pH (i.e., acidic) ranging from 1.3 to 3.7.
- The sludge contains sulfides, residual sulfuric acid, and entrained sulfur dioxide gas.
- Several compounds and metals were detected in soil and sludge samples including: anthracene, benzene, chromium, copper, hydrogen sulfide, lead, methyl anthracene isomers, methyl ethyl benzene, methyl fluorine, nickel, phenanthrene, pyrene, sulfur dioxide, toluene, trimethylbenzene, and trimethylnaphthalene isomers.

Based on the results of the RI field investigation the three COPC's listed above still represent the three principal contaminants identified as COPC's. No new COPC's were identified.

The 1995 BHHRA, based on its analytical results, did not find any exposure risk to potential receptors from groundwater at the Site. This RI confirmed the lack of contaminants in the groundwater in the vicinity of the Site. Therefore, no COPC's are identified in the shallow groundwater beneath the Site. According to the 1995 BHHRA, the key potential vapor airborne compounds with respect to potential future risk exposure in a scenario where the cover and fencing is not maintained on the Cooper Property and cover is not maintained on the Haack Property were:

- benzene; and
- hydrogen sulfide.

No new COPC's for potential vapor airborne compounds were identified as part of this RI.

Figure 26 depicts an updated CSM Block Diagram that shows the conceptual relationship between sumps, soil, groundwater flow within the upper and lower hydraulic zones, and deeper regional aquifers. A quick comparison of Figure 26 to Figure 7 shows that the most significant change to the preliminary CSM is the recharacterization of distinct, hydrogeologically delineated, hydraulic zones within the Bellflower Aquiclude beneath the Site. Prior to this RI the delineation of these permeable zones was based on limited and inconsistent boring data from MW's in the vicinity of the Site.

Section 2.1 of this report describes the historical background of the site, including some of the limitations of previous investigations. The RI/FS Workplan identified the data gaps that existed and presented a plan to obtain the data necessary to better define the CSM, which is presented below.

The following sections describe the various surface and subsurface elements that constitute the Site. They also address how these various elements interact with respect to the sludge and other physical and chemical forces based on the results of field investigation conducted as part of this RI and previous investigations.

4.1 TOPOGRAPHY AND SURFACE WATER

Early topographic maps show that the eastern half of the Site was elevated near the beginning of the 20th century and local surface drainage was towards the north and east. Detailed interpretation of historic aerial photographs suggests three major episodes of grading have occurred on the Cooper property and the northern Haack property. These include excavation of above grade material, excavation of the clay source pits, and deposition of sludge in the excavated pits to bring the property to the present grade. The southern portion of the Haack property and the residential property exhibits a more complex history. This area has been partially excavated and backfilled, and reworked and recontoured at various times over the past 100 years. Soil and other debris material from other portions of the Site have been moved onto the eastern portion of the Residential Area and the southern portion of the Haack property. The southern portion of the Residential Area has even been recontoured since the major field investigations for this RI were completed. The former creek west of the Site has been diverted to a concrete lined channel, south of the Site called the Dominguez Channel, which is the major stream channel draining the area.

Surface water chemistry in the vicinity of Site is defined by the chemistry of the water flowing within the Dominguez Channel. The quality of Dominguez Channel water is worse than the quality of the groundwater beneath the Site, measured in either the upper or lower hydraulic zones. Some VOC's, including tetrachloroethene and trichloroethene, have been measured in the Dominguez Channel where none were observed in any groundwater samples taken from Site monitoring wells. The concentrations of total metals were nearly identical in the upstream and downstream surface water samples (Table 29). When compared to metals concentration of the Site's groundwater from the upper hydraulic Zone A, the concentrations of antimony, molybdenum and nickel in surface water were more than twice the concentrations measured in groundwater. The concentrations of barium, lead, and copper measured in surface water were more than triple the concentrations measured in groundwater beneath the Site. No metal concentrations were measured in groundwater from the upper hydraulic zone that exceeded the metals concentrations found in the surface water.

The sludge contained in the sumps and Haack Rework Area does not impact the surface water in the Dominguez Channel. Also, water in the Dominguez Channel does not appear to impact the quality of water beneath the Site.

4.2 SUMPS AND SLUDGE

The subsurface investigations of the RI were successful in demarcating the depth and extent of sumps on the Haack and Cooper properties (sections 3.1, 3.2, and 3.3). Additional borings will be drilled along the northern Haack property line and east of the Cooper property to complete delineation of shallow sludge deposits. There are approximately 21,400 cubic yards of sludge contained within the sumps on the Haack and Cooper properties and in the Haack Rework Area. The sludge within each sump is similar in chemical composition and possesses similar physical properties. The sludge near the base of the Cooper South Sump appears to be slightly

less viscous then the sludge in the other two sumps, but the difference is small and is not likely to have any influence on proposed remedial alternatives.

Previous investigators had overestimated the depth and volume of sludge at the Site (sections 2 and 3). A key finding of the initial borings at the Site was that standard sampling protocol l resulted in inaccurate determination of the depth and thickness of sludge deposits (section 3.1 and 3.3). Therefore, although early investigators, particularly on the Haack property and near the periphery of the two Cooper sumps reported encountering sludge when drilling, the estimated sludge thickness was more likely greater than the actual thickness. An important finding of this RI was that over 95% of the sludge within the sumps occurs above the groundwater level of the hydraulic A zone. Therefore, since the sludge, which has very low permeability, is in the Vadose zone, and not the saturated zone the likelihood of COPC's being leached from the sludge by groundwater beneath the Site is substantially reduced.

Bench scale treatability testing of the sludge suggests that the sludge material is unsuitable for use as recycled asphalt for road construction or roofing since it has high viscosity, high solids content, and no ductility. Although treatability testing shows that the sludge can be effectively treated, treatment would require disturbance of the sludge. Hydrogen sulfide and sulfur dioxide will be released if the sludge is disturbed. The treatability testing and Stantec's field experience during drilling operations at the Site indicate the viscosity of the sludge is temperature dependant. Changes in ambient temperature of 20 or 30 degrees Fahrenheit affect the viscosity of the sludge. Isolating, or rather insulating, the sludge from fluctuations in temperature of more than a few degrees may be a consideration when evaluating remedial alternatives.

Based on previous investigations and data collected during this RI, if the sludge is not disturbed and it is physically isolated from the ground surface, the sludge does not pose a threat to local groundwater or air quality. In addition, the sludge has only impacted the surrounding soil at distances of a few feet from the soil/sludge contact (section 3.1).

4.3 VADOSE ZONE

The findings of Stantec's field investigations pertaining to sediment beneath the Site are discussed in section 3.1. This investigation documented that the vadose zone at the Site predominantly occurs at an elevation above six feet msl, which is approximately 14 feet bgs in the vicinity of the two Cooper sumps. The extensive amount of subsurface investigations has confirmed that the near surface sediment beneath the Site, which is part of the Bellflower Aquiclude, was primarily laid down by fluvial processes. The vadose zone sediment is primarily fine grained clay and silty clay (sections 3.3 and 3.4). Sandier sediments were deposited in layers that are not laterally extensive. Overall the vadose zone sediments exhibit very low to low permeability to vapor transport (sections 3.4 and 3.7).

In 2006 the vadose zone had localized areas, such as thin silty sand lenses that were wet. The wet soil conditions in the vadose soil samples were not indicative of significant perched groundwater due to the limited lateral extent of observed wet conditions. The water in these wet

lenses is not able to migrate far because of the discontinuous lateral extent and low hydraulic conductivity of the wet lenses and the strong capillary forces that retain the water within the pores of these sediments.

Near the upper hydraulic A zone wet sediments occur within the capillary fringe where the water is held by capillary force. The elevation of first encountered water varied from boring to boring across the Site and did not represent a uniform potentiometric surface. The artesian nature of the upper hydraulic A zone produced a uniform potentiometric surface across the Site.

Based on the chemical analyses of more than 300 sludge and soil samples (sections 3.1 and 3.5) leaching and migration of hydrocarbons and COPCs from the sludge into the soil was minimal. While there are a few isolated areas where some migration of hydrocarbons and COPCs occurred, the migration of these compounds is limited to a distance of a few feet from the soil/sludge contact. Since the sludge was emplaced more than 65 years ago migration of COPCs and other sludge constituents does not appear to have impacted groundwater beneath the Site.

The results of in-situ air permeability testing, active soil gas testing, and surface vapor flux testing suggest that vapors could migrate through the vadose zone. However, although vapors could migrate through the vadose soils, off-gassing and generation of vapors by the sludge in its present undisturbed state does not impact the environment. Hydrogen sulfide and other vapors could be released from the sludge if it is disturbed.

4.4 SATURATED ZONE

Site sediments below approximately five feet msl are saturated and have variable permeabilities. Two zones of higher permeability have been identified beneath the Site, the shallow hydraulic A zone and the deeper hydraulic B zone. The upper hydraulic A zone is partially confined and represents the start of the saturated zone beneath the Site. The upper hydraulic A zone varies in thickness across the Site but generally occurs from 5 feet to -5 feet msl. Approximately 50 feet of saturated predominantly clay, silty clay and silt separate the upper A and lower B hydraulic zones. There is a distinctive shell layer, which is several inches thick, at approximately -30 feet msl within the sediments separating the two hydraulic zones. The deeper hydraulic B zone is laterally continuous across the Site and occurs at an approximate elevation ranging between -45 and -70 feet msl.

Field investigations performed by Stantec, including slug tests of the monitoring wells in the vicinity of the Site, indicate that the both hydraulic zones have relatively low hydraulic conductivities (section 3.7). As discussed in section 3.7.4 the average hydraulic conductivity of the upper hydraulic A zone is 2.8 feet per day (ft/d) (9.0E-04 cm/sec) and is slightly greater for the lower hydraulic B zone, at 17 ft/d (6.0E-03 cm/sec). Both values are typical of silty sediments. A potentiometric surface can be measured and used to define groundwater flow directions and velocities for each hydraulic zone. The hydraulic gradient of the A zone is .003 to .005 with a flow direction ranging along an azimuth from 147 to 192 degrees. The hydraulic

gradient of the B zone is .004 to .005 with a flow direction along an azimuth of 93 to 105 degrees. Beneath the surface of the two Cooper sumps the depth to groundwater in the upper A zone is approximately 12 to 13 feet bgs while in the lower B zone the depth to groundwater is approximately 17 to 19 feet bgs.

The vertical migration of groundwater is a consideration because there is a potentiometric head differential between the upper and lower hydraulic zones that suggests the possibility of vertical downward migration of groundwater. Although there is a vertical downwards gradient between the upper and lower hydraulic zones, in practical terms the low hydraulic conductivity of the fine grained sediments separating the upper and lower hydraulic zones effectively isolates these two hydraulic zones from each other. The hydraulic isolation of these two zones is indicated by the different hydraulic heads, flow directions and groundwater chemistry of the upper and lower hydraulic zones.

The 85 day transducer test (section 3.9) indicated that both the upper and lower hydraulic zones were isolated from the Silverado Aquifer beneath the site. The Silverado Aquifer is a major groundwater supply source in the vicinity of the Site. The CSM block diagram shown in Figure 26 depicts the juxtaposition of the upper and lower hydraulic zones with respect to the screened interval of the Dalton supply well, which is completed in the Silverado Aquifer.

Groundwater quality beneath the Site does not appear to have been impacted by the sludge as no GRO, VOCs, SVOCs or PAHs detections have not established trends above their method reporting limits during this RI. Occasional detections have been qualified by the laboratory and subsequent monitoring has not reproduced those detections.

4.5 SUMMARY

Based on the results from previous investigations and the extensive field work performed as part of this RI the current Conceptual Site Model suggests that:

- The undisturbed sludge at the site does not pose a threat to either surface or groundwater quality in the vicinity of the Site;
- The undisturbed sludge at the Site does not pose a substantive threat to the air quality in the immediate vicinity of the Site. However, isolation of the sludge from temperature fluctuations above approximately 100 degrees would further minimize this potential impact;
- The undisturbed sludge does not pose a threat to further contamination of soil surrounding the sludge by leaching of COPC's from the sludge.

5.0 STANDARD LIMITATIONS

This report has been prepared as an informational document for compliance with §VII F, of the CD entered into between California DTSC and ARC. All work was performed under the supervision of a Professional Geologist as defined in the Geologist and Geophysicist Act of the California Code of Regulations.

This report was prepared in accordance with the scope of work outlined in Stantec's contract and with generally accepted professional engineering and environmental consulting practices existing at the time this report was prepared and applicable to the location of the site. It was prepared for the exclusive use of Atlantic Richfield Company, for the express purpose stated above. Any re-use of this report for a different purpose or by others not identified above shall be at the user's sole risk without liability to Stantec. To the extent that this report is based on information provided to Stantec by third parties, Stantec may have made efforts to verify this third party information, but Stantec cannot guarantee the completeness or accuracy of this information. The opinions expressed and data collected are based on the conditions of the site existing at the time of the field investigation. No other warranties, expressed or implied are made by Stantec.

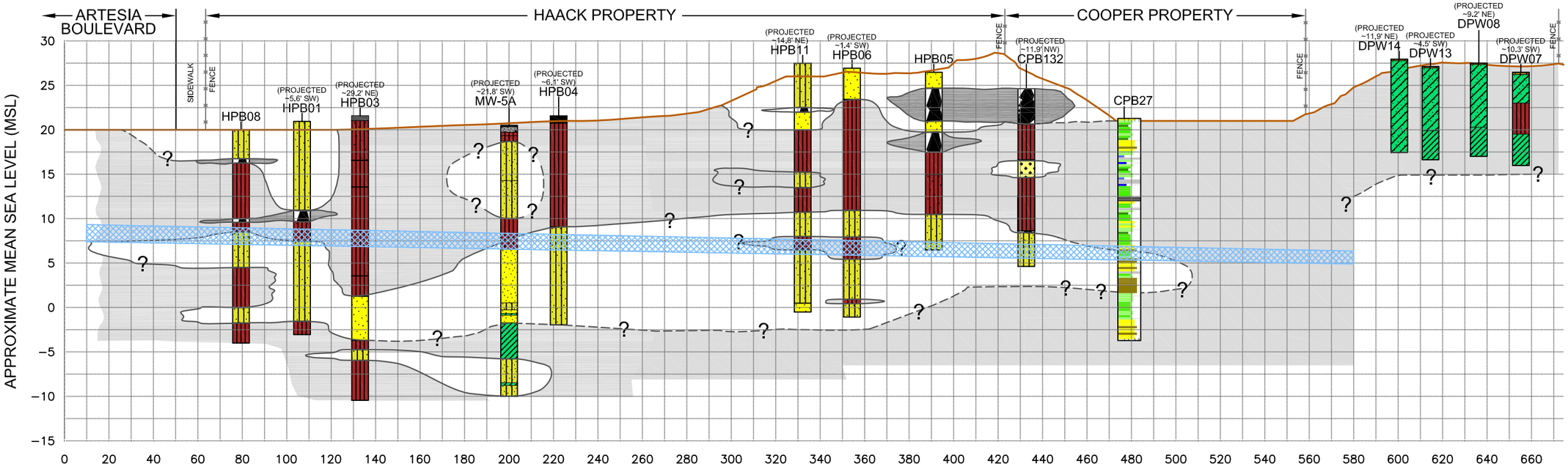
CROSS-SECTION NW-SE

NORTHWEST
B

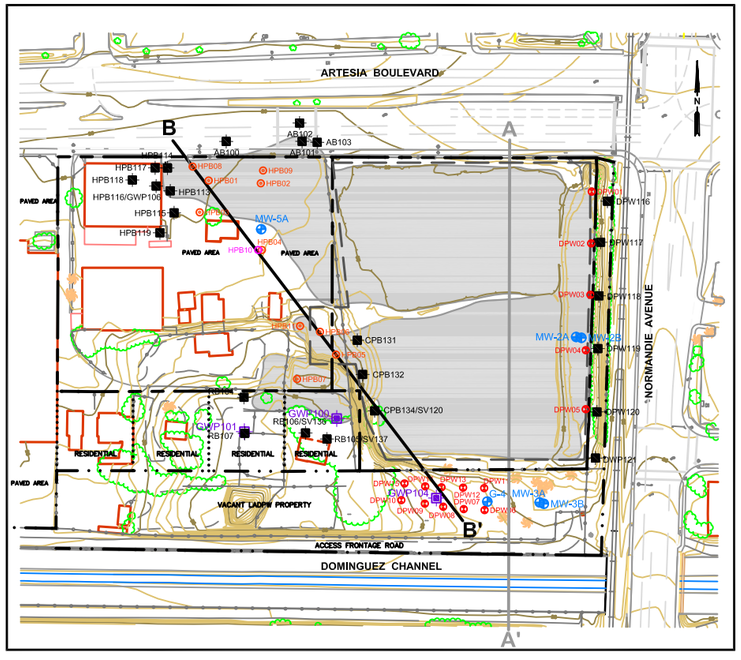
SOUTHEAST
B'

CROSS-SECTION VERTICAL SCALE (FEET)

0
12.5
25



CROSS-SECTION INDEX MAP



CROSS-SECTION INDEX MAP LEGEND

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- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 EPA GROUNDWATER MONITORING WELL
- CLUSTER WELLS (A&B)
- HPB01 SOIL/SLUDGE SAMPLE
- RI CPT BORINGS (DEPTH DISCRETE GROUNDWATER SAMPLES COLLECTED)
- DPW07 LA COUNTY DEPARTMENT OF PUBLIC WORKS SOIL SAMPLES
- GWP104 GROUNDWATER HYDROPUNCH SAMPLE LOCATIONS (A WATER BEARING ZONE)
- CPB132 SOIL BORING FOR SLUDGE DELINEATION
- APPROXIMATE SLUDGE DISTRIBUTION

0 200 400

APPROXIMATE SCALE (FEET)

0 50 100

CROSS-SECTION HORIZONTAL SCALE (FEET)

CROSS-SECTION LEGEND

—?— APPROXIMATE LITHOLOGIC CONTACT, QUERIED (?) WHERE UNCERTAIN

RANGE OF GROUNDWATER ELEVATION FROM JANUARY 2006 TO AUGUST 2010

UPPER SATURATED ZONE

GENERALIZED HYDROSTRATIGRAPHY

- SLUDGE DEPOSITS
- LOW PERMEABILITY, VERY FINE TO FINE GRAINED CLAYEY SILT, LOCALIZED INTERFINGERING OF SILTY SAND LENSES
- VERY LOW PERMEABILITY, SILTY CLAY TO CLAY

LITHOLOGY GRAPHICS

- SLUDGE
- TOP SOIL
- WELL GRADED SAND
- POORLY GRADED SAND
- SAND WITH SILT
- SILTY SAND
- CLAYEY SAND
- SILT
- LOW PLASTICITY CLAY

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FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

GEOLOGIC CROSS-SECTION B-B' (NORTHWEST-SOUTHWEST HAACK PROPERTY)

FIGURE: **10BS**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	10/28/10

FILEPATH:M:\CADDIGIS-US1331\Projects 2010\BP Arco\Gardena_Sumps\Geologic cross-sections\GS-CSX(BSM)-R1.dwg|rocampo|Dec 10, 2010 at 10:12|Layout: FIG10BS

NORTH
C

SOUTH
C'

CROSS-SECTION VERTICAL SCALE (FEET)
0
25
50

APPROXIMATE MEAN SEA LEVEL (MSL)
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80

ARTESIA BOULEVARD
SIDEWAK
FENCE
COOPER PROPERTY
LADPW
FENCE
FENCE
ACCESS FRONTAGE ROAD
DOMINGUEZ CHANNEL

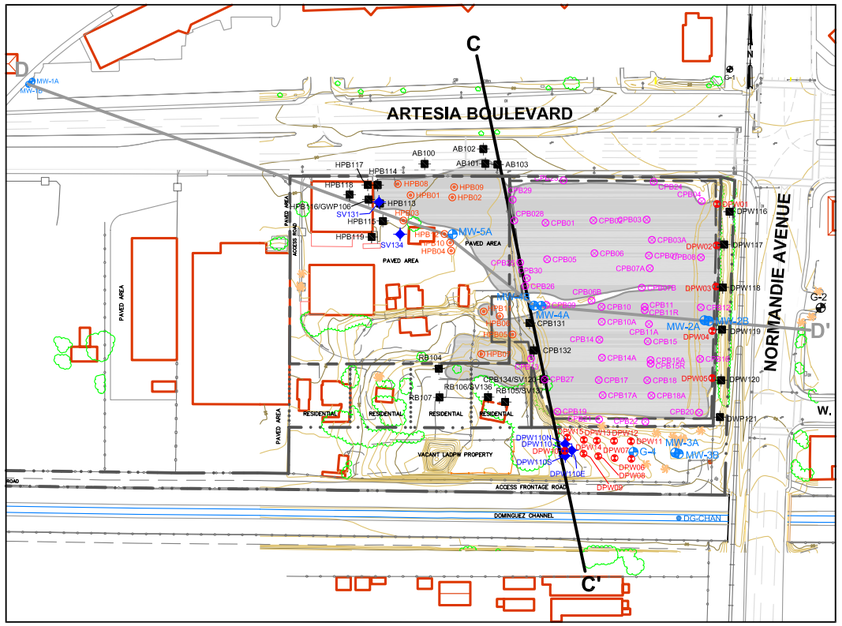
(PROJECTED ~3.5 SW) AB103
(PROJECTED ~9.2' NE) CPB29
(PROJECTED ~4.8' NE) CPB28
CPB25
CONE PENETRATION TEST SOUNDINGS 0 SBT 12
(PROJECTED ~5.6' NE) CPB30
CPB26
CONE PENETRATION TEST SOUNDINGS 0 SBT 12
(PROJECTED ~7.8' NE) MW-4B
NOT LOGGED
(PROJECTED ~19.4' NE) MW-04A
(PROJECTED ~5.5' SW) CPB131
(PROJECTED ~7.9' SW) CPB132
(PROJECTED ~15' SW) CPB13
CPB27
CONE PENETRATION TEST SOUNDINGS 0 SBT 12
(PROJECTED ~9.5' NE) CPB19
(PROJECTED ~16.7' NE) DPW15
(PROJECTED ~8.0' NE) DPW10

UPPER HYDRAULIC ZONE A

LOWER HYDRAULIC ZONE B

0 50 100
CROSS-SECTION HORIZONTAL SCALE (FEET)

CROSS-SECTION INDEX MAP



0 250 500
INDEX MAP SCALE (FEET)

INDEX MAP LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
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- CHAIN–LINK FENCE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-2A,B — CLUSTER WELLS (A&B)
- DG-CHAN — SURFACE WATER SAMPLING LOCATION (APPROXIMATE)/(ONLY SAMPLED FIRST QUARTER OF 2006)
- G-1 — ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SUMP LOCATIONS
- CPB01 — COOPER PROPERTY SOIL/SLUDGE SAMPLES
- DPW01 — LA COUNTY DEPARTMENT OF PUBLIC WORKS SOIL SAMPLES
- HPB01 — HACK PROPERTY SOIL/SLUDGE SAMPLE
- HPB118 — SOIL BORING FOR SLUDGE DELINEATION
- DPW110S — SOIL BORING FOR METAL AND pH

CROSS-SECTION LEGEND

- ? — APPROXIMATE LITHOLOGIC CONTACT, QUERIED (?) WHERE UNCERTAIN

RANGE OF GROUNDWATER ELEVATION FROM JANUARY 2006 TO AUGUST 2010

- UPPER SATURATED ZONE
- LOWER SATURATED ZONE

GENERALIZED CPT SOIL BEHAVIOR TYPES (SBT)

- SAND
- SILT
- CLAY
- STIFF FINE GRAINED

GENERALIZED HYDROSTRATIGRAPHY

- SLUDGE DEPOSITS
- LOW PERMEABILITY, VERY FINE TO FINE GRAINED SAND TO SILTY SAND, LOCALIZED INTERFINGERING OF SILTY SAND LENSES
- VERY LOW PERMEABILITY, SILTY CLAY TO CLAY

LITHOLOGY GRAPHICS

- SLUDGE
- WELL GRADED SAND
- POORLY GRADED SAND
- SAND WITH SILT
- SILTY SAND
- INTERBEDDED SILTY SAND/SANDY SILT
- SANDY SILT
- SILT
- ELASTIC SILT
- LOW PLASTICITY SILTY CLAY
- LOW PLASTICITY CLAY
- HIGH PLASTICITY CLAY
- LOW TO HIGH PLASTICITY CLAY

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FOR: Revised Draft - Report on 2006 Remedial Investigation
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Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

GEOLOGIC CROSS-SECTION C - C'

FIGURE: **10CS**

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211802064.300.111	R. Roman	C. Farr	K. Brown	10/22/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\BP-GS_CSCD.dwg|TRoman|Oct 25, 2010 at 9:37|Layout: CSC_FIG10CS

CROSS-SECTION VERTICAL SCALE (FEET)

0 25 50

WEST D

EAST D'

ARTESIA BOULEVARD

SIDEWALK

HAACK PROPERTY

COOPER PROPERTY

NORMANDIE AVENUE

FENCE

LADPW PROPERTY

FENCE

MW-1B

(PROJECTED ~12.9' SW) HPB116/GWP106

(PROJECTED ~9.8' SW) HPB118

(PROJECTED ~13.2' SW) HPB113

HPB03

(PROJECTED ~8.2' NW) MW-5A

HPB12

(PROJECTED ~14.7' NE) HPB04

(PROJECTED ~0.6' SW) MW-04A

MW-04B

(PROJECTED ~2.9' SW) CPB09

CONE PENETRATION TEST SOUNDINGS 0 SBT 12

(PROJECTED ~7.8' SW) CPB10

(PROJECTED ~8.6' SW) CPB11R

MW-2B

(PROJECTED ~12.1' NE) DPW119

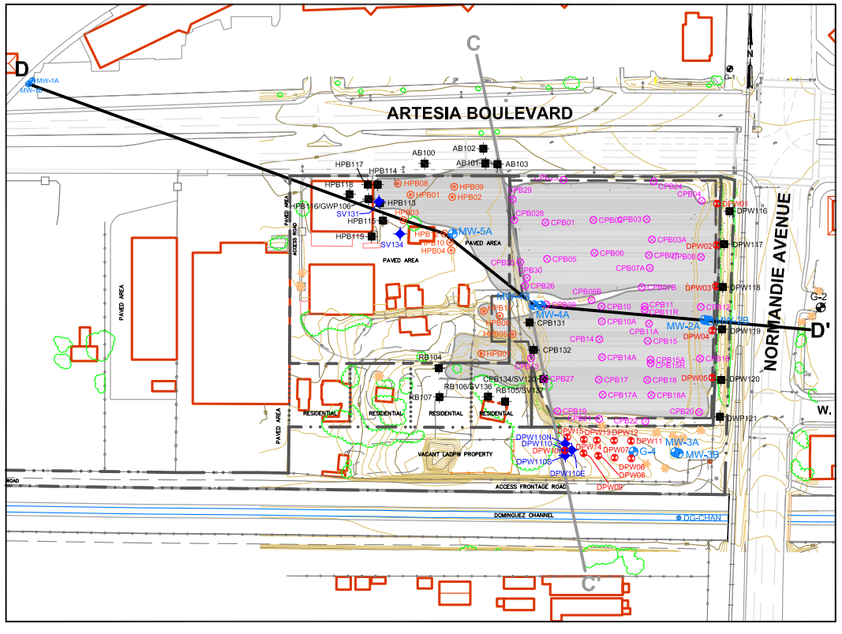
NOT LOGGED

NOT LOGGED

APPROXIMATE MEAN SEA LEVEL (MSL)

30 20 10 0 −10 −20 −30 −40 −50 −60 −70 −80

CROSS-SECTION INDEX MAP



0 250 500

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- DPW110S SOIL BORING FOR METAL AND pH

0 100 200

CROSS-SECTION HORIZONTAL SCALE (FEET)

CROSS-SECTION LEGEND

— ? — APPROXIMATE LITHOLOGIC CONTACT, QUERIED (?) WHERE UNCERTAIN

RANGE OF GROUNDWATER ELEVATION FROM JANUARY 2006 TO AUGUST 2010

- UPPER SATURATED ZONE
- LOWER SATURATED ZONE

GENERALIZED CPT SOIL BEHAVIOR TYPES (SBT)

- SLUDGE DEPOSITS
- SAND
- SILT
- CLAY
- STIFF FINE GRAINED

GENERALIZED HYDROSTRATIGRAPHY

- LOW PERMEABILITY, VERY FINE TO FINE GRAINED SAND TO SILTY SAND, LOCALIZED INTERFINGERING OF SILTY SAND LENSES
- VERY LOW PERMEABILITY, SILTY CLAY TO CLAY

LITHOLOGY GRAPHICS

- SLUDGE
- SAND
- SAND WITH SILT
- SILTY SAND
- INTERBEDDED SILTY SAND/SANDY SILT
- SANDY SILT
- SILT
- ELASTIC SILT
- LOW PLASTICITY SILTY CLAY
- LOW PLASTICITY CLAY
- HIGH PLASTICITY CLAY
- LOW TO HIGH PLASTICITY CLAY

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FOR: Revised Draft - Report on 2006 Remedial Investigation GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA

GEOLOGIC CROSS-SECTION D - D'

FIGURE: **10DS**

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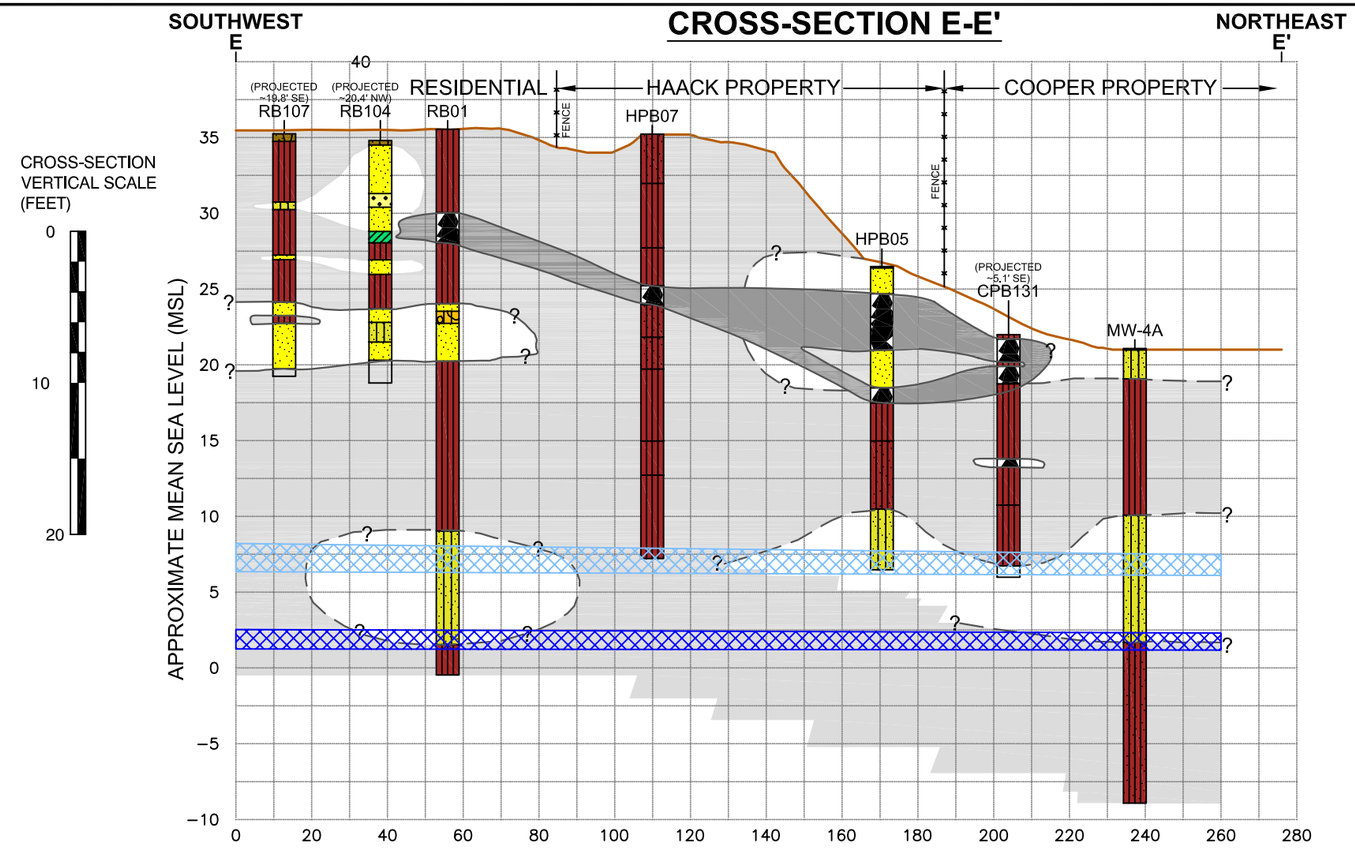
211802064.300.111	R. Roman	C. Farr	K. Brown	10/25/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\BP-GS_CSCD.dwg|TRoman|Oct 25, 2010 at 9:47|Layout: CSD_FIG10DS

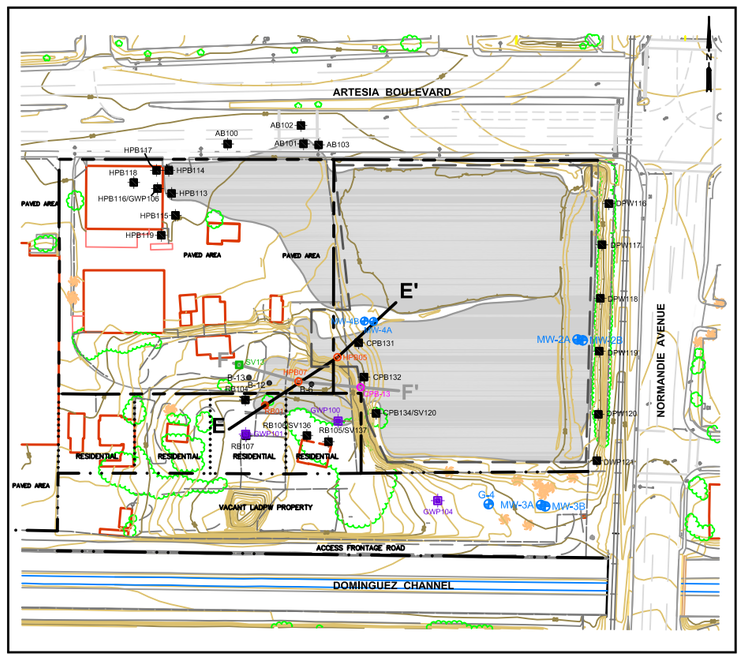
CROSS-SECTION E-E'



CROSS-SECTION VERTICAL SCALE (FEET)

0 — 10 — 20

CROSS-SECTION INDEX MAP



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- RB01 — SOIL/SLUDGE SAMPLE
- RB104 — SOIL BORING FOR SLUDGE DELINEATION
- GWP101 — GROUNDWATER HYDROPUNCH SAMPLE LOCATION (A WATER–BEARING ZONE)
- APPROXIMATE SLUDGE DISTRIBUTION

0 — 200 — 400

APPROXIMATE SCALE (FEET)

0 — 40 — 80

CROSS-SECTION HORIZONTAL SCALE (FEET)

CROSS-SECTION LEGEND

—— ? —— APPROXIMATE LITHOLOGIC CONTACT, QUERIED (?) WHERE UNCERTAIN

RANGE OF GROUNDWATER ELEVATION FROM JANUARY 2006 TO AUGUST 2010

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- LOW PERMEABILITY, VERY FINE TO FINE GRAINED CLAYEY SILT, LOCALIZED INTERFINGERING OF SILTY SAND LENSES
- VERY LOW PERMEABILITY, SILTY CLAY TO CLAY

LITHOLOGY GRAPHICS

- SLUDGE
- SILTY GRAVEL
- WELL GRADED SAND
- POORLY GRADED SAND
- POORLY GRADED SAND WITH SILT
- SILTY SAND
- SILT
- LOW PLASTICITY CLAY

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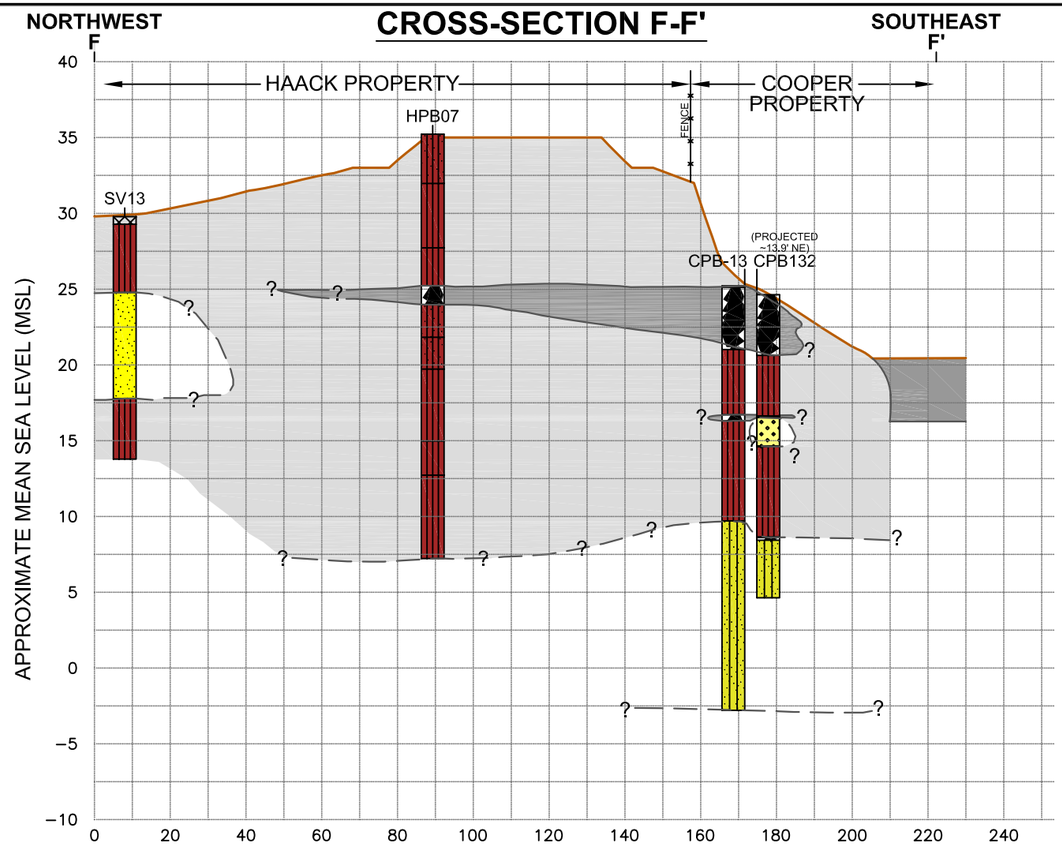
SLUDGE/GEOLOGIC CROSS-SECTION E-E' (SOUTHWEST-NORTHEAST) HAACK REWORK AREA

FIGURE: **10ES**

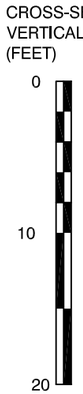
JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	10/25/10

FILEPATH:M:\CADDIGIS-US1331\Projects 2010\BP Arco\Gardena_Sumps\Geologic cross-sections\GS-CSEF R1.dwg|rocampo|Dec 10, 2010 at 10:32|Layout: FIG10ES

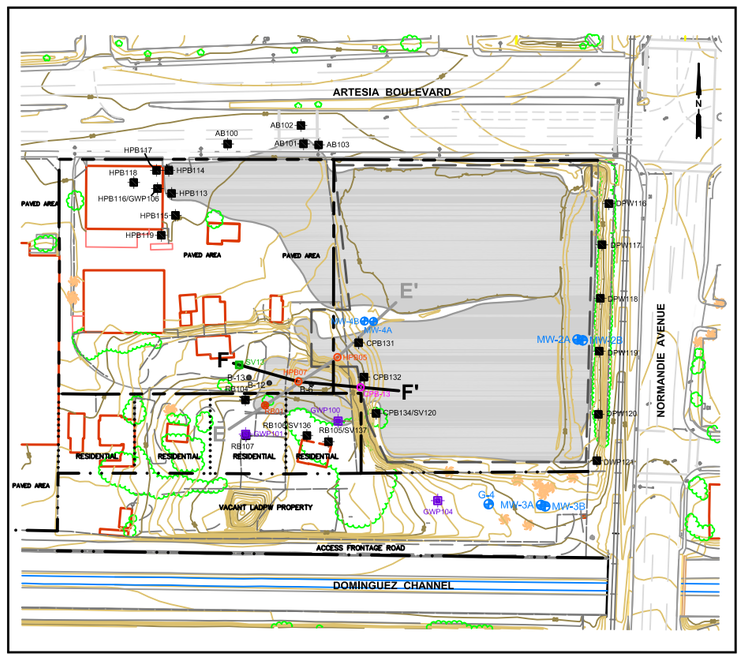
CROSS-SECTION F-F'



CROSS-SECTION VERTICAL SCALE (FEET)



CROSS-SECTION INDEX MAP



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0 200 400

APPROXIMATE SCALE (FEET)

0 40 80

CROSS-SECTION HORIZONTAL SCALE (FEET)

CROSS-SECTION LEGEND

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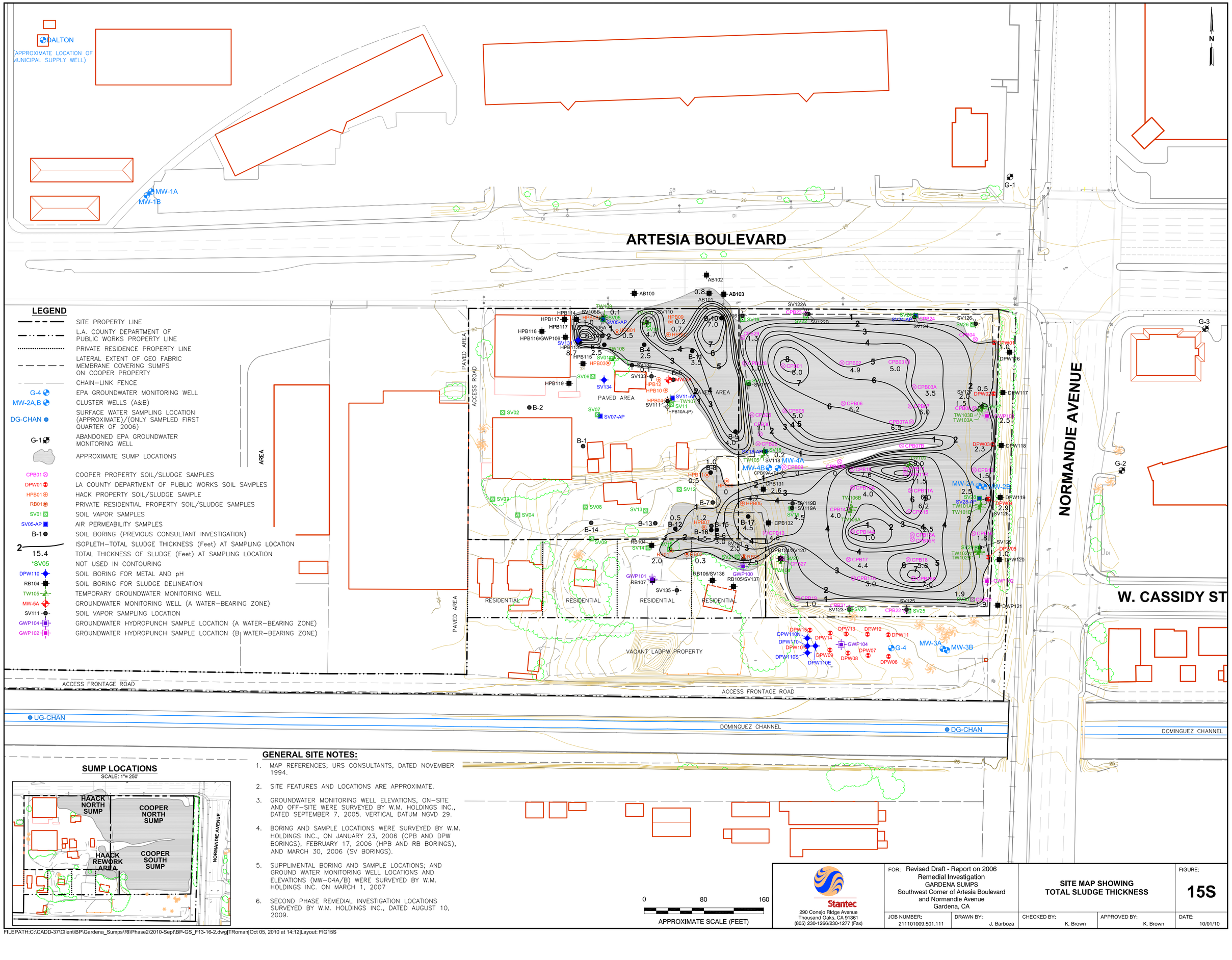
Gardena, CA

SLUDGE/GEOLOGIC CROSS-SECTION F-F' (WEST-EAST) HAACK REWORK AREA

FIGURE: **10FS**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	10/25/10

FILEPATH:M:\CADDIGIS-US1331\Projects 2010\BP Arco\Gardena_Sumps\Geologic cross-sections\GS-CSEF R1.dwg|rocampo|Dec 10, 2010 at 10:32|Layout: FIG10FS



SUMP LOCATIONS

SCALE: 1"= 250'

GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON-SITE AND OFF-SITE WERE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.
4. BORING AND SAMPLE LOCATIONS WERE SURVEYED BY W.M. HOLDINGS INC., ON JANUARY 23, 2006 (CPB AND DPW BORINGS), FEBRUARY 17, 2006 (HPB AND RB BORINGS), AND MARCH 30, 2006 (SV BORINGS).
5. SUPPLIMENTAL BORING AND SAMPLE LOCATIONS; AND GROUND WATER MONITORING WELL LOCATIONS AND ELEVATIONS (MW-04A/B) WERE SURVEYED BY W.M. HOLDINGS INC. ON MARCH 1, 2007
6. SECOND PHASE REMEDIAL INVESTIGATION LOCATIONS SURVEYED BY W.M. HOLDINGS INC., DATED AUGUST 10, 2009.

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SITE MAP SHOWING TOTAL SLUDGE THICKNESS

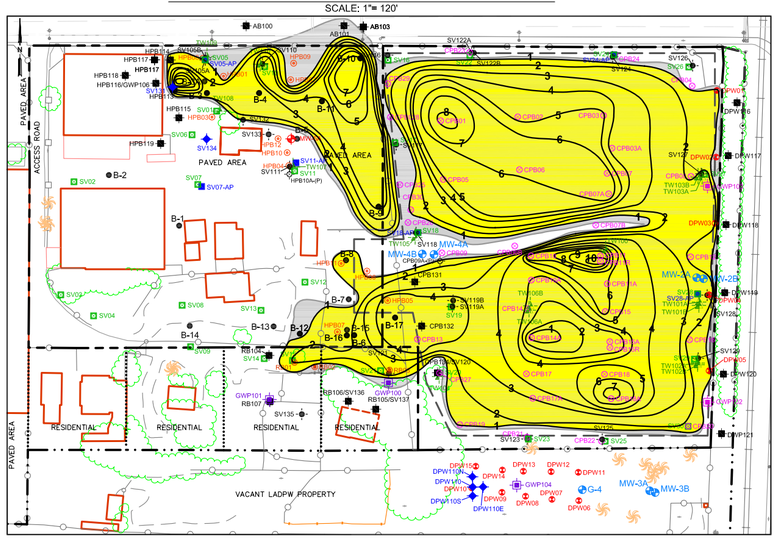
FIGURE: **15S**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211101009.501.111	J. Barboza	K. Brown	K. Brown	10/01/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\BP-GS_F13-16-2.dwg|TRoman|Oct 05, 2010 at 14:12|Layout: FIG15S

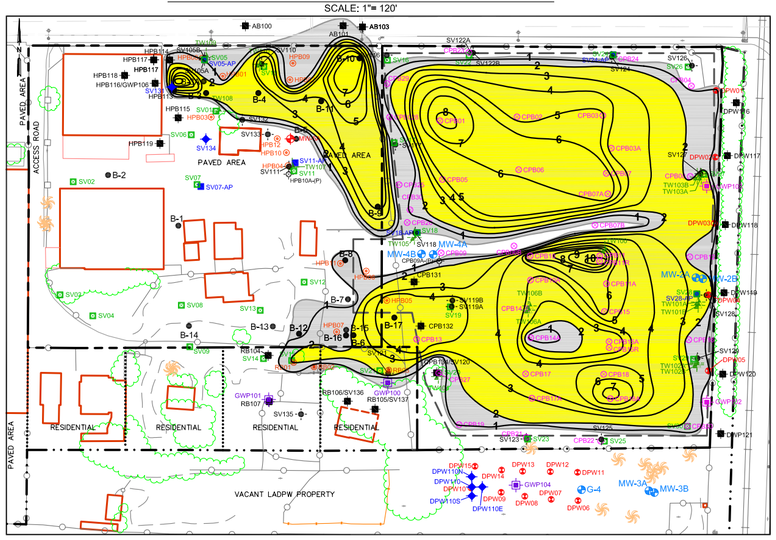
ISOPLETH - 1 FOOT TOTAL SLUDGE THICKNESS

SCALE: 1"= 120'



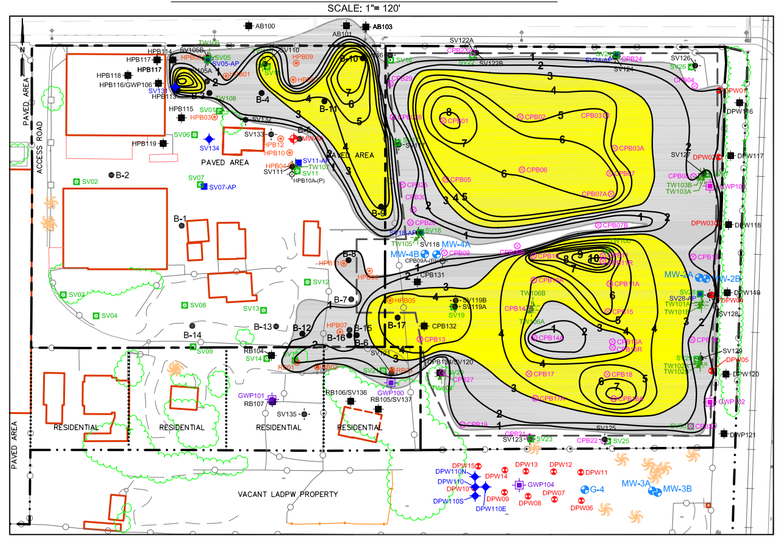
ISOPLETH - 2 FOOT TOTAL SLUDGE THICKNESS

SCALE: 1"= 120'



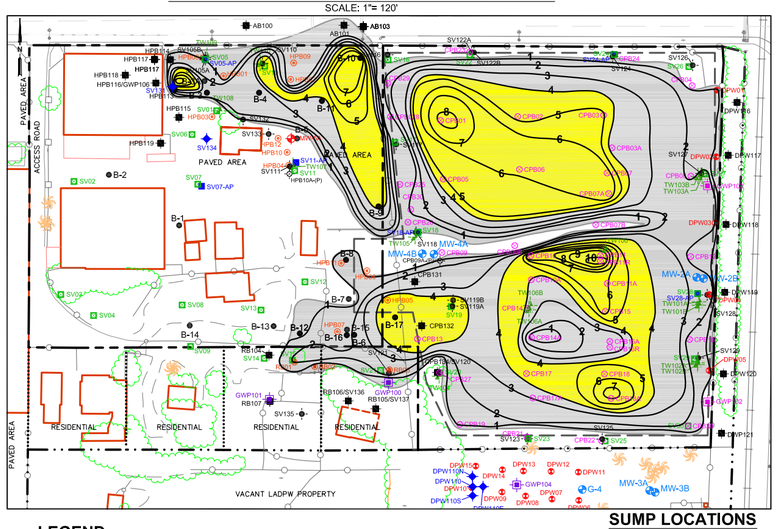
ISOPLETH - 3 FOOT TOTAL SLUDGE THICKNESS

SCALE: 1"= 120'



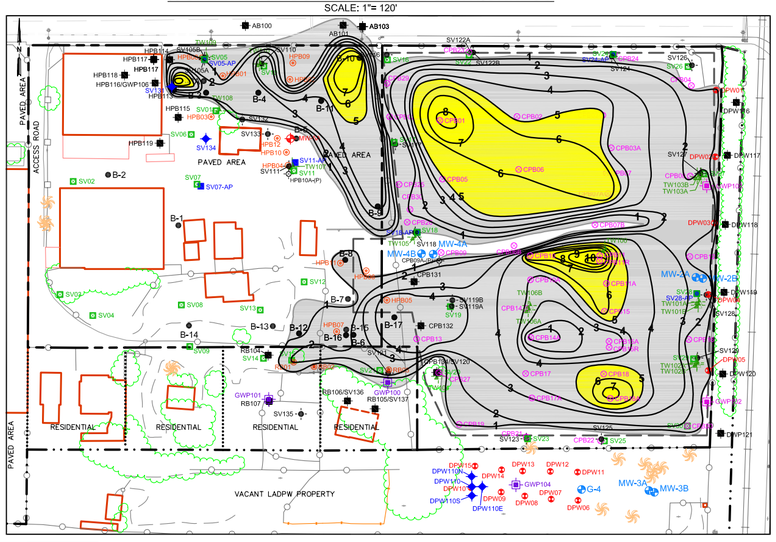
ISOPLETH - 4 FOOT TOTAL SLUDGE THICKNESS

SCALE: 1"= 120'



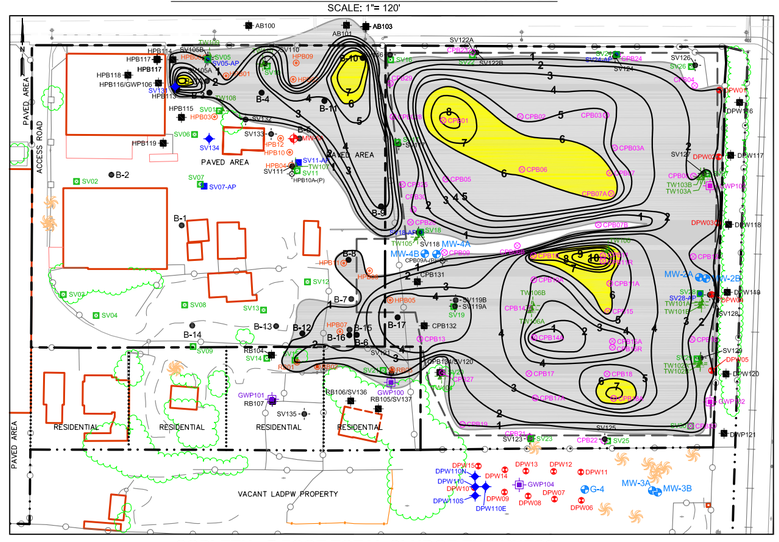
ISOPLETH - 5 FOOT TOTAL SLUDGE THICKNESS

SCALE: 1"= 120'



ISOPLETH - 6 FOOT TOTAL SLUDGE THICKNESS

SCALE: 1"= 120'



LEGEND

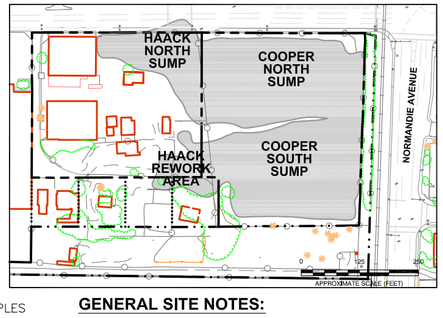
- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-2A,B — CLUSTER WELLS (A&B)
- APPROXIMATE SUMP LOCATIONS
- CPB01 — COOPER PROPERTY SOIL/SLUDGE SAMPLES
- DPW01 — LA COUNTY DEPARTMENT OF PUBLIC WORKS SOIL SAMPLES
- HPB01 — HACK PROPERTY SOIL/SLUDGE SAMPLE
- RB01 — PRIVATE RESIDENTIAL PROPERTY SOIL/SLUDGE SAMPLES
- SV01 — SOIL VAPOR SAMPLES
- SV05-AP — AIR PERMEABILITY SAMPLES
- B-1 — SOIL BORING (PREVIOUS CONSULTANT INVESTIGATION)
- DPW110 — SOIL BORING FOR METAL AND pH
- RB104 — SOIL BORING FOR SLUDGE DELINEATION
- TW105 — TEMPORARY GROUNDWATER MONITORING WELL
- MW-5A — GROUNDWATER MONITORING WELL (A WATER–BEARING ZONE)
- SV111 - — SOIL VAPOR SAMPLING LOCATION
- GWP104 — GROUNDWATER HYDROPUNCH SAMPLE LOCATION (A WATER–BEARING ZONE)
- GWP102 — GROUNDWATER HYDROPUNCH SAMPLE LOCATION (B WATER–BEARING ZONE)
- 2 — ISOPLETH–TOTAL SLUDGE THICKNESS (Feet)

0 120 240

APPROXIMATE SCALE (FEET)

SUMP LOCATIONS

SCALE: 1"= 250'



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. BORING AND SAMPLE LOCATIONS WERE SURVEYED BY W.M. HOLDINGS INC., ON JANUARY 23, 2006 (CPB AND DPW BORINGS), FEBRUARY 17, 2006 (HPB AND RB BORINGS), AND MARCH 30, 2006 (SV BORINGS). AND MARCH 1, 2007 (MW–04A/B AND SUPPLIMENTAL BORINGS)
4. SECOND PHASE REMEDIAL INVESTIGATION LOCATIONS SURVEYED BY W.M. HOLDINGS INC., DATED AUGUST 10, 2009.

APROXIMATE SURFACE AREAS

SURFACE AREA	ACRE	SQ. FEET
COOPER PROPERTY	3.13	136,416
HAACK PROPERTY	2.67	116,241
RESIDENCES	1.07	46,479
COOPER NORTH SUMP	1.35	59,220
COOPER SOUTH SUMP	1.35	59,140
HAACK NORTH SUMP	0.54	23,574
HAACK REWORK AREA	0.25	10,900
GEOSYNTHETIC COVER	2.91	126,588

COOPER PROPERTY'S SUMP ISOPLETH-TOTAL SLUDGE THICKNESS APPROXIMATE AREAS

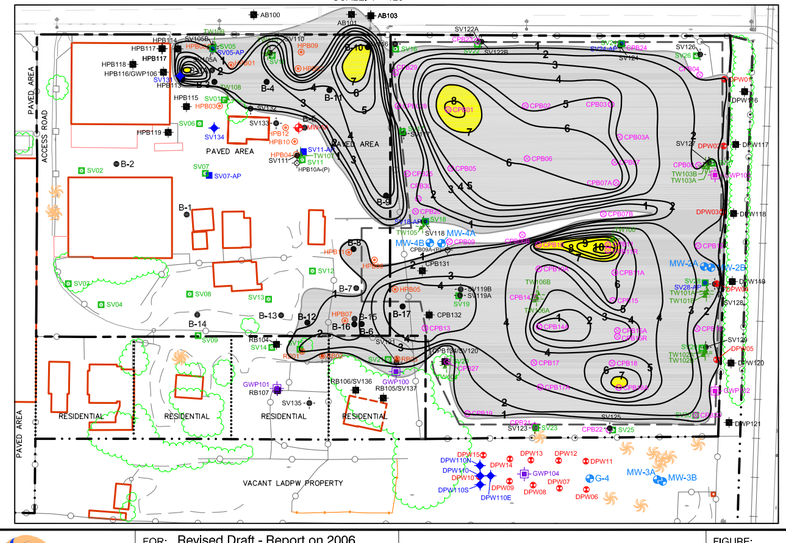
SLUDGE THICKNESS (FT.)	ACRES	SQ. FEET
1 FT.–COOPER NORTH SUMP	1.204	52,485
2 FT.–COOPER NORTH SUMP	1.042	45,398
3 FT.–COOPER NORTH SUMP	0.771	33,616
4 FT.–COOPER NORTH SUMP	0.590	25,720
5 FT.–COOPER NORTH SUMP	0.456	19,897
6 FT.–COOPER NORTH SUMP	0.227	9,914
7 FT.–COOPER NORTH SUMP	0.040	1,757
1 FT.–COOPER SOUTH SUMP	1.315	57,315
2 FT.–COOPER SOUTH SUMP	1.160	50,556
3 FT.–COOPER SOUTH SUMP	0.906	39,482
4 FT.–COOPER SOUTH SUMP	0.473	20,617
5 FT.–COOPER SOUTH SUMP	0.170	7,425
6 FT.–COOPER SOUTH SUMP	0.088	3,874
7 FT.–COOPER SOUTH SUMP	0.036	1,591

HAACK PROPERTY'S SUMP ISOPLETH-TOTAL SLUDGE THICKNESS APPROXIMATE AREAS

SLUDGE THICKNESS (FT.)	ACRES	SQ. FEET
1 FT.–HAACK NORTH SUMP	0.451	19,654
2 FT.–HAACK NORTH SUMP	0.377	16,441
3 FT.–HAACK NORTH SUMP	0.259	11,264
4 FT.–HAACK NORTH SUMP	0.179	7,806
5 FT.–HAACK NORTH SUMP	0.064	2,780
6 FT.–HAACK NORTH SUMP	0.038	1,639
7 FT.–HAACK NORTH SUMP	0.0186	812
1 FT.–HAACK REWORK AREA	0.212	9,276
2 FT.–HAACK REWORK AREA	0.109	4,754
3 FT.–HAACK REWORK AREA	0.05142	2,240
4 FT.–HAACK REWORK AREA	0.02782	1,212

ISOPLETH - 7 FOOT TOTAL SLUDGE THICKNESS

SCALE: 1"= 120'



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Southwest Corner of Artesia Boulevard and Normandie Avenue
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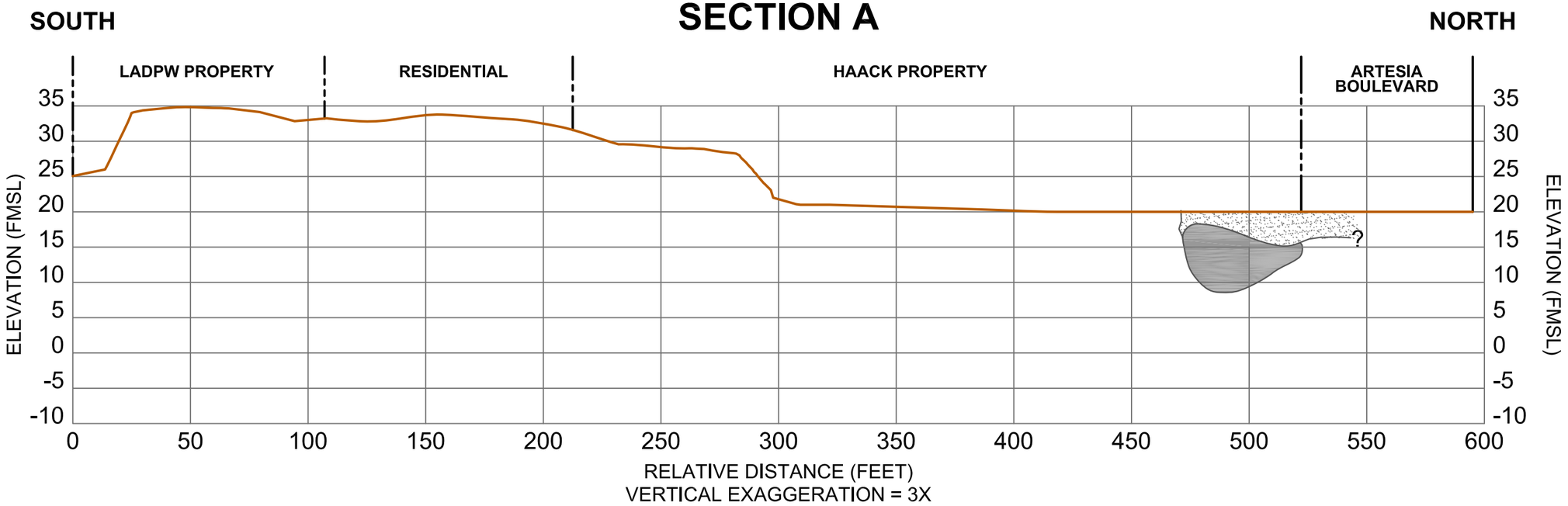
AREAS ENCOMPASSED BY SELECTED ISOPLETHS

FIGURE: **16S**

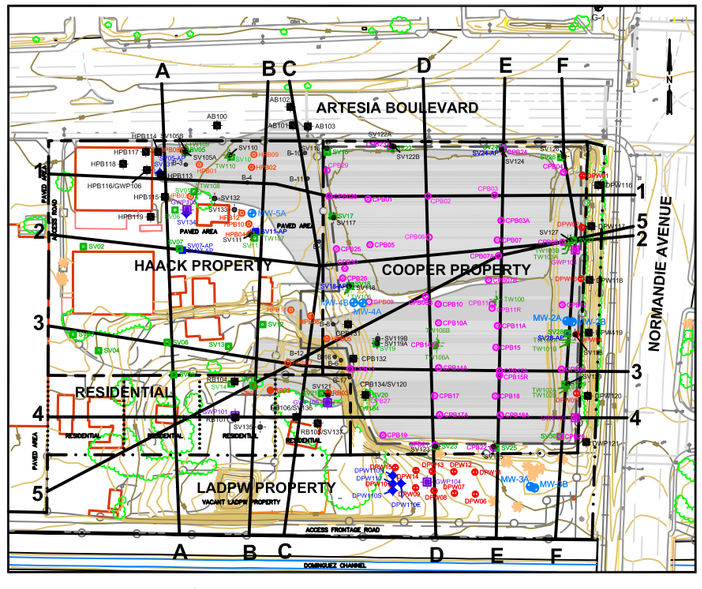
JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211101109.501.111	J. Barboza	K. Brown	K. Brown	11/16/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\BP-GS_F13-16-2.dwg|troman|Nov 16, 2010 at 12:44|Layout: FIG16S

SECTION A



CROSS-SECTION INDEX MAP



CROSS-SECTION INDEX MAP LEGEND

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- GROUNDWATER MONITORING WELL (A WATER–BEARING ZONE)
- SOIL VAPOR SAMPLING LOCATION
- GROUNDWATER HYDROPUNCH SAMPLE LOCATION (A WATER–BEARING ZONE)
- GROUNDWATER HYDROPUNCH SAMPLE LOCATION (B WATER–BEARING ZONE)

CROSS-SECTION LEGEND

- EXISTING SURFACE
- NATIVE SOIL
- SLUDGE
- REWORKED OR ADDED SOIL (FILL MATERIAL/NON NATIVE SOIL)

GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. SEE FIGURES 10E AND 10F FOR CROSS SECTIONS ACROSS HAACK REWORK AREA.

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NORTH-SOUTH CROSS-SECTIONS OF SLUDGE SECTION A

FIGURE: **17AS**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	11/09/10

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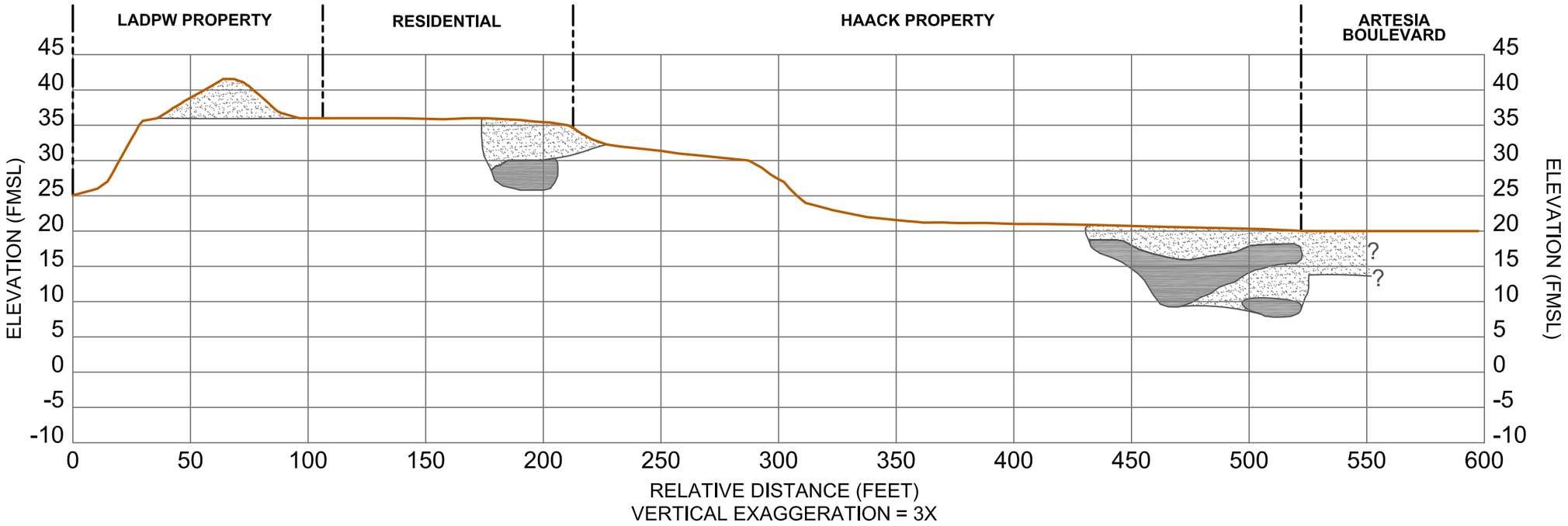
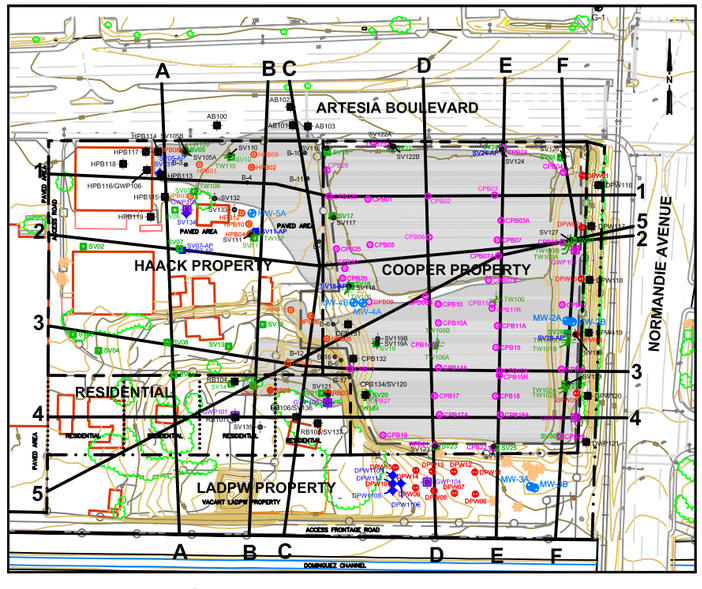
SECTION B

SOUTH

NORTH



CROSS-SECTION INDEX MAP



CROSS-SECTION INDEX MAP LEGEND

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- GROUNDWATER MONITORING WELL (A WATER–BEARING ZONE)
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- GROUNDWATER HYDROPUNCH SAMPLE LOCATION (A WATER–BEARING ZONE)
- GROUNDWATER HYDROPUNCH SAMPLE LOCATION (B WATER–BEARING ZONE)

CROSS-SECTION LEGEND

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3. SEE FIGURES 10E AND 10F FOR CROSS SECTIONS ACROSS HAACK REWORK AREA.

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GARDENA SUMPS
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Gardena, CA

NORTH-SOUTH CROSS-SECTIONS OF SLUDGE SECTION B

FIGURE: **17BS**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	11/04/10

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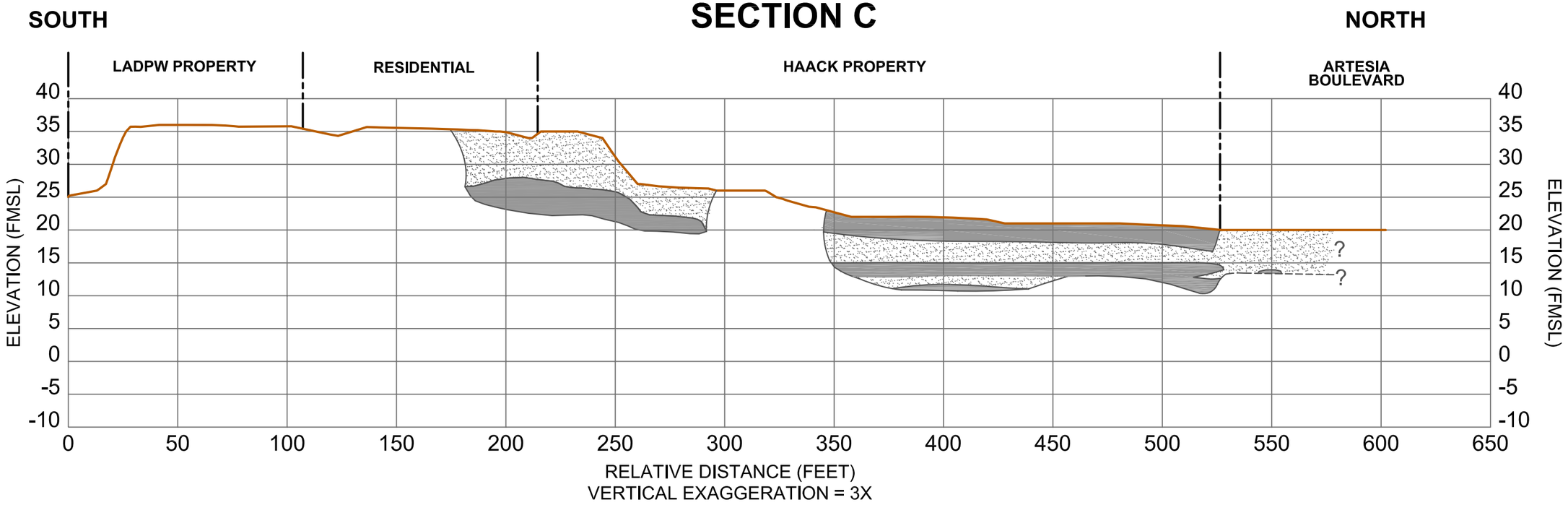
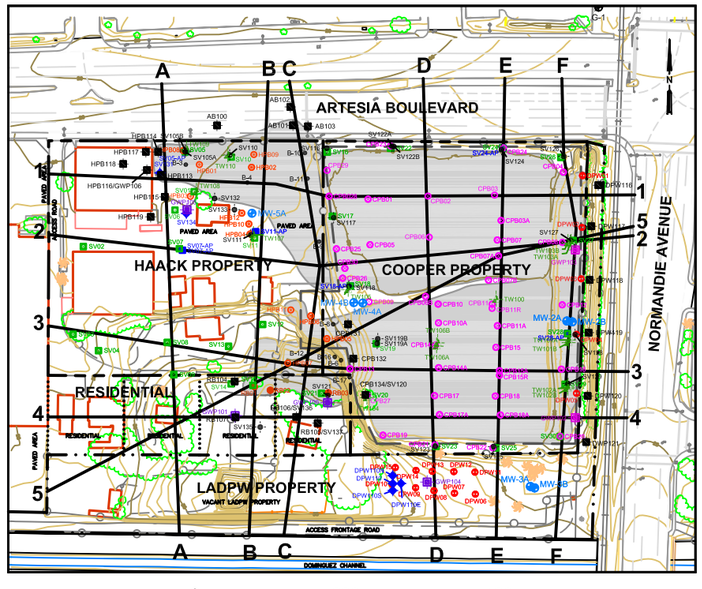
SECTION C



CROSS-SECTION INDEX MAP



CROSS-SECTION INDEX MAP LEGEND

- SITE PROPERTY LINE
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- GROUNDWATER MONITORING WELL (A WATER–BEARING ZONE)
- SOIL VAPOR SAMPLING LOCATION
- GROUNDWATER HYDROPUNCH SAMPLE LOCATION (A WATER–BEARING ZONE)
- GROUNDWATER HYDROPUNCH SAMPLE LOCATION (B WATER–BEARING ZONE)

CROSS-SECTION LEGEND

- EXISTING SURFACE
- NATIVE SOIL
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FOR: Revised Draft - Report on 2006 Remedial Investigation
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Gardena, CA

NORTH-SOUTH CROSS-SECTIONS OF SLUDGE SECTION C

FIGURE: **17CS**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	11/05/10

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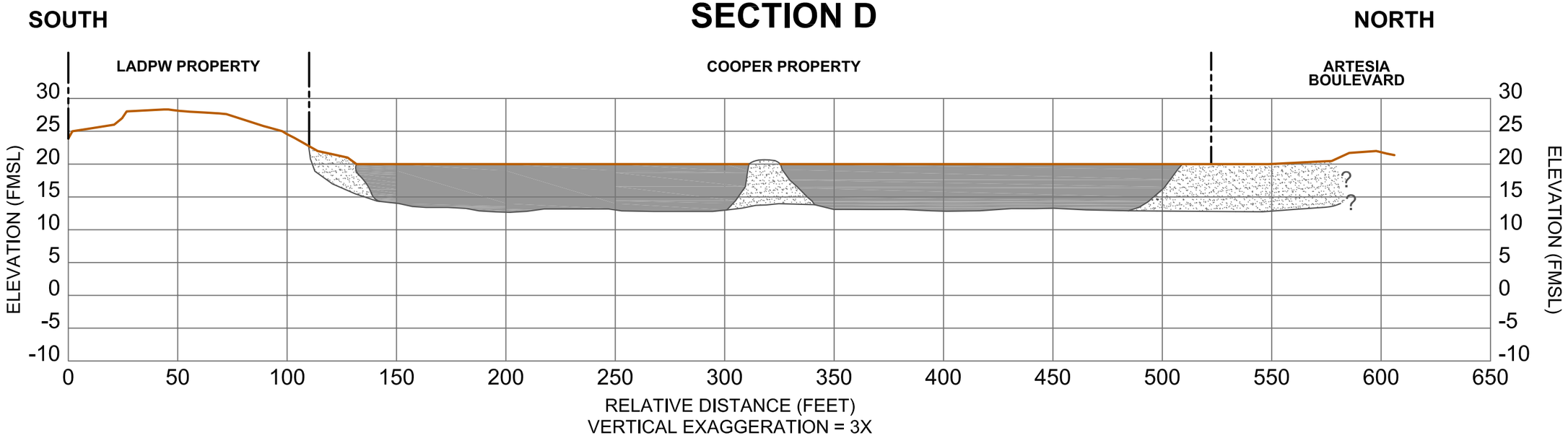
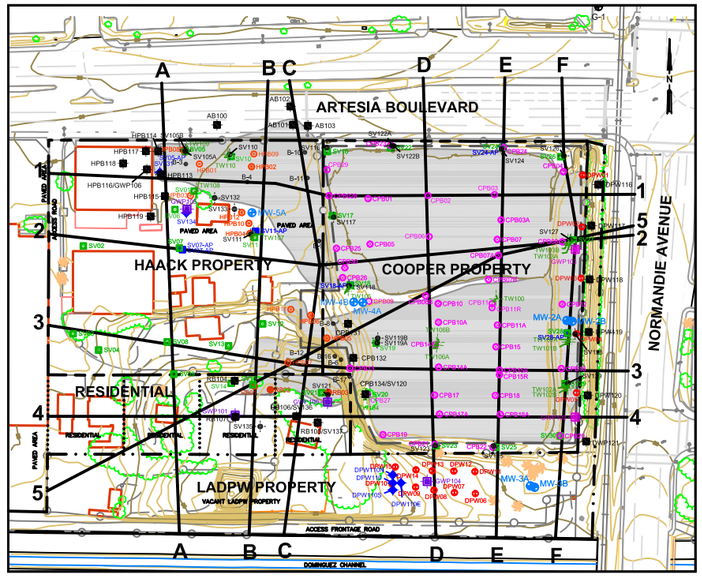
SECTION D



CROSS-SECTION INDEX MAP



CROSS-SECTION INDEX MAP LEGEND

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CROSS-SECTION LEGEND

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2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
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Gardena, CA

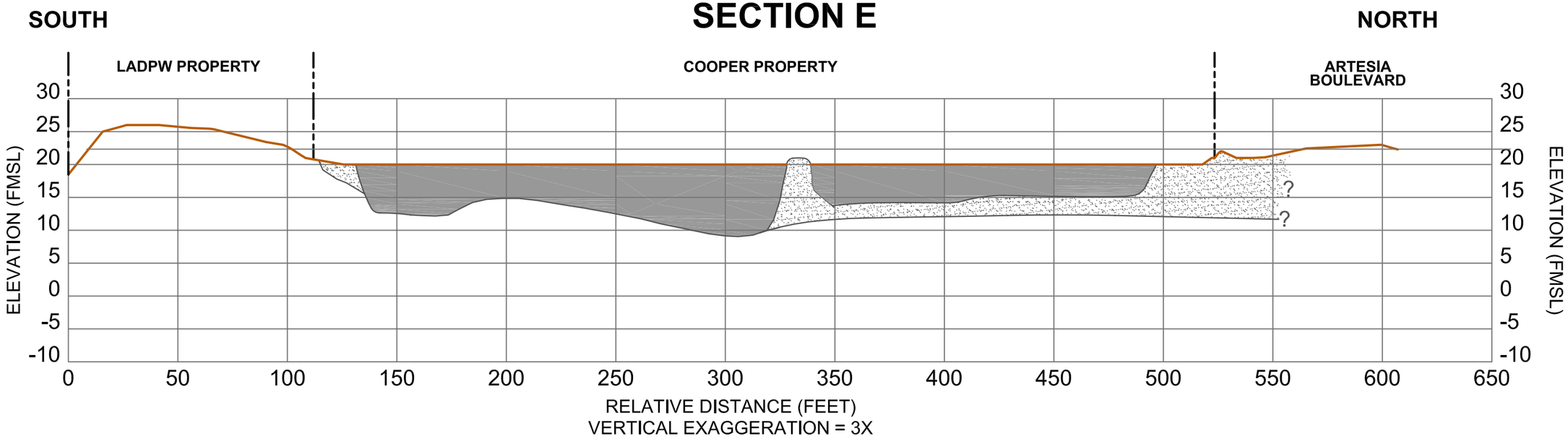
NORTH-SOUTH CROSS-SECTIONS OF SLUDGE SECTION D

FIGURE: **17DS**

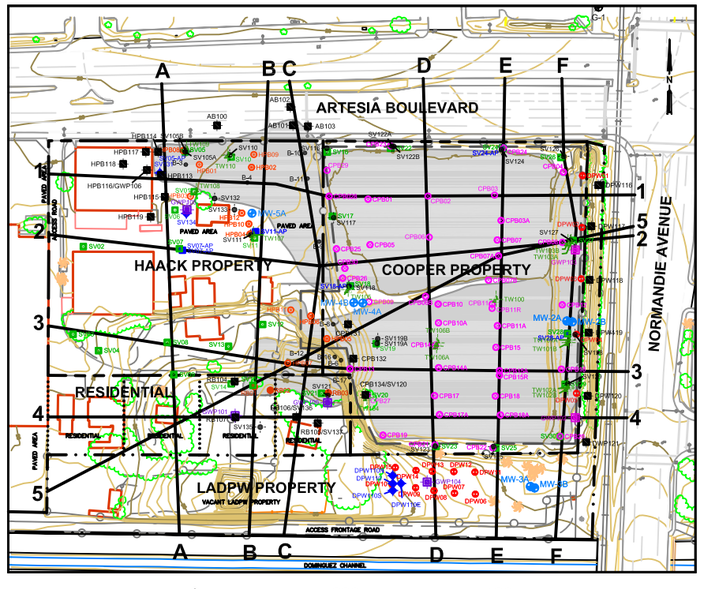
JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	11/05/10

FILEPATH:M:\CADDIGIS-US1331\Projects 2010\BP Arco\Gardena_Sumps\Geologic cross-sections\BP-GS_Cross-Section (N-S&E-W_3) R1.dwg|rocampo|Dec 10, 2010 at 10:39|Layout: FIG17DS (R1)

SECTION E



CROSS-SECTION INDEX MAP



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CROSS-SECTION LEGEND

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- SLUDGE
- REWORKED OR ADDED SOIL (FILL MATERIAL/NON NATIVE SOIL)

GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. SEE FIGURES 10E AND 10F FOR CROSS SECTIONS ACROSS HAACK REWORK AREA.

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FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

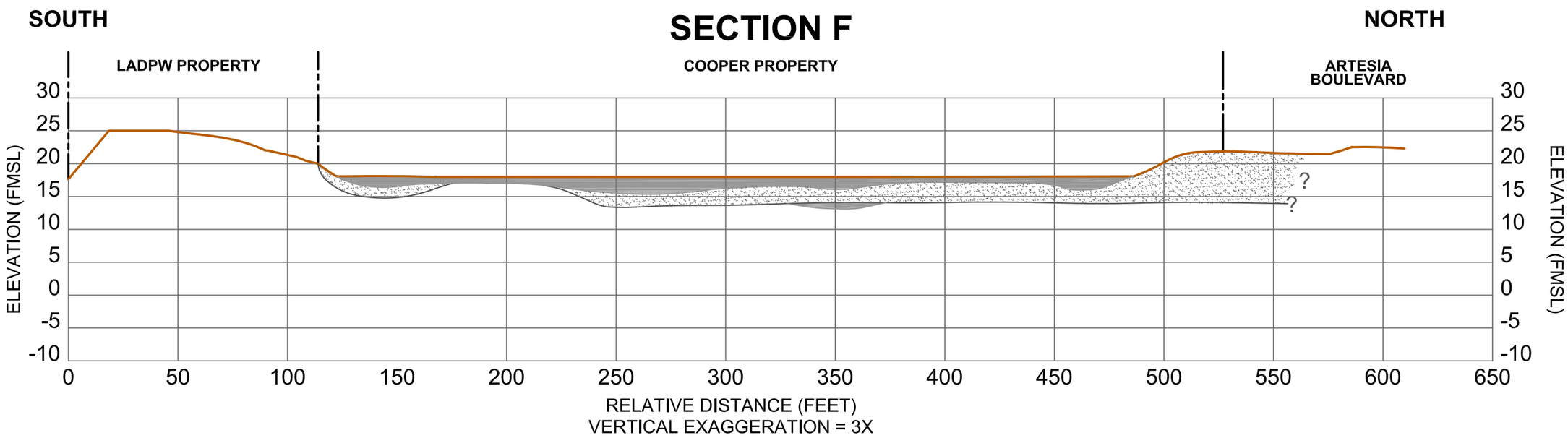
NORTH-SOUTH CROSS-SECTIONS OF SLUDGE SECTION E

FIGURE: **17ES**

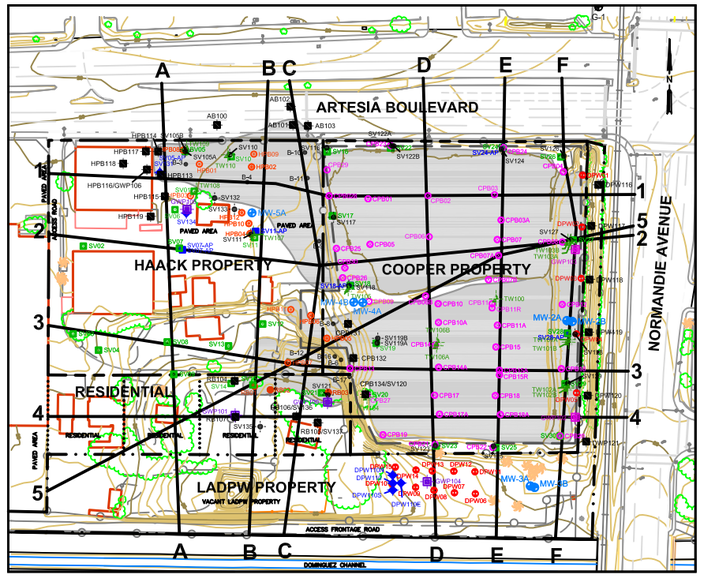
JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	11/05/10

FILEPATH:M:\CADDIGIS-US1331\Projects 2010\BP Arco\Gardena_Sumps\Geologic cross-sections\BP-GS_Cross-Section (N-S&E-W_3) R1.dwg|rocampo|Dec 10, 2010 at 10:40|Layout: FIG17ES (R1)

SECTION F



CROSS-SECTION INDEX MAP



CROSS-SECTION INDEX MAP LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
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- APPROXIMATE SLUDGE DISTRIBUTION
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- GROUNDWATER HYDROPUNCH SAMPLE LOCATION (A WATER–BEARING ZONE)
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CROSS-SECTION LEGEND

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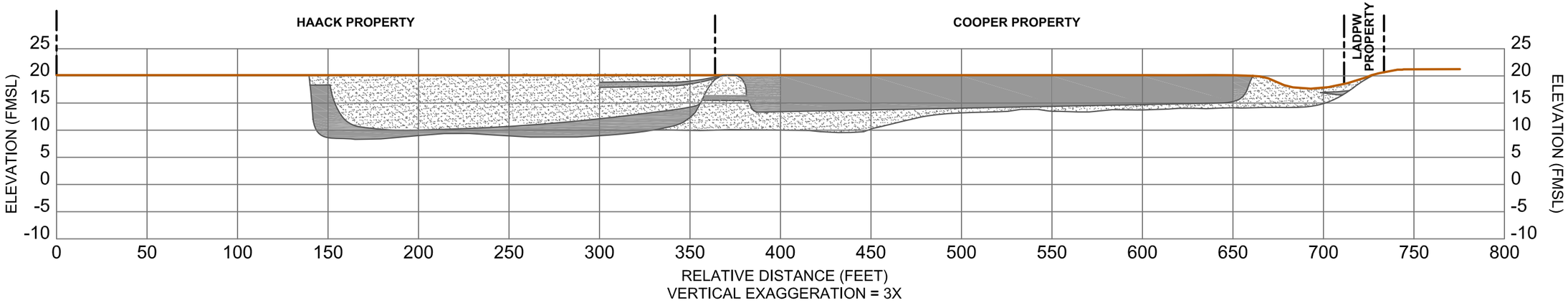
NORTH-SOUTH CROSS-SECTIONS OF SLUDGE SECTION F

FIGURE: **17FS**

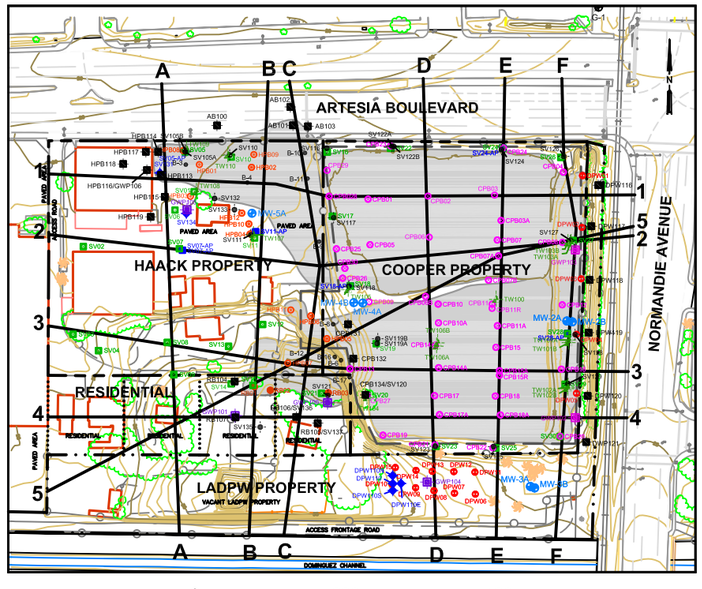
JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	11/05/10

FILEPATH:M:\CADDIGIS-US1331\Projects 2010\BP Arco\Gardena_Sumps\Geologic cross-sections\BP-GS_Cross-Section (N-S&E-W_3) R1.dwg|rocampo|Dec 10, 2010 at 10:43|Layout: FIG17FS (R1)

SECTION 1



CROSS-SECTION INDEX MAP



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EAST-WEST CROSS-SECTIONS OF SLUDGE SECTION 1

FIGURE: **17GS**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	11/05/10

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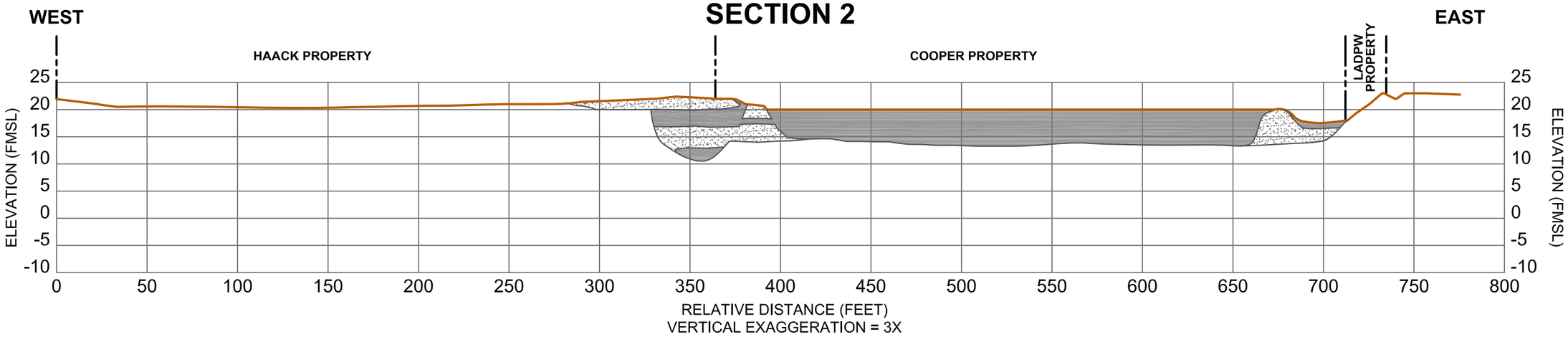
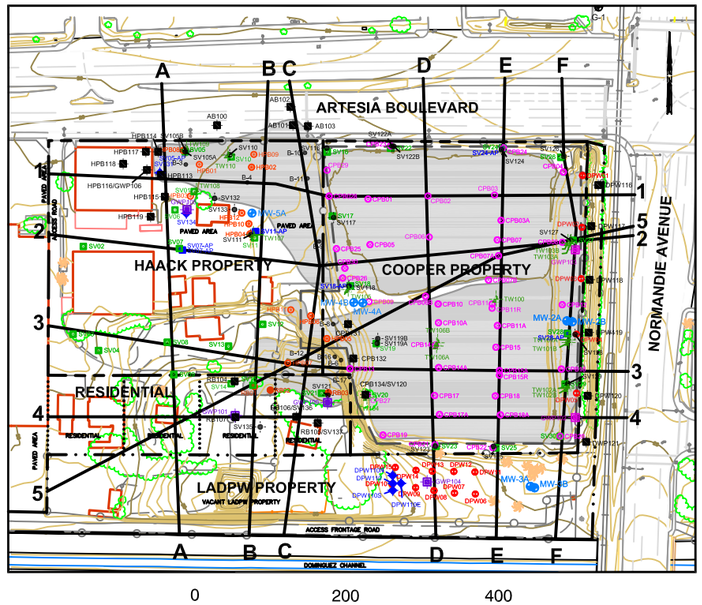
SECTION 2



CROSS-SECTION INDEX MAP



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EAST-WEST CROSS-SECTIONS OF SLUDGE SECTION 2

FIGURE: **17HS**

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211802064.300.111	R. Roman	C. Farr	K. Brown	11/05/10

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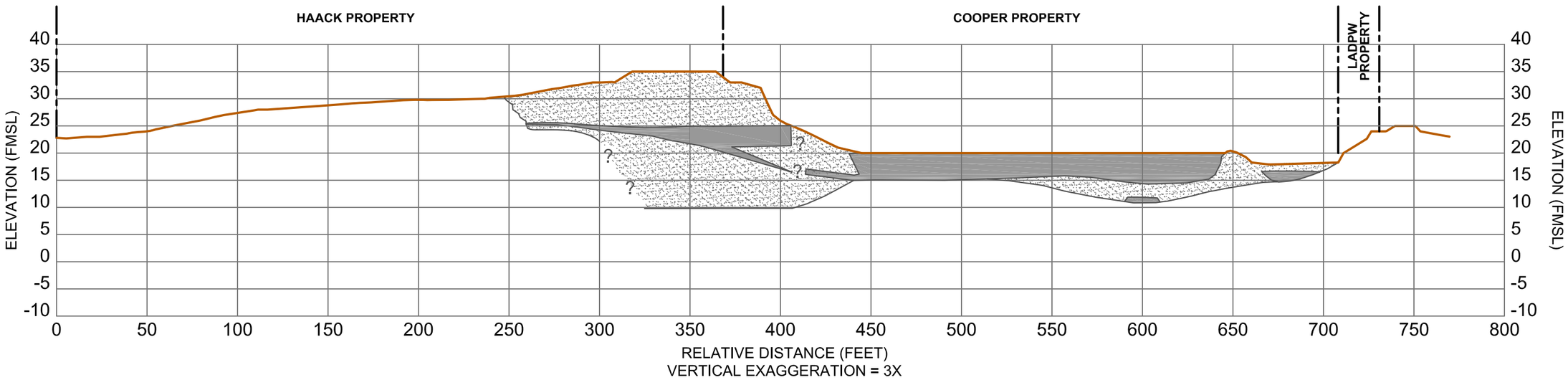
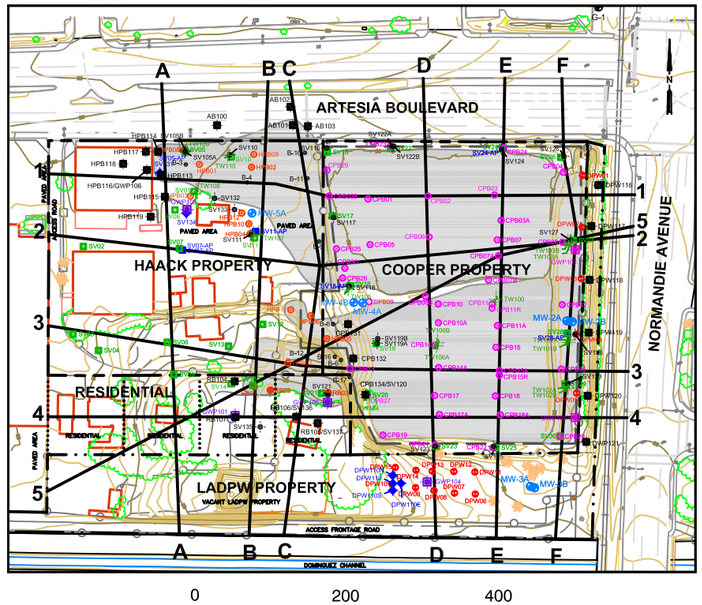
SECTION 3



CROSS-SECTION INDEX MAP



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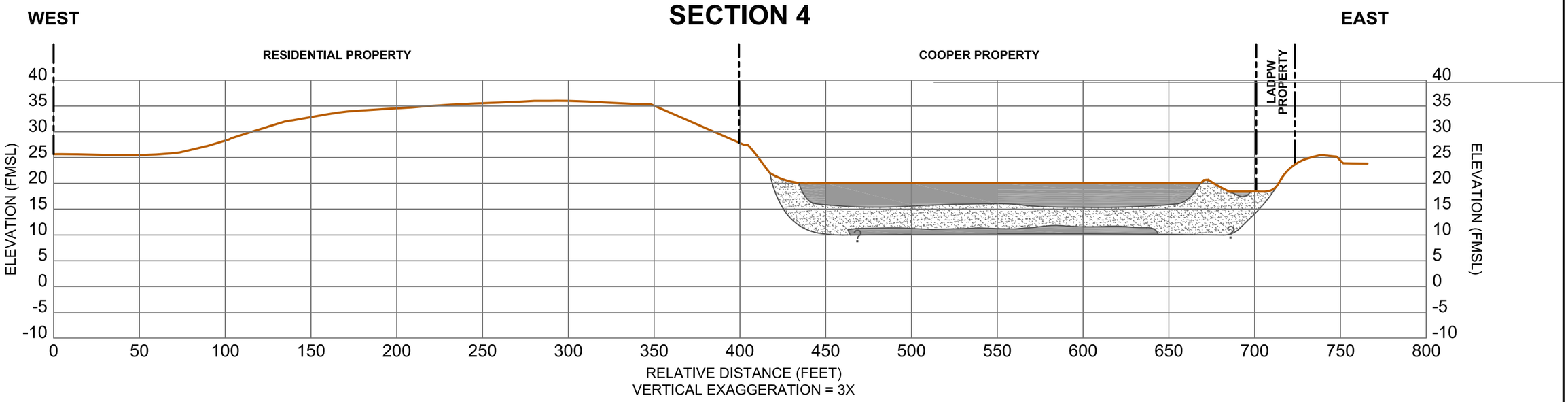
EAST-WEST CROSS-SECTIONS OF SLUDGE SECTION 3

FIGURE: **17IS**

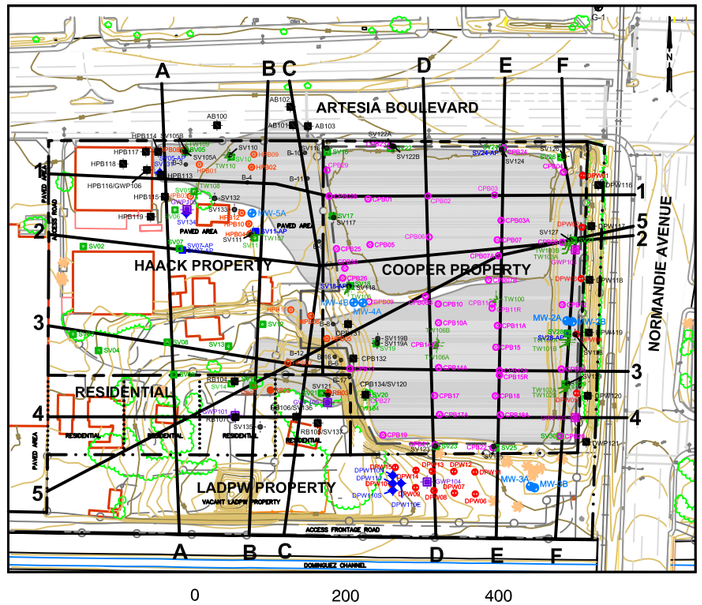
JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	11/05/10

FILEPATH:M:\CADDIGIS-US1331\Projects 2010\BP Arco\Gardena_Sumps\Geologic cross-sections\BP-GS_Cross-Section (N-S&E-W_3) R1.dwg|rocampo|Dec 10, 2010 at 10:57|Layout: FIG17IS (R1)

SECTION 4



CROSS-SECTION INDEX MAP



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EAST-WEST CROSS-SECTIONS OF SLUDGE SECTION 4

FIGURE: **17JS**

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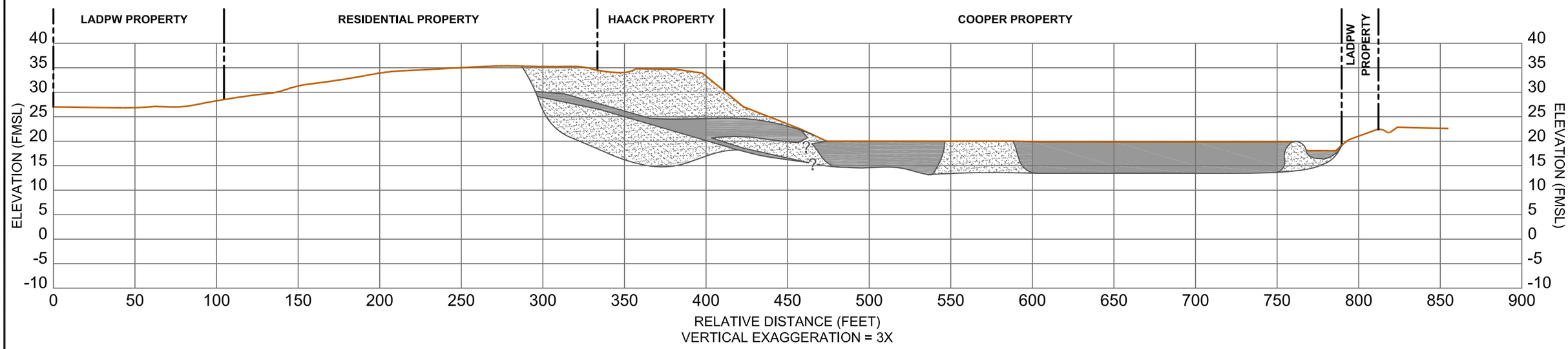
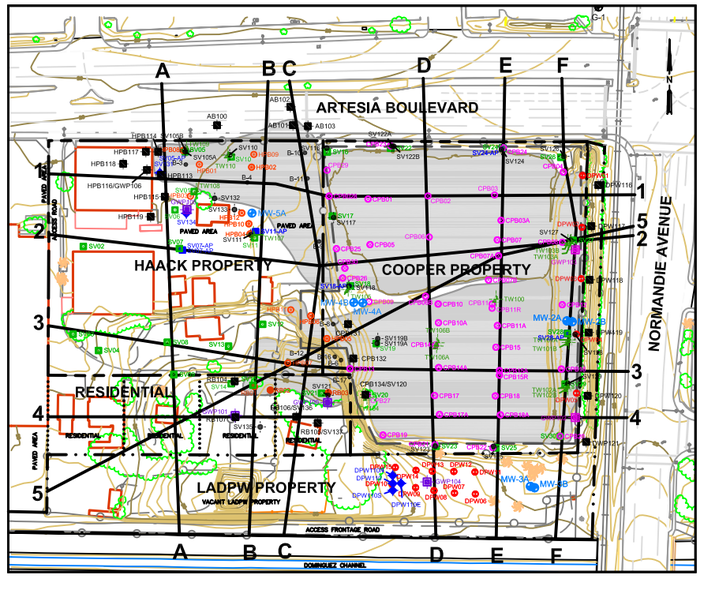
211802064.300.111	R. Roman	C. Farr	K. Brown	11/05/10

FILEPATH:M:\CADDIGIS-US1331\Projects 2010\BP Arco\Gardena_Sumps\Geologic cross-sections\BP-GS_Cross-Section (N-S&E-W_3) R1.dwg|rocampo|Dec 10, 2010 at 10:58|Layout: FIG17JS (R1)

SECTION 5



CROSS-SECTION INDEX MAP



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EAST-WEST CROSS-SECTIONS OF SLUDGE SECTION 5

FIGURE: **17KS**

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211802064.300.111	R. Roman	C. Farr	K. Brown	11/05/10

FILEPATH:M:\CADDIGIS-US1331\Projects 2010\BP Arco\Gardena_Sumps\Geologic cross-sections\BP-GS_Cross-Section (N-S&E-W_3) R1.dwg|rocampo|Dec 10, 2010 at 10:59|Layout: FIG17KS (R1)

SOUTH DALTON AVENUE

DALTON
(APPROXIMATE LOCATION OF MUNICIPAL SUPPLY WELL)

MW-01A
(10.14 FT MSL)

GRO	ND
VOC	ND
SVOC	8.3
LAB pH	7.45
FIELD pH	6.34
PAH	<0.19
TSULF	32 J

(6.93 FT MSL)

GRO	400
VOC	28*
SVOC	<19
LAB pH	4.55
FIELD pH	4.63
PAH	<0.94
TSULF	<100

(6.40 FT MSL)

GRO	ND
VOC	ND
SVOC	8.0
LAB pH	7.25
FIELD pH	6.43
PAH	<0.19
TSULF	<100

G-1

ARTESIA BOULEVARD

PAVED AREA

ACCESS ROAD

7.0

MW-5A

PAVED AREA

PAVED AREA

7.0

G-3

NORMANDIE AVENUE

6.5

MW-04A

MW-02A

6.5

G-2

(6.31 FT MSL)

GRO	ND
VOC	ND
SVOC	3.3 J
LAB pH	7.35
FIELD pH	6.41
PAH	<0.19
TSULF	<100

6.0

6.0

W. CASSIDY STREET

PAVED AREA

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

5.5

VACANT LADPW PROPERTY

G-4

MW-03A

5.5

ACCESS FRONTAGE ROAD

ACCESS FRONTAGE ROAD

UG-CHAN

DOMINGUEZ CHANNEL

FDCC-E

DOMINGUEZ CHANNEL

(5.42 FT MSL)

GRO	ND
VOC	ND
SVOC	2.2 J
LAB pH	7.15
FIELD pH	6.38
PAH	<0.19
TSULF	21 J

N

LEGEND

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- DG-CHAN — 2006 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- FDCC-E — 2008 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- G-1 — ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SUMP LOCATION
- GROUNDWATER ELEVATION CONTOUR LINE, DASHED WHERE INFERRED (Feet above mean sea level)
- GROUNDWATER GRADIENT (0.0039) BENEATH COOPER SUMP–BEARING A–177°
- SELECTED VOLATILE ORGANIC, SEMIVOLATILE ORGANIC, AND METAL CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L) AND pH IN GROUNDWATER SAMPLED ON AUGUST 31 AND SEPTEMBER 01, 2010.
- (6.23 FT MSL) GROUNDWATER ELEVATION FEET ABOVE MSL

GRO	=GASOLINE RANGE ORGANICS (C_4–C_{12}) BY 8015B
VOC	=VOLATILE ORGANIC COMPOUNDS BY 8260B
SVOC	=SEMI–VOLATILE ORGANIC COMPOUNDS BY 8270C BIS(2–ETYLHEXYL) PHTHALATE
LAB pH	=pH MEASURED IN THE LAB BY 9040B
FIELD pH	=pH MEASURED IN THE FIELD PRIOR TO SAMPLING
PAH	=POLYNUCLEAR AROMATIC HYDROCARBON BY 8270C CHRYSENE, PYRENE
TSULF	=TOTAL SULFIDES BY SM4500–SC,D

ND	NON–DETECT
J	ANALYTE WAS DETECTED BETWEEN THE MDL AND THE RL
G–4	GROUNDWATER ELEVATION DATA FROM G–4 & MW–1 NOT USED FOR CONTOURING
28*	1,3,5 TRIMETHYL BENZENE

GENERAL SITE NOTES:

1. REFERENCES; BASEMAP BY W.M. HOLDINGS INC., FLOWN SEPTEMBER 2005.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE ARE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005 MARCH 1, 2007 & AUGUST 10, 2009. VERTICAL DATUM NGVD 29.

0 140 280

APPROXIMATE SCALE (FEET)

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
(805) 230-1266/230-1277 (Fax)

FOR:
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

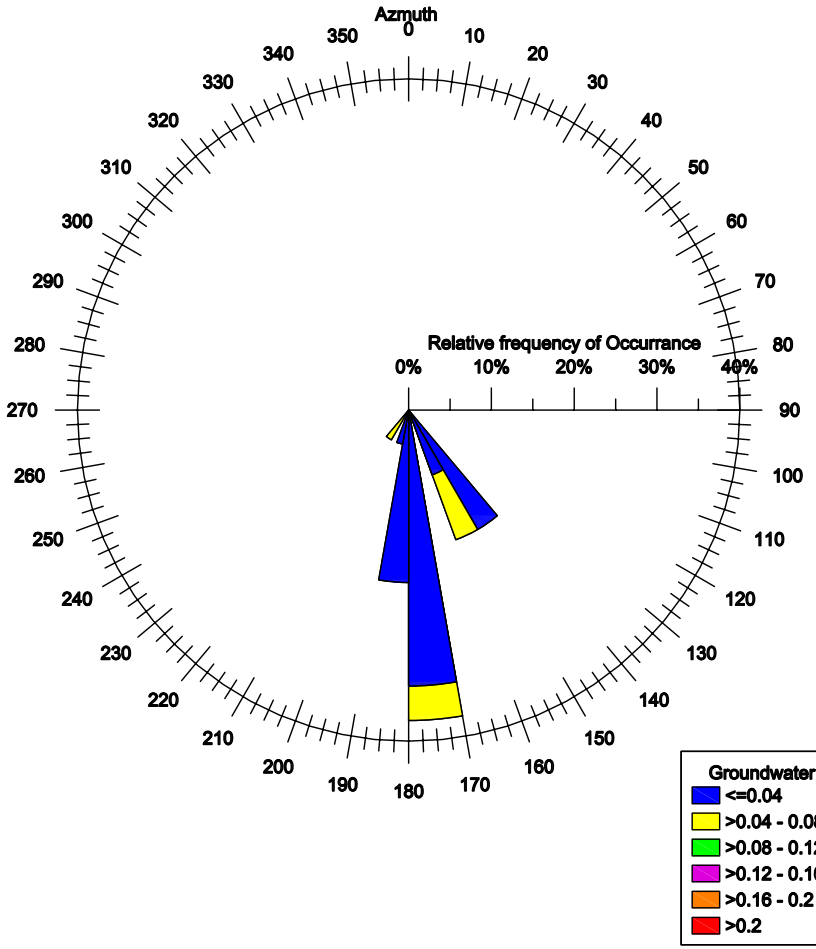
GROUNDWATER ELEVATIONS AND SELECTED ANALYTICAL RESULTS FOR UPPER HYDRAULIC ZONE A THIRD QUARTER 2010

FIGURE: **18S**

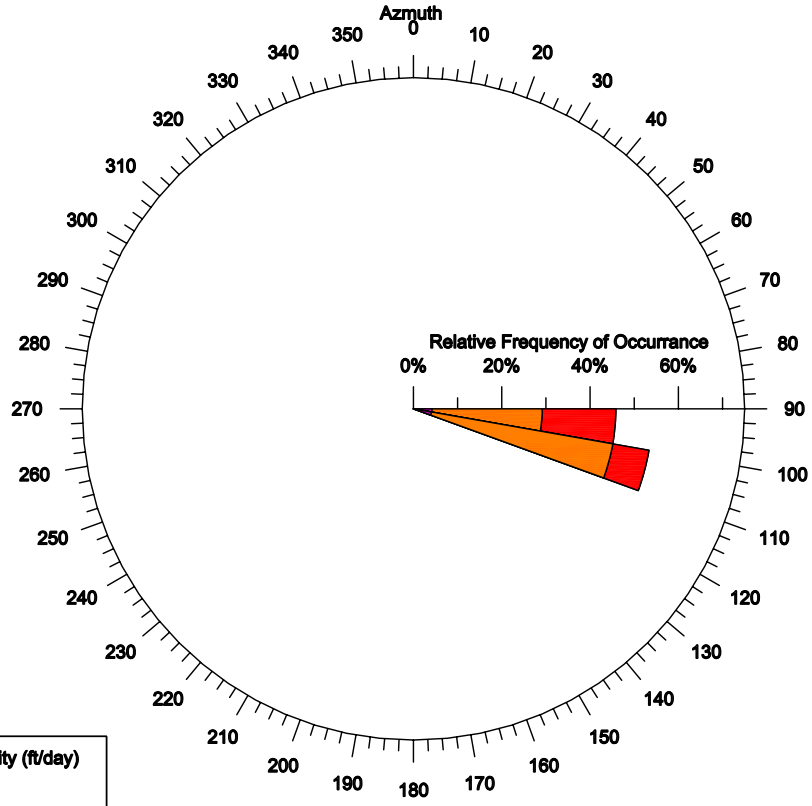
JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802132.300.113	J.Barboza	M.Mason	K.Brown	10/15/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\BPGardenaSumps_Q3GW10.dwg|troman|Oct 14, 2010 at 13:25|Layout: GWA

Groundwater Velocity and Direction
Upper Monitored Zone - Cooper Property



Groundwater Velocity and Direction
Lower Monitored Zone - Cooper Property



Groundwater Velocity (ft/day)
- <=0.04
- >0.04 - 0.08
- >0.08 - 0.12
- >0.12 - 0.16
- >0.16 - 0.2
- >0.2

NOTES:

1. OBSERVATION PERIOD OF ESTIMATED GROUNDWATER GRADIENT, VELOCITY, AND DIRECTION FOR VELOCITY POLAR DIAGRAMS, FOR FEBRUARY 15, 1994 TO PRESENT.

Stantec
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Thousand Oaks, CA 91361
(805) 230-1266/230-1277 (Fax)

FOR:		GROUNDWATER ROSE DIAGRAMS	FIGURE:
GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA			19S
JOB NUMBER: 211802132	DRAWN BY: R. Roman	CHECKED BY: M. Mason	APPROVED BY: K. Brown	DATE: 10/15/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\GS-Hydrograph.dwg|troman|Oct 14, 2010 at 14:20|Layout: FIG19S

SOUTH DALTON AVENUE

DALTON
(APPROXIMATE LOCATION OF MUNICIPAL SUPPLY WELL)

MW-01B

(7.33 FT MSL)

GRO	ND
VOC	ND
SVOC	4.6
LAB pH	7.58
FIELD pH	6.85
PAH	<0.19
TSULF	<100

(2.94 FT MSL)

GRO	ND
VOC	ND
SVOC	1.8 J
LAB pH	7.43
FIELD pH	6.71
PAH	<0.19
TSULF	<100

ARTESIA BOULEVARD

W. CASSIDY STREET

NORMANDIE AVENUE

PAVED AREA

ACCESS ROAD

RESIDENTIAL

VACANT LADPW PROPERTY

ACCESS FRONTAGE ROAD

UG-CHAN

DOMINGUEZ CHANNEL

DG-CHAN

FDCC-E

MW-04B

MW-02B

MW-03B

G-1

G-2

G-3

G-4

(1.57 FT MSL)

GRO	ND
VOC	ND
SVOC	<3.8
LAB pH	7.50
FIELD pH	6.98
PAH	<0.19
TSULF	29 J

(5.43 FT MSL)

GRO	ND
VOC	ND
SVOC	<3.8
LAB pH	7.47
FIELD pH	6.66
PAH	<0.19
TSULF	<100

(1.63 FT MSL)

GRO	ND
VOC	ND
SVOC	<3.8
LAB pH	7.74
FIELD pH	8.81
PAH	<0.19
TSULF	<100

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN-LINK FENCE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-2A,B — CLUSTER WELLS (A&B)
- DG-CHAN — 2006 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- FDCC-E — 2008 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- G-1 — ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SUMP LOCATION
- GROUNDWATER ELEVATION CONTOUR LINE, DASHED WHERE INFERRED (Feet above mean sea level)
- GROUNDWATER GRADIENT (0.0048) BENEATH COOPER SUMP-BEARING A-100°
- SELECTED VOLATILE ORGANIC, SEMIVOLATILE ORGANIC, AND METAL CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L) AND pH IN GROUNDWATER SAMPLED ON AUGUST 31 AND SEPTEMBER 01, 2010.
- (7.79 FT MSL) GROUNDWATER ELEVATION FEET ABOVE MSL

GRO	= GASOLINE RANGE ORGANICS (C4-C12) BY 8015B
VOC	= VOLATILE ORGANIC COMPOUNDS BY 8260B
SVOC	= SEMI-VOLATILE ORGANIC COMPOUNDS BY 8270C BIS(2-ETYLHEXYL) PHTHALATE
LAB pH	= pH MEASURED IN THE LAB BY 9040B
FIELD pH	= pH MEASURED IN THE FIELD PRIOR TO SAMPLING
PAH	= POLYNUCLEAR AROMATIC HYDROCARBON BY 8270C CHRYSENE, PYRENE
TSULF	= TOTAL SULFIDES BY SM4500-SC,D

ND — NON-DETECT

J — ANALYTE WAS DETECTED BETWEEN THE MDL AND THE RL

G-4 — GROUNDWATER ELEVATION DATA FROM G-4 NOT USED FOR CONTOURING

GENERAL SITE NOTES:

1. REFERENCES; BASEMAP BY W.M. HOLDINGS INC., FLOWN SEPTEMBER 2005.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON-SITE AND OFF-SITE ARE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005, MARCH 1, 2007 & AUGUST 10, 2009. VERTICAL DATUM NGVD 29.

0 140 280
APPROXIMATE SCALE (FEET)

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
(805) 230-1266/230-1277 (Fax)

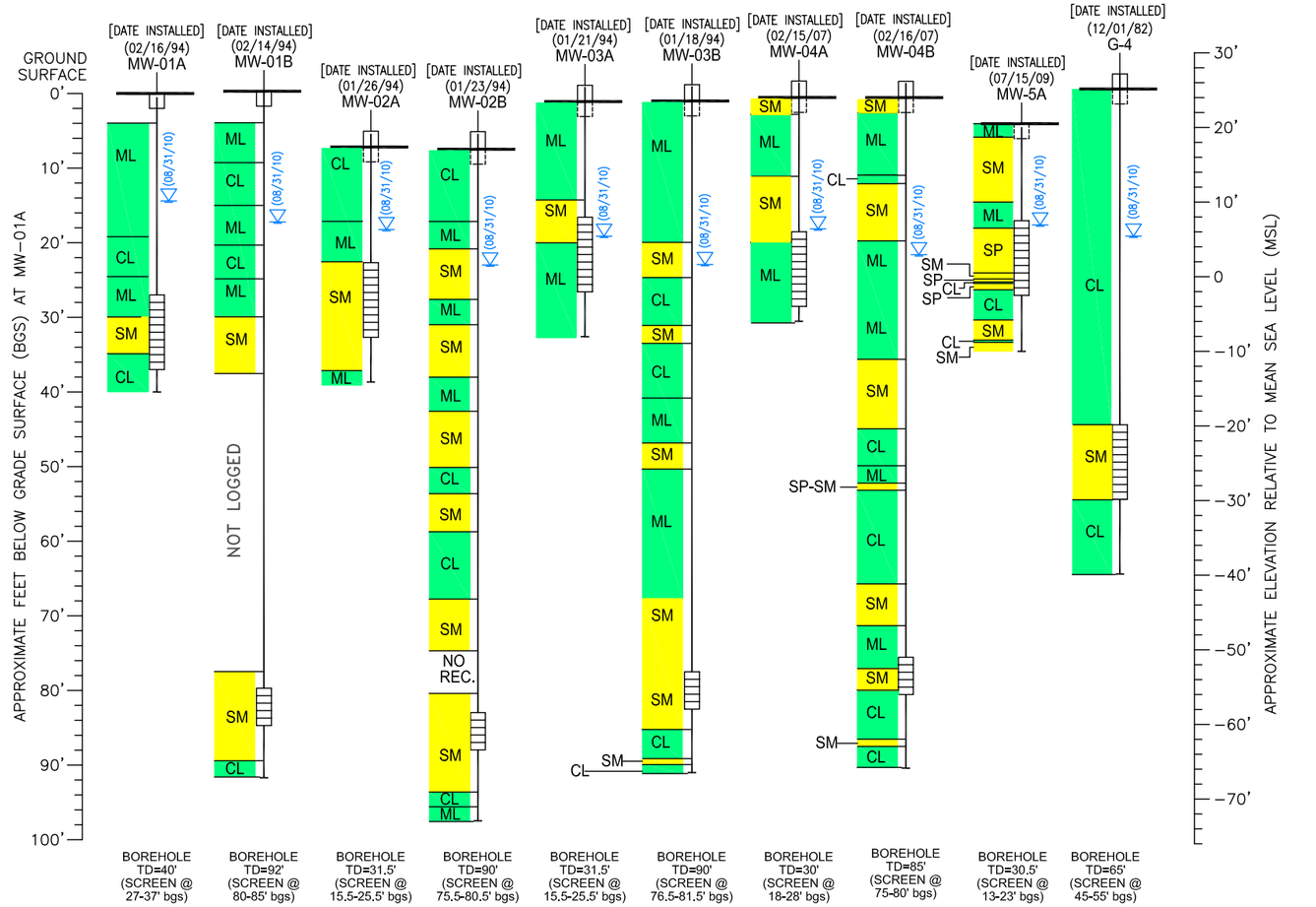
FOR:
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

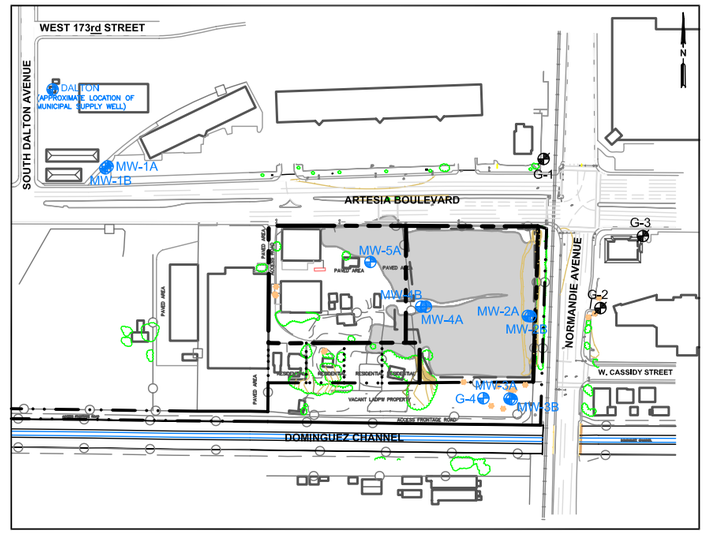
GROUNDWATER ELEVATIONS AND SELECTED ANALYTICAL RESULTS FOR LOWER HYDRAULIC ZONE B THIRD QUARTER 2010

FIGURE: **20S**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802132.300.113	J.Barboza	M.Mason	K.Brown	10/15/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\BPGardenaSumps_Q3GW10.dwg|troman|Oct 14, 2010 at 13:27|Layout: GWB





SITE MAP

1 INCH = 400 FEET

0 400 800

APPROXIMATE SITE MAP SCALE (FEET)

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- FENCE
- G-4 EPA GROUNDWATER MONITORING WELL
- G-1 ABANDONED EPA GROUNDWATER MONITORING WELL
- MW-1A/B GROUNDWATER MONITORING WELL (A/B)
- GROUNDWATER ELEVATION (DATE)
- APPROXIMATE SUMP LOCATION

GENERAL SITE MAP NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON-SITE AND OFF-SITE ARE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005, MARCH 1, 2007, AND AUGUST 10, 2009. VERTICAL DATUM NGVD 29.

Stantec
290 Conejo Ridge avenue
Thousand Oaks, CA 91361
(805) 230-1266/230-1277 (Fax)

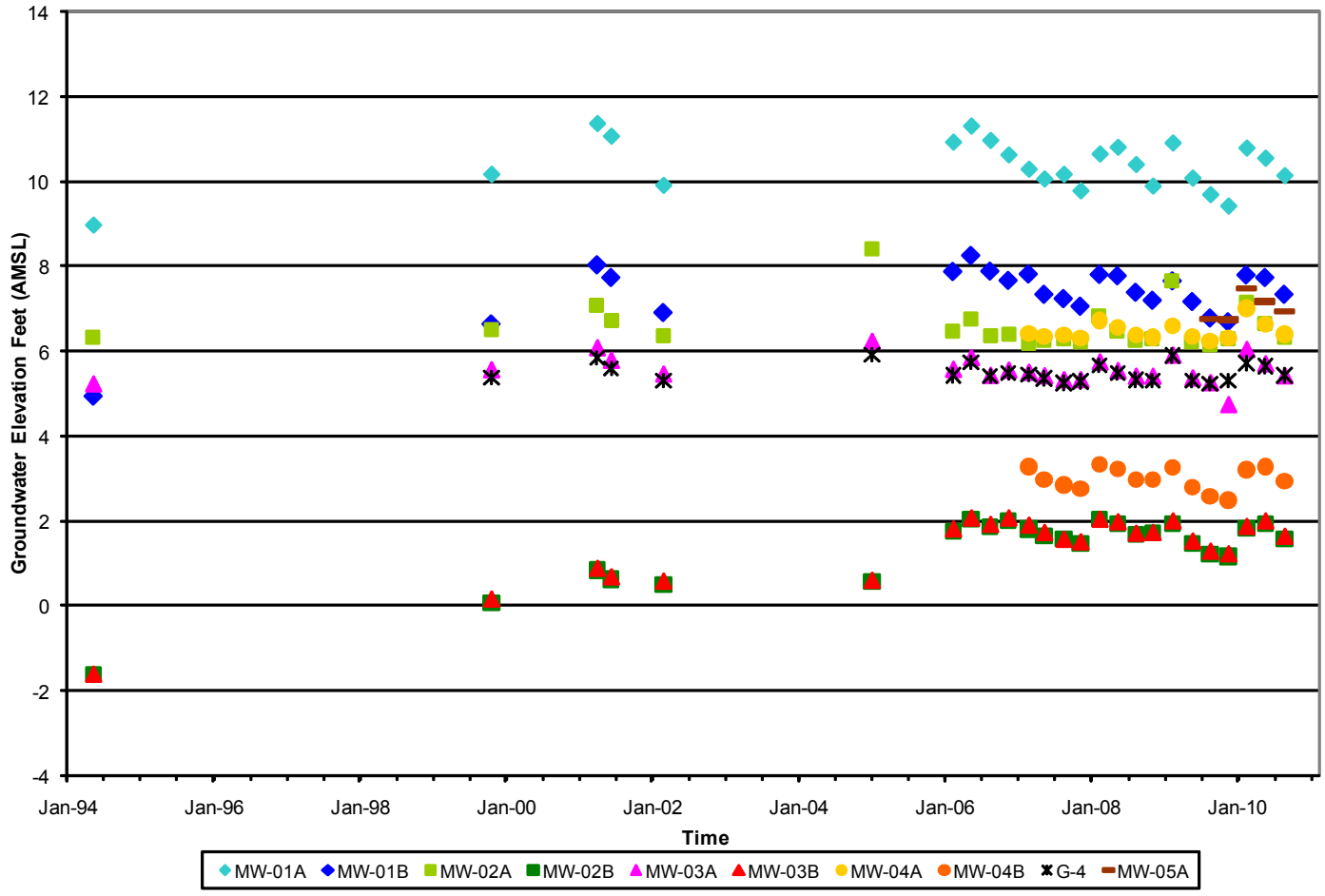
FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

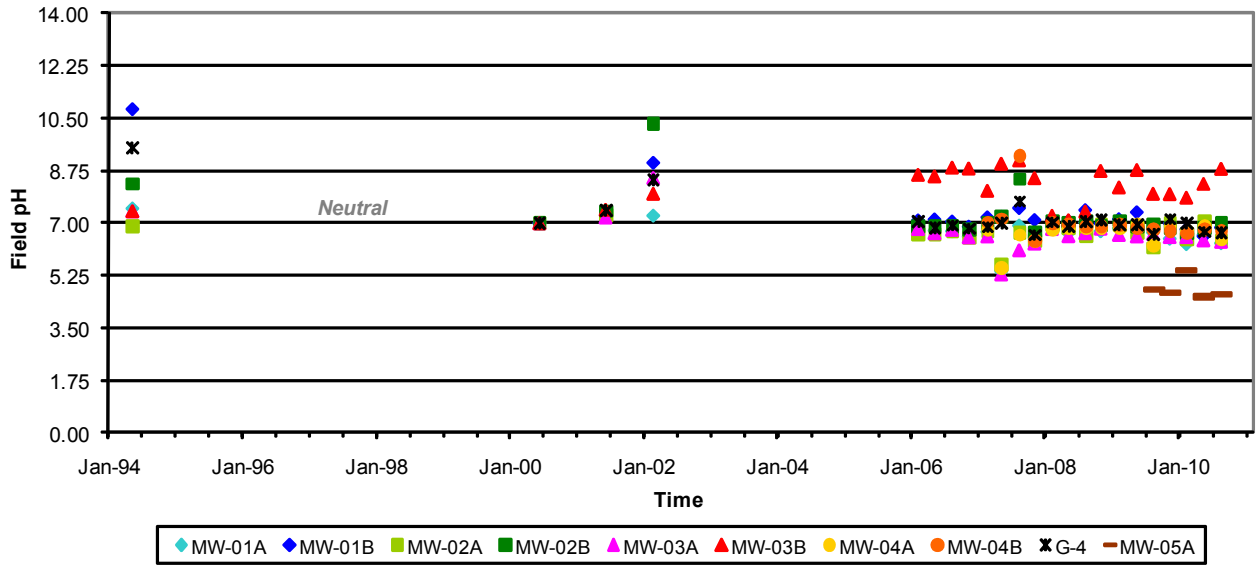
RELATIVE ELEVATIONS OF MONITORING WELLS AND GROUNDWATER AUGUST 31, 2010

FIGURE: **21S**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	10/15/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\BP-GS_F21S.dwg|troman|Oct 15, 2010 at 9:13|Layout: FIG21S





GRAPH NOTES:

1. ALL pH MEASUREMENTS TAKEN JUNE 15, 2000 WERE OBTAINED USING pH PAPER INSTEAD OF A pH METER. THUS, DATA RESOLUTION WAS LIMITED TO WHOLE pH UNITS.

2. DURING THE SECOND QUARTER 2007 THE INSTRUMENT USED TO MEASURE pH IN WELLS COMPLETED IN THE UPPER SATURATED ZONE HAD CALIBRATION ISSUES THAT RESULTED IN SLIGHTLY LOWER pH VALUES. DURING THE THIRD QUARTER 2007 A CALIBRATION ISSUE DEVELOPED IN THE INSTRUMENT USED TO MEASURE pH VALUES IN WELLS WITHIN THE LOWER SATURATED ZONE RESULTING IN SLIGHTLY ELEVATED pH VALUES.

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FOR:		FIGURE:
GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA	**GROUNDWATER HYDROGRAPH AND FIELD pH**	**22S**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802132	R. Roman	M. Mason	K. Brown	10/15/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\GS-Hydrograph.dwg|troman|Oct 14, 2010 at 14:21|Layout: FIG22S

ARTESIA BOULEVARD

NORMANDIE AVENUE

W. CASSIDY ST

ACCESS FRONTAGE ROAD

ACCESS FRONTAGE ROAD

DOMINGUEZ CHANNEL

DOMINGUEZ CHANNEL

PAVED AREA

ACCESS ROAD

PAVED AREA

PAVED AREA

PAVED AREA

PAVED AREA

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

VACANT LADPW PROPERTY

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- SV01 SOIL VAPOR SAMPLES

Sample ID:		
Depth		
5'	B	= Benzene
	T	= Toluene
	E	= Ethylbenzene
	o-x	= o-Xylene
	m,p,-X	= m,p, -Xylene
	1,3,5, Tr	= 1,3,5 Trimethylbenzene
	M	= Methane
	H	= Hydrogen Sulfide
	*	= Duplicate Sample Analytical Data
	**	= Second Event Analytical Data

ID: SV01	
Depth	
7'	B=0.1
	T=0.3
	H=0.047

ID: SV02	
Depth	
13'	T=0.4
	M=12
	m,p,-X=0.2

ID: SV03	
Depth	
5'	M=160
15'	B=0.1
	T=0.7
	M=77

ID: SV04	
Depth	
15'	B=0.1
	M=48

ID: SV06	
Depth	
5'	T=0.4
13'	T=0.4

ID: SV07	
Depth	
15'	M=26

ID: SV11	
Depth	
5'	B=0.2*
	T=0.5*
	M=53

ID: SV12	
Depth	
15'	B=0.1

ID: SV13	
Depth	
5'	T=0.4

ID: SV15	
Depth	
5'	M=10
15'	H=0.37

ID: SV16	
Depth	
13'	M=14
	Freon=0.4

ID: SV17	
Depth	
5'	M=10
	Freon=0.3
10'	T=0.4
	E=0.2

ID: SV18	
Depth	
5'	B=0.1
	T=0.4
	m,p,-X=0.2
	H=2.1
13'	Freon=0.4

ID: SV19	
Depth	
5'	B=0.3
	T=2.2
	E=0.3
	o-x=0.2
	m,p,-X=0.7*
	1,3,5,Tr=0.1*
	H=5.1
10'	B=0.1
	T=0.8
	m,p,-X=0.2
	H=0.21

ID: SV21	
Depth	
15'	M=14

ID: SV22	
Depth	
5'	M=28
13'	M=38

ID: SV23	
Depth	
15'	T=0.3

ID: SV24	
Depth	
13'	M=92

ID: SV25	
Depth	
13'	M=23
15'	T=0.3**

ID: SV26	
Depth	
13'	M=26
	Freon=0.3

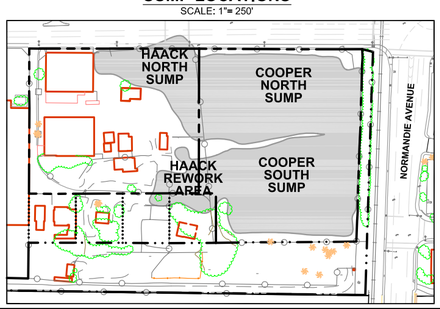
ID: SV28	
Depth	
5'	T=0.3
	M=220
	H=0.32
10'	M=99
	H=>50

ID: SV29	
Depth	
5'	M=16
	H=0.054

SV01 SV02 SV03 SV04 SV05 SV06 SV07 SV08 SV10 SV11 SV12 SV13 SV14 SV15 SV16 SV17 SV18 SV19 SV20 SV21 SV22 SV23 SV24 SV25 SV26 SV27 SV28 SV29 SV30

SUMP LOCATIONS

SCALE: 1"= 250'



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE WERE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.
4. BORING AND SAMPLE LOCATIONS WERE SURVEYED BY W.M. HOLDINGS INC., ON JANUARY 23, 2006 (CPB AND DPW BORINGS), FEBRUARY 17, 2006 (HPB AND RB BORINGS), AND MARCH 30, 2006 (SV BORINGS).
5. SUPPLIMENTAL BORING AND SAMPLE LOCATIONS; AND GROUNDWATER MONITORING WELL LOCATIONS AND ELEVATIONS (MW–4A/B) WERE SURVEYED BY W.M. HOLDING INC. ON MARCH 1, 2007
6. SUPPLIMENTAL BORING AND SAMPLE LOCATIONS; AND GROUNDWATER MONITORING WELL LOCATIONS (MW–5A) WERE SURVEYED BY W.M. HOLDING INC. ON AUGUST 10, 2009.
7. 2009 REMEDIAL INVESTIGATION LOCATIONS SURVEYED BY W.M. HOLDINGS INC., DATED AUGUST 10, 2009 AND OCTOBER 29, 2009.

0 80 160

APPROXIMATE SCALE (FEET)

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
(805) 230-1266/230-1277 (Fax)

FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

TEMPORARY SOIL VAPOR PROBE LOCATIONS WITH DETECTED VOC (8260B), H2S, AND METHANE ANALYTICAL RESULTS 2005 INVESTIGATION

FIGURE: **25**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	10/12/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\BP-GS_ActiveSoilGas_F25.dwg|troman|Oct 12, 2010 at 12:23|Layout: F25

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN-LINK FENCE
- SV133 - SOIL VAPOR SAMPLES
- SV131 - SOIL BORING FOR METAL AND pH
- CPB134/SV120 - SOIL BORING FOR SLUDGE DELINEATION

Sample ID:		
Depth		
5'	B	= Benzene
	T	= Toluene
	E	= Ethylbenzene
	o-x	= o-Xylene
	m,p,-X	= m,p, -Xylene
	1,3,5, Tr	= 1,3,5 Trimethylbenzene
	M	= Methane
	H	= Hydrogen Sulfide
	*	= Duplicate Sample Analytical Data
	**	= Second Event Analytical Data

ID:	SV131
Depth	
5'	B=19
	T=51
	E=18
	m,p,-X=36
	o-x=15
	1,3,5,Tr=16
	M=35
10'	B=12
	T=21
	E=14
	m,p,-X=40
	o-x=15
	1,3,5,Tr=29
	M=38

ID:	SV132
Depth	
7'	T=46
	E=32
	m,p,-X=110
	o-x=38
	1,3,5,Tr=20
12'	T=16
	E=6.6
	m,p,-X=22
	o-x=7.3
	M=79

ID:	SV133
Depth	
5'	T=120
	E=60
	m,p,-X=200
	o-x=62
	1,3,5,Tr=17
11'	B=6.2
	T=100
	E=41
	m,p,-X=150
	o-x=41
	1,3,5,Tr=9.6
11'DUP	B=6.4
	T=100
	E=41
	m,p,-X=150
	o-x=41
	1,3,5,Tr=9.9

ID:	SV116
Depth	
5'	T=5.5
	m,p,-X=7.9
	1,3,5,Tr=17
11'	B=7.2
	T=51
	E=11
	m,p,-X=26
	o-x=8.5

ID:	SV122
Depth	
5'	B=22
	T=39
	E=45
	m,p,-X=130
	o-x=34
	1,3,5,Tr=7.6
	M=18
11'	T=8.7
	m,p,-X=7.2
	M=18

ID:	SV124
Depth	
5'	T=6.7
	m,p,-X=20
	o-x=7.7
10'	B=16
	T=95
	E=33
	m,p,-X=110
	o-x=32
	1,3,5,Tr=5.6
10'DUP	B=11
	T=95
	E=33
	m,p,-X=110
	o-x=29

ID:	SV126
Depth	
5'	B=33
	T=130
	E=40
	m,p,-X=170
	o-x=63
	1,3,5,Tr=7.6
12'	B=21
	T=73
	E=41
	m,p,-X=150
	o-x=60
	1,3,5,Tr=11

ID:	SV134
Depth	
5'	B=5.0
	T=33
	E=5.7
	m,p,-X=27
	o-x=7.7
5'DUP	T=23
	m,p,-X=17
10'	T=30
	m,p,-X=18

ID:	SV111
Depth	
5'	T=57
	E=47
	o-x=51
	m,p,-X=87
	1,3,5,Tr=15
12.5'	B=120
	T=500
	E=140
	m,p,-X=440
	o-x=180
	1,3,5,Tr=44
	M=38

ID:	SV117
Depth	
5'	B=22
	T=120
	E=49
	m,p,-X=250
	o-x=74
	1,3,5,Tr=1,100
	M=13
10'	B=21
	T=240
	E=74
	m,p,-X=300
	o-x=93
	1,3,5,Tr=510
	M=14

ID:	SV118
Depth	
5'	B=250
	T=680
	E=170
	m,p,-X=240
	o-x=120
	1,3,5,Tr=28
	M=90
12'	B=5.5
	T=65
	E=54
	m,p,-X=110
	o-x=53
	1,3,5,Tr=16
	M=11

ID:	SV119
Depth	
6'	M=520
10'	B=340
	T=3,800
	E=410
	m,p,-X=2,200
	o-x=450
	1,3,5,Tr=100
	M=86

ID:	SV127
Depth	
5'	B=380
	T=1,700
	E=260
	m,p,-X=690
	o-x=230
	1,3,5,Tr=190
	M=320

ID:	SV128
Depth	
5'	B=66
	T=220
	E=60
	m,p,-X=150
	o-x=61
	1,3,5,Tr=51
8'	B=110
	T=830
	E=210
	m,p,-X=490
	o-x=180
	1,3,5,Tr=170

ID:	SV129
Depth	
5'	T=280
	m,p,-X=13
	o-x=5.6
	M=11
8'	B=15
	T=80
	E=19
	m,p,-X=68
	o-x=33
	1,3,5,Tr=9.6
	M=18

ID:	SV135
Depth	
5'	B=50
	T=240
	E=37
	m,p,-X=160
	o-x=64
	1,3,5,Tr=11
15'	T=6,3

ID:	SV121
Depth	
5'	T=7.1
5'DUP	T=6.1
15'	T=7.2

ID:	SV137
Depth	
5'	T=12
	m,p,-X=8.7
15'	T=26
	m,p,-X=14

ID:	SV120
Depth	
5'	T=9.8
	E=8.0
	m,p,-X=34
	o-x=23
	1,3,5,Tr=14
11'	B=8.0
	T=110
	E=65
	m,p,-X=200
	o-x=68
	1,3,5,Tr=20
	M=26

ID:	SV123
Depth	
5'	B=5.4
	T=11
	E=15
	m,p,-X=54
	o-x=8.3
	M=12
13'	T=10
	E=6.1
	m,p,-X=14

ID:	SV125
Depth	
12'	T=9.8
	m,p,-X=6.9

SV105B, SV105A, SV131, SV110, SV132, SV133, SV134, SV111, SV116, SV122A, SV122B, SV124, SV126, SV117, SV118, SV127, SV128, SV119B, SV119A, SV129, CPB134/SV120, SV121, RB106/SV136, RB105/SV137, SV135, SV123, SV125

PAVED AREA, ACCESS ROAD, PAVED AREA, PAVED AREA, RESIDENTIAL, RESIDENTIAL, RESIDENTIAL, VACANT LADPW PROPER

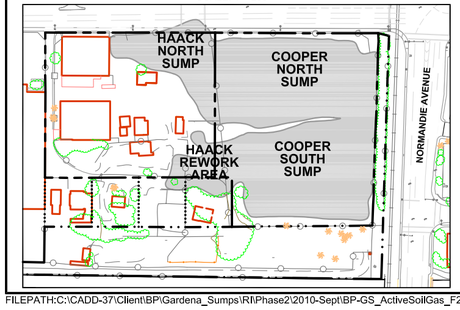
ACCESS FRONTAGE ROAD, ACCESS F

DOMINGUEZ CHANNEL, DOMINGUEZ CHANNEL

NORMANDIE AVENUE, W. CASSIDY ST

SUMP LOCATIONS

SCALE: 1"= 250'



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON-SITE AND OFF-SITE WERE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.
4. BORING AND SAMPLE LOCATIONS WERE SURVEYED BY W.M. HOLDINGS INC., ON JANUARY 23, 2006 (CPB AND DPW BORINGS), FEBRUARY 17, 2006 (HPB AND RB BORINGS), AND MARCH 30, 2006 (SV BORINGS).
5. SUPPLIMENTAL BORING AND SAMPLE LOCATIONS; AND GROUNDWATER MONITORING WELL LOCATIONS AND ELEVATIONS (MW-4A/B) WERE SURVEYED BY W.M. HOLDING INC. ON MARCH 1, 2007
6. SUPPLIMENTAL BORING AND SAMPLE LOCATIONS; AND GROUNDWATER MONITORING WELL LOCATIONS (MW-5A) WERE SURVEYED BY W.M. HOLDING INC. ON AUGUST 10, 2009.
7. 2009 REMEDIAL INVESTIGATION LOCATIONS SURVEYED BY W.M. HOLDINGS INC., DATED AUGUST 10, 2009 AND OCTOBER 29, 2009.

0 80 160

APPROXIMATE SCALE (FEET)

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
(805) 230-1266/230-1277 (Fax)

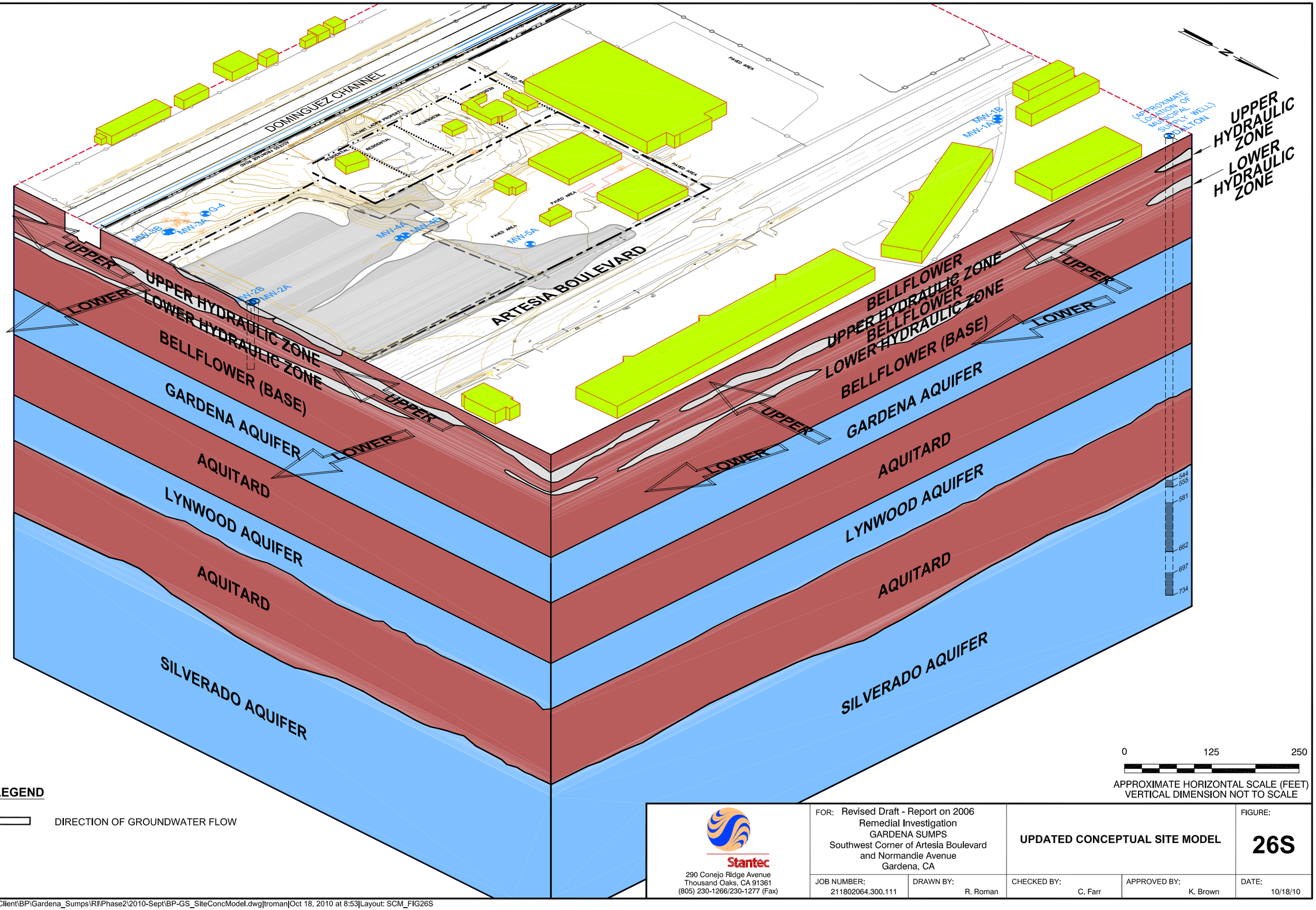
FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

TEMPORARY SOIL VAPOR PROBE LOCATIONS WITH DETECTED VOC (8260B), H2S, AND METHANE ANALYTICAL RESULTS 2009 INVESTIGATION

FIGURE: **25S**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	10/13/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\BP-GS_ActiveSoilGas_F25S.dwg|troman|Oct 18, 2010 at 9:20|Layout: FIG25S



Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
(805) 230-1266/230-1277 (Fax)

FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

UPDATED CONCEPTUAL SITE MODEL

FIGURE: **26S**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	10/18/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\BP-GS_SiteConcModel.dwg|troman|Oct 18, 2010 at 8:53|Layout: SCM_FIG26S

TABLES

Table 9A
Summary of General Inorganic Groundwater Chemistry
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			SM2320B	300.0			200.7					SM2340B	SM2510B	SM2540C
			Anions				Cations							
Sample ID	Date Sampled	Notes	Bicarbonate Alkalinity as CaCO3 (mg/L)	Chloride (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Calicum (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Hardness (mg/L)	Specific Conductance (umhos/cm @ 25C)	Total Dissolved Solids (mg/L)
MW-01A	11/20/2006		540	46	1.8	110	100	ND	36	3	190	410	1,400	850
MW-01A	5/19/2008		540	65	3.1	130	90	< 0.040	32	2.7	180	360	1,300	860
MW-01A	5/27/2009		520	84	4.5	140	97	< 0.040	33	2.6	190	380	1,400	920
MW-01A	5/27/2010		500	110	6.9	160	87	<0.040	29	3.6	200	340	1,400	900
MW-01B	11/20/2006		260	440	1.8	130	170	0.11	51	10	140	630	2,200	1,500
MW-01B	5/19/2008		280	460	2.3	140	170	< 0.040	53	9.0	170	640	2,000	1,400
MW-01B	5/27/2009		270	450	2.2	140	170	0.029 J	53	8.6	170	660	2,100	1,600
MW-01B	5/27/2010		280	490	2.4	150	170	0.024 J	54	8.5	170	640	2,100	1,500
MW-02A	11/21/2006		320	7.4	ND	120	110	0.016 J	42	1.2	38	440	850	510
MW-02A	5/20/2008		290	5.8	0.088 J	110	78	< 0.040	32	2	29	330	730	490
MW-02A	5/28/2009		280	5.8	<0.11	99	77	< 0.040	30	0.77	28 B-1	320	700	420
MW-02A	5/28/2010		280	7.1	<0.11	92	78	< 0.040	31	0.87	28	320	710	460
MW-02B	11/21/2006		510	420	ND	840	170	1.4	84	10	580	770	3,400	2200
MW-02B	5/20/2008		500	400	<0.11	690	140	1.1	67	9.1	480	620	3,100	2,200
MW-02B	5/28/2009		490	380	<0.11	640	130	1.1	64	8	490 B-1	600	3,000	2,100
MW-02B	5/28/2010		490	390	<0.22	580	130	1.1	64	7.7	450	590	3,000	2,000
MW-03A	11/20/2006		440	7.0	1.8	120	120	0.19	40	1.6	100	460	1,100	690
MW-03A	5/19/2008		480	7.3	2.1	190	130	0.094	45	0.96	75	510	1,200	810
MW-03A	5/27/2009		520	6.8	1.4	190	150	0.077	52	0.66	74	600	1,300	880
MW-03A	5/27/2010		570	6.6	0.91	220	160	0.20	56	0.71	69	630	1,300	880
MW-03B	11/20/2006		200	230	0.16	360	180	0.26	0.27	16	230	590	1,900	1,300
MW-03B	5/19/2008		330	300	<0.11	430	160	0.56	43	12	230	560	2,000	1,400
MW-03B	5/27/2009		250	270	<0.11	410	170	0.54	34	14	250	550	2,000	1,400
MW-03B	5/27/2010		310	320	<0.11	400	160	0.55	33	13	230	530	2,000	1,500

Table 9A
Summary of General Inorganic Groundwater Chemistry
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			SM2320B	300.0			200.7					SM2340B	SM2510B	SM2540C
			Anions				Cations							
Sample ID	Date Sampled	Notes	Bicarbonate Alkalinity as CaCO3 (mg/L)	Chloride (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Calicum (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Hardness (mg/L)	Specific Conductance (umhos/cm @ 25C)	Total Dissolved Solids (mg/L)
MW-04A	--	NS	--	--	--	--	--	--	--	--	--	--	--	--
MW-04A	5/20/2008		1,200	230	0.72	900	210	< 0.040	84	8.6	680	870	3,700	2,800
MW-04A	5/28/2009		1,100	220	1.0	850	190	< 0.040	76	6.8	670 B-1	800	3,700	2,700
MW-04A	5/28/2010		1,000	220	0.81	800	180	< 0.040	74	6.5	660	760	3,600	2,600
MW-04B	--	NS	--	--	--	--	--	--	--	--	--	--	--	--
MW-04B	5/20/2008		540	360	<0.11	650	180	0.33	69	9.9	390	740	2,900	2,100
MW-04B	5/28/2009		540	360	<0.11	590	190	0.39	71	8.7	420 B-1	770	2,900	2,000
MW-04B	5/28/2010		530	360	<0.22	490	180	0.40	66	8.0	360	720	2,700	1,900
MW-05A	5/27/2010		12	220	<0.22	4200	490	240	210	26	570	2100	5,300	5,900
G-4	11/20/2006		460	290	0.13	560	190	0.45	0.52	10	460	750	2,700	1,800
G-4	5/19/2008		390	820	<0.55	1,200	260	< 0.040	94	10	650	1,000	4,300	3,400
G-4	5/27/2009		490	440	0.098 J	910	220	0.56	79	9	600	870	3,600	2,700
G-4	5/27/2010		500	360	<0.22	940	180	0.11	65	8.5	500	710	3,300	2,500

Notes:
ND = Non-detect
< # = Analyte not detected above the method detection limit
J = Analyte was detected between the MDL and the RL
mg/l = milligrams per liter
-- = Not applicable / Not analyzed
NS = Not sampled
B-1 = Analyte present in Method Blank, Analyte concentration in sample is greater than 10x the concentration found in the method blank
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.

Table 9B
General Inorganic Groundwater Chemistry (Hydraulic A Zone)
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			300.0				200.7					SM2540C	SM2510B	SM2340B
			Anions				Cations							
Sample ID	Date Sampled	Notes	Bicarbonate Alkalinity as CaCO3 (mg/L)	Chloride (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Calicum (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Hardness (mg/L)	Specific Conductance (umhos/cm @ 25C)	Total Dissolved Solides (mg/L)
MW-01A	11/20/2006		540	46	1.8	110	100	ND	36	3	190	410	1,400	850
MW-01A	5/19/2008		540	65	3.1	130	90	< 0.040	32	2.7	180	360	1,300	860
MW-01A	5/27/2009		520	84	4.5	140	97	< 0.040	33	2.6	190	380	1,400	920
MW-01A	5/27/2010		500	110	6.9	160	87	<0.040	29	3.6	200	340	1,400	900
MW-02A	11/21/2006		320	7.4	ND	120	110	0.016 J	42	1.2	38	440	850	510
MW-02A	5/20/2008		290	5.8	0.088 J	110	78	< 0.040	32	2	29	330	730	490
MW-02A	5/28/2009		280	5.8	<0.11	99	77	< 0.040	30	0.77	28 B-1	320	700	420
MW-02A	5/28/2010		280	7.1	<0.11	92	78	< 0.040	31	0.87	28	320	710	460
MW-03A	11/20/2006		440	7.0	1.8	120	120	0.19	40	1.6	100	460	1,100	690
MW-03A	5/19/2008		480	7.3	2.1	190	130	0.094	45	0.96	75	510	1,200	810
MW-03A	5/27/2009		520	6.8	1.4	190	150	0.077	52	0.66	74	600	1,300	880
MW-03A	5/27/2010		570	6.6	0.91	220	160	0.20	56	0.71	69	630	1,300	880
MW-04A	--	NS	--	--	--	--	--	--	--	--	--	--	--	--
MW-04A	5/20/2008		1,200	230	0.72	900	210	< 0.040	84	8.6	680	870	3,700	2,800
MW-04A	5/28/2009		1,100	220	1.0	850	190	< 0.040	76	6.8	670 B-1	800	3,700	2,700
MW-04A	5/28/2010		1,000	220	0.81	800	180	< 0.040	74	6.5	660	760	3,600	2,600
MW-05A	5/27/2010		12	220	<0.22	4200	490	240	210	26	570	2100	5,300	5,900

Notes:
Sample ID order is based on groundwater flow gradient, from upgradient to down gradient.
ND = Non-detect
< # = Analyte not detected above the method detection limit
J = Analyte was detected between the MDL and the RL
mg/l = milligrams per liter
-- = Not applicable / Not analyzed
NS = Not sampled
B-1 = Analyte present in Method Blank, Analyte concentration in sample is greater than 10x the concentration found in the method blank
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.

Table 9C
General Inorganic Groundwater Chemistry (Hydraulic B Zone)
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			300.0				200.7					SM2540C	SM2510B	SM2340B
			Anions				Cations							
Sample ID	Date Sampled	Notes	Bicarbonate Alkalinity as CaCO3 (mg/L)	Chloride (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Calicum (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Hardness (mg/L)	Specific Conductance (umhos/cm @ 25C)	Total Dissolved Solides (mg/L)
MW-01B	11/20/2006		260	440	1.8	130	170	0.11	51	10	140	630	2,200	1,500
MW-01B	5/19/2008		280	460	2.3	140	170	< 0.040	53	9.0	170	640	2,000	1,400
MW-01B	5/27/2009		270	450	2.2	140	170	0.029 J	53	8.6	170	660	2,100	1,600
MW-01B	5/27/2010		280	490	2.4	150	170	0.024 J	54	8.5	170	640	2,100	1,500
MW-02B	11/21/2006		510	420	ND	840	170	1.4	84	10	580	770	3,400	2200
MW-02B	5/20/2008		500	400	<0.11	690	140	1.1	67	9.1	480	620	3,100	2,200
MW-02B	5/28/2009		490	380	<0.11	640	130	1.1	64	8	490 B-1	600	3,000	2,100
MW-02B	5/28/2010		490	390	<0.22	580	130	1.1	64	7.7	450	590	3,000	2,000
MW-03B	11/20/2006		200	230	0.16	360	180	0.26	0.27	16	230	590	1,900	1,300
MW-03B	5/19/2008		330	300	<0.11	430	160	0.56	43	12	230	560	2,000	1,400
MW-03B	5/27/2009		250	270	<0.11	410	170	0.54	34	14	250	550	2,000	1,400
MW-03B	5/27/2010		310	320	<0.11	400	160	0.55	33	13	230	530	2,000	1,500
MW-04B	--	NS	--	--	--	--	--	--	--	--	--	--	--	--
MW-04B	5/20/2008		540	360	<0.11	650	180	0.33	69	9.9	390	740	2,900	2,100
MW-04B	5/28/2009		540	360	<0.11	590	190	0.39	71	8.7	420 B-1	770	2,900	2,000
MW-04B	5/28/2010		530	360	<0.22	490	180	0.40	66	8.0	360	720	2,700	1,900

Notes:
Sample ID order is based on groundwater flow gradient, from upgradient to down gradient.
ND = Non-detect
< # = Analyte not detected above the method detection limit
J = Analyte was detected between the MDL and the RL
mg/l = milligrams per liter
-- = Not applicable / Not analyzed
NS = Not sampled
B-1 = Analyte present in Method Blank, Analyte concentration in sample is greater than 10x the concentration found in the method blank
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.

Table 14S
Groundwater Monitoring Well Construction Specifications
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Date Installed	Date Abandoned	Well Diameter (inches)	Well Material	Top of Casing Elevation (ft MSL)	Surface Elevation (ft MSL)	Total Depth of Boring (ft bgs)	Total Depth of Well (ft bgs)	Screen Interval (ft bgs)	Screen Interval (ft MSL)
MW-01A	02/16/94	--	4"	sch. 40 PVC	24.05	24.05	40	40	27-37	-2.95 to -12.95
MW-01B	02/14/94	--	4"	sch. 40 PVC	24.27	24.27	92	86	80-85	-55.73 to -60.73
MW-02A	01/26/94	--	4"	sch. 40 PVC	19.15	17.38	31.5	31.5	15.5-25.5	1.88 to -8.12
MW-02B	01/23/94	--	4"	sch. 40 PVC	19.36	17.08	90	83	75.5-80.5	-58.42 to -63.42
MW-03A	01/21/94	--	4"	sch. 40 PVC	25.45	23.46	31.5	27	15.5-25.5	7.96 to -2.04
MW-03B	01/18/94	--	4"	sch. 40 PVC	25.51	23.54	90	83.5	76.5-81.5	-52.96 to -57.96
MW-04A	02/15/07	--	4"	sch. 40 PVC	24.02	21.16	30	28	18-28	6.02 to -3.98
MW-04B	02/16/07	--	4"	sch. 40 PVC	23.99	21.19	88	85	75-80	-51.01 to 56.01
MW-05A	07/20/09	--	4"	sch. 40 PVC	20.21	20.50	30.5	28	13-23	7.5 to -2.5
G-1	12/1/1982*	1987 or 1988	4"	PVC*	--	--	70	62	50-55	-25.92 to -30.92
G-2	12/1/1982*	1987 or 1988	4"	PVC*	--	--	70	65	40-50	-14.91 to -24.91
G-3	12/1/1982*	1987 or 1988	4"	PVC*	--	--	65	65	50-60	-24.94 to -34.94
G-4	12/01/82	--	2"	PVC	27.12	25.14	65	65	45-55	-19.86 to -29.86

Notes
ft bgs = Feet below ground surface
ft MSL = Feet Mean Sea Level
-- = Not applicable / Not analyzed
* = Assumed from data for G-4
Total depth of well and screen intervals determined from downhole camera inspection conducted on December, 15, 2005

References
California Department of Health Services, 1987: *Site Inspection Report Gardena Sumps, Gardena, California.*
URS Consultants, Inc., 1994: *Groundwater Remedial Investigation Technical Memorandum, Gardena Sumps City of Gardena, California.*
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.
Top of well casing and surface elevation surveyed by WM Holdings, Incorporated on September 7, 2005 and March 1, 2007.

Table 16
Summary of Borings Completed at the Site During 2006 Investigation

Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Boring ID	Boring Depth (ft-bgs)	CPT Depth (ft-bgs)	Surface Elevation (ft MSL)	Boring Completion (date)	First Groundwater (ft-bgs)	Top of Sludge (ft-bgs)	Thickness of Non-Sludge Interbeds (ft-bgs)	Bottom of Sludge (ft-bgs)	Total Sludge Thickness (ft)	Elev. Top of Sludge (ft MSL)	Elev. Bottom of Sludge (ft MSL)	Correlating Borings	Number Soil/Sludge Samples	QA/QC Depth (ft-bgs)	Number of Vapor Samples	Number of Geotech Samples	Number of Groundwater Samples	Drilling Method	PPDT Depths (ft-bgs)	Comments
Cooper Property																				
CPB01	24.0	--	19.77	1/19/2006	20.4	0.0	9.5	17.5	8.0	19.77	2.27	--	6	20	--	--	--	GeoProbe	--	microcone refusal within one-foot of ground surface, hydrocarbon odor from 17.5 to 20 ft. bgs.
CPB02	20.0	--	19.83	1/17/2006	R	0.0	0.0	4.9	4.9	19.83	14.93	--	5	NST	--	--	--	GeoProbe	--	microcone refusal within one-foot of ground surface - additional samples obtained for treatability study
CPB03	20.0	5.5	19.83	1/12/2006	R	0.0	0.0	5.0	5.0	19.83	14.83	--	5	20	--	--	--	GeoProbe	--	
CPB3A	--	5.9	19.82	12/21/2006	--	0.0	1.5	5.0	3.5	19.82	14.82	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log
CPB04	24.0	--	20.13	1/18/2006	R	***no sludge encountered in boring***						SV26, DPW01	6	NST	--	--	--	GeoProbe	--	geoprobe refusal within one-foot of ground surface
CPB05	20.0	--	19.82	1/19/2006	R	0.0	0.0	5.0	5.0	19.82	14.82	--	5	20	--	--	--	GeoProbe	--	geoprobe refusal within one-foot of ground surface, hydrocarbon odor from 5 to 8 ft. bgs.
CPB06	19.5	--	19.79	1/17/2006	14.8	0.0	0.0	6.2	6.2	19.79	13.59	--	5	10	--	--	--	GeoProbe	--	
CPB06A	--	--	--	--	--	--	--	--	--	--	--	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log
CPB06B	--	31.7	20.58	1/9/2006	--	***no sludge encountered in boring***						--	NST	NST	--	--	--	Microcone	--	center of berm - microcone only, no samples, no lithologic boring log
CPB07	**20.0**	**33.3**	19.78	1/12/2006	R	0.0	0.0	6.0	6.0	19.78	13.78	--	5	5	--	--	--	GeoProbe / Microcone	--	
CPB07A	--	12.6	19.79	1/9/2006	--	1.0	0.0	7.2	6.2	18.79	12.59	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log
CPB07B	--	31.7	20.64	1/9/2006	--	***no sludge encountered in boring***						--	NST	NST	--	--	--	Mircocone	--	center of berm - microcone only, no samples, no lithologic boring log
CPB08	**31.0**	**34.9**	17.35	1/18/2006	17.2	0.0	0.0	1.5	1.5	17.35	15.85	SV27	8	NST	--	--	--	GeoProbe / Microcone	--	Hydrocarbon odor from 1.5 to 4.5 ft. bgs., 5.5 to 7 ft. bgs., and 12 to 18.5 feet bgs. Hydrocarbon staining from 5.5 to 7 ft bgs.
CPB09	**20.0**	**22.9**	20.88	1/9/2006	14.2	***no sludge encountered in boring***						--	5	NST	--	--	--	GeoProbe / Microcone	--	
CPB09	20.0	97	20.88	1/23/2006	--	--	--	--	--	--	--	--	--		--	--	3	CPT	21, 41.7, 51.5, 75.6, 94.8	*CPT only - proposed deep boring has not yet been drilled* Water Depths- 29, 53, 80
CPB10	**20.0**	**31.9**	20.50	1/10/2006	R	0.0	0.0	7.6	7.6	20.50	12.90	--	5	NST	--	--	--	GeoProbe / Microcone	--	
CPB10A	--	23.2	20.52	12/21/2005	--	0.0	0.0	4.0	4.0	20.52	16.52	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log
CPB11	27.0	34.5	20.50	12/22/2005	--	0.0	0.0	9.0	9.0	20.50	11.50	--	7	NST	--	--	--	Microcone	--	boring used to test sampling methods - DO NOT USE lithologic or analytical results
CPB11A	--	23.1	20.49	12/21/2005	--	0.0	0.0	6.0	6.0	20.49	14.49	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log, hydrocarbon staining from 13.5 to 15 ft. bgs.
CPB11R	20.0	--	20.49	1/12/2006	R	0.0	2.0	13.5	11.5	20.49	6.99	--	5	NST	--	--	--	GeoProbe	--	this boring was a re-drill of boring CPB11 (offset approximately 2 feet) to obtain accurate lithologic and analytical data
CPB12	20.0	34.3	17.33	1/17/2006	R	0.0	0.0	1.5	1.5	17.33	15.83	--	5	15	--	--	--	GeoProbe / Microcone	--	
CPB13	**28.0**	**28.4**	25.21	1/16/2006	R	0.0	4.3	8.9	4.6	25.21	16.31	--	7	NST	--	--	--	GeoProbe / Microcone	--	
CPB14	**20.0**	**32.7**	20.52	1/10/2006	R	0.0	0.0	4.0	4.0	20.52	16.52	--	5	NST	--	--	--	GeoProbe / Microcone	--	additional samples obtained for treatability study
CPB14A	--	23.9	20.49	12/21/2006	--	0.0	0.0	1.0	1.0	20.49	19.49	--	NST	NST	--	--	--	Microcone	--	microcone only, no samples, no lithologic boring log
CPB15	**20.0**	**32.4**	20.50	12/20/2005	R	0.0	3.0	9.2	6.2	20.50	11.30	--	6	NST	--	--	--	GeoProbe / Microcone	--	
CPB15A	--	23.2	20.43	12/21/2005	--	0.0	1.5	4.0	2.5	20.43	16.43	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log
CPB15R	--	--	--	--	--	--	--	--	--	--	--	--	1	NST	--	--	--	GeoProbe	--	boring was a redrill to correlate chemical analysis with the treatability sludge sample profile
CPB16	20.0	34.9	17.77	1/17/2006	R	1.0	0.2	3.0	1.8	16.77	14.77	--	5	1.5	--	--	--	GeoProbe / Microcone	--	Hydrocarbon staining from 0 to 1 ft. bgs.
CPB17	**20.0**	**29.8**	20.50	1/11/2006	R	0.0	4.6	9.0	4.4	20.50	11.50	--	5	1.5	--	--	--	GeoProbe / Microcone	--	
CPB17A	--	22.8	20.48	12/21/2005	--	0.0	5.0	8.0	3.0	20.48	12.48	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log
CPB18	24.0	32.3	20.41	12/20/2006	R	0.0	7.0	12.8	5.8	20.41	7.61	--	6	NST	--	--	--	GeoProbe / Microcone	--	additional samples obtained for treatability study
CPB18A	--	23.5	20.43	12/21/2005	--	0.0	0.0	7.0	7.0	20.43	13.43	--	NST	NST	--	--	--	Mircocone	--	microcone only, no samples, no lithologic boring log
CPB19	20.0	28.4	20.74	1/6/2006	14.6	0.0	0.0	1.0	1.0	20.74	19.74	--	5	5	--	--	--	GeoProbe / Microcone	--	hydrocarbon odor from at 2.5 ft bgs.
CPB20	20.0	26.8	18.54	1/17/2006	R	0.0	0.0	1.9	1.9	18.54	16.64	SV30	5	NST	--	--	--	GeoProbe / Microcone	--	
CPB21	20.0	33.5	22.14	1/13/2006	15.0	***no sludge encountered in boring***						SV23	5	NST	--	--	--	GeoProbe / Microcone	--	
CPB22	20.0	32.4	21.22	1/12/2006	16.3	***no sludge encountered in boring***						SV25	5	NST	--	--	--	GeoProbe / Microcone	--	
CPB23	20.0	6.9	20.12	1/18/2006	R	***no sludge encountered in boring***						SV22	5	NST	--	--	--	GeoProbe / Microcone	--	
CPB24	20.0	13.3	20.27		R	***no sludge encountered in boring***						SV24	5	NST	--	--	--	GeoProbe / Microcone	--	
CPB25	100.0	100	20.45	1/25/2006	--	--	--	--	--	--	--	--	--	COC	--	--	3	CPT	21.3, 43.8, 50.2, 74.3	CPT only - proposed deep boring has not yet been drilled Water Depths- 28, 52, 80
CPB26	98.0	98	20.86	1/23/2006	--	--	--	--	--	--	--	SV18	--	COC	--	--	3	CPT	28.7, 50.2, 76.1	CPT only - proposed deep boring has not yet been drilled Water Depths- 29, 55, 80
CPB27	100.0	100	20.57	1/24/2006	--	--	--	--	--	--	--	SV20	--	COC	--	--	3	CPT	26.4, 58.1, 74.2	CPT only - proposed deep boring has not yet been drilled Water Depths- 25, 52, 78
CPB-28	17.0	--	20.17	12/6/2006	16.7	4	0	4.8	0.8	16.17	15.37	--	3	NST	--	--	--	CFHSA	--	
CPB-29	11.5	--	20.26	12/6/2006	NE	3.2	1.5	8	3.3	17.06	12.26	--	0	NST	--	--	--	CFHSA	--	hydrocarbon odor and staining from 10 to 11.5 ft. bgs.
CPB-30	30.0	--	20.52	12/7/2006	R	1	1	3	1	19.5	17.5	--	3	NST	--	--	--	CFHSA	--	
MW-04A	30.0	--	21.08	2/16/2007	26	***no sludge encountered in boring***						CPB-09	0	NST	--	--	--	CFHSA	--	
MW-04B	90.0	--	20.99	12/8/2006	13.2	***no sludge encountered in boring***						CPB-09	7	NST	--	4	--	CFHSA	--	

Table 16
Summary of Borings Completed at the Site During 2006 Investigation

Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Boring ID	Boring Depth (ft-bgs)	CPT Depth (ft-bgs)	Surface Elevation (ft MSL)	Boring Completion (date)	First Groundwater (ft-bgs)	Top of Sludge (ft-bgs)	Thickness of Non-Sludge Interbeds (ft-bgs)	Bottom of Sludge (ft-bgs)	Total Sludge Thickness (ft)	Elev. Top of Sludge (ft MSL)	Elev. Bottom of Sludge (ft MSL)	Correlating Borings	Number Soil/Sludge Samples	QA/QC Depth (ft-bgs)	Number of Vapor Samples	Number of Geotech Samples	Number of Groundwater Samples	Drilling Method	PPDT Depths (ft-bgs)	Comments
Cooper Property																				
SV01	16.0	--	19.82	5/19/2006	NE	--	--	--	--	--	--	HPB03	NST	NST	1	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV02	16.0	--	20.15	3/13/2006	2.0	***no sludge encountered in boring***						--	3	NST	2	3	--	GeoProbe	--	
SV03	16.0	--	23.18	3/7/2006	R	***no sludge encountered in boring***						--	2	NST	2	--	--	GeoProbe	--	hydrocarbon odor at 1 ft bgs.
SV04	16.0	--	24.61	3/7/2006	R	***no sludge encountered in boring***						--	2	NST	2	--	--	GeoProbe	--	
SV05	16.0	--	19.62	3/8/2006	R	11.5	1.8	14.7	1.4	8.12	4.92	HPB08	--	NST	2	3	--	GeoProbe	--	
SV06	16.0	--	20.07	3/7/2006	15.2	***no sludge encountered in boring***						--	2	NST	2	--	--	GeoProbe	--	
SV07	16.0	--	20.51	3/7/2006	R	***no sludge encountered in boring***						--	2	NST	2	2	--	GeoProbe	--	hydrocarbon odor and staining from 0.75 to 2 ft bgs.
SV08	16.0	--	28.74	3/7/2006	R	***no sludge encountered in boring***						--	2	NST	2	--	--	GeoProbe	--	
SV09	16.0	--	32.60	3/8/2006	R	***no sludge encountered in boring***						--	2	NST	2	--	--	GeoProbe	--	
SV10	16.0	--	19.86	3/13/2006	R	4.8	1.0	10.5	4.7	15.06	9.36	--	3	NST	--	--	--	GeoProbe	--	hydrocarbon odor 10.50 to 16 ft bgs.
SV11	16.0	--	20.88	5/19/2006	NE	--	--	--	--	--	--	HPB04	--	NST	--	3	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV12	16.0	--	30.42	3/8/2006	R	***no sludge encountered in boring***						--	2	NST	2	--	--	GeoProbe	--	
SV13	16.0	--	29.78	3/7/2006	R	***no sludge encountered in boring***						--	2	NST	2	--	--	GeoProbe	--	
SV14	16.0	--	34.89	3/14/2006	NE	--	--	--	--	--	--	--	--	NST	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV15	16.0	--	35.58	3/14/2006	NE	--	--	--	--	--	--	RB01	--	NST	3	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV16	16.0	--	20.23	5/10/2006	NE	--	--	--	--	--	--	--	NST	NST	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV17	16.0	--	20.23	5/18/2006	NE	--	--	--	--	--	--	--	NST	1	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV18	15.3	--	20.89	3/8/2006	R	3.8	0.0	4.0	0.2	17.09	16.89	--	NST	NST	2	2	--	GeoProbe	--	soil vapor boring only - no soil samples collected
SV18-AP	5.0	--	20.89	3/8/2006	--	--	--	--	--	--	--	--	NST	NST	--	--	--	GeoProbe	--	soil vapor boring only, temporary well installed, no soil samples, no lithologic boring log - **soil vapor test unsuccessful because of water in well**
SV19	16.0	--	20.42	5/18/2006	NE	--	--	--	--	--	--	--	NST	1	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV20	16.0	--	20.52		NE	--	--	--	--	--	--	CPB27	NST	NST	NST	--	--	GeoProbe	--	no samples successfully recovered, no lithologic boring log
SV21	16.0	--	34.67	3/14/2006	NE	--	--	--	--	--	--	RB03	NST	NST	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples collected
SV22	16.0	--	19.94	3/9/2006	NE	--	--	--	--	--	--	CBP23	NST	NST	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples collected
SV23	16.0	--	22.15	5/18/2006	NE	--	--	--	--	--	--	CBP21	NST	NST	2	--	--	HA + GeoProbe	--	soil vapor boring only - no soil samples collected
SV24	16.0	--	20.03	3/9/2006	NE	--	--	--	--	--	--	CPB24	NST	NST	2	--	--	HA + GeoProbe	--	soil vapor boring only - no soil samples collected
SV24-AP	5.0	--	23.03	3/9/2006	--	--	--	--	--	--	--	CPB24	NST	NST	--	--	--	GeoProbe	--	soil vapor boring only, temporary well installed, no soil samples, no lithologic boring log - **soil vapor test unsuccessful because of water in well**
SV25	16.0	--	21.11	5/18/2006	NE	--	--	--	--	--	--	CPB22	NST	NST	3	--	--	GeoProbe	--	soil vapor boring only - no soil samples collected
SV26	16.0	--	21.02	3/9/2006	R	***no sludge encountered in boring***						--	NST	1	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples collected
SV27	16.0	--	17.33	3/9/2006	NE	--	--	--	--	--	--	CPB08	NST	NST	1	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV28	14.4	--	17.38	3/8/2006	R	0.0	0.0	2.5	2.5	17.38	14.88	(DPW04)	NST	NST	2	2	--	GeoProbe	--	
SV28-AP	5.0	--	17.38	3/8/2006	--	--	--	--	--	--	--	(DPW04)	NST	NST	--	--	--	GeoProbe	--	soil vapor boring only, temporary well installed, no soil samples, no lithologic boring log - **soil vapor test unsuccessful because of water in well**
SV29	16.0	--	17.52	5/18/2006	NE	--	--	--	--	--	--	(DPW05)	NST	NST	2	--	--	GeoProbe	--	soil vapor boring only - no soil samples, no lithologic boring log
SV30	16.0	--	18.48	5/18/2006	NE	--	--	--	--	--	--	CPB20	NST	NST	1	--	--	GeoProbe	--	soil vapor boring only - no soil samples collected
LA County DPW Property																				
DPW01	20.0	--	17.01	1/18/2006	16.3	0.5	0.0	1.5	1.0	16.51	15.51	CPB04	5	NST	--	--	--	Geoprobe	--	LADPW Property, hydrocarbon staining 4.6 to 4.8 ft bgs, hydrocarbon odor 4.8 to 6.5 ft bgs.
DPW02	6.0	--	17.16	1/13/2006	NE	0.0	0.0	0.5	0.5	17.16	16.66	--	2	NST	--	--	--	Geoprobe	--	LADPW Property
DPW03	6.0	--	17.34	1/13/2006	NE	0.0	2.2	4.5	2.3	17.34	12.84	--	2	NST	--	--	--	Geoprobe	--	LADPW Property
DPW04	6.0	--	17.42	1/13/2006	NE	0.0	0.6	3.5	2.9	17.42	13.92	(SV28)	2	NST	--	--	--	Geoprobe	--	LADPW Property
DPW05	6.0	--	17.67	1/13/2006	NE	0.0	0.0	1.0	1.0	17.67	16.67	(SV29)	1	NST	--	--	--	Geoprobe	--	LADPW Property
DPW06	10.5	--	25.99	1/11/2006	NE	***no sludge encountered in boring***						--	2	NST	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
DPW07	10.5	--	26.48	1/11/2006	NE	***no sludge encountered in boring***						--	2	NST	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
DPW08	10.5	--	27.51	1/11/2006	NE	***no sludge encountered in boring***						--	2	NST	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
DPW09	10.5	--	28.83	1/11/2006	NE	***no sludge encountered in boring***						--	2	NST	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
DPW10	10.5	--	30.51	1/11/2006	NE	***no sludge encountered in boring***						--	1	NST	--	--	--	Geoprobe	--	LADPW Property
DPW11	11.0	--	25.79	1/11/2006	NE	***no sludge encountered in boring***						--	2	2	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
DPW12	11.0	--	26.25	1/11/2006	NE	***no sludge encountered in boring***						--	NST	NST	--	--	--	Geoprobe	--	LADPW Property - no analytical samples
DPW13	11.0	--	27.12	1/11/2006	NE	***no sludge encountered in boring***						--	2	NST	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
DPW14	11.0	--	27.95	1/11/2006	NE	***no sludge encountered in boring***						--	2	NST	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
DPW15	11.0	--	29.59	1/20/2006	NE	***no sludge encountered in boring***						--	2	NST	--	--	--	Geoprobe	--	LADPW Property - sampled for metals ONLY
Haack Property																				
HPB01	24.0	--	20.82	2/8/2006	13.5	10.0	0.0	11.2	1.2	10.82	9.62	--	6	NST	--	--	--	HA + GeoProbe	--	
HPB02	24.0	--	20.95	2/9/2006	13.1	8.8	0.0	9.5	0.7	12.15	11.45	--	6	5	--	--	--	HA + GeoProbe	--	hydrocarbon odor 5 to 8 ft bgs, and 23 to 24 ft bgs.
HPB03	32.0	--	21.20	2/8/2006	20.3	***no sludge encountered in boring***						SV01	7	10	--	--	--	HA + GeoProbe	--	hydrocarbon odor 8 to 18 ft bgs, and 20.5 to 25 ft bgs.
HPB04	23.5	--	21.56	2/9/2006	17.0	***no sludge encountered in boring***						SV11	6	10	--	--	--	HA + GeoProbe	--	
HPB05	20.0	--	26.48	2/6/2006	R	1.8	1.2	9.0	6.0	24.68	17.48	--	5	5	--	--	--	Geoprobe	--	additional samples obtained for treatability study, hydrocarbon odor 9 to 12 ft bgs.
HPB06	28.0	--	26.93	2/6/2006	15.5	***no sludge encountered in boring***						--	6	25	--	--	--	Geoprobe	--	
HPB07	28.0	--	35.22	2/7/2006	R	10.0	0.0	11.2	1.2	25.22	24.02	--	6	20	--	--	--	Geoprobe	--	hydrocarbon staining 4 to 10 ft bgs and 13 ft bgs. hydrocarbon odor 20 to 20.25 ft bgs. and 25 to 26 ft bgs.

Table 16
Summary of Borings Completed at the Site During 2006 Investigation

Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Boring ID	Boring Depth (ft-bgs)	CPT Depth (ft-bgs)	Surface Elevation (ft MSL)	Boring Completion (date)	First Groundwater (ft-bgs)	Top of Sludge (ft-bgs)	Thickness of Non-Sludge Interbeds (ft-bgs)	Bottom of Sludge (ft-bgs)	Total Sludge Thickness (ft)	Elev. Top of Sludge (ft MSL)	Elev. Bottom of Sludge (ft MSL)	Correlating Borings	Number Soil/Sludge Samples	QA/QC Depth (ft-bgs)	Number of Vapor Samples	Number of Geotech Samples	Number of Groundwater Samples	Drilling Method	PPDT Depths (ft-bgs)	Comments
HPB08	24.0	--	20.65	2/8/2006	20.2	3.2	6.2	10.4	1.0	17.45	10.25	SV05	6	15	--	--	--	HA + GeoProbe	--	
HPB09	32.0	--	19.83	2/9/2006	16.4	7.8	0.0	8.0	0.2	12.03	11.83	--	8	1.5,10,15	--	--	--	HA + GeoProbe	--	hydrocarbon odor and staining 9.8 to 10 ft bgs. hydrocarbon odor 16 to 23 ft bgs.
HPB10	95.0	95	--	2/23/2006	--	***no sludge encountered in boring***						SV11	--	COC	--	--	2	CPT	36.4, 53.7, 84.6, 95.1	CPT only - proposed deep boring has not yet been drilled Water Depths- 55, 71 hydrocarbon staining 78 to 90 ft bgs.
HPB11	28.0	--	27.49	2/7/2006	R	5.0	0.0	5.5	0.5	22.49	21.99	SV11	7	25	--	--	--	Geoprobe	--	
HPB12	90.0	--	20.34	12/5/2007	20.0	***no sludge encountered in boring***						--	8	NST	--	--	--	CFHSA	--	hydrocarbon staining 10 to 11.5 ft bgs. hydrocarbon odor 78 to 90 ft bgs.
Residential Property																				
RB01	36.0	--	37.33	2/14/2006	28.2	5.5	0.0	7.5	2.0	31.83	29.83	SV15	8	--	--	--	--	Geoprobe	--	hydrocarbon staining at 27.5 ft bgs.
RB02	36.0	--	37.63	2/14/2006	28.9	8.5	0.0	8.8	0.3	29.13	28.83	--	8	NST	--	--	--	Geoprobe	--	hydrocarbon staining 8.75 to 11 ft bgs.
RB03	36.0	--	35.86	2/15/2006	29.2	8.5	0.0	11.0	2.5	27.36	24.86	SV21	8	--	--	--	--	Geoprobe	--	hydrocarbon odor 20 to 21.25 ft bgs., 24.50 to 24.90 ft bgs., and 28 to 34.25 ft bgs.

Notes:

ft-bgs = feet below ground surface
ft MSL = elevation in feet relative to Mean Sea Level
HA = hand auger
NE = not encountered
R = Range of depth to first encountered groundwater (please refer to boring logs notes 4 & 5)
-- = Not Applicable
NST = no sample taken
SL = Soil/Sludge Samples
SS = Soil Samples
( ) = Represents correlating boring more than two feet from the primary boring
If both the Boring Depth and the CPT Depth numbers are bolded this indicates that the sludge thickness measured in the lithologic log matchs the sludge thickness measured in the CTP log.

CPT = cone penetration test
CFHSA = continuous flight hollow stem auger

Table 16S
Summary of Borings Completed at the Site During 2009 Investigation

Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Boring ID	Boring Depth (ft-bgs)	CPT Depth (ft-bgs)	Surface Elevation (ft MSL)	Boring Completion (date)	First Groundwater (ft-bgs)	Top of Sludge (ft-bgs)	Thickness of Non-Sludge Interbeds (ft-bgs)	Bottom of Sludge (ft-bgs)	Total Sludge Thickness (ft)	Elev. Top of Sludge (ft MSL)	Elev. Bottom of Sludge (ft MSL)	Correlating Borings	Number Soil/Sludge Samples	QA/QC Depth (ft-bgs)	Number of Vapor Samples	Number of Geotech Samples	Number of Groundwater Samples	Drilling Method	PPDT Depths (ft-bgs)	Comments
Artesia Boulevard																				
AB100	15	--	19.49	7/15/2009	NE	***no sludge encountered in boring***						--	--	--	--	--	--	GeoProbe	--	First encountered groundwater not estimated, boring not advanced into potential saturated zone
AB101	18	--	19.30	7/15/2009	NE	5.5	0.0	6.2	0.7	13.80	13.10	--	--	--	--	--	--	GeoProbe	--	First encountered groundwater not estimated, boring not advanced into potential saturated zone
AB102	15.5	--	19.83	10/28/2009	NE	***no sludge encountered in boring***						--	--	--	--	--	--	GeoProbe	--	First encountered groundwater not estimated, boring not advanced into potential saturated zone
AB103	15.5	--	19.28	10/28/2009	NE	***no sludge encountered in boring***						--	--	--	--	--	--	GeoProbe	--	First encountered groundwater not estimated, boring not advanced into potential saturated zone
Cooper Property																				
CPB131	16	--	21.99	7/23/2009	NE	0.3	5.8	8.8	2.7	21.69	13.24	--	--	--	--	--	--	GeoProbe	--	
CB132	20	--	24.63	7/16/2009	NE	0.0	11.8	16.2	4.4	24.63	8.43	--	--	--	2	3	--	GeoProbe	--	
SV116	10	--	19.59	7/6/2009	NE	***no sludge encountered in boring***						SV16	--	--	2	2	--	Strataprobe	--	
SV117	10	--	20.26	7/6/2009	NE	***no sludge encountered in boring***						SV17	--	--	2	2	--	Strataprobe	--	
SV118	12	--	20.94	7/6/2009	NE	***no sludge encountered in boring***						--	--	--	2	2	--	Strataprobe	--	
SV119A	10.5	--	20.38	7/10/2009	NE	0.0	0.4	5.0	4.6	20.38	15.38	--	--	-	1	2	--	Geoprobe	--	
SV119B	10.5	--	20.37	7/10/2009	NE	***no sludge encountered in boring***						SV119A	--	--	--	--	--	Geoprobe	--	
SV120/CPB134	16	--	20.76	7/6/2009	NE	***no sludge encountered in boring***						SV20	--	--	2	2	--	Geoprobe	--	
SV122A	16	--	19.76	7/6/2009	NE	***no sludge encountered in boring***						SV22	--	--	2	2	--	Geoprobe	--	
SV122B	16	--	19.70	7/6/2009	NE	***no sludge encountered in boring***						SV22 &SV122A	--	--	--	--	--	Strataprobe	--	Supplemental boring not logged; soil gas survey samples only.
SV123	16	--	22.04	7/6/2009	NE	***no sludge encountered in boring***						SV23	--	--	2	2	--	Strataprobe	--	
SV124	11	--	20.04	7/7/2009	NE	***no sludge encountered in boring***						--	--	--	3	2	--	Strataprobe	--	Includes duplicate sample
SV125	16	--	21.04	7/6/2009	NE	***no sludge encountered in boring***						SV25	--	--	2	2	--	Strataprobe	--	
SV126	12	--	21.19	7/7/2009	NE	***no sludge encountered in boring***						--	--	--	2	2	--	Strataprobe	--	
SV127	8	--	17.27	7/7/2009	NE	0.0	0.0	2.0	2.0	17.27	15.27	--	--	--	2	2	--	Strataprobe	--	
SV127E	12	--	0.00	7/10/2009	NE	0.0	0.0	2.0	2.0	0.00	-2.00	SV127	--	--	--	--	--	Strataprobe	--	
SV128	8	--	17.35	7/7/2009	NE	0.0	0.0	2.5	2.5	17.35	14.85	--	--	--	2	2	--	Strataprobe	--	
SV128E	8	--	0.00	7/10/2009	NE	0.0	0.0	2.25	2.25	0.00	-2.25	SV128	--	--	--	--	--	Strataprobe	--	
SV129	8	--	17.42	7/7/2009	NE	***no sludge encountered in boring***						--	--	--	2	2	--	Strataprobe	--	
SV129E	8	--	0.00	7/10/2009	NE	***no sludge encountered in boring***						SV129	--	--	--	--	--	Strataprobe	--	
LA County DPW Property																				
DPW110	5.5	--	30.38	7/10/2009	NE	***no sludge encountered in boring***						DPW10	3	--	--	--	--	Strataprobe	--	Includes duplicate sample
DPW110E	5.5	--	30.38	7/10/2009	NE	***no sludge encountered in boring***						DPW10	2	--	--	--	--	Strataprobe	--	
DPW110N	5.5	--	30.38	7/10/2009	NE	***no sludge encountered in boring***						DPW10	2	--	--	--	--	Strataprobe	--	
DPW110S	5.5	--	30.38	7/10/2009	NE	***no sludge encountered in boring***						DPW10	2	--	--	--	--	Strataprobe	--	
DPW116	20	--	21.10	7/16/2009	NE	***no sludge encountered in boring***						--	--	--	--	--	--	Strataprobe	--	
DPW117	15.5	--	18.01	7/16/2009	NE	***no sludge encountered in boring***						--	--	--	--	--	--	Strataprobe	--	
DPW118	15.5	--	17.90	7/16/2009	NE	***no sludge encountered in boring***						--	--	--	--	--	--	Strataprobe	--	
DPW119	15.5	--	17.40	7/16/2009	12	***no sludge encountered in boring***						--	--	--	--	--	--	Strataprobe	--	
DPW120	15.5	--	17.84	7/16/2009	11.5	***no sludge encountered in boring***						--	--	--	--	--	--	Strataprobe	--	
DPW121	15.5	--	19.58	7/16/2009	12.5	***no sludge encountered in boring***						--	--	--	--	--	--	Strataprobe	--	
Haack Property																				
HPB110/SV110	12	--	--	7/9/2009	NE	***no sludge encountered in boring***						SV110	3	--	--	--	--	Geoprobe	--	
HPB113	12	--	19.75	7/9/2009	NE	2.0	0	10.75	8.8	17.75	9.00	--	4	2	--	--	--	Geoprobe	--	Includes duplicate sample
HPB114	16	--	19.65	7/22/2009	NE	0.45	5.5	7.6	1.7	19.20	12.05	--	1	--	--	--	--	Geoprobe	--	
HPB115	16	--	19.98	7/22/2009	13	***no sludge encountered in boring***						--	--	--	--	--	--	Geoprobe	--	
HPB116/GWP106	22	--	19.84	10/29/2009	14	***no sludge encountered in boring***						--	5	--	--	--	1	Geoprobe	--	Temporary well installed for groundwater sample collection
HPB117	18	--	19.85	10/29/2009	14	***no sludge encountered in boring***						--	5	--	--	--	--	Geoprobe	--	
HPB118	20	--	19.81	8/26/2010	13.5	***no sludge encountered in boring***						--	5	--	--	--	1	Geoprobe	--	
HPB119	20	--	19.98	8/26/2010	13.2	***no sludge encountered in boring***						--	5	--	--	--	1	Geoprobe	--	
GWP100	38.6	--	34.48	7/8/2009	NE	***no sludge encountered in boring***						SV121	1	--	--	--	1	Strataprobe	--	
GWP101	36.3	--	35.13	7/9/2009	NE	***no sludge encountered in boring***						RB107	1	--	--	--	1	Strataprobe	--	
GWP102	77	--	18.10	7/13/2009	12	***no sludge encountered in boring***						--	1	80	--	--	1	Geoprobe	--	
GWP103	80	--	17.04	7/21/2009	13	0.0	6.0	8.5	2.5	17.04	8.54	--	--	80	--	--	1	Geoprobe	--	
GWP104	28.6	--	27.62	7/9/2009	NE	***no sludge encountered in boring***						DPW08 & DPW09	--	--	--	--	1	Geoprobe	--	
GWP105	21	--	20.08	10/28/2009	16	***no sludge encountered in boring***						--	--	--	--	--	1	Geoprobe	--	
SV105A/B	10	--	19.70	7/8/2009	NE	4.0	0.0	4.1	0.1	15.70	15.60	--	--	--	--	3	--	Strataprobe	--	
SV110	15	--	19.86	7/9/2009	4.5	6.0	2.8	11.75	3.0	13.86	8.11	--	--	--	--	2	--	Strataprobe	--	
SV111	13	--	20.78	7/9/2009	NE	***no sludge encountered in boring***						--	--	--	2	2	--	Strataprobe	--	
SV131	12	--	19.78	7/9/2009	NE	***no sludge encountered in boring***						--	--	--	2	2	--	Geoprobe	--	
SV132	12	--	20.06	7/8/2009	NE	0.5	0.0	0.6	0.1	19.56	19.46	--	--	--	2	2	--	Strataprobe	--	
SV133	11	--	20.23	7/8/2009	NE	***no sludge encountered in boring***						--	--	--	3	2	--	Strataprobe	--	Includes duplicate sample
SV134	12	--	20.09	8/10/2009	NE	***no sludge encountered in boring***						--	--	--	3	2	--	Geoprobe	--	Includes duplicate sample
MW-5A	30.5	--	20.50	7/15/2009	13	***no sludge encountered in boring***						--	--	--	--	--	1	HA + GeoProbe	--	

Table 16S
Summary of Borings Completed at the Site During 2009 Investigation
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Boring ID	Boring Depth (ft-bgs)	CPT Depth (ft-bgs)	Surface Elevation (ft MSL)	Boring Completion (date)	First Groundwater (ft-bgs)	Top of Sludge (ft-bgs)	Thickness of Non-Sludge Interbeds (ft-bgs)	Bottom of Sludge (ft-bgs)	Total Sludge Thickness (ft)	Elev. Top of Sludge (ft MSL)	Elev. Bottom of Sludge (ft MSL)	Correlating Borings	Number Soil/Sludge Samples	QA/QC Depth (ft-bgs)	Number of Vapor Samples	Number of Geotech Samples	Number of Groundwater Samples	Drilling Method	PPDT Depths (ft-bgs)	Comments
Residential Property																				
RB104	16	--	34.80	7/9/2009	NE	***no sludge encountered in boring***						--	--	--	--	--	--	Geoprobe	--	
RB107	16	--	35.24	7/9/2009	NE	***no sludge encountered in boring***						--	--	--	--	--	--	Geoprobe	--	
SV121	16	--	34.36	7/8/2009	NE	8.3	5.8	16	1.9	26.06	18.36	--	--	5	3	2	--	Geoprobe	--	Includes duplicate sample
SV135	16	--	35.55	7/9/2009	NE	***no sludge encountered in boring***						--	--	15	2	2	--	Geoprobe	--	
SV136/RB106	16	--	35.18	7/9/2009	NE	***no sludge encountered in boring***						--	--	15	2	2	--	Geoprobe	--	
SV137/RB105	16	--	34.75	7/8/2009	NE	***no sludge encountered in boring***						--	--	--	2	2	--	Geoprobe	--	

Notes:

ft-bgs = feet below ground surface
ft MSL = elevation in feet relative to Mean Sea Level
HA = hand auger
NE = not encountered
CPT = cone penetration test
CFHSA = continuous flight hollow stem auger
R = Range of depth to first encountered groundwater (please refer t
-- = Not Applicable
NST = no sample taken
SL = Soil/Sludge Samples
SS = Soil Samples
( ) = Represents correlating boring more than two feet from the primary boring

If both the Boring Depth and the CPT Depth numbers are bolded this indicates that the sludge thickness measured in the lithologic log matchs the sludge thickness measured in the CTP log.

Table 17S
2009 Remedial Investigation Soil Analytical Results
(VOCs and Extractable Fuel Hydrocarbons)
Gardena Sumps Site
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015 B				8260B																											
Sample ID	Date Sampled	Sample Depth (feet)	GRO	DRO	ORO	EFH	Benzene	Ethylbenzene	Toluene	m,p-Xylenes	o-Xylenes	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoform	Bromomethane	n-Butylbenzene	sec-Butylbenzene	tert-Butylbenzene	Carbon tetrachloride	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	2-Chlorotoluene	4-Chlorotoluene	1,2-Dibromo-3-chloropropane	Dibromochloromethane	1,2-Dibromoethane (EDB)	Dibromomethane	1-2-Dichlorobenzen	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Dichlorodifluoromethane
			(C4 - C12)	(C13 - C28)	(C29 - C40)	(C13 - C40)																												
			(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
HPB116-SS-2	10/29/2009	2	--	<5.0	<5.0	<5.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HPB116-SS-5	10/29/2009	5	--	**930**	**2,400**	**3,300**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HPB116-SS-10	10/29/2009	10	--	**17,000**	**15,000**	**32,000**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HPB116-SS-18	10/29/2009	18	**0.21 J**	**12,000**	**13,000**	**25,000**	**0.00056 J**	**0.00044 J**	**0.00061 J**	**0.0016 J**	**0.0011 J**	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0018	<0.0044	<0.0018	<0.0044	<0.0044	<0.0044	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044
HPB116-SS-22	10/29/2009	22	**0.31 J**	**14,000**	**13,000**	**27,000**	**0.0020**	**0.0039**	**0.0052**	**0.012**	**0.0077**	<0.0049	<0.0049	<0.0020	<0.0049	<0.0049	<0.0049	**0.0029 J**	<0.0049	<0.0049	<0.0020	<0.0049	<0.0020	<0.0049	<0.0049	<0.0049	<0.0049	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0049
HPB117-SS-2	10/29/2009	2	--	<5.0	<5.0	**4.4 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HPB117-SS-5	10/29/2009	5	--	<5.0	<5.0	<5.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HPB117-SS-10	10/29/2009	10	--	**4.3 J**	<5.0	**7.0**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HPB117-SS-14	10/29/2009	14	<0.33	**8,200**	**5,500**	**14,000**	<0.0020	<0.0020	**0.0013 J**	**0.0012 J**	**0.00061**	<0.0049	<0.0049	<0.0020	<0.0049	<0.0049	**0.0013 J**	**0.00067**	<0.0049	<0.0049	<0.0020	<0.0049	<0.0020	<0.0049	<0.0049	<0.0049	<0.0049	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0049
HPB117-SS-18	10/29/2009	18	<0.31	**14,000**	**7,500**	**21,000**	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
HPB118-2	8/26/2010	2	<0.36	<5.0	<5.0	<5.0	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043
HPB118-5	8/26/2010	5	<0.41	<5.0	<5.0	<5.0	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0046	<0.0046	<0.0018	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0018	<0.0046	<0.0018	<0.0046	<0.0046	<0.0046	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0046
HPB118-10	8/26/2010	10	<0.30	<5.0	<5.0	<5.0	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0018	<0.0044	<0.0018	<0.0044	<0.0044	<0.0044	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044
HPB118-15	8/26/2010	15	<0.30	<5.0	<5.0	<5.0	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0039	<0.0016	<0.0039	<0.0039	<0.0039	<0.0039	<0.0039	<0.0039	<0.0016	<0.0039	<0.0016	<0.0039	<0.0039	<0.0039	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039
HPB118-20	8/26/2010	20	<0.31	<5.0	<5.0	<5.0	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0016	<0.0041	<0.0016	<0.0041	<0.0041	<0.0041	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041
HPB119-2	8/26/2010	2	**0.23 J**	**8.6**	<5.0	**8.8**	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	<0.0017	<0.0042	<0.0017	<0.0042	<0.0042	<0.0042	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042
HPB119-5	8/26/2010	5	<0.34	<5.0	<5.0	<5.0	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	<0.0017	<0.0042	<0.0017	<0.0042	<0.0042	<0.0042	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042
HPB119-10	8/26/2010	10	<0.31	<5.0	<5.0	<5.0	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0039	<0.0016	<0.0039	<0.0039	<0.0039	<0.0039	<0.0039	<0.0039	<0.0016	<0.0039	<0.0016	<0.0039	<0.0039	<0.0039	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039
HPB119-15	8/26/2010	15	<0.33	<5.0	<5.0	<5.0	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0038	<0.0038	<0.0015	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0015	<0.0038	<0.0015	<0.0038	<0.0038	<0.0038	<0.0038	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0038
HPB119-20	8/26/2010	20	<0.31	<5.0	<5.0	<5.0	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0039	<0.0016	<0.0039	<0.0039	<0.0039	<0.0039	<0.0039	<0.0039	<0.0016	<0.0039	<0.0016	<0.0039	<0.0039	<0.0039	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039
TB-SUMP-20100826	8/26/2010	--	<0.40	--	--	--	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0050	<0.0050	<0.0020	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0020	<0.0050	<0.0020	<0.0050	<0.0050	<0.0050	<0.0050	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0050

Notes:

GRO = Gasolone Range Organics by modified EPA Method 8015B
DRO = Diesel Range Organics by modified EPA Method 8015B
ORO = Oil Range Organics by modified EPA Method 8015B
EFH = Extractable Fuel Hydrocarbons by modified EPA Method 8015B
PCE = Tetrachloroethene
TCE = Trichloroethene

(mg/kg) = milligrams per kilograms
< = Analyte was not detected at or above the Reporting Limit (RL)
J = Quantitation is approximate due to limitations identified during the quality assurance review (data validation)
Results highlighted with **Bold** font indicate results > RL
-- = Not applicable / Not analyzed

Table 17S (continued)
Soil Analytical Results 2009 Investigation (VOCs and Extractable Fuel Hydrocarbons)
Gardena Sumps
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8260B																														
Sample ID	Date Sampled	Sample Depth (feet)	1,1-Dichloroethane (mg/kg)	1,2-Dichloroethane (mg/kg)	1,1-Dichloroethene (mg/kg)	cis-1,2-Dichloroethene (mg/kg)	trans-1,2-Dichloroethene (mg/kg)	1,2-Dichloropropane (mg/kg)	1,3-Dichloropropane (mg/kg)	2,2-Dichloropropane (mg/kg)	cis-1,3-Dichloropropene (mg/kg)	trans-1,3-Dichloropropene (mg/kg)	1,1-Dichloropropene (mg/kg)	Hexachlorobutadiene (mg/kg)	Isopropylbenzene (mg/kg)	p-Isopropyltoluene (mg/kg)	Methylene chloride (mg/kg)	Naphtalene (mg/kg)	n-Propylbenzene (mg/kg)	Styrene (mg/kg)	1,1,1,2-Tetrachloroethane (mg/kg)	1,1,2,2-Tetrachloroethane (mg/kg)	PCE (mg/kg)	1,2,3-Trichlorobenzene (mg/kg)	1,2,4-Trichlorobenzene (mg/kg)	1,1,1-Trichloroethane (mg/kg)	1,1,2-Trichloroethane (mg/kg)	TCE (mg/kg)	Trichlorofluoromethane (mg/kg)	1,2,3-Trichloropropane (mg/kg)	1,2,4-Trimethylbenzene (mg/kg)	1,3,5-Trimethylbenzene (mg/kg)	Vinyl Chloride (mg/kg)
HPB116-SS-2	10/29/2009	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HPB116-SS-5	10/29/2009	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HPB116-SS-10	10/29/2009	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HPB116-SS-18	10/29/2009	18	<0.0018	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0018	<0.018	<0.0044	<0.0018	<0.0018	<0.0044	<0.0018	<0.0018	<0.0044	<0.0044	<0.0018	<0.0018	<0.0018	<0.0044	<0.0088	**0.0018**	**0.0030**	<0.0044
HPB116-SS-22	10/29/2009	22	<0.0020	<0.0020	<0.0049	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0049	**0.0026**	**0.0054**	<0.020	**0.0028 J**	**0.0046**	<0.0020	<0.0049	<0.0020	<0.0020	<0.0049	<0.0049	<0.0020	<0.0020	<0.0020	<0.0049	<0.0098	**0.022**	**0.035**	<0.0049
HPB117-SS-2	10/29/2009	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HPB117-SS-5	10/29/2009	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HPB117-SS-10	10/29/2009	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HPB117-SS-14	10/29/2009	14	<0.0020	<0.0020	<0.0049	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0049	<0.0020	**0.00079 J**	<0.020	<0.0049	<0.0020	<0.0020	<0.0049	<0.0020	<0.0020	<0.0049	<0.0049	<0.0020	<0.0020	<0.0020	<0.0049	<0.0099	**0.00099 J**	**0.0013 J**	<0.0049
HPB117-SS-18	10/29/2009	18	<0.0017	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0017	<0.017	<0.0043	<0.0017	<0.0017	<0.0043	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0043	<0.0086	<0.0017	<0.0017	<0.0043
HPB118-2	8/26/2010	2	<0.0017	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0017	<0.017	<0.0043	<0.0017	<0.0017	<0.0043	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0043	<0.0086	<0.0017	<0.0017	<0.0043
HPB118-5	8/26/2010	5	<0.0018	<0.0018	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0046	<0.0018	<0.0018	<0.018	<0.0046	<0.0018	<0.0018	<0.0046	<0.0018	<0.0018	<0.0046	<0.0046	<0.0018	<0.0018	<0.0018	<0.0046	<0.0092	<0.0018	<0.0018	<0.0046
HPB118-10	8/26/2010	10	<0.0018	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0018	<0.018	<0.0044	<0.0018	<0.0018	<0.0044	<0.0018	<0.0018	<0.0044	<0.0044	<0.0018	<0.0018	<0.0018	<0.0044	<0.0088	<0.0018	<0.0018	<0.0044
HPB118-15	8/26/2010	15	<0.0016	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0016	<0.0016	<0.016	<0.0039	<0.0016	<0.0016	<0.0039	<0.0016	<0.0016	<0.0039	<0.0039	<0.0016	<0.0016	<0.0016	<0.0039	<0.0078	<0.0016	<0.0016	<0.0039
HPB118-20	8/26/2010	20	<0.0016	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0016	<0.016	<0.0041	<0.0016	<0.0016	<0.0041	<0.0016	<0.0016	<0.0041	<0.0041	<0.0016	<0.0016	<0.0016	<0.0041	<0.0081	<0.0016	<0.0016	<0.0041
HPB119-2	8/26/2010	2	<0.0017	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0017	<0.017	<0.0042	<0.0017	<0.0017	<0.0042	<0.0017	<0.0017	<0.0042	<0.0042	<0.0017	<0.0017	<0.0017	<0.0042	<0.0085	**0.00066 J**	<0.0017	<0.0042
HPB119-5	8/26/2010	5	<0.0017	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0017	<0.017	<0.0042	<0.0017	<0.0017	<0.0042	<0.0017	<0.0017	<0.0042	<0.0042	<0.0017	<0.0017	<0.0017	<0.0042	<0.0084	<0.0017	<0.0017	<0.0042
HPB119-10	8/26/2010	10	<0.0016	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0016	<0.0016	<0.016	<0.0039	<0.0016	<0.0016	<0.0039	<0.0016	<0.0016	<0.0039	<0.0039	<0.0016	<0.0016	<0.0016	<0.0039	<0.0078	<0.0016	<0.0016	<0.0039
HPB119-15	8/26/2010	15	<0.0015	<0.0015	<0.0038	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0038	<0.0015	<0.0015	<0.015	<0.0038	<0.0015	<0.0015	<0.0038	<0.0015	<0.0015	<0.0038	<0.0038	<0.0015	<0.0015	<0.0015	<0.0038	<0.0076	<0.0015	<0.0015	<0.0038
HPB119-20	8/26/2010	20	<0.0016	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0016	<0.0016	<0.016	<0.0039	<0.0016	<0.0016	<0.0039	<0.0016	<0.0016	<0.0039	<0.0039	<0.0016	<0.0016	<0.0016	<0.0039	<0.0079	<0.0016	<0.0016	<0.0039
TB-SUMP-20100826	8/26/2010	--	<0.0020	<0.0020	<0.0050	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0050	<0.0020	<0.0020	<0.020	<0.0050	<0.0020	<0.0020	<0.0050	<0.0020	<0.0020	<0.0050	<0.0050	<0.0020	<0.0020	<0.0020	<0.0050	<0.010	<0.0020	<0.0020	<0.0050

Notes:

GRO = Gasolone Range Organics by modified EPA Method 8015B
DRO = Diesel Range Organics by modified EPA Method 8015B
ORO = Oil Range Organics by modified EPA Method 8015B
EFH = Extractable Fuel Hydrocarbons by modified EPA Method 8015B
PCE = Tetrachloroethene
TCE = Trichloroethene

(mg/kg) = milligrams per kilograms
< = Analyte was not detected at or above the Reporting Limit (RL)
J = Quantitation is approximate due to limitations identified during the quality assurance review (data validation)
Results highlighted with **Bold** font indicate results > RL
-- = Not applicable / Not analyzed

Table 18S
Soil Analytical Results 2009 Investigation
(Semi-Volatile Organic Compounds)
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue, Gardena California

Well No	Sample Depth	Date	Acena phthene mg/kg	Acena phthylene mg/kg	Aniline mg/kg	Anthracene mg/kg	Benzidine mg/kg	Benzo(a) anthracene mg/kg	Benzo(a) pyrene mg/kg	Benzo(b) flu-oranthene mg/kg	Benzo(g,h,i)per ylene mg/kg	Benzo(k) flu-oranthene mg/kg	Benzoic acid mg/kg	Benzyl alcohol mg/kg	4-Bromo phenyl phenyl mg/kg	Butyl Benzyl Phthalate mg/kg	4-Chloro-3-methyl phenol mg/kg	4-Chloro aniline mg/kg	Bis(2-schloroethoxy) methane mg/kg	Bis(2-chloroethyl) ether mg/kg	Bis(2-chloroisopropyl) ether mg/kg	Bis(2-ethylhexyl) phthalate mg/kg	2-Chloro naphthalene mg/kg	2-Chloro phenol mg/kg	4-Chlorophenyl phenyl ether mg/kg
HPB-118-2	2	08/26/10	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	**0.24 J**	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-118-5	5	08/26/10	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-118-10	10	08/26/10	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-118-15	15	08/26/10	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-118-20	20	08/26/10	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-119-2	2	08/26/10	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-119-5	5	08/26/10	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-119-10	10	08/26/10	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-119-15	15	08/26/10	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-119-20	20	08/26/10	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.33

Well No	Sample Depth	Date	Chrysene mg/kg	Dibenz(a,h)a nthracene mg/kg	Diben zofuran mg/kg	Di-n-butyl phthalate mg/kg	1,2-Dichlorobenz ene mg/kg	1,3-Dichloroben zene mg/kg	1,4-Dichloroben zene mg/kg	3,3'-Dichloroben zidine mg/kg	2,4-Dichlorophenol mg/kg	Diethyl phthalate mg/kg	2,4-Dimethylph enol mg/kg	Diethyl phthalate mg/kg	4,6-Dinitro-2-methylphe mg/kg	2,4-Dinitrophe nol mg/kg	2,4-Dinitrotolue ne mg/kg	2,6-Dinitroto luene mg/kg	Di-n-octyl phthalate mg/kg	1,2-Diphenylhyd razine/Azobe mg/kg	Fluoranthene mg/kg	Fluorene mg/kg	Hexachlorob enzene mg/kg	Hexachlo robutadie ne mg/kg	Hexachlorocyc lopentadiene mg/kg
HPB-118-2	2	08/26/10	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.42	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83
HPB-118-5	5	08/26/10	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.42	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83
HPB-118-10	10	08/26/10	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.42	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83
HPB-118-15	15	08/26/10	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.42	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83
HPB-118-20	20	08/26/10	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.42	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83
HPB-119-2	2	08/26/10	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.42	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83
HPB-119-5	5	08/26/10	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.42	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83
HPB-119-10	10	08/26/10	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.42	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83
HPB-119-15	15	08/26/10	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.42	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83
HPB-119-20	20	08/26/10	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.42	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83

Well No	Sample Depth	Date	Hexachloro ethane mg/kg	Indeno(1,2,3-cd)pyrene mg/kg	Isophoro ne mg/kg	2-Methylnaphtha lene mg/kg	2-Methylphenol mg/kg	4-Methylphen ol mg/kg	Naphthalene mg/kg	2-Nitroaniline mg/kg	3-Nitroaniline mg/kg	4-Nitroaniline mg/kg	Nitrobenze ne mg/kg	2-Nitrophen ol mg/kg	4-Nitropheno l mg/kg	N-Nitroso-di-n-propylami mg/kg	N-Nitrosodiep henylamine mg/kg	Pentachl orophen ol mg/kg	Phenanthrene mg/kg	Phenol mg/kg	Pyrene mg/kg	1,2,4-Trichlorobe nzene mg/kg	2,4,5-Trichlorphen ol mg/kg	2,4,6-Trichloro phenol mg/kg
HPB-118-2	2	08/26/10	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.83	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-118-5	5	08/26/10	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.83	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-118-10	10	08/26/10	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.83	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-118-15	15	08/26/10	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.83	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-118-20	20	08/26/10	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.83	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-119-2	2	08/26/10	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.83	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-119-5	5	08/26/10	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.83	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-119-10	10	08/26/10	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.83	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-119-15	15	08/26/10	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.83	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
HPB-119-20	20	08/26/10	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.83	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33

Notes:
mg/kg= milligrams per kilograms
Analyzed by EPA 8270C

Table 18SA
Soil Analytical Results 2009 Investigation
(Polynuclear Aromatic Hydrocarbons)
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue, Gardena California

Well No	Sample Depth	Date	Acenaph-thene mg/kg	Acenaph-thylene mg/kg	Anthracene mg/kg	Benzo(a)-anthracene mg/kg	Benzo(a)-pyrene mg/kg	Benzo(b)flu-oranthene mg/kg	Benzo(g,h,i)p erylene mg/kg	Benzo(k)flu-oranthene mg/kg	Chrysene mg/kg	Dibenz-(a,h)an-thra-cene mg/kg	Fluoranthene mg/kg	Fluorene mg/kg	Indeno(1,2,3-cd)pyrene mg/kg	Naphtha-lene mg/kg	Phenan-threne mg/kg	Pyrene mg/kg
HPB-118-2	2	08/26/10	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
HPB-118-5	5	08/26/10	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
HPB-118-10	10	08/26/10	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
HPB-118-15	15	08/26/10	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
HPB-118-20	20	08/26/10	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
HPB-119-2	2	08/26/10	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
HPB-119-5	5	08/26/10	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
HPB-119-10	10	08/26/10	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
HPB-119-15	15	08/26/10	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	**0.0020 J**	<0.030	<0.030	**0.0021 J**	<0.030
HPB-119-20	20	08/26/10	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030

Notes:
mg/kg = milligrams per kilograms
Analyzed by EPA 8270C

Table 19S
Soil Analytical Results 2009 Investigation
(Metals, Chromium VI, and pH)
Gardena Sumps
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena California

EPA Method:			6020															7471 A / 7470A-Diss	7199 / 7196A	9040B / 9045C
Sample ID	Date Sampled	Sample Depth (feet)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	Mercury (mg/kg)	Chromium VI (mg/kg)	pH (mg/kg)
DWP110-SS-2.5	7/10/2009	2.5	<5.0	**5.4**	**120**	**0.70**	<2.5	**21**	**10**	**15**	**5.9**	**0.66 J**	**14**	**1.8 J**	<2.5	<2.5	**56**	**56**	**0.066**	**0.72**	**8.05**
DWP110-SS-2.5 DUP	7/10/2009	2.5	<5.0	**4.5**	**140**	**1.1 J**	<2.5	**23**	**10**	**15**	**6.1**	**0.53 J**	**16**	**1.1 J**	<2.5	<2.5	**58**	**55**	**0.17**	**0.68**	**8.35**
DWP110-SS-5.0	7/10/2009	5.0	**0.74 J**	<2.5	**140**	<1.5	**0.69 J**	**24**	**7.1**	**26**	**61**	**1.3 J**	**14**	**1.3 J**	<2.5	<2.5	**33**	**170**	**0.062**	<1.0	**7.44**
DWP110N-SS-2.5	7/10/2009	2.5	<5.0	<2.5	**110**	**0.54 J**	<2.5	**15**	**10**	**14**	**4.5**	**0.63 J**	**11**	**0.76 J**	<2.5	<2.5	**39**	**48 J**	**0.030**	**0.32 J**	**7.86**
DWP110N-SS-5.0	7/10/2009	5.0	<5.0	**3.4**	**150**	**0.72 J**	<2.5	**18**	**9.7**	**15**	**4.8**	**0.61 J**	**14**	<5.0	<2.5	<2.5	**44**	**69**	**0.047**	**0.33**	**8.14**
DWP110S-SS-2.5	7/10/2009	2.5	<5.0	<2.5	**130**	**0.86 J**	<2.5	**23**	**12**	**18**	**6.1**	**0.60 J**	**16**	**1.2 J**	<2.5	<2.5	**60**	**60**	**0.055**	**0.55**	**8.01**
DWP110S-SS-5.0	7/10/2009	5.0	<5.0	<2.5	**100**	<1.5	**0.57 J**	**73**	**5.7**	**19**	**56**	**0.74 J**	**11**	**0.83 J**	<2.5	<2.5	**20**	**120**	**0.062**	<1.0	**7.60**
DWP110E-SS-2.5	7/10/2009	2.5	<5.0	<2.5	**130**	**0.50 J**	<2.5	**19**	**10**	**17**	**5.1**	**0.57 J**	**13**	<5.0	<2.5	<2.5	**51**	**57**	**0.19**	**0.31 J**	**8.11**
DWP110E-SS-5.0	7/10/2009	5.0	<5.0	<2.5	**140**	<1.5	**0.71 J**	**46**	**5.7**	**21**	**25**	**0.75 J**	**9.9**	**1.1 J**	<2.5	<2.5	**27**	**150**	**0.060**	<1.0	**7.48**
HPB113-SS-2	7/9/2009	2.0	**11**	**42**	**750**	<1.5	**7.2**	**38**	**15 J**	**430**	**690 J**	**3.3 J**	**56 J**	<5.0	**1.4 J**	<2.5	**19**	**1,800**	**0.014 J**	<0.20	**6.48**
HPB113-SS-2-DUP	7/9/2009	2.0	**11**	**33**	**920**	<1.5	**5.2**	**27**	**6.2 J**	**360**	**1200 J**	**1.4 J**	**19 J**	**0.85 J**	**1.3 J**	<2.5	**24**	**1,900**	**0.016 J**	<0.20	**6.25**
HPB113-SS-5	7/9/2009	5	**5.2**	**13**	**540**	<1.5	**0.59 J**	**23**	**3.3**	**110**	**130**	**0.72 J**	**9.2**	<5.0	<2.5	<2.5	**6.7**	**690**	<0.020	<0.20	**7.43**
HPB113-SS-10	7/9/2009	10	<5.0	**3.6**	**91**	<1.5	<2.5	**15**	**7.2**	**31**	**9.7**	<5.0	**11**	**0.93 J**	<2.5	<2.5	**37**	**62**	<0.020	<0.20	**7.98**
HPB116-SS-2	10/29/2009	2	<4.9	<2.5	**93**	**0.38 J**	<2.5	**18**	**8.8**	**22**	**3.8**	**0.62 J**	**16**	<4.9	<2.5	<2.5	**40**	**140**	**0.49**	<0.20	--
HPB116-SS-5	10/29/2009	5	<5.0	<2.5	**110**	**0.37 J**	<2.5	**19**	**9.9**	**24**	**3.8**	**0.57 J**	**15**	<5.0	<2.5	**0.79 J**	**45**	**160**	**0.036**	**0.21**	--
HPB116-SS-10	10/29/2009	10	<5.0	<2.5	**120**	**0.44 J**	<2.5	**16**	**8.9**	**23**	**3.8**	<5.0	**14**	<5.0	<2.5	<2.5	**35**	**150**	**0.044**	<0.20	--
HPB116-SS-18	10/29/2009	18	<4.9	<2.5	**94**	**0.29 J**	<2.5	**21**	**8.2**	**25**	**3.7**	<4.9	**14**	<4.9	<2.5	<2.5	**39**	**150**	**0.044**	<0.20	--
HPB116-SS-22	10/29/2009	22	<5.0	<2.5	**97**	**0.36 J**	<2.5	**17**	**8.5**	**24**	**3.8**	<5.0	**13**	<5.0	<2.5	<2.5	**35**	**150**	**0.056**	<0.20	--
HPB117-SS-2	10/29/2009	2	<4.9	<2.5	**130**	**0.36 J**	**0.32 J**	**20**	**9.8**	**22**	**4.1**	<4.9	**15**	<4.9	<2.5	<2.5	**45**	**160**	**0.036**	**0.14 J**	--
HPB117-SS-5	10/29/2009	5	<5.0	<2.5	**110**	**0.29 J**	<2.5	**15**	**9.2**	**18**	**3.4**	<5.0	**13**	<5.0	<2.5	<2.5	**40**	**150**	**0.023**	<0.20	--
HPB117-SS-10	10/29/2009	10	<5.0	<2.5	**140**	**0.46 J**	<2.5	**23**	**10**	**22**	**4.2**	<5.0	**15**	<5.0	<2.5	<2.5	**45**	**160**	**0.030**	**0.22**	--
HPB117-SS-14	10/29/2009	14	<5.0	<2.5	**120**	**0.43 J**	<2.5	**22**	**9.8**	**31**	**5.0**	**0.66 J**	**17**	<5.0	<2.5	<2.5	**51**	**170**	**0.037**	<0.20	--
HPB117-SS-18	10/29/2009	18	<5.0	<2.5	**130**	**0.34 J**	<2.5	**18**	**9.5**	**24**	**3.8**	<5.0	**14**	<5.0	<2.5	<2.5	**40**	**160**	**0.077**	<0.20	--
HPB-118-2	8/26/2010	2	**0.99 J**	<2.5	**130**	**0.42 J**	**0.27 J**	**16**	**8.5**	**19**	**4.1 J**	**0.82 J**	**13**	<4.9	<2.5	**1.5 J**	**41**	**53**	**0.070**	**0.18 J**	**--**
HPB-118-5	8/26/2010	5	<5.0	<2.5	**110**	**0.39 J**	<2.5	**19**	**8.6**	**17**	**3.5**	<5.0	**13**	<5.0	<2.5	**0.62 J**	**44**	**50**	**0.059**	<0.20	**--**
HPB-118-10	8/26/2010	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**7.95**
HPB-119-2	8/26/2010	2	<5.0	<2.5	**110**	**0.41 J**	<2.5	**18**	**8.8**	**18**	**3.7**	<5.0	**13**	<5.0	<2.5	<2.5	**43**	**50**	**0.054**	**0.31**	**--**
HPB-119-5	8/26/2010	5	<5.0	<2.5	**120**	**0.43 J**	<2.5	**19**	**9.4**	**19**	**3.7**	<5.0	**14**	<5.0	<2.5	<2.5	**47**	**53**	**0.059**	**0.12 J**	**--**
HPB-119-10	8/26/2010	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**7.79**
RB-101-1.5	3/12/2010	1.5	**--**	**--**	**--**	**--**	**--**	**17**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	<1.0	--

Notes:

mg/kg = Milligrams per kilograms
DUP = Duplicate Sample
J = Quantitation is approximate due to limitations identified during the quality assurance review (data validation)
< = Denotes less than detection limits
Results highlight with bold font indicates result > RL

TABLE 20
Laboratory and Field pH Measurements of Soil and Sludge 2006 Investigation
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
CPB01	01/19/06	1.5	SW6020		1.01	VJ	-	
	01/19/06	5	SW6020		0.39	VJ	-	
	01/19/06	10	SW6020		0.93	VJ	-	
	01/19/06	15	SW6020		4.33		-	
	01/19/06	20	SW6020	DUP	1.20		-	obtained 1.5 feet below sludge contact
	01/19/06	19	SW6020		5.55	VJ	-	
	01/19/06	23	SW6020		7.86		-	
CPB02	01/17/06	1.5	SW6020		0.85	VJ	-	
	01/17/06	5	SW6020		1.39	VJ	-	obtained within 1.0 foot of sludge contact
	01/17/06	10	SW6020		7.39		-	
	01/17/06	14	SW6020		7.32		-	
	01/17/06	18	SW6020		7.06		-	
CPB03	01/12/06	1.5	SW6020		1.38		-	
	01/12/06	5	SW6020		4.47		-	obtained within 1.0 foot of sludge contact
	01/12/06	10	SW6020		8.16		-	
	01/12/06	15	SW6020		7.85		-	
	01/12/06	20	SW6020	DUP	7.97		-	
	01/12/06	19	SW6020		8.14		-	
CPB04	01/18/06	1.5	SW6020		7.58		-	
	01/18/06	5	SW6020		7.59		-	
	01/18/06	10	SW6020		8.23		-	
	01/18/06	15	SW6020		8.53		-	
	01/18/06	19	SW6020		8.30		-	
	01/18/06	24	SW6020		8.14		-	
CPB05	01/19/06	1.5	SW6020		1.66		-	
	01/19/06	5	SW6020		2.50		-	obtained within 1.0 foot of sludge contact
	01/19/06	10	SW6020		7.75		-	
	01/19/06	15	SW6020		7.83		-	
	01/19/06	20	SW6020	DUP	8.10		-	
	01/19/06	19	SW6020		8.31		-	

TABLE 20
Laboratory and Field pH Measurements of Soil and Sludge 2006 Investigation
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
CPB06	01/17/06	1.5	SW6020		0.84	VJ	-	
	01/17/06	5	SW6020		6.52		-	
	01/17/06	10	SW6020	DUP	7.40		-	obtained 4 feet below sludge contact
	01/17/06	11	SW6020		7.04		-	
	01/17/06	15	SW6020		7.62		-	
	01/17/06	19	SW6020		7.29		-	
CPB07	01/12/06	1.5	SW6020	DUP	1.62		-	
	01/12/06	1.5	SW6020		1.36		-	
	01/12/06	5	SW6020		0.43		-	
	01/12/06	10	SW6020		8.11		0.75	obtained 3.5 feet below sludge contact
	01/12/06	15	SW6020		8.14		-	
	01/12/06	19	SW6020		7.99		-	
CPB08	01/17/06	1.5	SW6020		7.30		0.6 - 1.4	
	01/17/06	8	SW6020		7.74		-	obtained 6.5 feet below sludge contact
	01/17/06	10	SW6020		8.62		-	
	01/17/06	15	SW6020		8.33		-	
	01/17/06	20	SW6020		7.84		6.11	
	01/18/06	23	SW6020		7.62		-	
	01/18/06	25	SW6020		7.78		6.70	
	01/18/06	30	SW6020		7.99		-	
CPB09	01/13/06	1.5	SW6020		8.91		-	boring located on berm approximately 6 feet from sump boundary
	01/13/06	5	SW6020		8.43		-	
	01/13/06	10	SW6020		8.26		-	
	01/13/06	15	SW6020		8.49		-	
	01/13/06	20	SW6020		8.36		-	
CPB10	01/10/06	1.5	SW6020		0.36		-	
	01/10/06	5	SW6020		0.43		-	
	01/10/06	10	SW6020		6.62		-	obtained 2.5 feet below sludge contact
	01/10/06	15	SW6020		2.98		-	
	01/10/06	20	SW6020		6.74		-	

TABLE 20
Laboratory and Field pH Measurements of Soil and Sludge 2006 Investigation
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
CPB11R	01/10/06	1.5	SW6020		0.63		-	
	01/10/06	5	SW6020		0.40		-	
	01/10/06	10	SW6020		7.39		-	obtained within 1.0 foot of sludge contact
	01/10/06	15	SW6020		0.66		-	obtained 1 foot below sludge contact
	01/12/06	20	SW6020		5.17		-	
CPB12	01/17/06	1.5	SW6020		3.90		-	
	01/17/06	5	SW6020		7.50		-	
	01/17/06	10	SW6020		8.14		-	
	01/17/06	15	SW6020	DUP	7.50		-	
	01/17/06	15	SW6020		7.58		-	
	01/17/06	20	SW6020		7.72		-	
CPB13	01/16/06	1.5	SW6020		2.82		-	
	01/16/06	5	SW6020		6.63		-	
	01/16/06	10	SW6020		4.55		-	obtained 1 foot below sludge contact
	01/16/06	15	SW6020		7.53		-	
	01/16/06	18	SW6020		7.88		-	
	01/16/06	25	SW6020		6.60		-	
	01/16/06	28	SW6020		7.77		-	
CPB14	01/10/06	1.5	SW6020		0.81		-	
	01/10/06	5	SW6020		4.42		-	obtained 1 foot below sludge contact
	01/10/06	10	SW6020		6.97		-	
	01/10/06	15	SW6020		6.96		-	
	01/10/06	19	SW6020		7.36		-	
CPB15	12/20/05	1.5	SW6020		2.12		2.39	
	12/20/05	5	SW6020		6.14		-	
	12/20/05	9	SW6020		8.42		-	
	12/20/05	11	SW6020		8.40		-	obtained 1.5 feet below sludge contact
	12/20/05	14	SW6020		7.56		-	
	12/20/05	20	SW6020		7.45		-	

TABLE 20
Laboratory and Field pH Measurements of Soil and Sludge 2006 Investigation
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
CPB16	01/17/06	2	SW6020	DUP	4.29		-	
	01/17/06	1	SW6020		3.69		-	
	01/17/06	5	SW6020		7.46		-	obtained 2 feet below sludge contact
	01/17/06	9	SW6020		8.02		-	
	01/17/06	15	SW6020		7.77		-	
	01/17/06	20	SW6020		7.86		-	
CPB17	01/09/06	1.5	SW6020	DUP	0.84		-	
	01/09/06	1.5	SW6020		0.85		-	
	01/09/06	5	SW6020		6.99		-	obtained 1.5 feet below sludge contact
	01/09/06	9	SW6020		4.92		-	obtained within 1.0 foot of sludge contact
	01/09/06	13	SW6020		7.21		-	obtained 4 feet below sludge contact
	01/10/06	19	SW6020		7.55		-	
CPB18	12/20/05	1.5	SW6020		1.68		3.05	
	12/20/05	5	SW6020		8.18		-	
	12/20/05	10	SW6020		9.05		-	
	12/20/05	15	SW6020		4.20		-	obtained 2 feet below sludge contact
	12/20/05	20	SW6020		6.43		-	
	12/20/05	24	SW6020		7.39		-	
CPB19	01/16/06	1.5	SW6020		7.94		-	obtained within 1.0 foot of sludge contact
	01/16/06	6	SW6020	DUP	8.23		-	
	01/16/06	5	SW6020		8.35		-	
	01/16/06	10	SW6020		8.25		-	
	01/16/06	15	SW6020		8.03		-	
	01/16/06	20	SW6020		7.79		-	
CPB20	01/17/06	1.5	SW6020		6.79		-	obtained within 1.0 foot of sludge contact
	01/17/06	5	SW6020		8.54		-	
	01/17/06	10	SW6020		8.77		-	
	01/17/06	15	SW6020		7.81		-	
	01/17/06	20	SW6020		8.09		-	

TABLE 20
Laboratory and Field pH Measurements of Soil and Sludge 2006 Investigation
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
CPB21	01/13/06	1	SW6020		9.59		-	boring located on berm approximately 10 feet from sump boundary
	01/13/06	5	SW6020		8.60		-	
	01/13/06	10	SW6020		8.27		-	
	01/13/06	15	SW6020		8.20		-	
	01/13/06	20	SW6020		8.01		-	
CPB22	01/12/06	1.5	SW6020		7.49		-	boring located on berm approximately 10 feet from sump boundary
	01/12/06	5	SW6020		8.37		-	
	01/12/06	10	SW6020		7.77		-	
	01/12/06	15	SW6020		8.18		-	
	01/12/06	20	SW6020		8.14		-	
CPB23	01/18/06	1.5	SW6020		7.97		-	boring located on berm approximately 8 feet from sump boundary
	01/18/06	5	SW6020		8.49		-	
	01/18/06	10	SW6020		7.95		-	
	01/18/06	15	SW6020		7.91		-	
	01/18/06	20	SW6020		7.39		5.41	
CPB24	01/20/06	1.5	SW6020		7.98		-	boring located on berm approximately 6 feet from sump boundary
	01/20/06	5	SW6020		8.26		-	
	01/20/06	10	SW6020		8.43		-	
	01/20/06	15	SW6020		8.48		-	
	01/20/06	20	SW6020		8.17		-	

TABLE 20
Laboratory and Field pH Measurements of Soil and Sludge 2006 Investigation
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
CPB28	12/05/06	6	SW6020		3.89		-	sample obtained in soil between sludge layers
	12/05/06	10	SW6020		5.07		-	
	12/05/06	14	SW6020		6.33		-	
CPB29	12/28/06	4	-		-		2.06	
	12/28/06	11	-		-		5.23	
CPB30	12/06/06	9	SW6020		8.19		-	
	12/06/06	19	SW6020		8.14		-	
	12/06/06	29	SW6020		8.84		-	
DPW01	01/18/06	1.5	SW6020		4.24		-	
	01/18/06	5	SW6020		8.02		-	
	01/18/06	10	SW6020		8.08		-	
	01/18/06	15	SW6020		7.93		-	
	01/18/06	20	SW6020		8.03		-	
DPW02	01/13/06	2	SW6020		5.87		-	
	01/13/06	5	SW6020		8.20		-	
DPW03	01/13/06	2	SW6020		3.79		-	
	01/13/06	5	SW6020		4.02		-	
DPW04	01/13/06	2	SW6020		0.88		-	
	01/13/06	5	SW6020		6.50		-	
DPW05	01/13/06	5	SW6020		8.04		-	

Table 20S
Laboratory and Field Screened pH Measurements of Soil and Sludge
2009 Investigation
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
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Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
AB100	7/15/2009	2			--		7.1	
		6.5			--		8.0	
AB101	7/15/2009	6.5			--		8.3	Obtained silt 3 inches below - reworked sludge
		10			--		7.2	
		12			--		7.1	
		14			--		7.5	
AB102	10/28/2009	2.5			--		8.5	
		2.75			--		8.8	
		3.5			--		7.6	
		3.75			--		7.3	
		5.5			--		8.4	
		8			--		8.0	
		11			--		8.5	
		15			--		8.3	
AB103	10/28/2009	2			--		5.2	
		2.5			--		6.7	
		3			--		6.7	
		4			--		7.1	
		4.5			--		7.2	
		5			--		7.2	
		5.5			--		6.9	
		6			--		7.3	
		12.5			--		7.3	
		14.5			--		5.7	
SV105	7/8/2009	5			--		--	
		8			--		--	
		10			--		--	

Table 20S
Laboratory and Field Screened pH Measurements of Soil and Sludge
2009 Investigation
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
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Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
SV110	7/9/2009	4			--		--	
		10			--		--	Obtained poorly graded sand - sludge contact
SV111	7/7/2009	5			--		2.5	
		12			--		3.0	
SV131	7/9/2009	5			--		--	Obtained dry sludge
		10			--		--	Obtained oily sludge
SV132	7/8/2009	11			--		6.0	
SV133	7/8/2009	5			--		7.0	
		11			--		6.0	
MW-5A	7/22/2009	10.5			--		9.5	
		14.5			--		7.6	
		18.5			--		7.0	
		22.5			--		8.1	
		26.5			--		8.8	
		30			--		8.5	
GWP105	10/29/2009	2.5			--		2.6	
		6			--		2.3	
		10			--		7.8	
		12			--		7.5	
		17			--		7.8	
		20			--		7.3	
HPB113	7/9/2009	2	9045C		6.48		--	Reworked sand and sludge contact
	DUP	2	9045C		6.25		--	
		5	9045C		7.43		--	Reworked sludge, glass, and plastic sludge
		10	9045C		7.98		--	
HPB114	7/22/2009	2	9045C		7.47		--	
		3			--		10.3	
		7			--		8.1	Reworked sludge and bricks
		12			--		9.0	
		14.5			--		6.7	
HPB115	7/22/2009	4			--		8.5	
		8			--		6.5	
		12			--		8.5	
		14.5			--		9.0	

Table 20S
Laboratory and Field Screened pH Measurements of Soil and Sludge
2009 Investigation
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Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
HPB116/GWP106	10/29/2009	2	9045C		8.41		7.0	
		5	9045C		7.02		6.5	
		7.5			--		7.3	
		10	9045C		7.73		7.8	
		18	9045C		7.37		8.0	
		22	9045C		7.24		6.2	
HPB117	10/29/2009	2	9045C		7.80		7.5	
		5	9045C		7.63		7.7	
		10	9045C		7.38		7.4	
		14	9045C		7.30		6.0	
		18	9045C		7.57		7.2	
HPB118	8/26/2010	2			--		6.0	
		5			--		8.8	
		10	9045C		7.95		7.1	
		15			--		7.9	
		20			--		6.9	
HPB119	8/26/2010	2			--		6.0	
		5			--		5.8	
		10	9045C		7.79		5.6	
		15			--		5.9	
		20			--		5.8	
CPB-131	7/23/2009	2.5			--		9.1	Obtained sandy silt and sludge
		8			--		6.7	Obtained 2 inches of silt above sludge
		10			--		7.5	Obtained 15 inches of silt below sludge
		14.5			--		5.4	
CPB-132	7/16/2009	4			--		3.9	
		8			--		5.1	Obtained sandy silt, sludge reworked - sand contact
		12			--		5.6	
		16			--		6.4	Obtained sandy silt - sludge contact
		18.5			--		6.6	
DPW-110	7/10/2009	2.5	9045C		8.05		--	
	DUP	2.5	9045C		8.35		--	
		5	9045C		7.44		--	
DPW-110N	7/10/2009	2.5	9045C		7.86		--	
		5	9045C		8.14		--	

Table 20S
Laboratory and Field Screened pH Measurements of Soil and Sludge
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Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
DPW-110S	7/10/2009	2.5	9045C		8.01		--	
		5	9045C		7.60		--	
DPW-110E	7/10/2009	2.5	9045C		8.11		--	
		5	9045C		7.48		--	
SV-118	--	--			--		--	
SV-119	7/10/2009	6			--		5.3	Obtained sandy silt 12 inches below sludge
		9.5			--		5.9	
SV-121	7/8/2009	5.5			--		--	
		14			--		--	
SV-135	7/9/2009	5			--		--	
		15			--		--	
SV-136/RB-106	7/9/2009	5			--		--	
		15			--		--	
SV-137/RB-105	7/8/2009	5			--		--	
		15			--		--	
RB-107/GWP-101-36	7/9/2009	5			--		--	
		15			--		--	
RB-104	7/9/2009	5			--		--	
		15			--		--	
SV-124	7/7/2009	5			--		--	
		11			--		--	
SV-126	7/7/2009	5			--		--	
		12			--		--	
SV-127	7/7/2009	5			--		--	
		8			--		--	

Table 20S
Laboratory and Field Screened pH Measurements of Soil and Sludge
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Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
SV-127E	7/10/2009	--			--		--	
GWP-103	7/21/2009	4			--		6.0	
		8			--		9.2	
		12			--		8.8	
		15			--		9.8	
		20			--		9.2	
		24			--		10.0	
		28			--		10.2	
		32			--		9.5	
		34.5			--		8.6	
		40			--		8.6	
		44			--		8.4	
		48			--		8.1	
		52			--		7.4	
		56			--		7.6	
		58			--		10.1	
		64			--		9.8	
		68			--		10.1	
		72			--		9.3	
		75			--		9.0	
DPW-116	7/16/2009	10.5			--		8.5	
		14.5			--		9.0	
		19			--		7.9	
DPW-117	7/16/2009	11			--		9.8	
		14			--		8.8	
SV-128E	7/7/2009	5			--		--	
		8			--		--	
SV-129	7/7/2009	5			--		--	
		8			--		--	
SV129E	7/7/2009	5			--		6.3	
		7.5			--		5.4	

Table 20S
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Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments
					Result	Qual	Result	
GWP-102-80	7/13/2009	10			--		6.1	
		20			--		6.1	
		30			--		6.1	
		40			--		5.9	
		50			--		6.5	
		60			--		6.1	
DPW-118	--	1			--		8.2	
		6.5			--		7.0	
		10.5			--		9.2	
		14.5			--		8.1	
DPW-119	7/14/2009	1			--		8.0	
		6.5			--		7.0	
		10.5			--		8.3	
		14.5			--		9.1	
DPW-120	7/14/2009	1			--		5.2	
		6			--		6.4	
		10.5			--		5.0	
		14.5			--		7.1	
DPW-121	7/14/2009	1			--		5.6	
		6.5			--		5.9	
		10.5			--		5.5	
		14.5			--		5.9	

TABLE 21
Comparison of Laboratory and Field Screened pH Measurements 2006 Investigation
Gardena Sumps
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Location	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments	pH difference
				Result	Qual	Result		
CPB06	1.5	-		-		3.05		
CPB07	10	SW6020		8.11		0.75		7.3
CPB08	1.5	SW6020		7.3		0.6 - 1.4		6.3
CPB08	20	SW6020		7.84		6.11		1.7
CPB08	25	SW6020		7.78		6.7		1.1
CPB15	1.5	SW6020		2.12		2.39		0.3
CPB18	1.5	SW6020		1.68		3.05		1.4
CPB23	20	SW6020		7.39		5.41		2
CPB28	4	-		-		1.94		
CPB29	4	-		-		2.06		
CPB29	11	-		-		5.23		
HPB01	15	SW6020		3.9		6.25		2.3
HPB01	20	SW6020		8.03		6.62		1.4
HPB01	24	SW6020		9.09		6.4		2.7
HPB02	7	-		-		4.71		
HPB02	20	SW6020		7.24		-		
HPB02	22	-		-		5.84		
HPB02	24	SW6020		7.28		-		
HPB03	20	SW6020		5.82		5.84		0
HPB05	1.5	SW6020		1.22		0.58	sample obtained 0.5 feet above sludge	0.6
HPB08	9.5	SW6020		6.87			sample obtained immediately above sludge	
HPB08	10	-		-		2.6		
HPB11	5	SW6020		5.76		3.5	sample obtained immediately below sludge	2.3
HPB11	10	SW6020		3.66		3.5		0.2
HPB11	13	-		-		3.25		
HPB11	15	SW6020		3.77		4.3		0.5
HPB12	12	SW6020		4.61		-		
HPB12	17	SW6020		4.11		-		
HPB12	20	-		-		5.04		
HPB12	32	SW6020		6.75		-		
HPB12	42	SW6020		7.04		-		
HPB12	62	SW6020		7.96		-		
HPB12	80	SW6020		7.01		-		
HPB12	90	SW6020		7.3		-		
RB01	6	-		-		2.5		
RB03	5	SW6020		8.24				
RB03	7.5	-		-		2.56	sample obtained 1 foot above sludge	
RB03	15	SW6020		2.17		2		0.2

Table 21S
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Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments	ph Difference
					Result	Qual	Result		
AB100	7/15/2009	2			--		7.1		
		6.5			--		8.0		
AB101	7/15/2009	6.5			--		8.3	Obtained silt 3 inches below - reworked sludge	
		10			--		7.2		
		12			--		7.1		
		14			--		7.5		
AB102	10/28/2009	2.5			--		8.5		
		2.75			--		8.8		
		3.5			--		7.6		
		3.75			--		7.3		
		5.5			--		8.4		
		8			--		8.0		
		11			--		8.5		
		15			--		8.3		
AB103	10/28/2009	2			--		5.2		
		2.5			--		6.7		
		3			--		6.7		
		4			--		7.1		
		4.5			--		7.2		
		5			--		7.2		
		5.5			--		6.9		
		6			--		7.3		
		12.5			--		7.3		
		14.5			--		5.7		
SV105	7/8/2009	5			--		--		
		8			--		--		
		10			--		--		
SV110	7/9/2009	4			--		--		
		10			--		--	Obtained poorly graded sand - sludge contact	
SV111	7/7/2009	5			--		2.5		
		12			--		3.0		
SV131	7/9/2009	5			--		--	Obtained dry sludge	
		10			--		--	Obtained oily sludge	
SV132	7/8/2009	11			--		6.0		
SV133	7/8/2009	5			--		7.0		
		11			--		6.0		
MW-5A	7/22/2009	10.5			--		9.5		
		14.5			--		7.6		
		18.5			--		7.0		
		22.5			--		8.1		
		26.5			--		8.8		
		30			--		8.5		
GWP105	10/29/2009	2.5			--		2.6		
		6			--		2.3		
		10			--		7.8		
		12			--		7.5		
		17			--		7.8		
		20			--		7.3		
HPB113	7/9/2009	2	9045C		6.48		--	Reworked sand and sludge contact	
	DUP	2	9045C		6.25		--		
		5	9045C		7.43		--	Reworked sludge, glass, and plastic sludge	
		10	9045C		7.98		--		
HPB114	7/22/2009	2	9045C		7.47		--		
		3			--		10.3		
		7			--		8.1	Reworked sludge and bricks	
		12			--		9.0		
		14.5			--		6.7		
HPB115	7/22/2009	4			--		8.5		
		8			--		6.5		
		12			--		8.5		
		14.5			--		9.0		
HPB116/GWP106	10/29/2009	2	9045C		8.41		7.0		1.41
		5	9045C		7.02		6.5		0.52
		7.5			--		7.3		
		10	9045C		7.73		7.8		-0.07
		18	9045C		7.37		8.0		-0.63
		22	9045C		7.24		6.2		1.04
HPB117	10/29/2009	2	9045C		7.80		7.5		0.30
		5	9045C		7.63		7.7		-0.07
		10	9045C		7.38		7.4		-0.02
		14	9045C		7.30		6.0		1.30
		18	9045C		7.57		7.2		0.37
HPB118	8/26/2010	2			--		6.0		
		5			--		8.8		
		10	9045C		7.95		7.1		0.85
		15			--		7.9		
		20			--		6.9		
HPB119	8/26/2010	2			--		6.0		
		5			--		5.8		
		10	9045C		7.79		5.6		2.19
		15			--		5.9		
		20			--		5.8		
CPB-131	7/23/2009	2.5			--		9.1	Obtained sandy silt and sludge	
		8			--		6.7	Obtained 2 inches of silt above sludge	
		10			--		7.5	Obtained 15 inches of silt below sludge	
		14.5			--		5.4		

Table 21S
Comparison of Laboratory and Field Screened pH Measurements 2009 Investigation
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Location	Date	Depth (ft bgs)	Method	Notes	pH		Field Screened pH	Comments	ph Difference
					Result	Qual	Result		
CPB-132	7/16/2009	4			--		3.9		
		8			--		5.1	Obtained sandy silt, sludge reworked - sand contac	
		12			--		5.6		
		16			--		6.4	Obtained sandy silt - sludge contact	
		18.5			--		6.6		
DPW-110	7/10/2009	2.5	9045C		8.05		--		
	DUP	2.5	9045C		8.35		--		
		5	9045C		7.44		--		
DPW-110N	7/10/2009	2.5	9045C		7.86		--		
		5	9045C		8.14		--		
DPW-110S	7/10/2009	2.5	9045C		8.01		--		
		5	9045C		7.60		--		
DPW-110E	7/10/2009	2.5	9045C		8.11		--		
		5	9045C		7.48		--		
SV-118	--	--			--		--		
SV-119	7/10/2009	6			--		5.3	Obtained sandy silt 12 inches below sludge	
		9.5			--		5.9		
SV-121	7/8/2009	5.5			--		--		
		14			--		--		
SV-135	7/9/2009	5			--		--		
		15			--		--		
SV-136/RB-106	7/9/2009	5			--		--		
		15			--		--		
SV-137/RB-105	7/8/2009	5			--		--		
		15			--		--		
RB-107/GWP-101-36	7/9/2009	5			--		--		
		15			--		--		
RB-104	7/9/2009	5			--		--		
		15			--		--		
SV-124	7/7/2009	5			--		--		
		11			--		--		
SV-126	7/7/2009	5			--		--		
		12			--		--		
SV-127	7/7/2009	5			--		--		
		8			--		--		
SV-127E	7/10/2009	--			--		--		
GWP-103	7/21/2009	4			--		6.0		
		8			--		9.2		
		12			--		8.8		
		15			--		9.8		
		20			--		9.2		
		24			--		10.0		
		28			--		10.2		
		32			--		9.5		
		34.5			--		8.6		
		40			--		8.6		
		44			--		8.4		
		48			--		8.1		
		52			--		7.4		
		56			--		7.6		
		58			--		10.1		
		64			--		9.8		
		68			--		10.1		
		72			--		9.3		
		75			--		9.0		
DPW-116	7/16/2009	10.5			--		8.5		
		14.5			--		9.0		
		19			--		7.9		
DPW-117	7/16/2009	11			--		9.8		
		14			--		8.8		
SV-128E	7/7/2009	5			--		--		
		8			--		--		
SV-129	7/7/2009	5			--		--		
		8			--		--		
SV129E	7/7/2009	5			--		6.3		
		7.5			--		5.4		
GWP-102-80	7/13/2009	10			--		6.1		
		20			--		6.1		
		30			--		6.1		
		40			--		5.9		
		50			--		6.5		
		60			--		6.1		
DPW-118	--	1			--		8.2		
		6.5			--		7.0		
		10.5			--		9.2		
		14.5			--		8.1		
DPW-119	7/14/2009	1			--		8.0		
		6.5			--		7.0		
		10.5			--		8.3		
		14.5			--		9.1		
DPW-120	7/14/2009	1			--		5.2		
		6			--		6.4		
		10.5			--		5.0		
		14.5			--		7.1		
DPW-121	7/14/2009	1			--		5.6		
		6.5			--		5.9		
		10.5			--		5.5		
		14.5			--		5.9		

Table 22S
Sludge Volume Calculations 2006 Investigation

Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Sump	Layer Thickness (feet)	Layer Area (sq ft)	Layer Volume (cu yards)	Cumulative Subtotals (cu yards)	Cumulative Total (cu yards)
Cooper North	0	54,909	2,034	2,034	2,034
	1	51,099	1,893	3,926	3,926
	2	43,822	1,623	5,549	5,549
	3	32,500	1,204	6,753	6,753
	4	25,767	954	7,707	7,707
	5	19,781	733	8,440	8,440
	6	10,848	402	8,842	8,842
	7	3,214	119	8,961	8,961
	8	2,608	97	9,057	9,057
	9	2,022	75	9,132	9,132
	10	1,554	58	9,190	9,190
	11	1,143	42	9,232	9,232
	12	865	32	9,264	9,264
	13	610	23	9,287	9,287
	14	342	13	9,299	9,299
	15	130	5	9,304	9,304
		Cooper North Subtotal:	**9,304**	**9,304**	**9,304**
Cooper South	0	55,845	2,068	2,068	11,373
	1	53,163	1,969	4,037	13,342
	2	45,262	1,676	5,714	15,018
	3	30,361	1,124	6,838	16,142
	4	17,077	632	7,471	16,775
	5	6,901	256	7,726	17,030
	6	3,535	131	7,857	17,161
	7	1,488	55	7,912	17,217
	8	924	34	7,947	17,251
	9	536	20	7,966	17,271
	10	234	9	7,975	17,279
		Cooper South Subtotal:	**7,975**	**7,975**	**17,279**
Haack North	0	21,519	797	797	18,076
	1	17,523	649	1,446	18,725
	2	13,932	516	1,962	19,241
	3	11,039	409	2,371	19,650
	4	7,762	287	2,658	19,938
	5	2,176	81	2,739	20,018
	6	1,268	47	2,786	20,065
	7	801	30	2,816	20,095
	8	608	23	2,838	20,117
	9	435	16	2,854	20,133
	10	312	12	2,866	20,145
	11	202	7	2,873	20,152
		Haack North Subtotal:	**2,873**	**2,873**	**20,152**
Haack Rework Area	0	13,043	483	483	20,636
	1	9,446	350	833	20,985
	2	7,362	273	1,106	21,258
	3	2,512	93	1,199	21,351
	4	307	11	1,210	21,362
	5	112	4	1,214	21,367
		Haack Rework Area Subtotal:	**1,214**	**1,214**	**21,367**

Notes:
sq ft = square feet
cu yards = cubic yards

Layer volume was calculated assuming the sides were normal to the surface, and the surface area of a particular layer was assumed to be the area of the top of the layer.

TABLE 22SA
Sludge Volume Calculations for the Gardena Sumps Site 2009 Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Sump	Layer Thickness (feet)	Layer Area (sq ft)	Layer Volume (cu yards)	Cumulative Subtotals (cu yards)	Cumulative Total (cu yards)
Cooper North	1	52,485	1,944	1,944	1,944
	2	45,398	1,681	3,625	3,625
	3	33,616	1,245	4,870	4,870
	4	25,720	953	5,823	5,823
	5	19,897	737	6,560	6,560
	6	9,914	367	6,927	6,927
	7	1,757	65	6,992	6,992
Cooper North Subtotal:			6,992	6,992	6,992
Cooper South	1	57,315	2,123	2,123	9,115
	2	50,556	1,872	3,995	10,987
	3	39,482	1,462	5,458	12,450
	4	20,617	764	6,221	13,213
	5	7,425	275	6,496	13,488
	6	3,874	143	6,640	13,632
	7	1,591	59	6,699	13,691
Cooper South Subtotal:			6,699	6,699	13,691
Haack North	1	19,654	728	728	14,419
	2	16,441	609	1,337	15,027
	3	11,264	417	1,754	15,445
	4	7,806	289	2,043	15,734
	5	2,780	103	2,146	15,837
	6	1,639	61	2,207	15,897
	7	812	30	2,237	15,928
Haack North Subtotal:			2,237	12,452	15,928
Haack Rework Area	1	9,276	344	344	16,271
	2	4,754	176	520	16,447
	3	2,240	83	603	16,530
	4	1,212	45	647	16,575
Haack Rework Area Subtotal:			647	2,113	16,575

Notes:
sq ft = square feet
cu yards = cubic yards
Layer volume was calculated assuming the sides were normal to the surface, and the surface area of a particular layer was assumed to be the top of the layer.

TABLE 26
Range of Metals Concentrations in Background
DPW Borings & Native Soil 2006 Investigation
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Metal	DPW6 thru DPW15		Native Soil		Sludge samples	
	min. value (mg/kg)	max. value (mg/kg)	min. value (mg/kg)	max. value (mg/kg)	min. value (mg/kg)	max. value (mg/kg)
antimony	0.072	0.430	0.040	0.700	0.030	0.290
arsenic	1.3	3.4	0.43	3.80	0.27	3.60
barium	78	160	51	230	<0.5	150
copper	14	38	8	64	0.2	160.0
cadmium	0.046	0.33	0.02	0.56	0.02	0.28
lead	4	5	2	10	2	85
molybdenum	0.31	0.78	0.10	1.80	0.14	2.70
thallium	0.11	0.31	0.10	0.34	0.11	0.29
vanadium	19	44	14	53	0.4	42
zinc	37	110	20	150	0.83	120
# of borings		10		56		23
#of samples		19		196		34

soil analytical outliers	36 of 2,144 lab analyses (1.7%)
antimony	CPB13 -10' = 1.2 mg/kg
arsenic	CPB08 - 8' = 5.3 mg/kg, DPW03 - 5' = 8.3 mg/kg, DPW10 - 2' = 82 mg/kg MW04B - 59' = 8.5 mg/kg, - 79' = 5.1 mg/kg, - 89' = 35 mg/kg HPB12 - 80' = 21 mg/kg, - 90' = 13 mg/kg
barium	DPW6 - 2' < 0.5 mg/kg
copper	CPB28 - 14' = 290 mg/kg
cadmium	DPW11 - 2' = 0.77 mg/kg, CPB08 - 8' = 0.95 mg/kg, MW04B - 89' = 0.90 mg/kg
lead	CPB08 - 8' = 82 mg/kg, CPB13 - 10' = 18 mg/kg, DPW6 - 2' < 0.5 mg/kg CPB22 - 1.5' = 18 mg/kg, DPW2 - 2' = 15 mg/kg, DPW11 - 2' = 40 mg/kg, DPW12 - 2' = 57 mg/kg, DPW13 - 2' =24 mg/kg, DPW14 - 2' = 23 mg/kg HPB03 - 1.5' = 16 mg/kg
molybdenum	HPB06 - 20' = 3.4 mg/kg
thallium	MW04B - 89' = 4.2 mg/kg
vanadium	DPW6 - 2' < 1.0 mg/kg
zinc	CPB08 - 8' = 170 mg/kg, CPB11R - 15' <10 mg/kg, DPW3 - 5' = 180 mg/kg DPW6 - 2' <10 mg/kg HPB11 - 15' = 330 mg/kg, - 25' = 340 mg/kg & 610 mg/kg MW04B - 89' = 15 mg/kg

Table 27S
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
MW-01A	05/11/94		--	ND	ND	ND	ND	ND	ND	1.8*	1.9*	ND	ND	ND	ND
MW-01A	06/15/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-01A	06/22/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01A	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01A	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01A	02/16/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	05/17/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	08/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	03/02/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	05/18/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20070518	05/18/07	Duplicate	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	08/23/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	02/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	08/18/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	11/10/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	02/18/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	05/27/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	08/25/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	11/23/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	02/22/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	05/27/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	08/31/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	01/21/94		--	ND	ND	1.5*	1.5*	1.7*	ND	ND	ND	ND	ND	ND	ND
MW-01B	05/11/94		--	ND	ND	ND	ND	ND	ND	2.3*	ND	1.6*	1.4*	ND	ND
MW-01B	06/15/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-01B	06/22/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01B	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01B	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01B	02/16/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	05/17/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	08/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	03/02/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	05/18/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	08/23/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Table 27S
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
MW-01B	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	02/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	08/18/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	11/10/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	02/18/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	05/27/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	08/25/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	11/23/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	02/22/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	05/27/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	08/31/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	01/21/94		--	45*	ND	ND	2.7*	ND	ND	ND	ND	ND	ND	ND	ND
MW-02A	05/10/94		--	--	ND	ND	2.7*	ND	ND	2.4*	--	1.4*	1.3*	ND	ND
MW-02A	05/11/94		--	ND	ND	ND	ND	ND	ND	2.5*	1.0*	1.1*	1.4*	ND	ND
MW-02A	06/15/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-02A	06/25/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02A	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02A	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02A	02/16/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	05/18/06		**26 J,MB**	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-02A	05/18/06	Duplicate	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	0.37 J	<2.0	<2.0	<2.0	<2.0
MW-02A	08/22/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-02A	08/22/06	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	11/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	08/24/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20070824	08/24/07	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	11/16/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20080220	02/20/08	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20080520	05/20/08	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	08/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20080819	08/19/08	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	11/11/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20081111	11/11/08	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Table 27S
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
MW-02A	02/19/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20090219	02/19/09	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	05/28/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20090528	05/28/09	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	08/26/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20090826	08/26/09	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	11/24/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20091124	11/24/09	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	02/23/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20100223	02/23/10	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	05/28/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20100528	05/28/10	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	09/01/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-201000901	09/01/10	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	05/11/94		--	ND	ND	ND	ND	ND	ND	2.0*	ND	ND	ND	ND	ND
MW-02B	06/19/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-02B	06/25/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02B	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02B	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02B	02/16/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-02B	02/16/06	Duplicate	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	05/17/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	08/22/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	11/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	08/24/07		**290 LH,AY**	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	11/16/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20071116	11/16/07	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	0.34 J	<2.0	<2.0
MW-02B	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	08/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	0.42 J	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	11/11/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	02/19/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	05/28/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	08/26/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	11/24/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50
MW-02B	02/23/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50
MW-02B	05/28/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	09/01/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 27S
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B										
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds										
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
MW-03A	05/10/94		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03A	06/15/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-03A	6/22/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03A	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03A	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03A	02/17/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	05/18/06		27 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	08/22/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-03A	11/20/06	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-03A	03/01/07	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	08/24/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	02/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	08/18/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	11/10/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	02/18/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	05/27/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/25/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	11/23/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	02/22/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	05/27/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/31/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 27S
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B										
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds										
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
MW-03B	05/10/94		--	ND	1.1*	ND	ND	ND	ND	ND	3.7*	**8.9**	**8.9**	1.1*	1.5*
MW-03B	07/05/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-03B	06/25/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03B	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03B	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03B	02/17/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	05/18/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	0.54 J	<2.0	<2.0	<2.0	<2.0
MW-03B	08/22/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	08/24/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	02/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	08/18/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	11/10/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	02/18/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	05/27/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/25/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	11/23/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	02/22/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	05/27/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/31/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 27S
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
MW-04A	03/02/07	New Well	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	08/23/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	11/16/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	08/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	11/11/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	02/19/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	05/28/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	08/26/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	11/24/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	02/23/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	05/28/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	09/01/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	03/02/07	New Well	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	08/23/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	11/16/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	05/20/08		30 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	08/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	11/11/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	02/19/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	05/28/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	08/26/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	11/24/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	02/23/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	05/28/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	09/01/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 27S
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
MW-05A	08/26/09	New well, 3Q09	**370**	--	**1.5**	<0.50	<0.50	<0.50	**3.6**	<0.50	<0.50	**1.6**	0.30 J	**3.1**	**21**
MW-05A	11/23/09		**440**	--	**1.7**	<0.50	<0.50	<0.50	**5.4**	<0.50	<0.50	**1.5**	<0.50	**2.7**	**22**
MW-05A	02/22/10		**170**	--	**0.88**	<0.50	<0.50	<0.50	**1.2**	<0.50	<0.50	0.70 J	<0.50	**1.1**	**8.6**
MW-05A	05/27/10		**390**	--	**0.73**	<0.50	<0.50	<0.50	**3.4**	<0.50	<0.50	**1.5**	<0.50	**2.8**	**23**
MW-05A	08/31/10		**400**	--	**1.7**	<0.50	<0.50	<0.50	**3.0**	<0.50	<0.50	**1.9**	<0.50	**3.4**	**28**
G-4	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
G-4	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
G-4	02/17/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	05/18/06		28 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	08/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	05/18/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	08/24/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	08/18/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	11/10/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	02/18/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	05/27/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/25/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	11/23/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	02/22/10		30 J	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	05/27/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/31/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
UG-CHAN-20060216	02/16/06		58 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	**23**	<2.0	<2.0	<2.0	<2.0	<2.0
FDCC-W-20080520	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	**19**	<2.0	<2.0	<2.0	<2.0	<2.0
DG-CHAN-20060216	02/16/06		58 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	**15**	<2.0	<2.0	<2.0	<2.0	<2.0
FDCC-E-20080520	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	**8.7**	<2.0	<2.0	<2.0	<2.0	<2.0

Table 27S
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
FB-Sump	02/16/06	Field Blank	<100	--	<2.0	<2.0	0.49 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	02/17/06	Field Blank	<100	--	<2.0	<2.0	0.39 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	05/17/06	Field Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	05/17/06	Field Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	08/21/06	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	08/22/06	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	11/20/06	Field Blank	<50	--	<2.0	<2.0	1.2 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	11/21/06	Field Blank	<50	--	<2.0	<2.0	1.4 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	03/01/07	Field Blank	<50	--	<2.0	<2.0	**2.3**	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	03/02/07	Field Blank	<50	--	<2.0	<2.0	**2.8**	0.67 J	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20070517	05/17/07	Field Blank	<100	--	<2.0	<2.0	0.6 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20070518	05/18/07	Field Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-082307	08/23/07	Field Blank	<50	--	<2.0	<2.0	1.9 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20070824	08/24/07	Field Blank	**65 PV**	--	<2.0	<2.0	1.7 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20071115	11/15/07	Field Blank	<50	--	<2.0	<2.0	**2.2**	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20071116	11/16/07	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	0.53 J	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080219	02/19/08	Field Blank	<50	--	<2.0	<2.0	0.74 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080220	02/20/08	Field Blank	<50	--	<2.0	<2.0	0.69 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080519	05/19/08	Field Blank	<50	--	<2.0	<2.0	1.0 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080520	05/20/08	Field Blank	41 J	--	<2.0	<2.0	1.1 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080818	08/18/08	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080819	08/19/08	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20081110	11/10/08	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20081111	11/11/08	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20090218	02/18/09	Field Blank	<50	--	<2.0	<2.0	**2.2**	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20090219	02/19/09	Field Blank	<50	--	<2.0	<2.0	**2.0**	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20090527	05/27/09	Field Blank	<50	--	<0.50	<0.50	**0.95**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20090528	05/28/09	Field Blank	<50	--	<0.50	<0.50	0.49 J	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20090825	08/25/09	Field Blank	<50	--	<0.50	<0.50	**1.9**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20090826	08/26/09	Field Blank	<50	--	<0.50	<0.50	**2.8**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20091123	11/23/09	Field Blank	<50	--	<0.50	<0.50	**2.0**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20091124	11/24/09	Field Blank	<50	--	<0.50	<0.50	**1.8**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20100222	02/22/10	Field Blank	<50	--	<0.50	<0.50	**2.3**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20100223	02/23/10	Field Blank	<50	--	<0.50	<0.50	**1.7**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20100527	05/27/10	Field Blank	<50	--	<0.50	<0.50	**1.6**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20100528	05/28/10	Field Blank	<50	--	<0.50	<0.50	**1.5**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20100831	08/31/10	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20100901	09/01/10	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 27S
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B										
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds										
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
TB1-Sump	02/16/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB2-Sump	02/16/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB3-Sump	02/16/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB1-Sump	02/17/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB2-Sump	02/17/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	05/17/06	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	05/17/06	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	05/18/06	Trip BlankA	33 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	05/18/06	Trip BlankB	25 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	05/18/06	Trip BlankC	26 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	08/21/06	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	08/21/06	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	08/22/06	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	08/22/06	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	11/20/06	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	11/20/06	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	11/20/06	Trip BlankC	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	11/21/06	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/01/07	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/01/07	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/01/07	Trip BlankC	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/02/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/02/07	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Table 27S
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)
TB3-Sump-20060216	02/16/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20070517	05/17/07	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20070518	05/18/07	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-082307	08/23/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20070824	08/24/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20071115	11/15/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20071116	11/16/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080219-A	02/19/08	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080219-B	02/19/08	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080219-C	02/19/08	Trip BlankC	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080220-A	02/20/08	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080220-B	02/20/08	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080519-A	05/19/08	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080519-B	05/19/08	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080519-C	05/19/08	Trip BlankC	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080520-D	05/20/08	Trip BlankD	34 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080520-E	05/20/08	Trip BlankE	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080520-F	05/20/08	Trip BlankF	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080818	08/18/08	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080819	08/19/08	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20081110	11/10/08	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20081111	11/11/08	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20090218	02/18/09	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20090219	02/19/09	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20090527	05/27/09	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20090528	05/28/09	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20090825	08/25/09	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20090826	08/26/09	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20091123	11/23/09	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20091124	11/24/09	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100222	02/22/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100223	02/23/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100527	05/27/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100528	05/28/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100831	08/31/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100901	09/01/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 27S
Summary of Volatile Organic Compounds Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
Sample ID	Date Sampled	Notes	GRO	Volatile Organic Compounds											
			C4 - C12 (µg/L)	Acetone (µg/L)	Benzene (µg/L)	Bromodi-chloro-methane (µg/L)	Chloroform (µg/L)	Dibromo-chloro-methane (µg/L)	Naphtalene (µg/L)	PCE (µg/L)	Toluene (µg/L)	m,p-Xylenes (µg/L)	o-Xylenes (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)

Notes:
GRO = Gasolone Range Organics by modified EPA Method 8015B
* = Analyte was quantitated below the established linear calibration range. Amount reported is an estimate.
ND = Not Detected. This data was obtained from a summary table of a report not prepared by SECOR/Stantec.
The actual laboratory reports are not available, thus MDL's can not be determined for this data.
<# = Analyte was not detected above the Reporting Limit (#)
µg/L = micrograms per liter
-- = Not applicable / Not analyzed
J = Analyte was detected between the MDL and the RL
MB or B = Analyte detected in the method blank
LH,AY = Due to sample matrix effects, the surrogate recovery was outside of acceptance limits.
PV = Hydrocarbon result partly due to individual peak(s) in quantity range.
Results highlighted with **Bold** font indicate results > RL
RL Change = in 2nd Qtr 2009 the RL's and MDL's were lowered to more closely match the CA State limits on those analytes.
For safety and security reasons, the surface water sampling locations in the Dominguez Flood Control Channel (DFCC) have been re-located.

References:

DTSC, 2000 and 2001. *2000 and 2001 Groundwater Sampling Report for Gardena Sumps.*
DTSC, 2002. *2002 Groundwater Sampling Report for Gardena Sumps.*
URS, 1994. *Groundwater Remedial Investigation Technical Memorandum* , Gardena Sumps, 1440 West Artesia Boulevard, Gardena, CA., November 14.
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.

Table 27SA
Groundwater Analytical Results 2009 Investigation
(VOCs and Extractable Fuel Hydrocarbons)
Gardena Sumps
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015 B				8260B																														
Sample ID	Date Sampled	Notes	GRO	DRO	ORO	EFH																															
			C4 - C12	C13 - C28	C29 - C40	C13 - C40	Benzene	Ethylbenzene	Toluene	m,p-Xylenes	o-Xylenes	Xylenes-Total	Bromobenzene	Bromochloromethane	Bromodichloromethan	Bromoform	Bromomethane	n-Butylbenzene	sec-Butylbenzene	tert-Butylbenzene	Carbon tetrachloride	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	2-Chlorotoluene	4-Chlorotoluene	1,2-Dibromo-3-chloropro	Dibromochloromethane	1,2-Dibromoethane	Dibromomethane	1-2-Dichloroben	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Dichlorodifluoromethan	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene
			(µg/L)	(mgL)	(mgL)	(mgL)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
GWP100-38	7/9/2009	A Zone	**74**	**1.7**	**0.37 J**	**2.1**	**0.75**	**0.52**	**2.4**	**3.2**	**0.99**	**4.2**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
GWP101-36	7/9/2009	A Zone	<50	**0.45 J**	**0.13 J**	**0.57**	**0.32 J**	<0.50	**0.36 J**	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
GWP102-80	7/13/2009	B Zone	<50	**0.51**	**0.58**	**1.1**	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
GWP103-80	7/21/2009	B Zone	<50	**1.1**	**0.88**	**2.0**	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
GWP104-28	7/24/2009	A Zone	<50	**0.86**	**0.27 J**	**1.1**	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
GWP105-21	10/28/2009		**39 J**	<5.0	<5.0	<5.0	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
GWP106-22	10/29/2009		**84**	--	--	--	**0.61**	**0.25 J**	**0.54**	**0.70 J**	**0.62**	**1.3**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TW103A	8/26/2009		**--**	**--**	**--**	**--**	**0.93**	**1.5**	**2.4**	**17**	**9.5**	**26**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**0.45 J**	<0.50	**1.4**	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TW103B	8/26/2009		**--**	**--**	**--**	**--**	**0.54**	**0.40 J**	**1.6**	**1.5**	**1.0**	**2.5**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**0.44 J**	<0.50	**1.1**	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TW108	8/26/2009		**72**	**1.7**	**0.13 J**	**1.9**	**1.6**	<0.50	**0.51**	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**0.65 J**	<0.50	**0.67**	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TW109	8/26/2009		**35 J**	**--**	**--**	**--**	**0.55**	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TW110	8/26/2009		<50	**--**	**--**	**--**	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TW110-DUP	8/26/2009		<50	**--**	**--**	**--**	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-5A	8/26/2009		**370**	**--**	**--**	**--**	**1.5**	**0.26 J**	<0.50	**1.6**	**0.30 J**	**1.9**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
HPB-118-GW	8/26/2010		<50	**0.098 J**	<0.48	**0.13 J**	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
HPB-119-GW	8/26/2010		<50	**0.19 J**	<0.54	**0.28 J**	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
EB-SUMP-20090826	8/26/2009		<50	**--**	**--**	**--**	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**2.2**	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP20090826	8/26/2009		<50	**--**	**--**	**--**	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**2.2**	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20090826A	8/26/2009		<50	**--**	**--**	**--**	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20090826B	8/26/2009		<50	**--**	**--**	**--**	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
Trip Blank	7/13/2009		<50	**--**	**--**	**--**	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
Trip Blank	7/21/2009		<50	**--**	**--**	**--**	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100826-	8/26/2010		<50	**--**	**--**	**--**	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100826-	8/26/2010		<50	--	--	--	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Notes:
GRO = Gasolone Range Organics by modified EPA Method 8015B
DRO = Diesel Range Organics by modified EPA Method 8015B
ORO = Oil Range Organics by modified EPA Method 8015B
EFH = Extractable Fuel Hydrocarbons by modified EPA Method 8015B
(µg/L) = micrograms per liter
(mg/L) = milligrams per liter
< = Analyte was not detected at or above the Reporting Limit (RL)
J = Estimated value (less than the method reporting limit and greater than or equal to the method detection limit)
Results highlighted with **Bold** font indicate results > RL
-- = Not applicable / Not analyzed

Table 27SA (continued)
Groundwater Analytical Results 2009 Investigation
(VOCs and Extractable Fuel Hydrocarbons)
Gardena Sumps
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8260B																											
Sample ID	Date Sampled	Notes	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	1,2-Dichloropropane (µg/L)	1,3-Dichloropropane (µg/L)	2,2-Dichloropropane (µg/L)	cis-1,3-Dichloropropene (µg/L)	trans-1,3-Dichloropropene (µg/L)	1,1-Dichloropro (µg/L)	Hexachlorobutadie (µg/L)	Isopropylbenzene (µg/L)	p-Isopropyltoluene (µg/L)	Methylene chloride (µg/L)	Naphtalene (µg/L)	n-Propylbenzene (µg/L)	Styrene (µg/L)	1,1,1,2-Tetrachloroethane (µg/L)	1,1,2,2-Tetrachloroethane (µg/L)	PCE (µg/L	1,2,3-Trichlorobenze (µg/L)	1,2,4-Trichlorobenzen (µg/L)	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	TCE (µg/L	Trichlorofluoromethan (µg/L)	1,2,3-Trichloropropane (µg/L)	1,2,4-Tri-methyl-benzene (µg/L)	1,3,5- Tri-methyl-benzene (µg/L)	Vinyl Chloride (µg/L)
GWP100-38	7/9/2009	A Zone	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**0.42 J**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**0.80**	**0.30 J**	<0.50
GWP101-36	7/9/2009	A Zone	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
GWP102-80	7/13/2009	B Zone	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
GWP103-80	7/21/2009	B Zone	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
GWP104-28	7/24/2009	A Zone	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
GWP105-21	10/28/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
GWP106-22	10/29/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**0.55**	**1.0**	<0.50
TW103A	8/26/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**1.1**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**0.72**	**0.30 J**	<0.50
TW103B	8/26/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**0.84**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**0.40 J**	**0.30 J**	<0.50
TW108	8/26/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**1.4**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**0.27 J**	**1.5**	<0.50
TW109	8/26/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	**1.5**	<0.50
TW110	8/26/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TW110-DUP	8/26/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-5A	8/26/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**3.6**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**3.1**	**21**	<0.50
HPB-118-GW	8/26/2010		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
HPB-119-GW	8/26/2010		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
EB-SUMP-20090826	8/26/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP20090826	8/26/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20090826A	8/26/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20090826B	8/26/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
Trip Blank	7/13/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
Trip Blank	7/21/2009		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**0.45 J**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100826-	8/26/2010		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100826-	8/26/2010		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Notes:
PCE = Tetrachloroethene
TCE = Trichloroethene
(µg/L) = micrograms per liter
(mg/L) = milligrams per liter
< = Analyte was not detected at or above the Reporting Limit (RL)
J = Estimated value (less than the method reporting limit and greater than or equal to the method detection limit)
Results highlighted with **Bold** font indicate results > RL

-- = Not applicable / Not analyzed

Table 28S
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbons, Chromium VI, pH, and Sulfide Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8270C			376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (µg/L)	Chrysene (µg/L)	Pyrene (µg/L)	Total (µg/L)	Reactive (µg/L)	(µg/L)		
MW-01A	05/11/94		8.6*	--	--	--	--	--	--	7.50
MW-01A	06/15/00		D	--	--	--	--	--	--	7.00
MW-01A	06/12/01	Add.Data	--	--	--	--	--	--	--	NS
MW-01A	06/22/01		ND	--	--	--	--	--	--	--
MW-01A	02/28/02		ND	--	--	--	--	--	--	7.26
MW-01A	03/10/02		ND	--	--	--	--	--	--	--
MW-01A	02/16/06		<48	<9.5	<9.5	23 J	ND *	1.6 J	7.13	6.77
MW-01A	05/17/06		<47	<9.4	<9.4	<100	ND *	<25	7.27	6.76
MW-01A	08/21/06		<47	<9.4	<9.4	51 J	ND *	<25	7.05	6.74
MW-01A	11/20/06		<47	<9.4	<9.4	20 J	ND *	<25	7.30	6.56
MW-01A	03/02/07		<47	<9.5	<9.5	<100	--	7.3 MB,J	--	6.72
MW-01A	05/18/07		8.2 J	<9.4	<9.4	44 J	--	<25	--	5.40
MW-01A	08/23/07		<47	<9.4	<9.4	<100	--	<25	7.17	6.93
MW-01A	11/15/07		<47	<9.4	<9.4	<100	--	<25	7.46	6.53
MW-01A	02/19/08		<47	<9.4	<9.4	<100	--	<25	7.35	6.90
MW-01A	05/19/08		<47	<9.4	<9.4	20 J	--	<25	7.53	6.68
MW-01A	08/18/08		<47	<9.5	<9.5	<100	--	<25	7.37	7.03
MW-01A	11/10/08		<47	<9.4	<9.4	<100	--	<25	7.55	6.74
MW-01A	02/18/09		<47	<9.4	<9.4	54 J	--	<25	7.60	6.84
MW-01A	05/27/09	RL Change	<3.8	<0.47	<0.47	<100	--	<2.0	7.34	6.83
MW-01A	08/25/09		1.8 J	<0.47	<0.47	<100	--	<2.0	7.24	6.70
MW-01A	11/23/09		**4.8**	<0.47	<0.47	<100	--	<2.0	7.56	6.20
MW-01A	02/22/10		<3.8	<0.47	<0.47	<100	--	<2.0	7.09	6.31
MW-01A	05/27/10		3.2 J	<0.48	<0.48	65 J	--	<2.0	7.37	6.62
MW-01A	08/31/10	& 09/29/2010	**8.3**	<0.47	<0.19	32 J	--	<2.0	7.45	6.34
MW-01B	01/21/94		--	--	--	--	--	--	--	--
MW-01B	05/11/94		--	--	--	--	--	--	--	10.80
MW-01B	06/15/00		D	--	--	--	--	--	--	7.00
MW-01B	06/12/01	Add.Data	--	--	--	--	--	--	--	NS
MW-01B	06/22/01		ND	--	--	--	--	--	--	--
MW-01B	02/28/02		ND	--	--	--	--	--	--	9.01
MW-01B	03/10/02		ND	--	--	--	--	--	--	--
MW-01B	02/16/06		<48	<9.5	<9.5	23 J	ND *	1.1 J	7.49	7.09
MW-01B	05/17/06		<47	<9.4	<9.4	<100	ND *	<25	7.63	7.12
MW-01B	08/21/06		<47	<9.4	<9.4	39 J	ND *	<25	7.32	7.05
MW-01B	11/20/06		<47	<9.4	<9.4	23 J	ND *	<25	7.52	6.88
MW-01B	03/02/07		<47	<9.5	<9.5	<100	--	8.5 MB,J	--	7.19
MW-01B	05/18/07		5.0 J	<9.4	<9.4	67 J	--	<25	--	7.21
MW-01B	08/23/07		<47	<9.4	<9.4	51 J	--	4.3 J	7.52	7.50
MW-01B	11/15/07		<48	<9.6	<9.6	<100	--	8.7 J	7.70	7.10
MW-01B	02/19/08		<47	<9.4	<9.4	<100	--	<25	7.58	7.11
MW-01B	05/19/08		<47	<9.4	<9.4	78 J	--	<25	7.73	7.07
MW-01B	08/18/08		<47	<9.4	<9.4	<100	--	<25	7.59	7.43
MW-01B	11/10/08		<47	<9.4	<9.4	<100	--	<25	7.63	6.99
MW-01B	02/18/09		<47	<9.4	<9.4	<100	--	7.4 J	7.75	7.13
MW-01B	05/27/09	RL Change	<3.8	<0.47	<0.47	<100	--	<2.0	7.56	7.36
MW-01B	08/25/09		**4.2**	<0.47	<0.47	<100	--	<2.0	7.50	6.79
MW-01B	11/23/09		<3.8	<0.47	<0.47	<100	--	<2.0	7.66	5.85
MW-01B	02/22/10		**5.5**	<0.47	<0.47	<100	--	<2.0	7.43	6.79
MW-01B	05/27/10		**3.9**	<0.48	<0.48	<100	--	<2.0	7.51	6.56
MW-01B	08/31/10	& 09/29/2010	**4.6**	<0.48	<0.19	<100	--	<2.0	7.58	6.85

Table 28S
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbons, Chromium VI, pH, and Sulfide Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8270C			376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (µg/L)	Chrysene (µg/L)	Pyrene (µg/L)	Total (µg/L)	Reactive (µg/L)	(µg/L)		
MW-02A	01/21/94		ND	--	--	--	--	--	--	--
MW-02A	05/10/94		13	--	--	--	--	--	--	--
MW-02A	05/11/94		12	--	--	--	--	--	--	6.90
MW-02A	06/15/00		D	--	--	--	--	--	--	7.00
MW-02A	06/12/01	Add.Data	--	--	--	--	--	--	--	7.25
MW-02A	06/25/01		ND	--	--	--	--	--	--	--
MW-02A	02/28/02		ND	--	--	--	--	--	--	--
MW-02A	03/10/02		ND	--	--	--	--	--	--	--
MW-02A	02/16/06		<48	<9.5	<9.5	23 J	ND *	0.97 J	7.02	6.63
MW-02A	05/18/06		<47	<9.4	<9.4	14 J	ND *	1.9 J	6.86	6.61
2MW-02A	05/18/06	Duplicate	<47	<9.4	<9.4	20 J	--	1.7 J	6.98	6.61
MW-02A	08/22/06		<47	<9.4	<9.4	35 J	ND *	<25	6.97	6.73
2MW-02A	08/22/06	Duplicate	<47	<9.4	<9.4	37 J	ND *	<25	6.98	6.73
MW-02A	11/21/06		<47	<9.4	<9.4	24 J	ND *	<25	7.22	6.52
MW-02A	03/01/07		<47	<9.5	<9.5	<100	--	<25	--	6.72
MW-02A	05/17/07		<47	<9.4	0.073 J	<100	--	<25	7.29	5.62
MW-02A	08/24/07		<47	<9.4	<9.4	44 J	--	<25	7.21	6.67
MW-02A	11/16/07		<48	<9.5	<9.5	<100	--	<25	7.32	6.39
MW-02A	02/20/08		<47	<9.4	<9.4	<100	--	<25	7.15	6.91
MW-02A	05/20/08		<47	<9.4	<9.4	63 J	--	<25	7.45	6.82
MW-02A	08/19/08		<47	<9.4	<9.4	46 J	--	<25	7.35	6.55
MW-02A	11/11/08		<47	<9.4	<9.4	<100	--	<25	7.33	6.93
MW-02A	02/19/09		<47	<9.4	<9.4	77 J	--	<25	7.39	6.91
MW-02A	05/28/09	RL Change	2.0 J	<0.48	<0.48	<100	--	<2.0	7.36	6.67
MW-02A	08/26/09		**8.2**	0.11 J	0.19 J	<100	--	<2.0	7.28	6.17
MW-02A	11/24/09		<3.8	<0.47	<0.47	<100	--	<2.0	7.43	7.08
MW-02A	02/23/10		<3.8	<0.48	<0.48	<100	--	<2.0	7.43	6.47
MW-02A	05/28/10		**10**	<0.48	<0.48	<100	--	<2.0	7.90	7.04
MW-02A	09/01/10	& 09/29/2010	3.3 J	<0.47	<0.19	<100	--	<2.0	7.35	6.41
MW-02B	05/11/94		21	--	--	--	--	--	--	8.30
MW-02B	06/15/00		ND	--	--	--	--	--	--	7.00
MW-02B	06/12/01	Add.Data	--	--	--	--	--	--	--	7.39
MW-02B	06/25/01		ND	--	--	--	--	--	--	--
MW-02B	02/28/02		ND	--	--	--	--	--	--	10.30
MW-02B	03/10/02		ND	--	--	--	--	--	--	--
MW-02B	02/16/06		<48	<9.5	<9.5	27 J	ND *	1.7 J	7.12	6.88
2MW-02B	02/16/06	Duplicate	<48	<9.5	<9.5	30 J	ND *	8.6 J	7.14	6.88
MW-02B	05/17/06		<47	<9.4	<9.4	<100	ND *	<25	7.26	6.88
MW-02B	08/22/06		<47	<9.4	<9.4	37 J	ND *	7.3 J	7.09	6.87
MW-02B	11/21/06		<47	<9.4	<9.4	58 J	500 J	<25	7.31	6.78
MW-02B	03/01/07		<47	<9.5	<9.5	37 J	--	25	--	6.98
MW-02B	05/17/07		<47	<9.4	<9.4	9.7 J	--	<25	7.36	7.19
MW-02B	08/24/07		<47	<9.4	<9.4	34 J	--	<25	7.33	8.47
MW-02B	11/16/07		<47	<9.4	<9.4	24 J	--	<25	7.34	6.70
MW-02B	02/20/08		<47	<9.4	<9.4	<100	--	<25	7.26	7.05
MW-02B	05/20/08		<47	<9.4	<9.4	69 J	--	<25	7.59	7.02
MW-02B	08/19/08		<47	<9.4	<9.4	51 J	--	<25	7.46	7.06
MW-02B	11/11/08		<47	<9.4	<9.4	<100	--	<25	7.46	6.92
MW-02B	02/19/09		<47	<9.4	<9.4	63 J	--	5.7 J	7.64	7.08
MW-02B	05/28/09	RL Change	2.9 J	<0.47	<0.47	42 J	--	<2.0	7.39	6.90
MW-02B	08/26/09		2.8 J	<0.47	<0.47	76 J	--	<2.0	7.41	6.96
MW-02B	11/24/09		**6.4**	<0.47	<0.47	25 J	--	<2.0	7.51	7.18
MW-02B	02/23/10		<3.8	<0.47	<0.47	<100	--	<2.0	7.45	6.65
MW-02B	05/28/10		<3.8	<0.47	<0.47	<100	--	<2.0	7.97	6.83
MW-02B	09/01/10	& 09/29/2010	<3.8	<0.47	<0.19	29 J	--	<2.0	7.50	6.98

Table 28S
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbons, Chromium VI, pH, and Sulfide Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8270C			376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (µg/L)	Chrysene (µg/L)	Pyrene (µg/L)	Total (µg/L)	Reactive (µg/L)	(µg/L)		
MW-03A	05/10/94		ND	--	--	--	--	--	--	7.40
MW-03A	06/15/00		ND	--	--	--	--	--	--	7.00
MW-03A	06/12/01	Add.Data	--	--	--	--	--	--	--	7.19
MW-03A	06/22/01		ND	--	--	--	--	--	--	--
MW-03A	02/28/02		ND	--	--	--	--	--	--	8.51
MW-03A	03/10/02		ND	--	--	--	--	--	--	--
MW-03A	02/17/06		<48	<9.5	<9.5	13 J	ND *	3.4 J	7.20	6.81
MW-03A	05/18/06		<47	<9.4	<9.4	14 J	ND *	<25	6.97	6.67
MW-03A	08/22/06		<47	<9.4	<9.4	35 J	ND *	<25	7.01	6.78
MW-03A	11/20/06		<47	<9.4	<9.4	66.J	ND *	<25	7.18	6.53
2MW-03A	11/20/06	Duplicate	<47	<9.4	<9.4	38 J	ND *	<25	7.14	6.78
MW-03A	03/01/07		<47	<9.5	<9.5	<100	--	4.2 J	6.56	6.53
2MW-03A	03/01/07	Duplicate	<47	<9.5	<9.5	<100	--	4.0 J	--	6.56
MW-03A	05/17/07		<47	<9.4	<9.4	<100	--	<25	7.16	5.29
MW-03A	08/24/07		<47	<9.4	<9.4	40 J	--	<25	7.11	6.10
MW-03A	11/15/07		<47	<9.4	<9.4	<100	--	7.6 J	7.29	6.32
MW-03A	02/19/08		<47	<9.4	<9.4	<100	--	<25	7.22	6.81
MW-03A	05/19/08		<47	<9.4	<9.4	83 J	--	<25	7.34	6.57
MW-03A	08/18/08		<47	<9.5	<9.5	<100	--	<25	7.18	6.67
MW-03A	11/10/08		<47	<9.4	<9.4	<100	--	<25	7.27	6.82
MW-03A	02/18/09		<47	<9.4	<9.4	47 J	--	<25	7.45	6.61
MW-03A	05/27/09	RL Change	<3.8	<0.48	<0.48	<100	--	0.85 J	7.13	6.56
MW-03A	08/25/09		1.8 J	<0.47	<0.47	54 J	--	0.84 J	7.01	6.64
MW-03A	11/23/09		**4.7**	<0.47	<0.47	<100	--	0.71 J	7.28	6.11
MW-03A	02/22/10		<3.8	<0.47	<0.47	<100	--	0.95 J	6.99	6.54
MW-03A	05/27/10		<3.8	<0.47	<0.47	<100	--	1.1 J	7.10	6.43
MW-03A	08/31/10	& 09/29/2010	2.2 J	<0.47	<0.19	21 J	--	1.1 J	7.15	6.38
MW-03B	05/10/94		8.9*	--	--	--	--	--	--	7.40
MW-03B	07/05/00		ND	--	--	--	--	--	--	7.00
MW-03B	06/12/01	Add.Data	--	--	--	--	--	--	--	7.45
MW-03B	06/25/01		ND	--	--	--	--	--	--	--
MW-03B	02/28/02		ND	--	--	--	--	--	--	7.98
MW-03B	03/10/02		ND	--	--	--	--	--	--	--
MW-03B	02/17/06		<48	<9.6	<9.6	<100	ND *	1.9 J	8.02	8.61
MW-03B	05/18/06		<47	<9.4	<9.4	<100	ND *	<25	7.86	8.56
MW-03B	08/22/06		<47	<9.4	<9.4	32 J	ND *	<25	8.01	8.85
MW-03B	11/20/06		<47	<9.4	<9.4	23 J	ND *	<25	7.98	8.82
MW-03B	03/01/07		<47	<9.5	<9.5	<100	--	<25	--	8.08
MW-03B	05/17/07		<47	<9.4	<9.4	<100	--	<25	8.02	8.98
MW-03B	08/24/07		<47	<9.4	<9.4	45 J	--	<25	8.09	9.09
MW-03B	11/15/07		<49	<9.7	<9.7	<100	--	9.1 J	8.06	8.50
MW-03B	02/19/08		<47	<9.4	<9.4	<100	--	6.6 J	7.48	7.25
MW-03B	05/19/08		<47	<9.4	<9.4	<100	--	<25	7.66	7.10
MW-03B	08/18/08		<47	<9.5	<9.5	<100	--	<25	7.53	7.39
MW-03B	11/10/08		<47	<9.4	<9.4	<100	--	<25	8.03	8.74
MW-03B	02/18/09		<47	<9.4	<9.4	57 J	--	<25	7.88	8.19
MW-03B	05/27/09	RL Change	<3.8	<0.47	<0.47	<100	--	<2.0	7.96	8.77
MW-03B	08/25/09		**4.5**	<0.47	<0.47	<100	--	<2.0	7.56	7.98
MW-03B	11/23/09		<3.8	<0.47	<0.47	<100	--	<2.0	7.87	7.12
MW-03B	02/22/10		<3.8	<0.47	<0.47	<100	--	<2.0	7.49	7.85
MW-03B	05/27/10		<3.8	<0.48	<0.48	<100	--	<2.0	7.66	8.31
MW-03B	08/31/10	& 09/29/2010	<3.8	<0.48	<0.19	<100	--	<2.0	7.74	8.81

Table 28S
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbons, Chromium VI, pH, and Sulfide Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

		EPA Method:	8270C			376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (µg/L)	Chrysene (µg/L)	Pyrene (µg/L)	Total (µg/L)	Reactive (µg/L)	(µg/L)		
MW-04A	03/02/07	New Well	<47	<9.5	<9.5	<100	--	**77 MB,LN,AY**	--	6.77
MW-04A	05/17/07		<47	<9.4	<9.4	15 J	--	<25	7.12	5.50
MW-04A	08/23/07		<47	<9.4	<9.4	<100	--	4.9 J	7.23	6.59
MW-04A	11/16/07		<47	<9.4	<9.4	<100	--	<25	7.09	6.40
MW-04A	02/20/08		<47	<9.4	<9.4	<100	--	<25	7.01	6.79
MW-04A	05/20/08		<47	<9.4	<9.4	57 J	--	5.4 J	7.29	6.80
MW-04A	08/19/08		<47	<9.4	<9.4	<100	--	<25	7.16	6.84
MW-04A	11/11/08		<47	<9.4	<9.4	<100	--	<25	7.18	6.82
MW-04A	02/19/09		<47	<9.4	<9.4	88 J	--	<25	7.35	6.83
MW-04A	05/28/09	RL Change	<3.8	<0.47	<0.47	<100	--	<2.0	7.14	6.93
MW-04A	08/26/09		**4.4**	<0.47	<0.47	52 J	--	<2.0	7.15	6.25
MW-04A	11/24/09		2.0 J	<0.47	<0.47	36 J	--	<2.0	7.27	7.02
MW-04A	02/23/10		<3.8	<0.47	<0.47	<100	--	<2.0	7.20	6.74
MW-04A	05/28/10		1.6 J	<0.48	<0.48	<100	--	<2.0	7.79	6.89
MW-04A	09/01/10	& 09/29/2010	**8.0**	<0.47	<0.19	<100	--	<2.0	7.25	6.43
MW-04B	03/02/07	New Well	<47	<9.5	<9.5	69 J	--	24 MB,J	--	7.02
MW-04B	05/17/07		<47	<9.4	<9.4	10 J	--	<25	7.34	7.12
MW-04B	08/23/07		<47	<9.4	<9.4	<100	--	6.8 J	7.05	9.22
MW-04B	11/16/07		<47	<9.4	<9.4	28 J	--	<25	7.27	6.42
MW-04B	02/20/08		<47	<9.4	<9.4	<100	--	<25	7.21	7.01
MW-04B	05/20/08		<47	<9.4	<9.4	60 J	--	<25	7.45	6.96
MW-04B	08/19/08		<47	<9.4	<9.4	43 J	--	<25	7.34	6.89
MW-04B	11/11/08		<47	<9.4	<9.4	<100	--	<25	7.34	6.89
MW-04B	02/19/09		<47	<9.4	<9.4	59 J	--	6.0 J	7.54	6.94
MW-04B	05/28/09	RL Change	<3.8	<0.47	<0.47	<100	--	<2.0	7.32	6.84
MW-04B	08/26/09		2.8 J	<0.47	<0.47	49 J	--	<2.0	7.40	6.77
MW-04B	11/24/09		**9.7**	<0.48	<0.48	<100	--	<2.0	7.46	7.05
MW-04B	02/23/10		<3.8	<0.47	<0.47	<100	--	<2.0	7.43	6.64
MW-04B	05/28/10		3.1 J	<0.47	<0.47	<100	--	<2.0	7.91	6.78
MW-04B	09/01/10	& 09/29/2010	1.8 J	<0.47	<0.19	<100	--	<2.0	7.43	6.71
MW-05A	08/26/09	New Well 3Q09	4.8 J	<1.2	<1.2	63 J	--	<2.0	5.15	4.78
MW-05A	11/23/09		3.7 J	<0.48	<0.48	<100	--	<20.0	4.70	4.54
MW-05A	02/22/10		<3.8	<0.48	0.11 J	<100	--	<2.0	5.78	5.41
MW-05A	05/27/10		<7.6	<0.95	<0.95	<100	--	<2.0	4.67	4.53
MW-05A	08/31/10	& 09/29/2010	<19	<2.4	<0.94	<100	--	<2.0	4.55	4.63

Table 28S
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbons, Chromium VI, pH, and Sulfide Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8270C			376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (µg/L)	Chrysene (µg/L)	Pyrene (µg/L)	Total (µg/L)	Reactive (µg/L)	(µg/L)		
G-4	05/10/94		140	--	--	--	--	--	--	9.50
G-4	06/15/00		ND	--	--	--	--	--	--	7.00
G-4	06/12/01	Add.Data	--	--	--	--	--	--	--	7.41
G-4	06/22/01		ND	--	--	--	--	--	--	--
G-4	02/28/02		ND	--	--	--	--	--	--	8.43
G-4	03/10/02		ND	--	--	--	--	--	--	--
G-4	02/17/06		<48	<9.5	<9.5	31 J	ND *	<25	7.38	7.05
G-4	05/18/06		<47	<9.4	<9.4	45 J	ND *	<25	7.09	6.84
G-4	08/21/06		<47	<9.4	<9.4	75 J	ND *	13 J	7.17	6.91
G-4	11/20/06		<47	<9.4	<9.4	49 J	ND *	<25	7.97	6.80
G-4	03/01/07		<47	<9.5	<9.5	<100	--	4.0 J	--	6.86
G-4	05/18/07		<47	<9.4	<9.4	44 J	--	15 J	--	6.98
G-4	08/24/07		<47	<9.4	<9.4	64 J	--	6.7 J	7.39	7.71
G-4	11/15/07		<47	<9.4	<9.4	<100	--	11 J	7.51	6.60
G-4	02/20/08		<47	<9.4	<9.4	62 J	--	<25	7.24	7.02
G-4	05/19/08		<47	<9.4	<9.4	25 J	--	<25	7.52	6.90
G-4	08/18/08		<47	<9.5	<9.5	<100	--	<25	7.34	7.05
G-4	11/10/08		<47	<9.5	<9.5	<100	--	<25	7.47	7.09
G-4	02/18/09		<47	<9.4	<9.4	<100	--	11 J	7.70	6.93
G-4	05/27/09	RL Change	2.2 J	<0.47	<0.47	<100	--	<2.0	7.40	6.94
G-4	08/25/09		**3.8**	<0.47	<0.47	<100	--	<2.0	7.24	6.62
G-4	11/23/09		2.5 J	<0.47	<0.47	<100	--	<2.0	7.62	7.09
G-4	02/22/10		<3.8	<0.48	<0.48	<100	--	<2.0	7.13	6.99
G-4	05/27/10		<3.8	<0.48	<0.48	20 J	--	<2.0	7.36	6.69
G-4	08/31/10	& 09/29/2010	<3.8	<0.47	<0.19	<100	--	<2.0	7.47	6.66
UG-CHAN-20060216	02/16/06		<47	<9.5	<9.5	27 J	<100,000	2.3 J	9.07	--
FDCC-W-20080520	05/20/08		<47	<9.4	<9.4	69 J	--	<25	9.11	--
DG-CHAN-20060216	02/16/06		<47	<9.4	<9.4	42 J	<100,000	2.6 J	8.94	--
FDCC-E-20080520	05/20/08		<47	<9.4	<9.4	83 J	--	<25	9.29	--
FB-SUMP	02/16/06	Field Blank	<48	<9.5	<9.5	22	ND *	0.97 J	8.67	8.67
FB-SUMP	02/17/06	Field Blank	<48	<9.5	<9.5	<100	ND *	<25	6.80	6.80
FB-SUMP	05/17/06	Field Blank	<47	<9.4	<9.4	--	--	--	--	--
FB-SUMP	05/18/06	Field Blank	<47	<9.4	<9.4	--	--	--	--	--
FB-SUMP	08/21/06	Field Blank	<47	<9.4	<9.4	--	--	--	--	--

Notes:
& 09-29-10 = wells were re-sampled on 9/29/2010 for SVOC analytes.
* = Analyte was quantitated below the established linear calibration range. Amount reported is an estimate.
** = pH was measured in the field using a Horriba U-22XB water quality meter
J = Analyte was detected between the MDL and the RL
LN,AY = The MS &/or the MSD were below acceptance limits due to sample matrix interference.
ND = Not Detected. This data was obtained from a summary table of a report not prepared by SECOR.The actual laboratory reports are not available, thus MDL's can not be determined for this data.
ND* = no MDL for reactive sulfide identified by the laboratory
<# = Analyte was not detected above the Reporting Limit (#)
NS = Not sampled
D = detected below quantitation limit
MB or B = Analyte present in Method Blank
µg/L = micrograms per liter
-- = Not applicable / Not analyzed
Add.Data = additional data located (Sep 2006) and included in this table, reference DTSC, 2000 and 2001 report.
pH measurements on June 15, 2000 were obtained using pH paper
pH measurements reported prior to 2006 were obtained from a summary table of a report not prepared by SECOR. The pH measurements are presumed to have been obtained in the field.
Results highlighted with **Bold** font indicate results > RL
Prior to 2006, some table data was incorrectly represented in mg/L and has been updated to correctly reflect µg/L.
For safety and security reasons, the surface water sampling locations in the Dominguez Flood Control Channel (DFCC) have been re-located.
During the second quarter 2007 the instrument used to measure pH in wells completed in the upper saturated zone had calibration issues that resulted in slightly lower pH values.
During the third quarter 2007 a calibration issue developed in the instrument used to measure pH values in wells within the lower saturated zone resulting in slightly elevated pH values.
RL Change = in 2nd Qtr 2009 the RL's and MDL's were lowered to more closely match the CA State limits on those analytes.
Total Sulfides test method changed to SM 4500-SD in 5-2009
pH test method changed to SM 4500-H,B in 2010

References:

DTSC, 2000 and 2001. *2000 and 2001Groundwater Sampling Report for Gardena Sumps.*
DTSC, 2002. *2002 Groundwater Sampling Report for Gardena Sumps.*
URS, 1994. *Groundwater Remedial Investigation Technical Memorandum* , Gardena Sumps, 1440 West Artesia Boulevard, Gardena, CA., November 14.
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.

Table 28SA
Groundwater Analytical Results 2009 Investigation
(Semi-Volatile Organic Compounds)
Gardena Sumps
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8270C																																
Sample ID	Date Sampled	Notes	Acenaphthene	Acenaphthylene	Aniline	Anthracene	Benzidine	Benzo(a) anthracene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k)fluoranthene	Benzoic acid	Benzyl alcohol	4-Bromophenyl phenyl ether	Butyl benzyl phthalate	4-Chloro-3-methylphenol	4-Chloroaniline	Bis(2-chloroethoxy) methane	Bis(2-chloroethyl)ether	Bis(2-chloroisopropyl)ether	Bis(2-ethylhexyl) phthalate	2-Chloronaphthalene	2-Chlorophenol	4-Chlorophenyl phenyl ether	Chrysene	Dibenz(a,h)anthracene	Dibenzofuran	Di-n-butyl phthalate	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	3,3'-Dichlorobenzidine	2,4-Dichlorophenol	Diethyl phthalate	2,4-Dimethylphenol	Dimethyl phthalate
			(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
GWP100-38	7/9/2009		<1.2	<1.2	<24	<1.2	<12	<12	<4.7	<12	<1.2	<47	**15**	<2.4	**2.2 J**	<4.7	<4.7	<1.2	<1.2	<1.2	<4.0	<1.2	<2.4	<1.2	<1.2	<1.2	<1.2	<4.7	**1.0 J**	<1.2	**1.7**	<12	<4.7	**2.1 J**	<4.7	<1.2
GWP101-36	7/9/2009		<0.59	<0.59	<12	<0.59	<5.9	<5.9	<2.4	<5.9	<0.59	**13 J**	**0.24 J**	<1.2	**1.4 J**	<2.4	<2.4	<0.59	<0.59	<0.59	<4.0	<0.59	<1.2	<0.59	<0.59	<0.59	<0.59	**0.78 J**	<0.59	<0.59	<0.59	<5.9	<2.4	**13**	<2.4	<0.59
GWP102-80	7/13/2009		<0.48	<0.48	<9.5	<0.48	<4.8	<4.8	<1.9	<4.8	<0.48	**6.7 J**	**0.17 J**	<0.95	**1.2 J**	<1.9	<1.9	<0.48	<0.48	<0.48	<3.8	<0.48	<0.95	<0.48	<0.48	<0.48	<0.48	**0.40 J**	<0.48	<0.48	<0.48	<4.8	<1.9	**1.4**	<1.9	<0.48
GWP103-80	7/21/2009		<1.2	<1.2	<24	<1.2	<12	**0.42 J**	**0.52 J**	<12	<1.2	**10 J**	<12	<2.4	<12	<4.7	<4.7	<1.2	<1.2	<1.2	**4.3 J**	<1.2	<2.4	<1.2	1.3	<1.2	<1.2	<4.7	<1.2	<1.2	<1.2	<12	<4.7	**3.1**	<4.7	<1.2
GWP104-28	7/24/2009		<0.49	**0.097 J**	<9.7	<0.49	<4.9	<4.9	<1.9	<4.9	<0.49	**3.8 J**	**0.16 J**	<1.9	**1.0 J**	<1.9	<0.49	<0.49	<0.49	<0.49	<3.9	<0.49	<0.97	<0.49	<0.49	<0.49	<0.49	**0.25 J**	<0.49	<0.49	<0.49	<4.9	<1.9	**0.41 J**	<1.9	<0.49
GWP105-21	10/28/2009		<1.0	<1.0	<20	<1.0	<10	<10	<4.0	<10	<1.0	**8.0 J**	<10	<2.0	<10	<4.0	<4.0	<1.0	<1.0	<1.0	<8.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	**1.1 J**	<1.0	<1.0	<1.0	<10	<4.0	**45**	<4.0	<1.0
TW108	8/26/2009		<3.6	<3.6	<71	<3.6	<36	<36	<14	<36	<3.6	<140	<36	<7.1	**9.6 J**	<14	<14	<3.6	<3.6	<3.6	**12 J**	<3.6	<7.1	<3.6	<3.6	<3.6	<3.6	**5.4 J**	<3.6	<3.6	<3.6	<36	<14	<7.1	**89**	<3.6
TW109	8/26/2009		<1.2	<1.2	<24	<1.2	<12	**1.6 J**	**1.6 J**	**0.33 J**	<1.2	**9.0 J**	<12	<2.4	**2.8 J**	<4.8	<4.8	<1.2	<1.2	<1.2	**5.0 J**	<1.2	<2.4	<1.2	**1.6**	<1.2	<1.2	<4.8	<1.2	<1.2	<1.2	<12	<4.8	<2.4	**0.71 J**	<1.2
TW110	8/26/2009		<1.2	<1.2	<24	<1.2	<12	<12	<4.8	<12	<1.2	<48	<12	<2.4	**2.9 J**	<4.8	<4.8	<1.2	<1.2	<1.2	<9.5	<1.2	<2.4	<1.2	<1.2	<1.2	<1.2	<4.8	<1.2	<1.2	<1.2	<12	<4.8	**0.71 J**	<4.8	<1.2
HPB-118-GW	8/26/2010		<0.48	<0.48	<9.5	<0.48	<4.8	<4.8	<1.9	<4.8	<0.48	<19	**1.5 J**	<0.95	<4.8	<1.9	<1.9	<0.48	<0.48	<0.48	<3.8	<0.48	<0.95	<0.48	<0.48	<0.48	<0.48	<1.9	<0.48	<0.48	<0.48	<4.8	<1.9	<0.95	<1.9	<0.48
HPB-119-GW	8/26/2010		<0.48	<0.48	<9.5	<0.48	<4.8	<4.8	<1.9	<4.8	<0.48	<19	**0.99 J**	<0.95	<4.8	<1.9	<1.9	<0.48	<0.48	<0.48	**14**	<0.48	<0.95	<0.48	<0.48	<0.48	<0.48	<1.9	<0.48	<0.48	<0.48	<4.8	<1.9	**0.23 J**	<1.9	<0.48

Notes:
(µg/L) = micrograms per liter
< = Analyte was not detected at or above the Reporting Limit (RL)
J = Analyte was detected between the MDL and the Reporting Limits (RL)
Results highlighted with **Bold** font indicate results > RL

Table 28SA (continued)
Groundwater Analytical Results 2009 Investigation
(Semi-Volatile Organic Compounds)
Gardena Sumps
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8270C																																	
Sample ID	Date Sampled	Notes	4,6-Dinitro-2-methylphenol	2,4-Dinitrophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	Di-n-octyl phthalate	1,2-Diphenylhydrazine/Azobenzene	Fluoranthene	Fluorene	Hexachlorobenzene	Hexachlorobutadiene	Hexachlorocyclopentadiene	Hexachloroethane	Indeno(1,2,3-cd)pyrene	Isophorone	2-Methylnaphthalene	2-Methylphenol	4-Methylphenol	Naphthalene	2-Nitroaniline	3-Nitroaniline	4-Nitroaniline	Nitrobenzene	2-Nitrophenol	4-Nitrophenol	N-Nitroso-di-n-propylamine	N-Nitrosodimethylamine	N-Nitrosodiphenylamine	Pentachlorophenol	Phenanthrene	Phenol	Pyrene	1,2,4-Trichlorobenzene	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol
			(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
GWP100-38	7/9/2009		<12	<12	<12	<12	<12	**1.2 J**	<1.2	<1.2	<2.4	<4.7	<12	<7.1	<4.7	<2.4	<2.4	<4.7	<12	<2.4	<12	<12	<12	<2.4	<4.7	<12	<4.7	<4.7	<2.4	<4.7	**0.47 J**	<2.4	<1.2	<2.4	<4.7	<2.4
GWP101-36	7/9/2009		<5.9	<5.9	<5.9	<5.9	<5.9	<1.2	<0.59	<0.59	<1.2	<2.4	<5.9	<3.5	<2.4	<1.2	<1.2	<2.4	<5.9	<1.2	<5.9	<5.9	<5.9	<1.2	<2.4	<5.9	<2.4	<2.4	<1.2	<2.4	<0.59	**0.35 J**	<0.59	<1.2	<2.4	<1.2
GWP102-80	7/13/2009		<4.8	<4.8	<4.8	<4.8	<4.8	<0.95	<4.8	<0.48	<0.95	<1.9	<4.8	<2.9	<1.9	<0.95	<0.95	<1.9	<4.8	<0.95	<4.8	<4.8	<4.8	<0.95	<1.9	<4.8	<1.9	<1.9	<0.95	<1.9	**0.11 J**	**0.32 J**	<0.48	<0.95	<1.9	<0.95
GWP103-80	7/21/2009		<12	<12	<12	<12	<12	<2.4	<1.2	<1.2	<2.4	<4.7	<12	<7.1	<4.7	<2.4	<2.4	<4.7	<12	<2.4	<12	<12	<12	<2.4	<4.7	<12	<4.7	<4.7	<2.4	<4.7	**1.0 J**	<2.4	**0.75 J**	<2.4	<4.7	<2.4
GWP104-28	7/24/2009		<4.9	<4.9	<4.9	<4.9	<4.9	<0.97	<0.49	<0.49	<0.97	<1.9	<4.9	<2.9	<1.9	<0.97	<0.97	<1.9	<4.9	<0.97	<4.9	<4.9	<4.9	<0.97	<1.9	<4.9	<1.9	<1.9	<0.97	<1.9	<0.49	<0.97	<0.49	<0.97	<1.9	<0.97
GWP105-21	10/28/2009		<10	<10	<10	<10	<10	<2.0	<1.0	<1.0	<2.0	<4.0	<10	<6.0	<4.0	<2.0	<2.0	<4.0	<10	<2.0	<10	<10	<10	<2.0	<4.0	<10	<4.0	<4.0	<2.0	<4.0	<1.0	**0.64 J**	**0.28 J**	<2.0	<4.0	<2.0
TW108	8/26/2009		<36	<36	<36	<36	<36	<7.1	<3.6	**1.4 J**	<7.1	<14	<36	<21	<14	**2.4 J**	<7.1	**56**	**21 J**	<7.1	<36	<36	<36	<7.1	<14	<36	<14	<14	<7.1	<14	**1.4 J**	**4.4 J**	<3.6	<7.1	<14	<7.1
TW109	8/26/2009		<12	<12	<12	<12	<12	<2.4	<1.2	**0.43 J**	<2.4	<4.8	<12	<7.1	<4.8	**0.29 J**	**0.43 J**	<4.8	<12	<2.4	<12	<12	<12	<2.4	<4.8	<12	<4.8	<4.8	<2.4	<4.8	**1.7**	<2.4	**0.62 J**	<2.4	<4.8	<2.4
TW110	8/26/2009		<12	<12	<12	<12	<12	<2.4	<1.2	<1.2	<2.4	<4.8	<12	<7.1	<4.8	<2.4	<2.4	<4.8	<12	<2.4	<12	<12	<12	<2.4	<4.8	<12	<4.8	<4.8	<2.4	<4.8	<1.2	<2.4	<1.2	<2.4	<4.8	<2.4
HPB-118-GW	8/26/2010		<4.8	<4.8	<4.8	<4.8	<4.8	<0.95	<0.48	<0.48	<0.95	<1.9	<4.8	<2.9	<1.9	<0.95	<0.95	<1.9	<4.8	<0.95	<4.8	<4.8	<4.8	<0.95	<1.9	<4.8	<1.9	<1.9	<0.95	<1.9	<0.48	<0.95	<0.48	<0.95	<1.9	<0.95
HPB-119-GW	8/26/2010		<4.8	<4.8	<4.8	<4.8	**0.61 J**	<0.95	<0.48	<0.48	<0.95	<1.9	<4.8	<2.9	<1.9	<0.95	<0.95	<1.9	<4.8	<0.95	<4.8	<4.8	<4.8	<0.95	<1.9	<4.8	<1.9	<1.9	<0.95	<1.9	<0.48	<0.95	<0.48	<0.95	<1.9	<0.95

Notes:
(µg/L) = micrograms per liter
< = Analyte was not detected at or above the Reporting Limit (RL)
J = Analyte was detected between the MDL and the Reporting Limits (RL)
Results highlighted with **Bold** font indicate results > RL

Table 28SB
Groundwater Analytical Results 2009 Investigation
(Polynuclear Aromatic Hydrocarbons)
Gardena Sumps
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena California

EPA Method:			8310															
Sample ID	Date Sampled	Notes	Naphthalene (µg/L)	Acenaphthylene (µg/L)	Acenaphthene (µg/L)	Fluorene (µg/L)	Phenanthrene (µg/L)	Anthracene (µg/L)	Fluoranthene (µg/L)	Pyrene (µg/L)	Benzo(a) anthracene (µg/L)	Chrysene (µg/L)	Benzo(b) fluoranthene (µg/L)	Benzo(k) fluoranthene (µg/L)	Benzo(a) pyrene (µg/L)	Dibenz(a,h) anthracene (µg/L)	Benzo(g,h,i) perylene (µg/L)	Ideno(1,2,3-cd) pyrene (µg/L)
GWP100-38	7/9/2009		**2.1**	**4.2**	<1.0	<0.10	**0.53**	<0.20	<0.10	<0.10	<0.050	<0.10	<0.10	<0.050	<0.050	<0.10	<0.10	<0.10
GWP101-36	7/9/2009		<0.50	<1.0	<1.0	<0.10	<0.10	<0.20	<0.10	<0.10	<0.050	<0.10	<0.10	<0.050	<0.050	<0.10	<0.10	<0.10
GWP102-80	7/13/2009	ISG1004-01	<0.50 UJ	<1.0 UJ	<1.0 UJ	<0.10 UJ	<0.10 UJ	<0.20 UJ	**0.71 J**	<0.10 UJ	<0.050 UJ	<0.10 UJ	<0.10 UJ	<0.050 UJ	<0.050 UJ	<0.10 UJ	<0.10 UJ	<0.10 UJ
GWP102-80	7/13/2009	ISG1004-01RE1	<0.50 UJ	<1.0 UJ	<1.0 UJ	<0.10 UJ	**0.11 J**	<0.20 UJ	**0.52 J**	<0.10 UJ	<0.050 UJ	<0.10 UJ	<0.10 UJ	<0.050 UJ	<0.050 UJ	<0.10 UJ	<0.10 UJ	<0.10 UJ
GWP103-80	7/21/2009		<0.50	<1.0	<1.0	<0.10	**0.76**	<0.050	**1.7**	**0.77 J**	<0.050	**0.42**	<0.10	<0.050	<0.050	<0.10	<0.10	<0.10
GWP104-28	7/24/2009		<0.50	<1.0	<1.0	<0.10	<0.10	<0.20	<0.10	<0.10	<0.050	<0.10	<0.10	<0.050	<0.050	<0.10	<0.10	<0.10
GWP105-21	10/28/2009		<0.93	<1.9	<1.9	<0.19	<0.19	<0.37	<0.19	<0.19	<0.093	<0.19	<0.19	<0.093	<0.093	<0.19	<0.19	<0.19
HPB-118-GW	8/26/2010		<0.50	<1.0	<1.0	<0.10	**0.044**	<0.20	<0.10	<0.10	<0.050	<0.10	<0.10	<0.050	<0.050	<0.10	<0.10	<0.10
HPB-119-GW	8/26/2010		<0.50	<1.0	<1.0	<0.10	**0.077**	<0.20	<0.10	<0.10	<0.050	<0.10	<0.10	<0.050	<0.050	<0.10	<0.010	<0.10

Notes:
(µg/L) = micrograms per liter
< = Analyte was not detected at or above the Reporting Limit (RL)
Results highlighted with **Bold** font indicate results > RL
UJ = This compound was not detected, but the reporting limit is probably higher due to a low bias identified during the quality assurance review conducted by Environmental Standards, Inc.

Table 29S
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
MW-01A	05/11/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.20
MW-01A	06/15/00		--	--	**161**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	06/22/01		--	--	**61**	--	--	--	--	--	--	--	--	--	--	--	--	--	0.40**
MW-01A	02/28/02		<10	<10	**53**	<1.0	<1.0	<10	--	<2.0	<10	--	<10	<10	<10	<10	<10	<10	--
MW-01A	02/16/06		0.38 J	0.97 J	**77**	<0.50	0.18 J	<2.0	0.34 J	1.8 J	<1.0	**3.2**	<2.0	1.5 J	<1.0	<1.0	**6.4**	2.4 J	<0.20
MW-01A	05/17/06		<2.0	<1.0	**69**	<0.50	<1.0	<2.0	<2.0	<2.0	<1.0	**3.4**	<2.0	<2.0	<1.0	<1.0	**6.1**	<20	<0.20
MW-01A	08/21/06		0.36 J	1.1 J	**88**	<0.50	0.18 J	<2.0	0.35 J	1.1 J	0.13 J	**4.7**	1.9 J	1.9 J	<1.0	0.31 J	**5.6**	3.4 J	<0.20
MW-01A	11/20/06		0.14 J	<1.0	**80**	<0.50	0.22 J	<2.0	0.44 J	1.7 J	<1.0	**3.6**	1.5 J	1.2 J	<1.0	<1.0	**6.8**	3.4 J	<0.20
MW-01A	03/02/07		0.066 J	0.74 J	**74**	<0.50	0.15 J	<2.0	0.44 J	1.5 J	<1.0	**3.3**	<2.0	0.78 J	<1.0	<1.0	**5.8**	4.1 J	<0.20
MW-01A	05/18/07		<2.0	**1.1**	**71 CQ**	<0.50	0.18 J	<2.0	0.38 J	1.1 J	<1.0	**2.5**	1.1 J	1.2 J	<1.0	<1.0	**6.7**	3.2 J, MB	<0.20
MW-01A	08/23/07		<10	<5.0	**85**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.5 J	<10	1.9 J	<5.0	<5.0	4.1 J	<100	<0.20
MW-01A	11/15/07		<2.0	**1.4**	**72**	<0.50	0.13 J	<2.0	0.39 J	0.81 J	<1.0	**2.7**	<2.0	0.48 J	<1.0	<1..0	**5.2**	<20	<0.20
MW-01A	02/19/08		<2.0	**1.8**	**83**	<0.50	0.11 J	<2.0	0.47 MB,J	1.3 J	<1.0	**3.4**	<2.0	0.48 J	<1.0	<1..0	**5.4**	3.0 J	<0.20
MW-01A	05/19/08		<2.0	**1.5**	**74**	<0.50	0.18 J	<2.0	0.27 J	1.2 J	<1.0	**3.1**	<2.0	1.7 J,MB	<1.0	<1..0	**5.4**	3.9 J	<0.20
MW-01A	08/18/08		<2.0	**1.0**	**73**	<0.50	0.17 J	<2.0	0.39 J	1.4 J	<1.0	**3.0**	1.5 J	1.6 J	<1.0	<1.0	**5.4**	4.4 J	<0.20
MW-01A	11/10/08		<2.0	**1.6**	**65**	<0.50	0.17 J	<2.0	0.42 J	1.1 J	<1.0	**2.2**	<2.0	1.5 J	<1.0	<1.0	**7.6**	<20	<0.20
MW-01A	02/18/09		0.27 J	**1.1**	**83**	<0.50	0.21 J	<2.0	0.51 J	1.6 J	<1.0	**3.4**	<2.0	1.3 J	<1.0	0.23 J	**5.8**	4.6 J	<0.20
MW-01A	05/27/09		<2.0	**1.1**	**83**	<0.50	0.21 J	**2.9**	0.65 J	1.9 J	<1.0	**3.0**	<2.0	1.3 J	<1.0	<1.0	**5.9**	3.7 J	<0.20
MW-01A	08/25/09		<2.0	<1.0	**80**	<0.50	0.19 J	<2.0	0.53 J	**3.0**	<1.0	**2.9**	<2.0	1.9 J	<1.0	<1.0	**5.9**	4.3 J	<0.20
MW-01A	11/23/09		<2.0	**1.1**	**76**	<0.50	0.20 J	<2.0	0.45 J	1.3 J	<1.0	**2.1**	0.97 J	**2.6**	<1.0	<1.0	**7.1**	<20	<0.20
MW-01A	02/22/10		<2.0	**2.3**	**100**	<0.50	0.17 J	<2.0	0.80 J	1.7 J	<1.0	**5.0**	1.5 J	**2.0**	<1.0	<1.0	**2.6**	<20	<0.20
MW-01A	05/27/10		<2.0	<1.0	**77**	<0.50	0.18 J	<2.0	0.46 J	1.2 J	<1.0	1.9 J	1.7 J	**2.7**	<1.0	<1.0	**7.4**	<20	<0.20
MW-01A	08/31/10		0.30 J	**1.1**	**74**	<0.50	0.21 J	<2.0	0.46 J	0.85 J	<1.0	**2.0**	**2.0**	**2.6 B**	<1.0	<1.0	**7.7**	<20	0.16 J
MW-01B	01/21/94		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	05/11/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.20
MW-01B	06/15/00		--	--	**480**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	06/22/01		--	--	**263**	--	--	--	--	--	--	--	--	--	--	--	--	--	0.40**
MW-01B	02/28/02		<10	<10	**110**	<1.0	**1.0**	<10	--	--	<10	--	<10	<10	<10	<10	<10		--
MW-01B	02/16/06		0.18 J	0.58 J	**500**	<0.5	0.16 J	<2.0	0.41 J	1.3 J	<1.0	**2.3**	<2.0	**3.0**	<1.0	<1.0	<2.0	1.4 J	<0.20
MW-01B	05/17/06		<2.0	<1.0	**440**	<0.50	<1.0	<2.0	<2.0	<2.0	<1.0	**2.5**	<2.0	**2.6**	<1.0	<1.0	<2.0	<20	<0.20
MW-01B	08/21/06		0.23 J	<1.0	**440**	<0.50	0.11 J	<2.0	0.45 J	0.60 J	0.15 J	2.2 J	2.6 J	**4.1**	<1.0	<1.0	<2.0	3.7 J	<0.20
MW-01B	11/20/06		0.56 J	0.75 J	**400**	0.078 J	0.11 J	<2.0	0.26 J	1.8 J	<1.0	**2.6**	<2.0	**2.1**	<1.0	<1.0	1.2 J	6.5 J	<0.20
MW-01B	03/02/07		0.82 J	0.71 J	**250**	<0.50	0.15 J	<2.0	0.25 J	**2.3**	<1.0	**3.1**	<2.0	1.7 J	<1.0	<1.0	1.6 J	3.8 J	<0.20
MW-01B	05/18/07		0.64 J	<1.0	**350 CQ**	<0.50	0.18 J	0.77 J	0.34 J	1.6 J	0.11 J	**2.9**	1.7 J	**2.2**	<1.0	<1.0	1.4 J	6.7 J,MB	<0.20
MW-01B	08/23/07		<10	<5.0	**270**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.3 J	<10	3.8 J	<5.0	<5.0	<10	18 J	<0.20
MW-01B	11/15/07		0.51 J	**1.4**	**280**	<0.50	0.14 J	<2.0	0.30 J	1.5 J	<1.0	**3.1**	<2.0	1.5 J	<1.0	<1.0	1.2 J	<20	<0.20
MW-01B	02/19/08		<2.0	**1.3**	**350**	<0.50	0.16 J	<2.0	0.29 MB,J	1.0 J	<1.0	**2.8**	<2.0	1.6 J	<1.0	<1.0	1.3 J	<20	<0.20
MW-01B	05/19/08		<2.0	**1.4**	**280**	<0.50	0.14 J	<2.0	0.40 J	0.77 J	<1.0	**2.5**	<2.0	**3.6 CQ**	<1.0	<1..0	1.4 J	11 J	<0.20
MW-01B	08/18/08		0.21 J	**1.2**	**300**	<0.50	<1.0	<2.0	0.44 J	1.1 J	<1.0	**2.5**	1.6 J	**4.2**	<1.0	<1.0	1.1 J	2.5 J	<0.20
MW-01B	11/10/08		0.74 J	**1.7**	**290**	<0.50	<1.0	**5.7**	0.52 J	1.2 J	<1.0	**3.0**	**4.6**	**4.7**	<1.0	<1.0	1.6 J	<20	<0.20
MW-01B	02/18/09		0.26 J	**1.6**	**270**	<0.50	<1.0	<2.0	0.44 J	**14**	0.44 J	**2.8**	<2.0	**3.5**	<1.0	<1.0	1.3 J	10 J	<0.20
MW-01B	05/27/09		0.46 J	**1.4**	**340**	<0.50	<1.0	<2.0	0.54 J	1.6 J	<1.0	**2.7**	<2.0	**3.5**	<1.0	<1.0	1.2 J	<20	<0.20
MW-01B	08/25/09		0.39 J	0.73 J	**280**	<0.50	<1.0	<2.0	0.37 J	**2.4**	<1.0	**3.0**	<2.0	**3.7**	<1.0	<1.0	1.2 J	5.3 J	<0.20
MW-01B	11/23/09		0.32 J	<1.0	**280**	<0.50	<1.0	1.7 J	0.50 J	**3.5**	<1.0	**2.9**	1.7 J	**6.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-01B	02/22/10		<2.0	<1.0	**290**	<0.50	0.16 J	<2.0	0.44 J	1.1 J	<1.0	**2.6**	1.5 J	**5.5**	<1.0	<1.0	1.5 J	<20	<0.20
MW-01B	05/27/10		<2.0	**1.0**	**280**	<0.50	<1.0	<2.0	0.52 J	0.82 J	<1.0	**2.3**	**3.5**	**5.5**	<1.0	<1.0	1.4 J	<20	<0.20
MW-01B	08/31/10		1.1 J	**1.4**	**270**	<0.50	<1.0	<2.0	0.42 J	1.4 J	<1.0	**3.1**	**3.1**	**4.5 B**	<1.0	<1.0	1.6 J	<20	<0.20

Table 29S
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
MW-02A	01/21/94		--	--	--	--	--	--		--	--	--	--	--	--	--	--	--	--
MW-02A	05/11/94		--	--	<1.0	--	--	--		--	--	--	--	--	--	--	--	--	<0.20
MW-02A	06/15/00		--	--	**130**	--	--	--		--	--	--	--	--	--	--	--	--	--
MW-02A	06/25/01		--	--	**30**	--	--	--		--	--	--	--	--	--	--	--	--	ND**
MW-02A	02/28/02		<10	<10	**34**	<1.0	<1.0	<10	<2.0	<2.0	<10	--	<10	<10	<10	<10	<10	<10	--
MW-02A	02/16/06		0.081 J	<1.0	**48**	<0.50	0.20 J	<2.0	**1.6**	**2.2**	<1.0	**6.5**	<2.0	1.6 J	<1.0	<1.0	**4.4**	**2.3**	<0.20
MW-02A	05/18/06		<2.0	0.68 J	**58**	<0.50	0.32 J	<2.0	0.92 J	1.9 J	<1.0	5.5 J	1.4 J	0.61 J	<1.0	<1.0	**5.5**	**1400 CQ**	<0.20
2MW-02A	05/18/06	Duplicate	<2.0	0.68 J	**59**	<0.50	0.28 J	<2.0	0.96 J	1.9 J	<1.0	5.7 J	1.7 J	0.47 J	<1.0	<1.0	**5.5**	**9.8**	<0.20
MW-02A	08/22/06		<2.0	<1.0	**47**	<0.50	0.27 J	<2.0	1.3 J	1.2 J	0.08 J	**5.4**	1.5 J	<2.0	<1.0	<1.0	**4.9**	5.4 J	<0.20
2MW-02A	08/22/06	Duplicate	<2.0	<1.0	**47**	<0.50	0.27 J	<2.0	1.3 J	1.1 J	<1.0	**5.3**	1.5 J	<2.0	<1.0	<1.0	**4.1**	2.1 J	<0.20
MW-02A	11/21/06		0.32 J	<1.0	**49**	<0.50	0.32 J	<2.0	**1.6**	**2.0**	<1.0	**6.8**	0.98 J	0.72 J	<1.0	<1.0	**5.0**	11 J	<0.20
MW-02A	03/01/07		0.067 J	<1.0	**46**	<0.50	0.20 J	<2.0	**1.4**	1.7 J	<1.0	**6.2**	<2.0	0.45 J	<1.0	<1.0	**4.6**	4.7 J	<0.20
MW-02A	05/17/07		<2.0	<1.0	**42 CQ**	<0.50	0.2 J	<2.0	0.86 J	1.5 J	<1.0	**5.8**	1.4 J	0.52 J	<1.0	<1.0	**3.8**	<20	<0.20
MW-02A	08/24/07		<10	<5.0	**40**	<2.5	<5.0	<10	1.5 J	8.2 J	<1.0	6.0 J	<10	<2.0	<5.0	<5.0	4.8 J	<100	**65**
MW-02A	11/16/07		<2.0	**1.2**	**46**	<0.50	0.21 J	<2.0	**1.6**	1.3 J	<1.0	**6.4**	<2.0	<2.0	<1.0	<1.0	**3.8**	<20	<0.20
MW-02A	02/20/08		<2.0	<1.0	**47**	<0.50	0.19 J	<2.0	**1.4 MB**	1.6 J	<1.0	**6.5**	<2.0	0.32 J	<1.0	<1.0	**4.7**	<20	<0.20
MW-02A	05/20/08		<2.0	<1.0	**37**	<0.50	0.14 J	<2.0	0.83 J	1.2 J	<1.0	**5.7**	<2.0	1.2 J,MB	<1.0	<1.0	**3.5**	<20	<0.20
MW-02A	08/19/08		0.35 J	<1.0	**37**	<0.50	0.21 J	<2.0	**1.2**	1.8 J	<1.0	**7.1**	1.3 J	0.72 J	<1.0	<1.0	**4.3**	<20	<0.20
MW-02A	11/11/08		0.41 J	<1.0	**47**	<0.50	0.21 J	<2.0	**1.5**	1.5 J	<1.0	**7.5**	<2.0	0.48 J	<1.0	<1.0	**4.4**	<20	<0.20
MW-02A	02/19/09		<2.0	0.85 J	**50**	<0.50	0.22 J	<2.0	**1.5**	1.7 J	<1.0	**6.2**	<2.0	<2.0	<1.0	<1.0	**4.2**	<20	<0.20
MW-02A	05/28/09		<2.0	<1.0	**32**	<0.50	0.19 J	<2.0	0.66 J	1.9 J	<1.0	**5.4 B-1**	<2.0	0.42 J	<1.0	<1.0	**3.8**	<20	<0.20
MW-02A	08/26/09		<2.0	<1.0	**42**	<0.50	0.27 J	<2.0	**1.4**	**2.6**	0.65 J	**7.4**	<2.0	0.53 J	<1.0	0.22 J	**5.1**	3.8 J	<0.20
MW-02A	11/24/09		<2.0	<1.0	**48**	<0.50	0.23 J	<2.0	**1.6**	1.5 J	<1.0	**7.4**	0.87 J	0.91 J	<1.0	<1.0	**4.1**	<20	<0.20
MW-02A	02/23/10		<2.0	<1.0	**48**	<0.50	0.23 J	<2.0	**1.2**	1.6 J	<1.0	**7.2**	1.5 J	0.85 J	<1.0	0.35 J	**4.2**	<20	<0.20
MW-02A	05/28/10		<2.0	<1.0	**41**	<0.50	0.13 J	<2.0	0.75 J	1.4 J	<1.0	**5.8**	<2.0	0.64 J	<1.0	0.32 J	**3.6**	**25**	<0.20
MW-02A	09/01/10		0.33 J	<1.0	**43**	<0.50	0.28 J	<2.0	**2.3 B**	1.5 J	<1.0	**8.8**	1.5 J	0.75 J	<1.0	0.25 J	**4.4**	<20	<0.20
MW-02B	05/11/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.20
MW-02B	06/19/00		--	--	**110**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-02B	06/25/01		--	--	**40**	--	--	--	--	--	--	--	--	--	--	--	--	--	ND**
MW-02B	02/28/02		**11**	**11**	**30**	**1.0**	**1.0**	<10	--	--	**14**	--	<10	14	<10	**18**	**11**	<10	--
MW-02B	02/16/06		<2.0	0.78 J	**33**	<0.50	<1.0	<2.0	0.35 J	**4.7**	<1.0	**2.7**	<2.0	**3.9**	<1.0	<1.0	<2.0	3.0 J	<0.20
2MW-02B	02/16/06	Duplicate	<2.0	0.61 J	**31**	<0.50	<1.0	1.6 J	0.32 J	**4.6**	<1.0	**2.7**	<2.0	**3.6**	<1.0	<1.0	<2.0	8.0 J	<0.20
MW-02B	05/17/06		<2.0	<1.0	**33**	<0.50	0.32 J	<2.0	<2.0	**2.2**	<1.0	**2.8**	<2.0	**2.9**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/22/06		<2.0	1.2 J	**32**	<0.50	<1.0	<2.0	0.39 J	1.2 J	0.14 J	3.2 J	2.9 J	**5.2**	<1.0	<1.0	<2.0	3.4 J	<0.20
MW-02B	11/21/06		0.22 J	<1.0	**32**	0.078 J	<1.0	<2.0	0.34 J	1.8 J	<1.0	**3.4**	1.6 J	**4.7**	<1.0	<1.0	<2.0	3.1 J	<0.20
MW-02B	03/01/07		<2.0	**1.4**	**28**	<0.50	<1.0	<2.0	0.28 J	1.7 J	<1.0	**2.8**	<2.0	**2.7**	<1.0	<1.0	<2.0	5.8 J	<0.20
MW-02B	05/17/07		<2.0	<1.0	**36 CQ**	<0.50	<1.0	<2.0	0.29 J	1.5 J	<1.0	**3.2**	2.0	**2.2**	<1.0	<1.0	<2.0	3.1 J	<0.20
MW-02B	08/24/07		<10	<5.0	**27**	<2.5	<5.0	<10	<5.0	<10	<5.0	2.8 J	<10	6.3 J	<5.0	<5.0	<10	**150**	<0.20
MW-02B	11/16/07		<2.0	**1.9**	**30**	<0.50	<1.0	<2.0	0.24 J	1.1 J	<1.0	**2.8**	<2.0	1.1 J	<1.0	<1.0	<2.0	5.0 J	<0.20
MW-02B	02/20/08		<2.0	0.97 J	**30**	<0.50	<1.0	<2.0	0.16 MB,J	**2.0**	<1.0	**3.0**	<2.0	<2.0	<1.0	<1.0	<2.0	2.9 J	0.10 J
MW-02B	05/20/08		<2.0	0.98 J	**32**	<0.50	<1.0	<2.0	0.24 J	**2.1**	<1.0	**3.2**	<2.0	**2.5 MB**	<1.0	<1.0	<2.0	3.0 J	<0.20
MW-02B	08/19/08		<2.0	<1.0	**30**	<0.50	<1.0	<2.0	0.30 J	1.6 J	<1.0	**3.2**	1.7 J	**4.5**	<1.0	<1.0	<2.0	3.3 J	<0.20
MW-02B	11/11/08		0.94 J	**1.3**	**51**	<0.50	<1.0	<2.0	0.34 J	1.8 J	**1.5**	**3.8**	0.92 J	**2.9**	<1.0	<1.0	<2.0	**110**	<0.20
MW-02B	02/19/09		<2.0	**1.3**	**33**	<0.50	<1.0	<2.0	0.22 J	1.9 J	<1.0	**3.1**	<2.0	**2.2**	<1.0	<1.0	<2.0	4.3 J	0.10 J
MW-02B	05/28/09		<2.0	<1.0	**32**	<0.50	<1.0	<2.0	0.37 J	**4.6**	<1.0	**3.3 B**	<2.0	**3.0**	<1.0	<1.0	<2.0	3.5 J	<0.20
MW-02B	08/26/09		<2.0	<1.0	**37**	0.21 J	<1.0	<2.0	0.40 J	**2.6**	<1.0	**4.0**	1.6 J	**2.7**	<1.0	<1.0	<2.0	4.8 J	<0.20
MW-02B	11/24/09		<2.0	**1.0**	**35**	<0.50	<1.0	<2.0	0.32 J	1.4 J	<1.0	**3.6**	1.5 J	**6.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	02/23/10		<2.0	0.96 J	**37**	<0.50	<1.0	<2.0	0.39 J	**2.2**	<1.0	**3.4**	**2.6**	**4.5**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	05/28/10		<2.0	<1.0	**35**	<0.50	<1.0	<2.0	0.31 J	1.7 J	<1.0	**3.6**	1.1 J	**5.7**	<1.0	0.53 J	<2.0	<20	<0.20
MW-02B	09/01/10		0.33 J	<1.0	**35**	<0.50	0.12 J	<2.0	0.37 J, B	1.4 J	<1.0	**4.6**	1.5 J	**4.9**	<1.0	<1.0	<2.0	<20	<0.20

Table 29S
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
MW-03A	05/10/94		--	--	<1.0	--	--	--		--	--	--	--	--	--	--	--	--	<0.2
MW-03A	06/15/00		--	--	**170**	--	--	--		--	--	--	--	--	--	--	--	--	--
MW-03A	06/22/01		--	--	**70**	--	--	--		--	--	--	--	--	--	--	--	--	ND**
MW-03A	02/28/02		**15**	**12**	**70**	**1.0**	**1.0**	<10		**10**	**19**	--	<10	**18**	**<10**	**15**	**15**	<10	--
MW-03A	02/17/06		1.3 J	<1.0	**66**	<0.50	0.042 J	**2.3**	0.14 J	1.3 J	<1.0	1.4 J	<2.0	1.3 J	<1.0	<1.0	**4.6**	1.2 J	<0.20
MW-03A	05/18/06		0.10 J	<1.0	**70**	<0.50	0.034 J	1.7 J	0.21 J	1.3 J	0.066 J	1.1 J	1.2 J	0.42 J	<1.0	<1.0	**5.3**	15 J	<0.20
MW-03A	08/22/06		<2.0	<1.0	**68**	<0.50	0.17 J	2.2 J	0.26 J	0.93 J	0.23 J	0.96 J	1.6 J	0.68 J	<1.0	<1.0	**4.4**	4.9 J	<0.20
MW-03A	11/20/06		0.15 J	<1.0	**74**	<0.50	0.071 J	1.4 J	0.16 J	1.1 J	<1.0	1.1 J	<2.0	0.30 J	<1.0	<1.0	**5.5**	<20	<0.20
2MW-03A	11/20/06	Duplicate	0.13 J	<1.0	**76**	<0.50	0.083 J	1.5 J	0.22 J	1.4 J	<1.0	1.0 J	<2.0	<2.0	<1.0	<1.0	**5.3**	7.5 J	<0.20
MW-03A	03/01/07		0.099 J	0.78 J	**74**	<0.50	<1.0	1.8 J	0.22 J	0.91 J	<1.0	1.1 J	<2.0	<2.0	<1.0	<1.0	**5.1**	4.8 J	<0.20
2MW-03A	03/02/07	Not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-03A	05/17/07		0.2 J	<1.0	**82 CQ**	<0.50	<1.0	1.2 J	0.18 J	0.81 J	<1.0	1.2 J	1.6 J	0.38 J	<1.0	<1.0	**3.9**	<20	<0.20
MW-03A	08/24/07		<10	<5.0	**73**	<2.5	<5.0	<10	<5.0	<10	<5.0	1.2J	<10	1.8 J	<5.0	<5.0	3.7J	**130**	<0.20
MW-03A	11/15/07		<2.0	0.86 J	**79**	<0.50	<1.0	1.2 J	0.15 J	<2.0	<1.0	1.0 J	<2.0	<2.0	<1.0	<1.0	**3.4**	2.6 J	<0.20
MW-03A	02/19/08		<2.0	0.98 J	**88**	<0.50	<1.0	1.1 J	<1.0	1.2 J	<1.0	1.1 J	<2.0	<2.0	<1.0	<1.0	**3.9**	2.5 J	<0.20
MW-03A	05/19/08		<2.0	<1.0	**88**	<0.50	<1.0	1.5 J	0.23 J	0.83 J	<1.0	1.0 J	<2.0	1.4 J,MB	<1.0	<1.0	**4.3**	<20	<0.20
MW-03A	08/18/08		<2.0	<1.0	**78**	<0.50	<1.0	1.0 J	0.28 J	1.5 J	<1.0	0.95 J	1.9 J	0.69 J	<1.0	<1.0	**4.2**	2.5 J	<0.20
MW-03A	11/10/08		<2.0	<1.0	**82**	<0.50	<1.0	**2.6**	0.32 J	1.3 J	<1.0	0.99 J	**3.5**	0.39 J	<1.0	<1.0	**4.6**	<20	<0.20
MW-03A	02/18/09		0.20 J	<1.0	**90**	<0.50	0.20 J	1.6 J	0.32 J	**2.3**	0.40 J	1.1 J	<2.0	<2.0	<1.0	<1.0	**4.0**	5.0 J	<0.20
MW-03A	05/27/09		<2.0	<1.0	**91**	<0.50	<1.0	1.0 J	0.36 J	1.8 J	<1.0	1.1 J	<2.0	0.39 J	<1.0	<1.0	**4.3**	5.0 J	<0.20
MW-03A	08/25/09		0.23 J	<1.0	**90**	<0.50	0.11 J	1.1 J	0.35 J	1.9 J	<1.0	1.7 J	0.97 J	1.4 J	<1.0	<1.0	**3.9**	8.1 J	<0.20
MW-03A	11/23/09		<2.0	<1.0	**99**	<0.50	0.49 J	<2.0	0.42 J	1.8 J	<1.0	1.1 J	**2.0**	1.4 J	<1.0	<1.0	**5.2**	<20	<0.20
MW-03A	02/22/10		<2.0	<1.0	**86**	<0.50	<1.0	1.5 J	0.40 J	1.4 J	<1.0	0.78 J	1.5 J	0.98 J	<1.0	<1.0	**5.7**	<20	<0.20
MW-03A	05/27/10		<2.0	<1.0	**100**	<0.50	<1.0	<2.0	0.42 J	1.2 J	<1.0	0.54 J	**3.9**	0.77 J	<1.0	<1.0	**4.4**	**29**	<0.20
MW-03A	08/31/10		0.35 J	<1.0	**93**	<0.50	0.16 J	1.3 J	0.33 J	1.1 J	<1.0	1.2 J	**3.9**	0.62 J, B	<1.0	<1.0	**4.1**	<20	<0.20
MW-03B	05/10/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.2
MW-03B	07/05/00		--	--	**130**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-03B	06/25/01		--	--	**40**	--	--	--	--	--	--	--	--	--	--	--	--	--	ND**
MW-03B	02/28/02		**10**	<10	**137**	**1.0**	**1.5**	<10	--	--	**15**	--	**14**	**11**	<10	<10	<10	<10	--
MW-03B	02/17/06		1.1 J	**3.0**	**65**	<0.50	<1.0	0.63 J	0.42 J	**3.1**	<1.0	**2.7**	<2.0	**2.8**	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-03B	05/18/06		0.40 J	<1.0	**65**	<0.50	0.32 J	<2.0	0.60 J	2.0 J	0.38 J	2.9 J	<2.0	1.7 J	0.33 J	<1.0	<2.0	**11**	<0.20
MW-03B	08/22/06		<2.0	<1.0	**68**	<0.50	<1.0	<2.0	0.37 J	0.70 J	0.11 J	3.5 J	4.7	2.8 J	<1.0	<1.0	<2.0	3.8 J	<0.20
MW-03B	11/20/06		0.34 J	**1.2**	**80**	<0.50	<1.0	<2.0	0.38 J	1.4 J	<1.0	**4.6**	**3.3**	**2.9**	<1.0	0.20 J	<2.0	4.1 J	<0.20
MW-03B	03/02/07	Not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-03B	05/17/07		0.2 J	**2.0**	**71 CQ**	<0.50	<1.0	<2.0	0.30 J	0.95 J	<1.0	**4.2**	**3.4**	**2.3**	<1.0	0.16 J	<2.0	3.4 J	<0.20
MW-03B	08/24/07		<10	<5.0	**54**	<2.5	<5.0	<10	<5.0	<10	<5.0	3.7 J	<10	5.5 J	<5.0	<5.0	<2.0	**230**	<0.20
MW-03B	11/15/07		<2.0	**3.0**	**57**	<0.50	<1.0	<2.0	0.30 J	<2.0	<1.0	**3.1**	<2.0	0.37 J	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-03B	02/19/08		<2.0	**4.0**	**54**	<0.50	<1.0	<2.0	0.35 J	1.8 J	<1.0	**2.9**	<2.0	<2.0	<1.0	<1.0	<2.0	7.9 J	<0.20
MW-03B	05/19/08		<2.0	**3.2**	**52**	<0.50	<1.0	<2.0	0.31 J	1.1 J	<1.0	**3.2**	<2.0	**2.0 MB**	<1.0	<1..0	<2.0	2.7 J	<0.20
MW-03B	08/18/08		<2.0	**3.5**	**52**	<0.50	<1.0	<2.0	0.42 J	1.3 J	<1.0	**2.7**	**2.3**	**3.1**	<1.0	<1.0	<2.0	10 J	<0.20
MW-03B	11/10/08		<2.0	**3.4**	**61**	<0.50	<1.0	1.2 J	0.39 J	1.6 J	<1.0	**3.7**	**4.3**	**3.2**	<1.0	<1.0	<2.0	8.2 J	<0.20
MW-03B	02/18/09		<2.0	**3.1**	**64**	<0.50	<1.0	<2.0	0.30 J	1.3 J	<1.0	**3.6**	<2.0	1.2 J	<1.0	<1.0	<2.0	3.2 J	<0.20
MW-03B	05/27/09		<2.0	**2.9**	**59**	<0.50	<1.0	<2.0	0.47 J	**2.6**	<1.0	**3.6**	<2.0	**2.1**	<1.0	<1.0	<2.0	3.1 J	<0.20
MW-03B	08/25/09		0.26 J	**2.3**	**54**	<0.50	<1.0	<2.0	0.37 J	1.6 J	<1.0	**3.8**	<2.0	**3.8**	<1.0	<1.0	<2.0	7.4 J	<0.20
MW-03B	11/23/09		<2.0	**3.6**	**61**	<0.50	<1.0	<2.0	0.40 J	1.2 J	<1.0	**3.6**	**2.3**	**3.8**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/22/10		<2.0	**2.3**	**54**	<0.50	<1.0	<2.0	0.39 J	1.1 J	<1.0	**3.0**	**2.6**	**4.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	05/27/10		<2.0	**2.6**	**56**	<0.50	<1.0	<2.0	0.38 J	0.87 J	<1.0	**3.1**	**4.3**	**4.4**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/31/10		<2.0	**2.2**	**48**	<0.50	<1.0	<2.0	0.33 J	0.56 J	<1.0	**3.3**	**3.2**	**3.8 B**	<1.0	<1.0	<2.0	<20	<0.20

Table 29S
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
MW-04A	03/02/07	New Well	0.36 J	**1.7**	**21**	<0.50	0.21 J	<2.0	**1.8**	**2.8**	0.16 J	**5.4**	**2.3**	**4.4**	<1.0	<1.0	**13**	**40 LN,AY**	<0.20
MW-04A	05/17/07		0.26 J	**2.3**	**22 CQ**	<0.50	0.24 J	<2.0	**1.1**	**2.5**	<1.0	**5.6**	**3.1**	**4.9**	<1.0	<1.0	**9.9**	**6.3**	<0.20
MW-04A	08/23/07		<10	4.8J	**21**	<2.5	<5.0	<10	1.2 J	<10	<1.0	5.6 J	7.2J	**13**	<5.0	<5.0	9.6J	18 J	<0.20
MW-04A	11/16/07		<2.0	3.30	**20**	<0.50	0.26 J	<2.0	**1.0**	**4.3**	<1.0	**4.7**	<2.0	**2.2**	<1.0	<1.0	**11**	4.8 J	<0.20
MW-04A	02/20/08		<2.0	**2.1**	**22**	<0.50	0.24 J	<2.0	0.84 MB,J	**3.1**	<1.0	**4.9**	<2.0	<2.0	<1.0	<1.0	**13**	4.6 J	<0.20
MW-04A	05/20/08		<2.0	**2.3**	**25**	<0.50	0.33 J	<2.0	**1.1**	**4.0**	<1.0	**5.3**	1.5 J	**3.9 CQ**	<1.0	<1.0	**12**	12 J	<0.20
MW-04A	08/19/08		<2.0	**1.5**	**21**	<0.50	0.33 J	<2.0	0.87 J	**3.2**	<1.0	**4.7**	**4.0**	**8.6**	<1.0	<1.0	**12**	4.9 J	<0.20
MW-04A	11/11/08		<2.0	**1.6**	**23**	<0.50	0.31 J	<2.0	0.99 J	**2.9**	<1.0	**5.0**	**2.3**	**5.4**	<1.0	<1.0	**14**	5.1 J	<0.20
MW-04A	02/19/09		<2.0	**2.8**	**22**	<0.50	0.23 J	<2.0	0.90 J	**3.2**	<1.0	**5.2**	<2.0	**4.7**	<1.0	<1.0	**10**	16 J	0.13 J
MW-04A	05/28/09		<2.0	**1.3**	**22**	<0.50	0.33 J	<2.0	**1.1**	**6.9**	<1.0	**4.9 B-1**	<2.0	**4.9**	<1.0	<1.0	**13**	5.0 J	<0.20
MW-04A	08/26/09		<2.0	0.78 J	**25**	<0.50	0.32 J	<2.0	**1.1**	**3.7**	<1.0	**5.3**	**2.8**	**4.3**	<1.0	<1.0	**13**	5.2 J	<0.20
MW-04A	11/24/09		<2.0	**2.0**	**22**	<0.50	0.27 J	<2.0	0.90 J	**2.5**	<1.0	**4.9**	**3.7**	**8.9**	<1.0	<1.0	**12**	<20	<0.20
MW-04A	02/23/10		<2.0	**1.1**	**24**	<0.50	0.35 J	<2.0	0.97 J	**3.4**	<1.0	**5.1**	**5.1**	**7.8**	<1.0	<1.0	**12**	<20	<0.20
MW-04A	05/28/10		<2.0	**1.5**	**24**	<0.50	0.36 J	<2.0	0.81 J	**2.8**	<1.0	**4.8**	**3.4**	**9.7**	<1.0	<1.0	**13**	<20	<0.20
MW-04A	09/01/10		<2.0	<1.0	**23**	<0.50	0.34 J	<2.0	0.72 J, B	**2.1**	<1.0	**5.4**	**3.3**	**7.0**	<1.0	<1.0	**12**	7.1 J	<0.20
MW-04B	03/02/07	New Well	0.80 J	**6.5**	**120**	<0.50	<1.0	<2.0	0.50 J	**2.1**	0.38 J	**7.1**	<2.0	**1.5**	<1.0	<1.0	0.93 J	12 J	<0.20
MW-04B	05/17/07		<2.0	**8.9**	**86 CQ**	<0.50	<1.0	<2.0	0.35 J	1.4 J	<1.0	**3.6**	1.6 J	**2.8**	<1.0	<1.0	<2.0	2.8 J	<0.20
MW-04B	08/23/07		<10	**13**	**74**	<2.5	<5.0	3.7 J	<5.0	<10	<1.0	3.0 J	5.0 J	7.4 J	<5.0	<5.0	<10	14 J	<0.20
MW-04B	11/16/07		<2.0	**8.4**	**67**	<0.50	<1.0	<2.0	0.36 J	1.3 J	<1.0	**2.9**	<2.0	1.2 J	<1.0	<1.0	<2.0	3.4 J	<0.20
MW-04B	02/20/08		<2.0	**6.8**	**60**	<0.50	<1.0	<2.0	0.28 MB,J	**2.0**	<1.0	**3.0**	<2.0	<2.0	<1.0	<1.0	<2.0	4.0 J	<0.20
MW-04B	05/20/08		<2.0	**5.8**	**54**	<0.50	<1.0	<2.0	0.35 J	**2.9**	<1.0	**3.0**	<2.0	**3.2 MB**	<1.0	<1.0	<2.0	4.2 J	<0.20
MW-04B	08/19/08		<2.0	**5.0**	**45**	<0.50	<1.0	<2.0	0.40 J	1.7 J	<1.0	**2.8**	**2.4**	**4.2**	<1.0	<1.0	<2.0	3.0 J	<0.20
MW-04B	11/11/08		<2.0	**4.5**	**54**	<0.50	<1.0	<2.0	0.45 J	1.9 J	<1.0	**2.8**	1.4 J	**3.3**	<1.0	<1.0	<2.0	3.2 J	<0.20
MW-04B	02/19/09		<2.0	**5.6**	**47**	<0.50	<1.0	<2.0	0.32 J	2.2	<1.0	**2.7**	<2.0	**2.5**	<1.0	<1.0	<2.0	6.6 J	<0.20
MW-04B	05/28/09		<2.0	**4.7**	**46**	<0.50	<1.0	<2.0	0.51 J	**4.5**	<1.0	**3.0 B**	<2.0	**3.1**	<1.0	<1.0	<2.0	4.4 J	<0.20
MW-04B	08/26/09		<2.0	**4.2**	**48**	<0.50	<1.0	<2.0	0.49 J	**3.0**	<1.0	**3.1**	1.2 J	**2.3**	<1.0	<1.0	<2.0	**23**	<0.20
MW-04B	11/24/09		<2.0	**4.6**	**44**	<0.50	<1.0	<2.0	0.41 J	1.6 J	<1.0	**2.4**	**2.1**	**6.2**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	02/23/10		<2.0	**4.5**	**48**	<0.50	<1.0	<2.0	0.50 J	**2.2**	<1.0	**2.7**	**3.6**	**5.2**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	05/28/10		<2.0	**4.4**	**45**	<0.50	<1.0	<2.0	0.40 J	1.6 J	<1.0	**2.7**	1.9 J	**6.3**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	09/01/10		<2.0	**3.5**	**41**	<0.50	<1.0	<2.0	0.36 J, B	1.2 J	<1.0	**3.1**	1.7 J	**4.3**	<1.0	<1.0	<2.0	<20	<0.20
MW-05A	08/26/09		<10	<5.0	**28**	**7.9**	**11**	<10	**270**	**62**	<5.0	1.5 J	**400**	**13**	<5.0	<5.0	**18**	**3,500**	<0.20
MW-05A	11/23/09		<10	<5.0	**22**	**9.3**	**8.9**	<10	**240**	**94**	<5.0	<10	**350**	**18**	<5.0	<5.0	**39**	**4,100**	0.19 J
MW-05A	02/22/10		<10	<5.0	**21**	**3.9**	3.9 J	<10	**120**	**33**	<5.0	1.2 J	**140**	**12**	<5.0	<5.0	**13**	**1,300**	<0.20
MW-05A	05/27/10		<2.0	<1.0	**17**	**7.4**	**5.7**	<2.0	**140**	**62**	0.53 J	<2.0	**190**	**13**	<1.0	<1.0	**29**	**3,800**	<0.20
MW-05A	08/31/10		<10	<5.0	**18**	**10**	**6.8**	<10	**210**	**100**	1.1 J	<10	**280**	**17 B-1**	<5.0	<5.0	**53**	**3,200**	<0.20
G-1	+		--	--	--	<0.50	--	--	--	<2.0	--	--	--	--	<1.0	--	--	<20	--
G-2	+		`	--	--	<0.50	--	--	--	<2.0	--	--	--	--	20	--	--	<20	--
G-3	+		--	--	--	<0.50	--	--	--	<2.0	--	--	--	--	30	--	--	<20	--

Table 29S
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
G-4	+		--	--	--	<0.50	--	--	--	<2.0	--	--	--	--	<1.0	--	--	<20	--
G-4	05/10/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.20
G-4	06/15/00		--	--	**134**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G-4	06/22/01		--	--	**50**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G-4	02/28/02		**14**	**11**	**44**	**1.0**	**1.5**	**25**	--	**11**	**19**	--	**26**	**17**	**11**	**21**	**19**	<20	<0.20
G-4	02/17/06		0.32 J	0.80 J	**44**	<0.50	<1.0	<2.0	0.92 J	**4.8**	<1.0	**2.4**	0.36 J	**4.6**	<1.0	<1.0	**8.4**	4.2 J	<0.20
G-4	05/18/06		0.17 J	**1.0**	**42**	<0.50	0.046 J	<2.0	0.95 J	**2.8**	0.057 J	**3.0**	**3.9**	**3.8**	<1.0	<1.0	**8.6**	**6.8**	<0.20
G-4	08/21/06		0.16 J	<1.0	**43**	<0.50	0.056 J	1.4 J	1.3 J	2.3 J	0.40 J	2.9 J	**5.0**	**4.2**	<1.0	<1.0	**10.0**	7.0 J	<0.20
G-4	11/20/06		0.15 J	0.80 J	**48**	<0.50	<1.0	<2.0	**1.1**	**2.3**	<1.0	**3.0**	**2.3**	**3.4**	<1.0	<1.0	**9.2**	10 J	<0.20
G-4	03/01/07		0.078 J	**1.1**	**35**	<0.50	<1.0	<2.0	0.99 J	**2.2**	<1.0	**3.0**	1.2 J	**2.6**	<1.0	<1.0	**9.4**	9.1 J	<0.20
G-4	05/18/07		<2.0	**1.0**	**43 CQ**	<0.50	<1.0	<2.0	**1.0**	**3.5**	0.12 J	**3.0**	**2.3**	**2.5**	<1.0	<1.0	**8.6**	4.1 J,MB	<0.20
G-4	08/24/07		<10	<5.0	**35**	<2.5	<5.0	<10	0.98J	<10	<1.0	2.6 J	<2.0	7.6 J	<1.0	<1.0	9.1 J	<100	<0.20
G-4	11/15/07		<2.0	<1.0	**37**	<0.50	<1.0	<2.0	0.93 J	1.6 J	<1.0	**2.6**	<2.0	1.2 J	<1.0	<1.0	**6.9**	<20	<0.20
G-4	02/20/08		<2.0	**2.0**	**44**	<0.50	<1.0	<2.0	0.96 MB,J	**3.0**	<1.0	**2.6**	<2.0	0.32 J	<1.0	<1.0	**8.3**	8.3 J	<0.20
G-4	05/19/08		<2.0	0.82 J	**54**	<0.50	<1.0	<2.0	**1.1**	**3.4**	<1.0	**2.5**	<2.0	**3.6 CQ**	<1.0	<1.0	**7.1**	5.6 J	<0.20
G-4	08/18/08		<2.0	**1.0**	**41**	<0.50	<1.0	<2.0	**1.1**	**2.7**	<1.0	**2.5**	**3.8**	**6.3**	<1.0	<1.0	**7.7**	4.1 J	<0.20
G-4	11/10/08		<2.0	**1.7**	**38**	<0.50	<1.0	<2.0	**1.0**	**2.9**	<1.0	**2.6**	**2.2**	**5.2**	<1.0	<1.0	**7.2**	**31**	<0.20
G-4	02/18/09		<2.0	**1.3**	**48**	<0.50	<1.0	1.5 J	**1.2**	**3.6**	<1.0	**2.7**	<2.0	**3.2**	<1.0	<1.0	**8.5**	15 J	<0.20
G-4	05/27/09		<2.0	**1.1**	**44**	<0.50	<1.0	1.2 J	**1.7**	**6.8**	<1.0	**3.1**	<2.0	**3.5**	<1.0	<1.0	**10.0**	7.4 J	<0.20
G-4	08/25/09		<2.0	0.90 J	**40**	<0.50	<1.0	0.75 J	**1.2**	**4.7**	<1.0	**3.2**	1.8 J	**5.0**	<1.0	<1.0	**8.3**	4.3 J	<0.20
G-4	11/23/09		<2.0	**1.3**	**35**	<0.50	<1.0	<2.0	**1.0**	**3.8**	<1.0	**3.4**	**3.1**	**4.9**	<1.0	<1.0	**8.8**	<20	<0.20
G-4	02/22/10		<2.0	<1.0	**37**	<0.50	<1.0	<2.0	**1.2**	**3.0**	<1.0	**3.3**	**3.6**	**5.4**	<1.0	<1.0	**9.8**	<20	<0.20
G-4	05/27/10		<2.0	<1.0	**39**	<0.50	<1.0	<2.0	**1.2**	**3.2**	<1.0	**3.6**	**6.0**	**6.4**	<1.0	<1.0	**8.8**	<20	<0.20
G-4	08/31/10		<2.0	0.93 J	**40**	<0.50	<1.0	<2.0	**1.0**	**1.8 J**	<1.0	**3.9**	**5.0**	**5.6 B**	<1.0	<1.0	**8.2**	<20	<0.20
UG-CHAN-20060216	02/16/06		0.37 J	**1.1**	**89**	<0.50	0.17 J	1.9 J	0.45 J	**11**	0.86 J	**6.0**	1.3 J	**3.2**	<1.0	<1.0	**4.4**	**21**	<0.20
FDCC-W-20080520	05/20/08		**2.5**	**2.7**	**100**	<0.50	0.24 J	1.1 J	0.60 J	**14**	**3.1**	**10**	**2.4**	0.98 J	<1.0	<1.0	**6.5**	**27**	<0.20
DG-CHAN-20060216	02/16/06		1.2 J	<1.0	**110**	<0.50	0.33 J	**2.9**	0.96 J	**17**	**4.9**	**5.4**	**2.4**	1.6 J	0.070 J	<1.0	**4.9**	**64**	<0.20
FDCC-E-20080520	05/20/08		**2.3**	**3.0**	**93**	<0.50	0.25 J	1.2 J	0.65 J	**16**	**2.4**	**11**	**2.9**	1.1 J	<1.0	<1.0	**6.3**	**33**	<0.20
FB-SUMP	02/16/06	Field Blank	0.050 J	<1.0	0.39 J	<0.50	<1.0	0.80 J	<2.0	0.52 J	<1.0	<2.0	<2.0	0.58 J	<1.0	<1.0	<2.0	<20	<0.20
FB-SUMP	02/17/06	Field Blank	0.15 J	<1.0	<1.0	<0.50	<1.0	0.89 J	<2.0	0.75 J	<1.0	<2.0	<2.0	0.53 J	<1.0	<1.0	<2.0	<20	<0.20
FB-SUMP	05/17/06	Field Blank	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FB-SUMP	05/18/06	Field Blank	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
* = Analyte was quantitated below the established linear calibration range. Amount reported is an estimate.
** = Method in water by manual cold vapor
+ = Sampling occurred between August 10 and 17, 1987
CQ = Analyte concentration greater than 10 times the blank concentration
J = Analyte was detected between the MDL and the RL
LN,AY = The MS &/or the MSD were below acceptance limits due to sample matrix interference.
ND = Not Detected. This data was obtained from a summary table of a report not prepared by SECOR. The actual laboratory reports are not available, thus MDL's can not be determined for this data.
MB or B = Analyte present in Method Blank
B-1 = Analyte present in Method Blank, Analyte concentration in sample is greater than 10x the concentration found in the method blank
<# = Analyte was not detected above the Reporting Limit (#)
µg/L = micrograms per liter
-- = Not applicable / Not analyzed
Results highlighted with **Bold** font indicate results > RL
Prior to 2006, some table data was incorrectly represented in mg/L and has been updated to correctly reflect µg/L.
For safety and security reasons, the surface water sampling locations in the Dominguez Flood Control Channel (DFCC) have been re-located.

References:

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Table 30S
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
MW-01A	05/17/06		<2.0	**1.3**	**75**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.6**	<2.0	<2.0	<1.0	<1.0	**6.6**	<20	<0.20
MW-01A	08/21/06		0.26 J	<1.0	**79**	<0.50	0.14 J	<2.0	0.31 J	1.1 J	<1.0	**3.5**	**3.0**	1.1 J	<1.0	<1.0	**4.3**	2.5 J	<0.20
MW-01A	11/20/06		0.080 J	<1.0	**77**	<0.50	0.18 J	<2.0	0.34 J	1.4 J	<1.0	**3.4**	<2.0	0.99 J	<1.0	<1.0	**6.5**	2.6 J	<0.20
MW-01A	03/02/07	No sample	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	05/18/07		<2.0	**1.6**	**66**	<0.50	0.15 J	<2.0	0.37 J	1.0 J	<1.0	**2.7**	1.5 J	1.7 J	<1.0	<1.0	**6.0**	<20	<0.20
MW-01A	08/23/07		<10	<5.0	**78**	<2.5	<5.0	<10	<5.0	<10	<5.0	3.9 J	<10	<10	<5.0	<5.0	3.6 J	<100	<0.20
MW-01A	11/15/07		<2.0	**1.0**	**68**	<0.50	0.15 J	<2.0	0.41 J	1.3 J	0.13 J	**2.3**	<2.0	0.77 J	<1.0	<1.0	**5.7**	19 J	<0.20
MW-01A	02/19/08		0.23 J	**1.5**	**85**	<0.50	0.13 J	<2.0	0.57 J	1.4 J	<1.0	**3.6**	<2.0	0.68 J	<1.0	<1.0	**5.1**	2.7 J	<0.20
MW-01A	05/19/08		<2.0	**1.5**	**88**	<0.50	0.14 J	<2.0	0.35 J	1.1 J	<1.0	**3.5**	<2.0	**2.0 MB**	<1.0	<1.0	**5.4**	<20	<0.20
MW-01A	08/18/08		<2.0	**1.0**	**72**	<0.50	0.14 J	<2.0	0.39 J	1.1 J	<1.0	**3.1**	1.6 J	1.3 J	<1.0	<1.0	**5.4**	3.8 J	<0.20
MW-01A	11/10/08		0.29 J	**1.3**	**75**	<0.50	0.15 J	<2.0	0.41 J	1.1 J	<1.0	**2.5**	<2.0	1.8 J	<1.0	<1.0	**6.6**	<20	<0.20
MW-01A	02/18/09		<2.0	**1.4**	**78**	<0.50	0.16 J	<2.0	0.51 J	1.2 J	<1.0	**3.2**	<2.0	1.6 J	<1.0	<1.0	**5.5**	2.5 J	<0.20
MW-01A	05/27/09		0.26 J	**1.3**	**86**	<0.50	0.15 J	<2.0	0.70 J	**2.2**	<1.0	**3.7**	<2.0	1.3 J	<1.0	<1.0	**5.9**	<20	<0.20
MW-01A	08/25/09		0.28 J	0.92 J	**79**	<0.50	0.14 J	<2.0	0.49 J	**2.0**	<1.0	**3.2**	<2.0	0.97 J	<1.0	<1.0	**6.5**	2.7 J	<0.20
MW-01A	11/23/09		0.56 J	<1.0	**70**	<0.50	0.23 J	1.1 J	0.51 J	1.6 J	0.31 J	1.8 J	1.0 J	**2.8**	<1.0	<1.0	**6.9**	<20	<0.20
MW-01A	02/22/10		<2.0	**1.8**	**100**	<0.50	0.18 J	<2.0	0.80 J	1.9 J	<1.0	**4.1**	**2.7**	**2.2**	<1.0	<1.0	**4.4**	<20	<0.20
MW-01A	05/27/10		<2.0	**1.4**	**82**	<0.50	0.17 J	<2.0	0.57 J	**2.1**	<1.0	**2.3**	1.7 J	**3.0**	<1.0	<1.0	**7.3**	<20	<0.20
MW-01A	08/31/10		0.45 J	<1.0	**77**	<0.50	0.17 J	<2.0	0.47 J	1.1 J, B	<1.0	**2.6**	1.7 J	**2.0**	<1.0	<1.0	**6.6**	<20	<0.20
MW-01B	05/17/06		<2.0	**1.7**	**470**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**2.7**	<2.0	**2.5**	<1.0	<1.0	<2.0	<20	<0.20
MW-01B	08/21/06		0.21 J	<1.0	**450**	<0.50	0.091 J	<2.0	0.43 J	0.73 J	<1.0	1.9 J	**4.4**	**3.6**	<1.0	<1.0	1.0 J	3.3 J	<0.20
MW-01B	11/20/06		0.78 J	<1.0	**340**	<0.50	0.12 J	<2.0	0.24 J	**2.1**	<1.0	**3.1**	<2.0	1.6 J	<1.0	<1.0	1.5 J	<20	<0.20
MW-01B	03/02/07		0.95 J	0.76 J	**260**	<0.50	0.16 J	<2.0	0.24 J	**2.4 MB**	<1.0	**3.3**	<2.0	1.9 J	<1.0	<1.0	1.6 J	6.4 J	<0.20
MW-01B	05/18/07		0.66 J	**1.3**	**330**	<0.50	0.15 J	<2.0	0.37 J	1.3 J	<1.0	**3.2**	**2.2**	**4.5**	<1.0	<1.0	0.90 J	<20	<0.20
MW-01B	08/23/07		<2.0	<1.0	**260**	<2.5	<5.0	<10	<5.0	<10	<5.0	3.9J	<10	1.6J	<5.0	<5.0	<10	<100	<0.20
MW-01B	11/15/07		0.52 J	<1.0	**280**	<0.50	0.15 J	<2.0	0.35 J	1.8 J	<1.0	**3.0**	<2.0	**2.3**	<1.0	<1.0	1.1 J	2.6 J	<0.20
MW-01B	02/19/08		0.22 J	<1.0	**340**	<0.50	0.20 J	<2.0	0.45 J	1.2 J	<1.0	**3.2**	<2.0	**2.2**	<1.0	<1.0	1.0 J	3.0 J	<0.20
MW-01B	05/19/08		<2.0	<1.0	**350**	<0.50	<1.0	<2.0	0.38 J	<2.0	<1.0	**2.6**	<2.0	**3.4 MB**	<1.0	<1.0	0.98 J	<20	<0.20
MW-01B	08/18/08		0.44 J	**1.1**	**320**	<0.50	<1.0	<2.0	0.48 J	0.91 J	<1.0	**2.7**	1.8 J	**4.6**	<1.0	<1.0	1.3 J	<20	<0.20
MW-01B	11/10/08		0.82 J	**1.3**	**320**	<0.50	<1.0	<2.0	0.44 J	0.88 J	<1.0	**3.0**	**3.1**	**5.1**	<1.0	<1.0	1.5 J	<20	<0.20
MW-01B	02/18/09		0.51 J	0.87 J	**280**	<0.50	<1.0	0.79 J	0.48 J	1.1 J	<1.0	**3.2**	<2.0	**4.0**	<1.0	<1.0	1.4 J	<20	<0.20
MW-01B	05/27/09		0.42 J	**1.3**	**330**	<0.50	<1.0	<2.0	0.59 J	1.7 J	<1.0	**3.1**	<2.0	**3.4**	<1.0	<1.0	1.2 J	<20	<0.20
MW-01B	08/25/09		0.39 J	<1.0	**290**	<0.50	<1.0	<2.0	0.43 J	**4.6**	<1.0	**3.3**	<2.0	**2.3**	<1.0	<1.0	1.6 J	<20	<0.20
MW-01B	11/23/09		0.31 J	<1.0	**72**	<0.50	<1.0	<2.0	0.48 J	1.2 J	<1.0	**3.2**	1.8 J	**5.2**	<1.0	<1.0	1.7 J	<20	<0.20
MW-01B	02/22/10		<2.0	<1.0	**310**	<0.50	0.11 J	<2.0	0.49 J	1.4 J	<1.0	**2.5**	1.9 J	**5.7**	<1.0	<1.0	1.6 J	<20	<0.20
MW-01B	05/27/10		0.44 J	**1.3**	**320**	<0.50	<1.0	<2.0	0.60 J	1.7 J	<1.0	**2.9**	**2.3**	**6.2**	<1.0	<1.0	**2.3**	<20	<0.20
MW-01B	08/31/10		0.95 J	**1.1**	**290**	<0.50	<1.0	<2.0	0.41 J	0.73 J, B	<1.0	**3.1**	**3.4**	**5.2**	<1.0	<1.0	1.1 J	<20	<0.20
MW-02A	05/18/06		<2.0	**1.1**	**57**	<0.50	0.31 J	<2.0	**1.0**	**9.4**	<1.0	**5.5**	1.4 J	0.35 J	<1.0	<1.0	**5.9**	3.6 J	<0.20
2MW-02A	05/18/06	Duplicate	<2.0	<1.0	**54**	<0.50	0.32 J	<2.0	**1.1**	**2.0**	<1.0	**5.9**	**2.3**	0.40 J	<1.0	<1.0	**5.6**	3.4 J	<0.20
MW-02A	08/22/06		<2.0	<1.0	**49**	<0.50	0.21 J	<2.0	**1.0**	1.4 J	0.18 J	**5.0**	**2.5**	0.35 J	<1.0	<1.0	**3.2**	3.7 J	<0.20
2MW-02A	08/22/06	Duplicate	<2.0	<1.0	**50**	<0.50	0.22 J	<2.0	**1.0**	1.3 J	<1.0	**5.2**	**2.5**	<2.0	<1.0	<1.0	**2.6**	2.3 J	<0.20
MW-02A	11/21/06		0.083 J	<1.0	**48**	<0.50	0.22 J	<2.0	**1.5**	1.8 J	<1.0	**6.2**	<2.0	0.72 J	<1.0	<1.0	**4.8**	<20	<0.20
MW-02A	03/02/07		0.087 J	**1.0 MB**	**45 CQ**	<0.50	0.22 J	<2.0	**1.4**	**2.7 MB**	<1.0	**6.1**	<2.0	0.38 J	<1.0	<1.0	**4.5**	5.2 MB,J	<0.20
MW-02A	05/17/07		<2.0	<1.0	**41**	<0.50	0.18 J	<2.0	0.82 J	1.3 J	<1.0	**5.8**	0.95 J	0.60 J	<1.0	<1.0	**4.4**	<20	<0.20
MW-02A	08/24/07		<10	<5.0	**47**	<2.5	<5.0	<10	1.6 J	<10	<1.0	7.6 J	<10	<10	<5.0	<5.0	4.4J	<100	<0.20
MW-02A	11/16/07		<2.0	<1.0	**42**	<0.50	0.20 J	**4.8 MB**	**1.6**	1.7 MB,J	<1.0	**6.2**	1.5 J	0.57 J	<1.0	<1.0	**3.8**	<20	<0.20
MW-02A	02/20/08		<2.0	<1.0	**45**	<0.50	0.20 J	<2.0	**1.5**	1.6 J	<1.0	**6.7**	<2.0	0.36 J	<1.0	<1.0	**4.7**	<20	<0.20
MW-02A	05/20/08		<2.0	<1.0	**39**	<0.50	0.15 J	<2.0	0.88 J	1.1 J	<1.0	**6.0**	<2.0	0.93 J,MB	<1.0	<1.0	**4.3**	<20	<0.20
MW-02A	08/19/08		<2.0	<1.0	**39**	<0.50	0.21 J	<2.0	**1.2**	1.5 J	<1.0	**6.6**	1.4 J	0.54 J	<1.0	<1.0	**4.0**	<20	<0.20
MW-02A	11/11/08		0.33 J	<1.0	**46**	<0.50	0.22 J	<2.0	**1.5**	1.7 J	<1.0	**7.4**	<2.0	0.44 J	<1.0	<1.0	**4.6**	6.3 J	<0.20
MW-02A	02/19/09		<2.0	0.96 J	**53**	<0.50	0.23 J	<2.0	**1.4**	1.3 J	<1.0	**7.0**	<2.0	1.1 J	<1.0	<1.0	**4.5**	<20	<0.20
MW-02A	05/28/09		<2.0	<1.0	**36**	<0.50	0.14 J	<2.0	0.80 J	**2.0**	<1.0	**6.5**	<2.0	0.69 J	<1.0	<1.0	**4.6**	<20	<0.20
MW-02A	08/26/09		<2.0	**1.0**	**44**	<0.50	0.28 J	<2.0	**1.5**	1.7 J	<1.0	**7.7**	<2.0	0.69 J	<1.0	<1.0	**5.5**	<20	<0.20
MW-02A	11/24/09		<2.0	<1.0	**47**	<0.50	0.25 J	<2.0	**1.5**	1.5 J	<1.0	**7.0**	1.2 J	1.1 J	<1.0	<1.0	**4.2**	5.4 J	<0.20
MW-02A	02/23/10		<2.0	<1.0	**47**	<0.50	0.20 J	<2.0	**1.1**	1.7 J	<1.0	**7.4**	0.87 J	0.85 J	<1.0	0.32 J	**4.1**	<20	<0.20
MW-02A	05/28/10		<2.0	<1.0	**40**	<0.50	0.12 J	<2.0	0.65 J	1.5 J	<1.0	**5.7**	0.61 J	0.94 J	<1.0	<1.0	**3.2**	<20	<0.20
MW-02A	09/01/10		0.33 J	<1.0	**47**	<0.50	0.27 J	<2.0	**1.3**	1.4 J	<1.0	**8.5**	1.5 J	<2.0	<1.0	0.21 J	**4.4**	<20	<0.20

Table 30S
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
MW-02B	05/17/06		<2.0	**2.3**	**34**	<0.50	<1.0	<2.0	<1.0	**2.1**	<1.0	**2.9**	<2.0	**2.8**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/22/06		<2.0	<1.0	**33**	<0.50	<1.0	<2.0	0.34 J	1.5 J	<1.0	**2.6**	**3.4**	**5.0**	<1.0	<1.0	<2.0	2.2 J	<0.20
MW-02B	11/21/06		<2.0	0.90 J	**30**	<0.50	<1.0	<2.0	0.21 J	1.6 J	<1.0	**2.9**	<2.0	**3.2**	<1.0	<1.0	<2.0	2.8 J	<0.20
MW-02B	03/02/07		<2.0	**1.8 MB**	**27 CQ**	<0.50	<1.0	<2.0	0.25 J	**2.3 MB**	<1.0	**3.4**	<2.0	**2.4**	<1.0	<1.0	<2.0	5.1 MB,J	<0.20
MW-02B	05/17/07		<2.0	**1.0**	**32**	<0.50	<1.0	<2.0	0.23 J	1.2 J	<1.0	**3.0**	0.96 J	**4.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/24/07		<2.0	<1.0	**34**	<2.5	<5.0	<10	<5.0	<10	<5.0	3.0 J	<10	3.3 J	<5.0	<5.0	<10	<100	<0.20
MW-02B	11/16/07		<2.0	<1.0	**28**	<0.50	<1.0	<2.0	0.26 J	1.7 MB,J	<1.0	**2.2**	<2.0	**2.0**	<1.0	<1.0	<2.0	3.7 MB,J	<0.20
MW-02B	02/20/08		<2.0	<1.0	**29**	<0.50	<1.0	<2.0	0.29 J	**2.5**	<1.0	**3.2**	<2.0	0.54 J	<1.0	<1.0	<2.0	4.0 J	<0.20
MW-02B	05/20/08		<2.0	**1.0**	**33**	<0.50	<1.0	<2.0	0.22 J	1.6 J	<1.0	**3.0**	<2.0	**2.1 MB**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/19/08		<2.0	<1.0	**30**	<0.50	<1.0	<2.0	0.30 J	1.4 J	<1.0	**3.0**	**2.0**	**5.2**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	11/11/08		0.97 J	<1.0	**34**	<0.50	<1.0	<2.0	0.31 J	1.8 J	<1.0	**3.6**	<2.0	**2.8**	<1.0	<1.0	<2.0	2.8 J	<0.20
MW-02B	02/19/09		<2.0	<1.0	**35**	<0.50	<1.0	<2.0	0.28 J	1.9 J	<1.0	**3.3**	1.0 J	**2.5**	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-02B	05/28/09		<2.0	0.97 J	**33**	<0.50	<1.0	<2.0	0.30 J	**4.8**	<1.0	**4.3**	<2.0	**2.6**	<1.0	<1.0	<2.0	3.2 J	<0.20
MW-02B	08/26/09		<2.0	**1.8**	**37**	<0.50	<1.0	<2.0	0.40 J	**2.1**	<1.0	**3.7**	0.95 J	**4.0**	<1.0	<1.0	<2.0	3.4 J	<0.20
MW-02B	11/24/09		<2.0	**1.1**	**34**	<0.50	<1.0	<2.0	0.36 J	1.5 J	<1.0	**3.2**	1.6 J	**5.6**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	02/23/10		<2.0	<1.0	**32**	<0.50	<1.0	<2.0	0.36 J	**2.0**	<1.0	**3.8**	1.3 J	**5.3**	<1.0	<1.0	<2.0	5.3 J	<0.20
MW-02B	05/28/10		<2.0	<1.0	**34**	<0.50	<1.0	<2.0	0.32 J	1.6 J	<1.0	**3.4**	0.83 J	**6.5**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	09/01/10		<2.0	<1.0	**34**	<0.50	<1.0	<2.0	0.30 J	1.1 J	<1.0	**4.3**	1.5 J	**3.6**	<1.0	<1.0	<2.0	<20	<0.20
MW-03A	05/18/06		<2.0	**1.1**	**65**	<0.50	<1.0	1.8 J	0.12 J	0.89 J	<1.0	0.86 J	0.64 J	<2.0	<1.0	<1.0	**4.5**	3.1 J	<0.20
MW-03A	08/22/06		<2.0	<1.0	**69**	<0.50	0.053 J	0.87 J	0.16 J	0.99 J	0.15 J	0.84 J	**2.3**	0.44 J	<1.0	<1.0	**3.6**	3.5 J	<0.20
MW-03A	11/20/06		0.16 J	<1.0	**73**	<0.50	0.084 J	1.3 J	<1.0	1.1 J	<1.0	1.2 J	<2.0	0.52 J	<1.0	<1.0	**4.8**	<20	<0.20
2MW-03A	11/20/06	Duplicate	0.13 J	<1.0	**74**	<0.50	0.085 J	1.3 J	<1.0	0.95 J	<1.0	1.1 J	<2.0	0.38 J	<1.0	<1.0	**4.7**	2.5 J	<0.20
MW-03A	03/01/07		0.087 J	<1.0	**75 CQ**	<0.50	0.073 J	1.3 J	<1.0	1.5 MB,J	<1.0	1.2 J	<2.0	<2.0	<1.0	<1.0	**4.4**	5.6 MB,J	<0.20
2MW-03A	03/01/07	Duplicate	0.084 J	<1.0	**72 CQ**	<0.50	<1.0	1.4 J	<1.0	**6.6 MB**	<1.0	1.2 J	<2.0	0.33 J	<1.0	<1.0	**4.4**	7.9 MB,J	<0.20
MW-03A	05/17/07		<2.0	<1.0	**74**	<0.50	<1.0	1.6 J	0.16 J	<2.0	<1.0	1.3 J	<2.0	0.47 J	<1.0	<1.0	**4.1**	<100	<0.20
MW-03A	08/24/07		<2.0	<1.0	**88**	<2.5	<5.0	<10	<5.0	<10	<5.0	1.7 J	5.8 J	<10	<5.0	<5.0	<10	15 J	<0.20
MW-03A	11/15/07		<2.0	<1.0	**78**	<0.50	0.15 J	1.5 J	0.22 J	1.2 J	<1.0	0.71 J	<2.0	0.34 J	<1.0	<1.0	**4.1**	3.0 J	<0.20
MW-03A	02/19/08		<2.0	<1.0	**86**	<0.50	<1.0	1.7 J	0.23 J	1.3 J	<1.0	1.3 J	<2.0	<2.0	<1.0	<1.0	**3.7**	3.0 J	<0.20
MW-03A	05/19/08		<2.0	<1.0	**85**	<0.50	<1.0	1.3 J	0.15 J	<2.0	<1.0	0.92 J	<2.0	1.6 J,MB	<1.0	<1.0	**3.8**	<20	<0.20
MW-03A	08/18/08		<2.0	<1.0	**81**	<0.50	<1.0	0.83 J	0.24 J	1.3 J	<1.0	0.99 J	**2.6**	1.0 J	<1.0	<1.0	**3.9**	<20	<0.20
MW-03A	11/10/08		0.23 J	<1.0	**84**	<0.50	<1.0	1.3 J	0.26 J	**2.1**	<1.0	1.1 J	**3.1**	0.74 J	<1.0	<1.0	**4.8**	3.0 J	<0.20
MW-03A	02/18/09		0.21 J	<1.0	**93**	<0.50	<1.0	1.4 J	0.21 J	1.3 J	<1.0	1.3 J	<2.0	<2.0	<1.0	<1.0	**4.1**	<20	<0.20
MW-03A	05/27/09		<2.0	<1.0	**90**	<0.50	0.27 J	0.98 J	0.36 J	**2.3**	<1.0	**2.0**	<2.0	0.53 J	<1.0	<1.0	**4.7**	<20	<0.20
MW-03A	08/25/09		<2.0	<1.0	**86**	<0.50	<1.0	<2.0	0.29 J	1.6 J	<1.0	1.3 J	<2.0	0.42 J	<1.0	<1.0	**4.7**	<20	<0.20
MW-03A	11/23/09		<2.0	<1.0	**93**	<0.50	0.23 J	1.0 J	0.33 J	**2.3**	<1.0	1.3 J	1.8 J	1.4 J	<1.0	<1.0	**5.0**	<20	<0.20
MW-03A	02/22/10		<2.0	<1.0	**87**	<0.50	<1.0	<2.0	0.29 J	1.7 J	<1.0	0.84 J	1.8 J	0.96 J	<1.0	<1.0	**5.4**	12 J	<0.20
MW-03A	05/27/10		<2.0	<1.0	**97**	<0.50	<1.0	<2.0	0.38 J	**2.0**	<1.0	1.0 J	**2.0**	0.84 J	<1.0	<1.0	**4.7**	<20	<0.20
MW-03A	08/31/10		<2.0	<1.0	**92**	<0.50	0.15 J	0.99 J	0.27 J	1.0 J, B	<1.0	1.2 J	**4.0**	1.1 J	<1.0	<1.0	**4.2**	<20	<0.20

Table 30S
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
MW-03B	05/18/06		<2.0	<1.0	**64**	<0.50	<1.0	<2.0	0.41 J	1.6 J	<1.0	2.8 J	<2.0	<2.0	0.21 J	<1.0	<2.0	10 J	<0.20
MW-03B	08/22/06		<2.0	<1.0	**69**	<0.50	<1.0	<2.0	0.36 J	0.97 J	0.045 J	**2.7**	**4.6**	**2.7**	<1.0	<1.0	<2.0	2.6 J	<0.20
MW-03B	11/20/06		0.33 J	**1.7**	**71**	<0.50	<1.0	<2.0	0.24 J	1.4 J	<1.0	**4.6**	1.1 J	**3.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	03/01/07		<2.0	**3.4 MB**	**58 CQ**	<0.50	<1.0	<2.0	0.30 J	1.0 MB,J	<1.0	**3.5**	<2.0	1.6 J	<1.0	<1.0	<2.0	7.1 MB,J	<0.20
MW-03B	05/17/07		<2.0	**2.5**	**63**	<0.50	<1.0	<2.0	0.26 J	0.80 J	<1.0	**3.8**	**2.3**	**3.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/24/07		<2.0	<1.0	**63**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.2 J	5.8 J	2.2 J	<5.0	<5.0	<10	<100	<0.20
MW-03B	11/15/07		<2.0	**1.8**	**63**	<0.50	<1.0	<2.0	0.39 J	1.5 J	<1.0	**3.5**	<2.0	1.7 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/19/08		<2.0	**3.2**	**51**	<0.50	<1.0	<2.0	0.43 J	1.6 J	<1.0	**3.0**	<2.0	0.49 J	<1.0	<1.0	<2.0	4.4 J	<0.20
MW-03B	05/19/08		<2.0	**3.6**	**50**	<0.50	<1.0	<2.0	0.32 J	1.0 J	<1.0	**2.5**	<2.0	**2.0 MB**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/18/08		<2.0	**3.4**	**47**	<0.50	<1.0	<2.0	0.41 J	1.1 J	<1.0	**2.6**	**2.6**	**4.1**	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-03B	11/10/08		<2.0	**3.5**	**57**	<0.50	<1.0	1.3 J	0.42 J	1.2 J	<1.0	**3.5**	**4.6**	**4.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/18/09		<2.0	**2.9**	**61**	<0.50	<1.0	<2.0	0.34 J	1.5 J	<1.0	**3.8**	<2.0	1.8 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	05/27/09		<2.0	**3.1**	**54**	<0.50	<1.0	<2.0	0.85 J	**4.0**	<1.0	**4.4**	<2.0	**2.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/25/09		0.48 J	**3.2**	**47**	<0.50	<1.0	<2.0	0.40 J	**2.1**	<1.0	**3.8**	<2.0	**1.6 J**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	11/23/09		<2.0	**2.5**	**53**	<0.50	<1.0	<2.0	0.41 J	1.1 J	<1.0	**3.5**	1.6 J	**3.6**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/22/10		<2.0	**2.2**	**55**	<0.50	<1.0	<2.0	0.47 J	1.5 J	<1.0	**3.2**	**2.8**	**5.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	05/27/10		<2.0	**2.8**	**53**	<0.50	<1.0	<2.0	0.52 J	**2.2**	<1.0	**3.2**	**2.5**	**4.7**	<1.0	<1.0	<2.0	6.2 J	<0.20
MW-03B	08/31/10		<2.0	**2.3**	**47**	<0.50	<1.0	<2.0	0.35 J	0.59 J, B	<1.0	**3.2**	**3.3**	**4.3**	<1.0	<1.0	<2.0	<20	<0.20
MW-04A	03/02/07	New Well	0.30 J	**1.7**	**21**	<0.50	0.22 J	<2.0	**1.8**	**2.9 MB**	<1.0	**5.7**	**2.1**	**5.4**	<1.0	<1.0	**12**	**32**	<0.20
MW-04A	05/17/07		0.24 J	**2.6**	**22**	<0.50	0.22 J	<2.0	**1.0**	**2.2**	<1.0	**5.6**	**2.4**	**9.9**	<1.0	<1.0	**11**	**5.2**	<0.20
MW-04A	08/23/07		<2.0	<3.5	**21**	<2.5	<5.0	<10	1.2 J	<10	<1.0	5.3 J	7.2 J	6.2 J	<5.0	<5.0	**12**	<100	<0.20
MW-04A	11/16/07		<2.0	**1.6**	**19**	<0.50	0.28 J	1.9 MB,J	**1.1**	**2.9 MB**	<1.0	**4.3**	1.4 J	**2.8**	<1.0	<1.0	**11**	5.3 MB,J	<0.20
MW-04A	02/20/08		<2.0	**1.5**	**21**	<0.50	0.28 J	<2.0	**1.0**	**3.8**	<1.0	**4.9**	<2.0	1.3 J	<1.0	<1.0	**13**	5.4 J	<0.20
MW-04A	05/20/08		<2.0	**1.3**	**24**	<0.50	0.31 J	<2.0	0.84 J	**3.1**	<1.0	**4.7**	<2.0	**2.8 MB**	<1.0	<1.0	**13**	3.3 J	<0.20
MW-04A	08/19/08		<2.0	**1.7**	**21**	<0.50	0.30 J	<2.0	0.89 J	**2.6**	<1.0	**4.6**	**3.6**	**9.8**	<1.0	<1.0	**12**	2.5 J	<0.20
MW-04A	11/11/08		<2.0	<1.0	**23**	<0.50	0.30 J	<2.0	0.98 J	**2.8**	<1.0	**4.9**	**2.3**	**5.3**	<1.0	<1.0	**13**	5.1 J	<0.20
MW-04A	02/19/09		<2.0	**1.5**	**23**	<0.50	0.22 J	<2.0	**1.0**	**2.9**	<1.0	**4.9**	**3.2**	**4.3**	<1.0	<1.0	**12**	11 J	<0.20
MW-04A	05/28/09		<2.0	**1.3**	**22**	<0.50	0.34 J	<2.0	0.87 J	**7.1**	<1.0	**5.6**	<2.0	**5.2**	<1.0	<1.0	**12**	5.9 J	<0.20
MW-04A	08/26/09		<2.0	**1.9**	**23**	<0.50	0.41 J	<2.0	**1.0**	**3.1**	<1.0	**5.1**	**2.4**	**5.5**	<1.0	<1.0	**14**	<20	<0.20
MW-04A	11/24/09		<2.0	**1.6**	**21**	<0.50	0.30 J	<2.0	0.90 J	**2.6**	<1.0	**4.3**	**4.2**	**8.1**	<1.0	<1.0	**12**	<20	<0.20
MW-04A	02/23/10		<2.0	**1.3**	**22**	<0.50	0.33 J	<2.0	0.89 J	**3.4**	<1.0	**5.5**	**4.0**	**7.5**	<1.0	<1.0	**14**	<20	<0.20
MW-04A	05/28/10		<2.0	**1.1**	**24**	<0.50	0.35 J	<2.0	0.90 J	**3.2**	<1.0	**5.2**	**3.1**	**9.3**	<1.0	0.34 J	**12**	<20	<0.20
MW-04A	09/01/10		<2.0	**1.2**	**22**	<0.50	0.39 J	1.1 J	0.84 J	**2.2**	<1.0	**5.1**	**3.6**	**6.4**	<1.0	<1.0	**13**	<20	<0.20
MW-04B	03/02/07	New Well	0.78 J	**6.2**	**120**	<0.50	<1.0	<2.0	0.31 J	1.4 MB,J	<1.0	**7.4**	<2.0	**2.8**	<1.0	<1.0	<2.0	4.1 J	<0.20
MW-04B	05/17/07		<2.0	**9.5**	**83**	<0.50	<1.0	<2.0	0.30 J	1.2 J	<1.0	**3.6**	1.5 J	**4.7**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	08/23/07		<2.0	**7.0**	**85**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.1 J	6.4 J	3.6 J	<5.0	<5.0	<10	<100	<0.20
MW-04B	11/16/07		<2.0	**6.8**	**61**	<0.50	<1.0	<2.0	0.38 J	1.7 MB,J	<1.0	**2.4**	<2.0	**2.8**	<1.0	<2.0	<2.0	2.8 MB,J	<0.20
MW-04B	02/20/08		<2.0	**6.0**	**60**	<0.50	<1.0	<2.0	0.39 J	**3.3**	<1.0	**3.2**	<2.0	0.49 J	<1.0	<2.0	<2.0	4.4 J	<0.20
MW-04B	05/20/08		<2.0	**5.2**	**60**	<0.50	<1.0	<2.0	0.30 J	**2.0**	<1.0	**3.0**	<2.0	**2.2 MB**	<1.0	<1.0	<2.0	15 J	<0.20
MW-04B	08/19/08		<2.0	**5.1**	**46**	<0.50	<1.0	<2.0	0.37 J	1.5 J	<1.0	**2.6**	1.8 J	**4.8**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/11/08		<2.0	**3.9**	**51**	<0.50	<1.0	<2.0	0.38 J	1.8 J	<1.0	**2.7**	0.99 J	**3.0**	<1.0	<1.0	<2.0	2.5 J	<0.20
MW-04B	02/19/09		<2.0	**4.8**	**50**	<0.50	<1.0	<2.0	0.34 J	**2.4**	<1.0	**2.7**	1.1 J	**2.4**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	05/28/09		<2.0	**4.4**	**46**	<0.50	<1.0	<2.0	0.38 J	**4.6**	<1.0	**4.0**	<2.0	**3.2**	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-04B	08/26/09		<2.0	**4.8**	**48**	<0.50	<1.0	<2.0	0.47 J	**4.2**	<1.0	**3.0**	1.2 J	**4.9**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/24/09		<2.0	**4.5**	**43**	<0.50	<1.0	<2.0	0.43 J	1.5 J	<1.0	**2.0**	**2.3**	**5.2**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	02/23/10		<2.0	**4.5**	**48**	<0.50	<1.0	<2.0	0.47 J	**2.1**	<1.0	**2.9**	**2.9**	**4.9**	<1.0	<1.0	<2.0	5.3 J	<0.20
MW-04B	05/28/10		<2.0	**4.4**	**46**	<0.50	<1.0	<2.0	0.40 J	1.6 J	<1.0	**3.0**	1.1 J	**6.2**	<1.0	0.25 J	<2.0	<20	<0.20
MW-04B	09/01/10		<2.0	**3.8**	**44**	<0.50	<1.0	<2.0	0.31 J	1.2 J	<1.0	**2.9**	1.7 J	**3.4**	<1.0	<1.0	<2.0	<20	<0.20
MW-05A	08/26/09		<10	<5.0	**27**	**6.3**	**11**	<10	**270**	**55**	<5.0	1.7 J	**410**	**16**	<5.0	<5.0	**17**	**3,200**	<0.20
MW-05A	11/23/09		<10	<5.0	**16**	**10**	**8.8**	<10	**240**	**97**	<5.0	<10	**350**	**18**	<5.0	<5.0	**34**	**4,200**	<0.20
MW-05A	02/22/10		<10	<5.0	**22**	**3.8**	4.0 J	<10	**130**	**28**	<5.0	1.2 J	**150**	**13**	<5.0	<5.0	6.7 J	**1,400**	<0.20
MW-05A	05/27/10		<2.0	<1.0	**14**	**6.1**	**5.1**	<2.0	**190**	**74**	<1.0	0.22 J	**240**	**17**	<1.0	<1.0	**32**	**4,400**	<0.20
MW-05A	08/31/10		<10	<5.0	**17**	**11**	**7.0**	<10	**210**	**110 B-1**	1.2 J	1.0 J	**290**	**16**	<5.0	<5.0	**45**	**3,500**	<0.20

Table 30S
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (µg/L)
FDCC-W-20080520	05/20/08		**2.1**	**2.7**	**92**	<0.50	0.20 J	<2.0	0.49 J	**11**	0.87 J	**10**	**2.3**	0.89 J	<1.0	<1.0	**5.9**	16 J	<0.20
FDCC-E-20080520	05/20/08		**2.4**	**2.8**	**85**	<0.50	0.18 J	<2.0	0.53 J	**11**	0.34 J	**11**	**2.4**	1.0 J	<1.0	<1.0	**6.4**	13 J	<0.20
G-4	05/18/06		0.098 J	**2.3**	**43**	<0.50	<1.0	<2.0	0.89 J	2.9	<1.0	**2.7**	**3.1**	**2.7**	<1.0	<1.0	**8.8**	10 J	<0.20
G-4	08/21/06		0.10 J	<1.0	**44**	<0.50	0.039 J	<2.0	0.87 J	1.5 J	<1.0	**2.3**	**6.1**	**5.3**	<1.0	<1.0	**5.0**	2.1 J	<0.20
G-4	11/20/06		0.34 J	<1.0	**45**	<0.50	<1.0	<2.0	0.94 J	1.9 J	<1.0	**3.2**	1.3 J	**3.6**	<1.0	0.16 J	**8.0**	11 J	<0.20
G-4	03/01/07		0.075 J	**1.0 MB**	**35 CQ**	<0.50	0.051 J	<2.0	0.86 J	**4.3 MB**	<1.0	**2.9**	1.1 J	**2.6**	<1.0	<1.0	**8.2**	6.3 MB,J	<0.20
G-4	05/18/07		<2.0	**1.1**	**45**	<0.50	<1.0	<2.0	**1.0**	1.8 J	<1.0	**2.7**	**4.3**	**5.7**	<1.0	<1.0	**6.7**	<20	<0.20
G-4	08/24/07		<2.0	<1.0	**42**	<2.5	<5.0	<10	1.0 J	<10	<1.0	3.2 J	7.4 J	3.6 J	<5.0	<5.0	7.6 J	<100	<0.20
G-4	11/15/07		<2.0	0.94 J	**37**	<0.50	<1.0	<2.0	**1.2**	**2.6**	<1.0	**2.7**	<2.0	**3.2**	<1.0	<1.0	**8.3**	3.6 J	<0.20
G-4	02/20/08		<2.0	<1.0	**47**	<0.50	<1.0	<2.0	**1.1**	**3.6**	<1.0	**2.6**	<2.0	1.1 J	<1.0	<1.0	**7.8**	4.9 J	<0.20
G-4	05/19/08		<2.0	**1.2**	**67**	<0.50	<1.0	<2.0	**1.2**	**4.2**	<1.0	**2.4**	<2.0	**3.8 MB**	<1.0	<1.0	**7.2**	4.5 J	<0.20
G-4	08/18/08		<2.0	0.79 J	**48**	<0.50	<1.0	<2.0	**1.2**	**2.8**	<1.0	**2.3**	**5.2**	**6.5**	<1.0	<1.0	**6.7**	<20	<0.20
G-4	11/10/08		<2.0	**1.6**	**40**	<0.50	<1.0	<2.0	**1.1**	**2.4**	<1.0	**2.8**	**2.1**	**6.4**	<1.0	<1.0	**8.3**	2.5 J	<0.20
G-4	02/18/09		<2.0	<1.0	**48**	<0.50	<1.0	<2.0	**1.1**	**3.2**	<1.0	**3.0**	<2.0	**3.8**	<1.0	<1.0	**7.6**	3.6 J	<0.20
G-4	05/27/09		<2.0	<1.0	**43**	<0.50	<1.0	<2.0	**1.4**	**7.9**	<1.0	**3.8**	<2.0	**4.0**	<1.0	<1.0	**8.6**	5.2 J	<0.20
G-4	08/25/09		<2.0	<1.0	**39**	<0.50	<1.0	<2.0	**1.1**	**4.5**	<1.0	**3.5**	1.7 J	**2.6**	<1.0	<1.0	**8.2**	4.6 J	<0.20
G-4	11/23/09		<2.0	**1.0**	**37**	<0.50	<1.0	<2.0	**1.1**	**2.6**	<1.0	**3.5**	**2.3**	**4.7**	<1.0	<1.0	**9.6**	<20	<0.20
G-4	02/22/10		<2.0	<1.0	**22**	<0.50	<1.0	<2.0	**1.2**	**3.2**	<1.0	**3.3**	**3.1**	**6.6**	<1.0	<1.0	**9.9**	<20	<0.20
G-4	05/27/10		<2.0	**1.2**	**40**	<0.50	<1.0	<2.0	**1.4**	**5.1**	<1.0	**3.5**	**3.1**	**6.4**	<1.0	<1.0	**9.4**	<20	<0.20
G-4	08/31/10		0.52 J	<1.0	**54**	<0.50	<1.0	<2.0	0.98 J	1.7 J, B	<1.0	**3.7**	**5.7**	**6.4**	<1.0	<1.0	**7.0**	8.3 J	<0.20

Notes:
<# = Analyte was not detected above the Reporting Limit (#)
ND = Not Detected. This data was obtained from a summary table of a report not prepared by SECOR.
The actual laboratory reports are not available, thus MDL's can not be determined for this data.
CQ = analyte concentration greater than 10 times the blank concentration
J = Analyte was detected between the MDL and the RL
MB or B = Analyte present in Method Blank
µg/L = micrograms per liter
Results highlighted with **Bold** font indicate results > RL
Prior to the 2008 sampling event, dissolved metals was not tested for in surface water samples.
-- = Not applicable / Not analyzed
For safety and security reasons, the surface water sampling locations in the Dominguez Flood Control Channel (DFCC) have been re-located.

SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.
Prior to 2006, some table data was incorrectly represented in mg/L and has been updated to correctly reflect µg/L.

Table 30SA
Groundwater Analytical Results 2009 Investigation
(Metals and pH)
Gardena Sumps
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena California

EPA Method:			6020															7470 A	9040 B	7199
Sample ID	Date Sampled	Notes	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Mercury (mg/L)	pH (pH units)	Chromium VI (mg/L)
GWP100-38	7/9/2009		<20	**17**	**450**	**130**	**180**	**1,200**	**1,700**	**1,400**	**120**	**12 J**	**4,200**	**69**	**3.9 J**	<10	**440**	**3,400**	<0.0020	**4.74**	<0.0020
GWP100-38	7/9/2009	6020-Diss	<10	<5.0	**71**	**50**	**140**	**18**	**1,400**	**97**	<5.0	**4.7 J**	**3,000**	**36**	<5.0	<5.0	<10	**630**	**0.00017 J**	**--**	--
GWP101-36	7/9/2009		<10	**21**	**1,800**	**15**	**7.3**	**470**	**270**	**500**	**140**	**12**	**360**	**12**	<5.0	**1.7 J**	**550**	**1,000**	**0.00097**	**6.74**	**0.0011 J**
GWP101-36	7/9/2009	6020-Diss	**0.44 J**	<2.0	**48**	<1.0	**2.0**	<4.0	**40**	**6.3**	<2.0	**24**	**52**	**5.5**	<2.0	<2.0	<4.0	**17 J**	<0.00020	--	**--**
GWP102-80	7/13/2009		**1.2 U***	**48 J**	**1,200**	**3.8**	**2.5 J**	**280 J**	**85**	**270 J**	**60**	**73 J**	**160 J**	**7.3 U***	<5.0	**1.5 J**	**290 J**	**460**	**0.00066**	**--**	<0.0020
GWP102-80	7/13/2009	6020-Diss	**1.5 U***	**3.0**	**130**	<0.50	**0.21 J**	**0.82 J**	**2.4**	**1.5 J**	<1.0	**100**	**17**	**3.5**	<1.0	<1.0	<2.0 UJ	<20	<0.00020	**--**	--
GWP103-80	7/21/2009		**1.7 U***	**25 J**	**1,600**	**6.0**	**6.3**	**240**	**110**	**330**	**87**	**15 R**	**210**	**6.2 U***	<5.0	**2.9 J**	**240 J**	**570**	<0.0020	**--**	<0.0020
GWP103-80	7/21/2009	6020-Diss	**0.79 U***	<1.0	**43**	<0.50	**0.13 J**	**0.83 J**	**1.4**	**1.3 J**	<1.0	**70 R**	**9.9**	**1.7 J**	<1.0	<1.0	<2.0	<20	<0.00020	**--**	**--**
GWP104-28	7/24/2009		<10	**23**	**1,700**	**9.7**	**5.9**	**460**	**160**	**470**	**110**	**12**	**250**	**2.6**	**0.77 J**	**2.0**	**300**	**780**	<0.00020	**--**	<0.0020
GWP104-28	7/24/2009	6020-Diss	**1.4 J**	<1.0	**45**	<0.50	**0.63 J**	**0.89 J**	**11**	**7.1**	<1.0	**44**	**16**	<2.0	<1.0	<1.0	**1.2 J**	**6.9 J**	<0.00020	**--**	**--**
GWP105-21	10/28/2009		**5.8**	**6.6**	**3,100**	**56**	**44**	**720**	**1,600**	**1,300**	**840**	**2.1 J**	**1,500**	**27**	**6.7**	<5.0	**260**	**9,400**	**0.0012**	**6.84**	<0.0020
GWP105-21	10/28/2009	6020-Diss	**1.8 J**	<2.0	**33**	<1.0	**2.1**	<4.0	**36**	**12**	<2.0	**9.6**	**64**	**11**	<2.0	**0.42 J**	**2.1 J**	**71**	<0.00020	**--**	**--**
GWP106-22	10/29/2009		**1.6 J**	**77**	**11,000**	**21**	**23**	**640**	**390**	**2,600**	**420**	**11**	**540**	**18**	**5.5**	**1.1 J**	**710**	**2,700**	**0.0028**	**7.44**	<0.0020
GWP106-22	10/29/2009	6020-Diss	**2.9 J**	**10**	**230**	<2.0	**0.46 J**	**4.2 J**	**1.6 J**	**2.8 J**	**1.2 J**	**85**	**23**	**7.4 J**	<4.0	<4.0	**4.8 J**	**25 J**	<0.00020	**--**	**--**
MW-05A	8/26/2009		<10	<5.0	**28**	**7.9**	**11**	<10	**270**	**62**	<5.0	**1.5 J**	**400**	**13**	<5.0	<5.0	**18**	**3,500**	<0.20	**5.15**	**--**
MW-05A	8/26/2009	6020-Diss	<10	<5.0	**27**	**6.3**	**11**	<10	**270**	**55**	<5.0	**1.7 J**	**410**	**16**	<5.0	<5.0	**17**	**3,200**	<0.20	**--**	**--**
TW108	8/26/2009		<200	<100	**97 J**	**150**	**320**	**350**	**7,700**	**620**	**120**	<200	**37,000**	**210**	<100	<100	**1,500**	**1,800,000**	**0.00065**	**3.82**	**--**
TW-109	8/26/2009		**16 J**	**30**	**800**	<2.5	**8.9 J**	**240**	**88**	**2,600**	**2,600**	<40	**240**	**14 J**	<20	<20	<10	**27,000**	<0.00020	**--**	**--**
TW-109	8/26/2009	6020-Diss	**4.9 J**	**4.7 J**	**35**	<2.5	**0.93 J**	<10	**76**	**22**	**3.8 J**	**3.9 J**	**200**	**9.9 J**	<5.0	<5.0	<10	**5,400**	<0.00020	**--**	**--**
TW110	8/26/2009		<10	**5.6**	**940**	**1.1 J**	**1.4 J**	**32**	**140**	**130**	**21**	**2.3 J**	**110**	**3.8 J**	<5.0	<5.0	**67**	**1,700**	<0.00020	**6.93**	**--**
TW110	8/26/2009	6020-Diss	<10	<5.0	**14**	<2.5	**1.2 J**	<10	**120**	**11**	<5.0	**2.4 J**	**95**	**4.0 J**	<5.0	<5.0	<10	**1,400**	<0.00020	**--**	**--**
HPB-118-GW	8/26/2010		<2.0	<1.0	**54**	<0.50	**0.40 J**	**1.2 J**	**1.9**	**2.2**	<1.0	**6.2**	**1.9 J**	**2.2**	**0.10 J**	<1.0	**11**	<20	<0.00020	**--**	<0.0020
HPB-118-GW	8/26/2010	6020-Diss	**0.81 J**	<1.0	**57**	<0.50	**0.40 J**	<2.0	**8.3**	**2.7**	<1.0	**22**	**9.7**	**2.7**	<1.0	<1.0	**4.4**	<20	<0.00020	**--**	**--**
HPB-119-GW	8/26/2010		<10	**13**	**2,400**	**35**	**18**	**910**	**660**	**1,000**	**210**	**2.2 J**	**880**	**22**	**3.0 J**	**1.6 J**	**340**	**2,500**	**0.0034**	**--**	**0.0012 J**
HPB-119-GW	8/26/2010	6020-Diss	**1.7 J**	<5.0	**25**	<2.5	<5.0	**20**	**2.7 J**	<10	<5.0	**11**	<10	<10	<5.0	<5.0	<10	<100	<0.00020	**--**	**--**

Notes:
(µg/L) = micrograms per liter
(mg/L) = milligrams per liter
< = Analyte was not detected at or above the Reporting Limit (RL)
J = Quantitation is approximate due to limitations identified during the quality assurance review (data validation)
-- = Not applicable / Not analyzed
Results highlighted with **Bold** font indicate results > RL
R = Unusable positive result; compound may or may not be present in this sample
U* = This compound should be considered "not-detected" because it was detected in an associated blank at a similar level
UJ = This compound was not detected, but the reporting limit is probably higher due to a low bias identified during the quality assurance review
Results highlighted with **Bold** font indicate results > RL

Table 32S
Summary of Groundwater Gauging and Elevation Data
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-01A	24.19	05/11/94	15.22	39.00	8.97	--	175	0.0053	0.044	--	
MW-01A	24.19	10/22/99	14.02	37.20	10.17	1.20	160	0.00499	0.041	--	Gauged on either 10/22 or 11/4/99
MW-01A	24.19	04/03/01	12.82	37.40	11.37	1.20	158	0.00553	0.046	--	
MW-01A	24.19	06/12/01	13.12	37.40	11.07	-0.30	156.5	0.0036	0.030	--	
MW-01A	24.19	02/28/02	14.28	37.38	9.91	-1.16	159.5	0.00477	0.039	--	
MW-01A	24.19	01/06/05	--	--	--	--	--	--	--	--	Well inaccessible
MW-01A	24.05	02/16/06	13.12	37.30	10.93	1.02	146.5	0.0038	0.031	--	
MW-01A	24.05	05/17/06	12.74	37.25	11.31	0.38	149	0.00476	0.039	--	
MW-01A	24.05	08/21/06	13.08	37.57	10.97	-0.34	147	0.0047	0.039	--	
MW-01A	24.05	11/20/06	13.42	37.57	10.63	-0.34	147	0.0043	0.035	--	
MW-01A	24.05	03/01/07	13.76	NM	10.29	-0.34	192	NC	NC	--	Not calculated off site
MW-01A	24.05	05/17/07	13.99	37.17	10.06	-0.23	180	NC	NC	--	Not calculated off site
MW-01A	24.05	08/23/07	13.88	37.38	10.17	0.11	180	NC	NC	--	Not calculated off site
MW-01A	24.05	11/15/07	14.27	37.26	9.78	-0.39	180	NC	NC	--	Not calculated off site
MW-01A	24.05	02/19/08	13.40	NM	10.65	0.87	190	NC	NC	--	Not calculated off site
MW-01A	24.05	05/19/08	13.24	37.36	10.81	0.16	180	NC	NC	--	Not calculated off site
MW-01A	24.05	08/18/08	13.65	NM	10.40	-0.41	179	NC	NC	--	Not calculated off site
MW-01A	24.05	11/10/08	14.16	37.35	9.89	-0.51	182	NC	NC	--	Not calculated off site
MW-01A	24.05	02/18/09	13.14	37.30	10.91	1.02	215	NC	NC	--	Not calculated off site
MW-01A	24.05	05/27/09	13.97	37.34	10.08	-0.83	180	NC	NC	--	Not calculated off site
MW-01A	24.05	08/25/09	14.36	37.20	9.69	-0.39	179	NC	NC	--	Not calculated off site
MW-01A	24.05	11/23/09	14.63	37.33	9.42	-0.27	182	NC	NC	--	Not calculated off site
MW-01A	24.05	02/22/10	13.26	37.17	10.79	1.37	189	NC	NC	--	Not calculated off site
MW-01A	24.05	05/27/10	13.50	37.19	10.55	-0.24	185	NC	NC	--	Not calculated off site
MW-01A	24.05	08/31/10	13.91	37.44	10.14	-0.41	177	NC	NC	--	Not calculated off site
MW-01A	24.05	09/29/10	13.72	37.40	10.33	0.19	NC	NC	NC	--	re-sampled for SVOC's
MW-01B	24.52	05/11/94	19.60	86.00	4.92	--	102.5	0.00557	0.207	0.076	
MW-01B	24.52	10/22/99	17.89	84.70	6.63	1.71	100	0.0056	0.208	0.067	Gauged on either 10/22 or 11/4/99
MW-01B	24.52	04/03/01	16.49	85.10	8.03	1.40	101	0.00617	0.229	0.063	
MW-01B	24.52	06/12/01	16.79	84.90	7.73	-0.30	100	0.0063	0.234	0.063	
MW-01B	24.52	02/28/02	17.62	84.90	6.90	-0.83	99.5	0.00549	0.204	0.057	
MW-01B	24.52	01/06/05	--	--	--	--	--	--	--	--	Well inaccessible
MW-01B	24.27	02/16/06	16.40	85.10	7.87	0.97	104	0.00462	0.171	0.058	
MW-01B	24.27	05/17/06	16.02	85.00	8.25	0.38	101	0.0053	0.197	0.058	
MW-01B	24.27	08/21/06	16.39	85.27	7.88	-0.37	103	0.0045	0.167	0.058	
MW-01B	24.27	11/20/06	16.61	85.27	7.66	-0.22	103	0.0042	0.156	0.056	
MW-01B	24.27	03/01/07	16.46	84.93	7.81	0.15	92.5	NC	NC	0.047	Not calculated off site
MW-01B	24.27	05/17/07	16.94	84.95	7.33	-0.48	97	NC	NC	0.052	Not calculated off site
MW-01B	24.27	08/23/07	17.04	85.23	7.23	-0.10	105	NC	NC	0.055	Not calculated off site
MW-01B	24.27	11/15/07	17.22	85.23	7.05	-0.18	103	NC	NC	0.052	Not calculated off site
MW-01B	24.27	02/19/08	16.47	NM	7.80	0.75	105	NC	NC	0.054	Not calculated off site
MW-01B	24.27	05/19/08	16.50	85.26	7.77	-0.03	102	NC	NC	0.057	Not calculated off site
MW-01B	24.27	08/18/08	16.89	NM	7.38	-0.39	102	NC	NC	0.057	Not calculated off site
MW-01B	24.27	11/10/08	17.08	85.20	7.19	-0.19	105	NC	NC	0.051	Not calculated off site
MW-01B	24.27	02/18/09	16.62	84.91	7.65	0.46	100	NC	NC	0.062	Not calculated off site
MW-01B	24.27	05/27/09	17.11	85.10	7.16	-0.49	100	NC	NC	0.055	Not calculated off site
MW-01B	24.27	08/25/09	17.50	85.30	6.77	-0.39	98	NC	NC	0.055	Not calculated off site
MW-01B	24.27	11/23/09	17.59	84.91	6.68	-0.09	99	NC	NC	0.052	Not calculated off site
MW-01B	24.27	02/22/10	16.48	85.24	7.79	1.11	102	NC	NC	0.057	Not calculated off site
MW-01B	24.27	05/27/10	16.54	85.00	7.73	-0.06	100	NC	NC	0.053	Not calculated off site
MW-01B	24.27	08/31/10	16.94	NM	7.33	-0.40	100	NC	NC	0.053	Not calculated off site
MW-01B	24.27	09/29/10	16.93	85.02	7.34	0.01	NC	NC	NC	NC	re-sampled for SVOC's

Table 32S
Summary of Groundwater Gauging and Elevation Data
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-02A	19.22	05/11/94	12.90	27.00	6.32	--	175	0.0053	0.044	--	
MW-02A	19.22	10/22/99	12.72	28.10	6.50	0.18	160	0.00499	0.041	--	Gauged on either 10/22 or 11/4/99
MW-02A	19.22	04/03/01	12.13	28.34	7.09	0.59	158	0.00553	0.046	--	
MW-02A	19.22	06/12/01	12.50	28.21	6.72	-0.37	156.5	0.0036	0.030	--	
MW-02A	19.22	02/28/02	12.87	28.20	6.35	-0.37	159.5	0.00477	0.039	--	
MW-02A	19.22	01/06/05	10.81	28.52	8.41	2.06	--	--	--	--	
MW-02A	19.15	02/16/06	12.70	28.25	6.45	-1.96	146.5	0.0038	0.031	--	
MW-02A	19.15	05/17/06	12.39	28.25	6.76	0.31	149	0.00476	0.039	--	
MW-02A	19.15	08/21/06	12.80	28.52	6.35	-0.41	147	0.0047	0.039	--	
MW-02A	19.15	11/20/06	12.76	28.52	6.39	0.04	147	0.0043	0.035	--	
MW-02A	19.15	03/01/07	12.96	25.50	6.19	-0.20	192	0.0034	0.028	--	
MW-02A	19.15	05/17/07	12.91	28.15	6.24	0.05	180	0.0038	0.031	--	
MW-02A	19.15	08/23/07	12.87	28.25	6.28	0.04	180	0.0044	0.036	--	
MW-02A	19.15	11/15/07	12.94	28.25	6.21	-0.07	180	0.004	0.033	--	
MW-02A	19.15	02/19/08	12.34	28.21	6.81	0.60	190	0.0048	0.040	--	
MW-02A	19.15	05/19/08	12.68	28.29	6.47	-0.34	180	0.0042	0.035	--	
MW-02A	19.15	08/18/08	12.88	28.21	6.27	-0.20	179	0.0036	0.030	--	
MW-02A	19.15	11/10/08	12.87	28.25	6.28	0.01	182	0.0041	0.034	--	
MW-02A	19.15	02/18/09	11.50	28.28	7.65	1.37	215	0.0087	0.072	--	
MW-02A	19.15	05/27/09	12.92	28.25	6.23	-1.42	180	0.0040	0.033	--	
MW-02A	19.15	08/25/09	13.02	NM	6.13	-0.10	179	0.0040	0.033	--	
MW-02A	19.15	11/24/09	12.86	28.15	6.29	0.16	182	0.0041	0.034	--	
MW-02A	19.15	02/22/10	12.00	28.17	7.15	0.86	189	0.0048	0.040	--	
MW-02A	19.15	05/27/10	12.52	28.98	6.63	-0.52	185	0.0042	0.035	--	
MW-02A	19.15	08/31/10	12.84	28.28	6.31	-0.32	177	0.0039	0.032	--	
MW-02A	19.15	09/29/10	12.81	28.31	6.34	0.03	NC	NC	NC	--	re-sampled for SVOC's
MW-02B	19.49	05/11/94	21.11	83.00	-1.62	--	102.5	0.00557	0.207	0.132	
MW-02B	19.49	10/22/99	19.42	81.76	0.07	1.69	100	0.0056	0.208	0.107	Gauged on either 10/22 or 11/4/99
MW-02B	19.49	04/03/01	18.66	82.92	0.83	0.76	101	0.00617	0.229	0.104	
MW-02B	19.49	06/12/01	18.87	82.90	0.62	-0.21	100	0.0063	0.234	0.102	
MW-02B	19.49	02/28/02	19.00	82.91	0.49	-0.13	99.5	0.00549	0.204	0.098	
MW-02B	19.49	01/06/05	18.93	82.91	0.56	0.07	--	--	--	--	
MW-02B	19.36	02/16/06	17.62	82.95	1.74	1.18	104	0.00462	0.171	0.079	
MW-02B	19.36	05/17/06	17.33	82.85	2.03	0.29	101	0.0053	0.197	0.079	
MW-02B	19.36	08/21/06	17.50	83.16	1.86	-0.17	103	0.0045	0.167	0.075	
MW-02B	19.36	11/20/06	17.35	83.16	2.01	0.15	103	0.0042	0.156	0.073	
MW-02B	19.36	03/01/07	17.56	80.50	1.80	-0.21	92.5	0.0054	0.200	0.073	
MW-02B	19.36	05/17/07	17.71	82.79	1.65	-0.15	97	0.005	0.186	0.077	
MW-02B	19.36	08/23/07	17.80	83.00	1.56	-0.09	105	0.0045	0.167	0.079	
MW-02B	19.36	11/15/07	17.90	83.00	1.46	-0.10	103	0.0044	0.163	0.079	
MW-02B	19.36	02/19/08	17.32	83.02	2.04	0.58	105	0.0045	0.167	0.080	
MW-02B	19.36	05/19/08	17.43	83.05	1.93	-0.11	102	0.0045	0.167	0.076	
MW-02B	19.36	08/18/08	17.68	82.97	1.68	-0.25	102	0.0046	0.171	0.077	
MW-02B	19.36	11/10/08	17.65	82.70	1.71	0.03	105	0.0044	0.163	0.076	
MW-02B	19.36	02/18/09	17.42	82.90	1.94	0.23	100	0.0043	0.160	0.095	
MW-02B	19.36	05/27/09	17.89	82.98	1.47	-0.47	100	0.0046	0.171	0.079	
MW-02B	19.36	08/25/09	18.14	28.18	1.22	-0.25	98	0.0047	0.174	0.082	
MW-02B	19.36	11/24/09	18.20	82.74	1.16	-0.06	99	0.0048	0.178	0.086	
MW-02B	19.36	02/22/10	17.54	83.03	1.82	0.66	102	0.0048	0.178	0.089	
MW-02B	19.36	05/27/10	17.43	82.86	1.93	0.11	100	0.0044	0.163	0.078	
MW-02B	19.36	08/31/10	17.79	82.83	1.57	-0.36	100	0.0048	0.178	0.079	
MW-02B	19.36	09/29/10	17.72	82.86	1.64	0.07	NC	NC	NC	NC	re-sampled for SVOC's

Table 32S
Summary of Groundwater Gauging and Elevation Data
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-03A	25.54	05/11/94	20.31	28.50	5.23	--	175	0.0053	0.044	--	
MW-03A	25.54	10/22/99	19.98	28.36	5.56	0.33	160	0.00499	0.041	--	Gauged on either 10/22 or 11/4/99
MW-03A	25.54	04/03/01	19.47	28.45	6.07	0.51	158	0.00553	0.046	--	
MW-03A	25.54	06/12/01	19.76	28.45	5.78	-0.29	156.5	0.0036	0.030	--	
MW-03A	25.54	02/28/02	20.08	28.45	5.46	-0.32	159.5	0.00477	0.039	--	
MW-03A	25.54	01/06/05	19.32	28.42	6.22	0.76	--	--	--	--	
MW-03A	25.45	02/16/06	19.88	28.50	5.57	-0.65	146.5	0.0038	0.031	--	
MW-03A	25.45	05/17/06	19.61	28.45	5.84	0.27	149	0.00476	0.039	--	
MW-03A	25.45	08/21/06	20.02	28.67	5.43	-0.41	147	0.0047	0.039	--	
MW-03A	25.45	11/20/06	19.90	28.67	5.55	0.12	147	0.0043	0.035	--	
MW-03A	25.45	03/01/07	19.95	25.50	5.50	-0.05	192	0.0034	0.028	--	
MW-03A	25.45	05/17/07	20.03	28.40	5.42	-0.08	180	0.0038	0.031	--	
MW-03A	25.45	08/23/07	20.12	28.49	5.33	-0.09	180	0.0044	0.036	--	
MW-03A	25.45	11/15/07	20.12	28.47	5.33	0.00	180	0.004	0.033	--	
MW-03A	25.45	02/19/08	19.71	28.47	5.74	0.41	190	0.0048	0.040	--	
MW-03A	25.45	05/19/08	19.91	28.46	5.54	-0.20	180	0.0042	0.035	--	
MW-03A	25.45	08/18/08	20.04	28.48	5.41	-0.13	179	0.0036	0.030	--	
MW-03A	25.45	11/10/08	20.04	28.51	5.41	0.00	182	0.0041	0.034	--	
MW-03A	25.45	02/18/09	19.55	28.37	5.90	0.49	215	0.0087	0.072	--	
MW-03A	25.45	05/27/09	20.08	28.48	5.37	-0.53	180	0.0040	0.033	--	
MW-03A	25.45	08/25/09	20.19	28.49	5.26	-0.11	179	0.0040	0.033	--	
MW-03A	25.45	11/23/09	20.70	28.61	4.75	-0.51	182	0.0041	0.034	--	
MW-03A	25.45	02/22/10	19.42	28.40	6.03	1.28	189	0.0048	0.040	--	
MW-03A	25.45	05/27/10	19.75	28.44	5.70	-0.33	185	0.0042	0.035	--	
MW-03A	25.45	08/31/10	20.03	28.50	5.42	-0.28	177	0.0039	0.032	--	
MW-03A	25.45	09/29/10	20.03	28.52	5.42	0.00	NC	NC	NC	--	re-sampled for SVOC's
MW-03B	25.60	05/11/94	27.20	84.00	-1.60	--	102.5	0.00557	0.207	0.112	
MW-03B	25.60	10/22/99	25.44	82.94	0.16	1.76	100	0.0056	0.208	0.089	Gauged on either 10/22 or 11/4/99
MW-03B	25.60	04/03/01	24.72	83.15	0.88	0.72	101	0.00617	0.229	0.085	
MW-03B	25.60	06/12/01	24.92	82.90	0.68	-0.20	100	0.0063	0.234	0.084	
MW-03B	25.60	02/28/02	25.02	82.89	0.58	-0.10	99.5	0.00549	0.204	0.080	
MW-03B	25.60	01/06/05	25.00	83.41	0.60	0.02	--	--	--	--	
MW-03B	25.51	02/16/06	23.71	83.10	1.80	1.20	104	0.00462	0.171	0.062	
MW-03B	25.51	05/17/06	23.45	83.00	2.06	0.26	101	0.0053	0.197	0.062	
MW-03B	25.51	08/21/06	23.60	83.31	1.91	-0.15	103	0.0045	0.167	0.058	
MW-03B	25.51	11/20/06	23.45	83.31	2.06	0.15	103	0.0042	0.156	0.057	
MW-03B	25.51	03/01/07	23.62	82.92	1.89	-0.17	92.5	0.0054	0.200	0.059	
MW-03B	25.51	05/17/07	23.79	82.97	1.72	-0.17	97	0.005	0.186	0.061	
MW-03B	25.51	08/23/07	23.95	83.20	1.56	-0.16	105	0.0045	0.167	0.062	
MW-03B	25.51	11/15/07	24.01	83.24	1.50	-0.06	103	0.0044	0.163	0.063	
MW-03B	25.51	02/19/08	23.48	83.15	2.03	0.53	105	0.0045	0.167	0.061	
MW-03B	25.51	05/19/08	23.54	83.20	1.97	-0.06	102	0.0045	0.167	0.059	
MW-03B	25.51	08/18/08	23.81	83.13	1.70	-0.27	102	0.0046	0.171	0.061	
MW-03B	25.51	11/10/08	23.79	83.22	1.72	0.02	105	0.0044	0.163	0.060	
MW-03B	25.51	02/18/09	23.52	82.90	1.99	0.27	100	0.0043	0.160	0.064	
MW-03B	25.51	05/27/09	23.99	83.14	1.52	-0.47	100	0.0046	0.171	0.063	
MW-03B	25.51	08/25/09	24.23	83.00	1.28	-0.24	98	0.0047	0.174	0.065	
MW-03B	25.51	11/23/09	24.29	82.93	1.22	-0.06	99	0.0048	0.178	0.058	
MW-03B	25.51	02/22/10	23.65	83.20	1.86	0.64	102	0.0048	0.178	0.068	
MW-03B	25.51	05/27/10	23.52	83.33	1.99	0.13	100	0.0044	0.163	0.061	
MW-03B	25.51	08/31/10	23.88	83.00	1.63	-0.36	100	0.0048	0.178	0.062	
MW-03B	25.51	09/29/10	23.81	83.02	1.70	0.07	NC	NC	NC	NC	re-sampled for SVOC's

Table 32S
Summary of Groundwater Gauging and Elevation Data
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-04A	24.02	03/02/07	17.61	31.06	6.41	--	192	--	--	--	New Well
MW-04A	24.02	05/17/07	17.68	31.08	6.34	-0.07	180	--	--	--	
MW-04A	24.02	08/23/07	17.65	31.20	6.37	0.03	180	0.0044	0.036	--	
MW-04A	24.02	11/15/07	17.71	37.18	6.31	-0.06	180	0.004	0.033	--	
MW-04A	24.02	02/19/08	17.30	31.30	6.72	0.41	190	0.0048	0.040	--	
MW-04A	24.02	05/19/08	17.47	31.20	6.55	-0.17	180	0.0042	0.035	--	
MW-04A	24.02	08/18/08	17.64	31.22	6.38	-0.17	179	0.0036	0.030	--	
MW-04A	24.02	11/10/08	17.70	31.12	6.32	-0.06	182	0.0041	0.034	--	
MW-04A	24.02	02/18/09	17.43	31.15	6.59	0.27	215	0.0087	0.072	--	
MW-04A	24.02	05/27/09	17.69	31.11	6.33	-0.26	180	0.0040	0.033	--	
MW-04A	24.02	08/25/09	17.79	31.12	6.23	-0.10	179	0.0040	0.033	--	
MW-04A	24.02	11/24/09	17.72	31.12	6.30	0.07	182	0.0041	0.034	--	
MW-04A	24.02	02/22/10	17.01	31.04	7.01	0.71	189	0.0048	0.040	--	
MW-04A	24.02	05/27/10	17.39	31.05	6.63	-0.38	185	0.0042	0.035	--	
MW-04A	24.02	08/31/10	17.62	31.10	6.40	-0.23	177	0.0039	0.032	--	
MW-04A	24.02	09/29/10	17.60	31.20	6.42	0.02	NC	NC	NC	--	re-sampled for SVOC's
MW-04B	23.99	03/02/07	20.71	88.30	3.28	---	92.5	0.0054	0.200	0.055	New Well
MW-04B	23.99	05/17/07	21.02	88.00	2.97	-0.31	97	0.005	0.186	0.059	
MW-04B	23.99	08/23/07	21.14	88.55	2.85	-0.12	105	0.0045	0.167	0.062	
MW-04B	23.99	11/15/07	21.23	88.40	2.76	-0.09	103	0.0044	0.163	0.062	
MW-04B	23.99	02/19/08	20.65	88.47	3.34	0.58	105	0.0045	0.167	0.059	
MW-04B	23.99	05/19/08	20.76	88.46	3.23	-0.11	102	0.0045	0.167	0.058	
MW-04B	23.99	08/18/08	21.01	90.68	2.98	-0.25	102	0.0046	0.171	0.060	
MW-04B	23.99	11/10/08	21.02	88.42	2.97	-0.01	105	0.0044	0.163	0.059	
MW-04B	23.99	02/18/09	20.74	88.12	3.25	0.28	100	0.0043	0.160	0.059	
MW-04B	23.99	05/27/09	21.20	88.41	2.79	-0.46	100	0.0046	0.171	0.062	
MW-04B	23.99	08/25/09	21.42	88.20	2.57	-0.22	98	0.0047	0.174	0.064	
MW-04B	23.99	11/24/09	21.51	88.10	2.48	-0.09	99	0.0048	0.178	0.067	
MW-04B	23.99	02/22/10	20.79	88.38	3.20	0.72	102	0.0048	0.178	0.067	
MW-04B	23.99	05/27/10	20.72	88.22	3.27	0.07	100	0.0044	0.163	0.059	
MW-04B	23.99	08/31/10	21.05	88.21	2.94	-0.33	100	0.0048	0.178	0.061	
MW-04B	23.99	09/29/10	21.01	88.28	2.98	0.04	NC	NC	NC	NC	re-sampled for SVOC's
MW-05A	20.21	08/25/09	13.45	28.11	6.76	3.56	179	0.0040	0.033	--	New Well, 3Q09
MW-05A	20.21	11/23/09	13.48	--	6.73	-0.03	182	0.0041	0.034	--	
MW-05A	20.21	02/22/10	12.74	28.04	7.47	0.74	189	0.0048	0.040	--	
MW-05A	20.21	05/27/10	13.04	28.10	7.17	-0.30	185	0.0042	0.035	--	
MW-05A	20.21	08/31/10	13.28	28.12	6.93	-0.24	177	0.0039	0.032	--	
MW-05A	20.21	09/29/10	13.25	28.24	6.96	0.03	NC	NC	NC	--	re-sampled for SVOC's

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Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
G-1	24.08	12/87	19.20	NM	4.88	--	--	--	--	--	Well abandoned in 1987 or 1988
G-2	25.09	12/87	21.40	NM	3.69	--	--	--	--	--	Well abandoned in 1987 or 1988
G-3	25.06	12/87	21.60	NM	3.46	--	--	--	--	--	Well abandoned in 1987 or 1988
G-4	27.35	12/87	24.70	NM	2.65	--	--	--	--	--	
G-4	27.15	05/11/94	NM	NM	NM	--	--	--	--	--	
G-4	27.15	10/22/99	21.77	67.44	5.38	--	--	--	--	--	Gauged on either 10/22 or 11/4/99
G-4	27.15	04/03/01	21.32	67.95	5.83	0.45	--	--	--	--	
G-4	27.15	06/12/01	21.57	68.00	5.58	-0.25	--	--	--	--	
G-4	27.15	02/28/02	21.86	68.00	5.29	-0.29	--	--	--	--	
G-4	27.15	01/06/05	21.25	68.65	5.90	0.61	--	--	--	--	
G-4	27.12	02/16/06	21.69	NM	5.43	-0.47	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	05/17/06	21.38	NM	5.74	0.31	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	08/21/06	21.72	NM	5.40	-0.34	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	11/20/06	21.65	NM	5.47	0.07	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	03/01/07	21.67	NM	5.45	-0.02	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	05/17/07	21.76	NM	5.36	-0.09	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	08/23/07	21.87	NM	5.25	-0.11	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	11/15/07	21.84	NM	5.28	0.03	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	02/19/08	21.47	NM	5.65	0.37	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	05/19/08	21.63	NM	5.49	-0.16	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	08/18/08	21.80	NM	5.32	-0.17	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	11/10/08	21.83	NM	5.29	-0.03	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	02/18/09	21.34	NM	5.78	0.49	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	05/27/09	21.81	NM	5.31	-0.47	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	08/25/09	21.90	NM	5.22	-0.09	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	11/23/09	21.81	NM	5.31	0.09	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	02/22/10	21.40	NM	5.72	0.41	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	05/27/10	21.48	NM	5.64	-0.08	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	08/31/10	21.69	NM	5.43	-0.21	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	09/29/10	21.74	NM	5.38	-0.05	--	--	--	--	re-sampled for SVOC's

Notes:
During 3Q-2010 wells were re-sampled 09-29-10 for SVOC's
ft MSL = Feet Mean Sea Level
ft btoc = Feet below top of casing
NM = Not Measured
NC = Horizontal Groundwater Gradient & Velocity Not calculated off of Cooper Sump Site
-- = Not applicable / Not analyzed
Groundwater Monitoring Well Elevations, Surveyed by M.W. Holdings Inc., September 9, 2005 and March 1, 2007.
New Groundwater Monitoring Well (MW-05A) Elevation, Surveyed by M.W. Holdings Inc., August 10, 2009
Groundwater velocity calculations based on an assumed average porosity (η) and hydraulic conductivity (K) of the upper and lower monitored zones of 0.34 and 2.8 f/d, and 0.458 and 17 f/d respectively.

References:

EEI, 1987: *Site Inspection Report Gardena Sumps, Gardena, California.*
DTSC, 2000 and 2001: *2002 Groundwater Sampling Report for Gardena Sumps.*
DTSC, 2002: *2002 Groundwater Sampling Report for Gardena Sumps.*
URS Consultants, Inc., 1994: *Groundwater Remedial Investigation Technical Memorandum, Gardena Sumps City of Gardena, California.*
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps City of Gardena, California.

Table 33S
Summary of Volatile Organic Compounds Measured in Soil Gas Survey - Method 8260B
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

| EPA Method: 8260B | | SV01-VS-07 5/19/06 | SV02-VS-5 3/14/06 | SV02-VS-13 5/19/06 | SV03-VS-5 3/15/06 | SV03-VS-15 3/15/06 | SV04-VS-5 3/15/06 | SV04-VS-15 3/15/06 | SV06-VS-05 5/19/06 | SV06-VS-13 5/19/06 | SV07-VS-5 3/09/06 | SV07-VS-15 3/09/06 | SV08-VS-5 3/15/06 | SV08-VS-15 3/15/06 | SV09-VS-5 3/14/06 | SV09-VS-15 3/14/06 | SV11-VS-5 3/14/06 | SV11-ZVS-5 3/14/06 | SV11-VS-13 5/19/06 | SV12-VS-5 3/15/06 | SV12-VS-15 3/15/06 | SV13-VS-5 3/15/06 | SV13-VS-15 3/15/06 | SV14-VS-5 3/14/06 | SV14-VS-15 3/14/06 | SV15-VS-5 3/14/06 | SV15-VS-10 3/14/06 | SV16-VS-5 3/10/06 | SV16-VS-13 3/10/06 | SV17-VS-5 3/10/06 | SV17-ZVS-5 3/10/06 | SV17-VS-10 5/19/06 | SV17-ZVS-10 5/19/06 | SV18-VS-05 5/18/06 | SV18-VS-13 3/10/06 | SV19-VS-05 5/18/06 | SV19-ZVS-05 5/18/06 | SV19-VS-10 5/19/06 | SV21-VS-5 3/14/06 | SV21-VS-15 3/14/06 | SV22-VS-5 3/09/06 | SV22-VS-13 3/09/06 | SV23-VS-05 5/18/06 | SV23-VS-15 5/18/06 | SV24-VS-5 3/09/06 | SV24-VS-13 3/09/06 | SV25-VS-5 3/14/05 | SV25-VS-05 5/18/06 | SV25-VS-13 3/14/06 | SV25-VS-15 5/18/06 | SV26-VS-5 3/09/06 | SV26-VS-13 3/09/06 | SV28-VS-05 5/18/06 | SV28-VS-10 5/18/06 | SV29-VS-05 5/18/06 | SV29-VS-10 5/18/06 | SV30-VS-05 5/18/06 |
|---|---|---

Table 34
Summary of Volatile Organic Compounds Measured in Soil Gas Survey - Method TO-15 2006 Investigation
Gardena Sumps
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:															QA / QC						
TO-15																					
Volatile	Notes	SVO3-VS-15 3/15/06	SVO8-VS-05 3/15/06	SV09-VS-15 3/14/06	SV11-VS-05 3/14/06	SV11-VS-13 5/19/06	SV15-VS-10 3/14/06	SV16-VS-13 3/10/06	SV17-VS-05 3/10/06	SV19-VS-05 5/19/06	SV19-VS-10 5/19/06	SV24-VS-05 3/14/06	SV26-VS-13 3/9/06	SV29-VS-05 5/19/06	TRIP BLANK 3/9/06	TRIP BLANK 3/10/06	TRIP BLANK 3/14/06	TRIP BLANK 3/14/06	TRIP BLANK 3/15/06	TRIP BLANK 5/19/06
1,1-Difluroethane (LCC)	µg/l	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Propene	µg/m^3 Air	**6200**	**310**	**37**	**2500**	**30**	**360**	**650**	**300**	**440**	**24**	<10	**420**	**860**	<10	<10	<10	<10	<10	<10
Dichlorodifluromethane	µg/m^3 Air	<5.5	<5.5	<5.5	**6.1**	<5.5	<5.5	**6.3**	**5.6**	<5.5	<5.5	<5.5	**14**	ND	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5
Chloromethane	µg/m^3 Air	<5.0	<5.0	<5.0	**7.3**	<5.0	**6.7**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dichloroterafluoroethane	µg/m^3 Air	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	**9.7**	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5
Vinyl chloride	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Butadiene	µg/m^3 Air	<5.0	<5.0	**9.5**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroethane	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	**6.8**	<5.0	<5.0	<5.0	**11**	<5.0	<5.0	**12**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromoethene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichlorofluoroethane	µg/m^3 Air	<5.0	**6.4**	**5.3**	**11**	<5.0	<5.0	**5.6**	<5.0	<5.0	<5.0	<5.0	**10**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone	µg/m^3 Air	**150**	**160**	**270**	**230**	**98**	**290**	**150**	**130**	**1700**	<20	**110**	**170**	**290**	<20	<20	<20	<20	<20	<20
1,1-Dichloroethene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2-Trichlorotrifluoroetha	µg/m^3 Air	**30**	**18**	**11**	**140**	<6.0	<6.0	**20**	**26**	<6.0	<6.0	<6.0	**26**	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
Allyl choride	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methylene choride	µg/m^3 Air	**8.0**	**5.5**	<5.0	**25**	<5.0	<5.0	**8.1**	**8.4**	<5.0	<5.0	<5.0	**10**	**5.5**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Carbon disulfide	µg/m^3 Air	**130**	**32**	**28**	**110**	<5.0	**75**	**53**	**48**	**670**	**21**	<5.0	**170**	**67**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,2-Dichlorethene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl accetate	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Butanone	µg/m^3 Air	**16**	**8.7**	**29**	**51**	**20**	**120**	**38**	**22**	**960**	**31**	**7.0**	**26**	**19**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
n-Hexane	µg/m^3 Air	**230**	**43**	<5.0	**520**	**12**	**170**	**45**	**30**	**620**	**67**	<5.0	**58**	**230**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,2-Dichloroethene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethyl acetate	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroform	µg/m^3 Air	<5.0	<5.0	<5.0	**18**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**23**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Tetrahydrofuran	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,1-Trichloroethane	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloroethane	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzene	µg/m^3 Air	**39**	**45**	**17**	**200**	**15**	**77**	**35**	**23**	**260**	**68**	<5.0	**51**	**56**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Carbon tetrachoride	µg/m^3 Air	<5.5	<5.5	<5.5	**10**	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	**6.7**	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5
Cyclohexane	µg/m^3 Air	**190**	**59**	**310**	**110**	**66**	**140**	**75**	**68**	**910**	**920**	**27**	**170**	**2500**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,2,4-Trimethylpentane	µg/m^3 Air	**31**	**25**	**59**	**500**	**49**	<5.0	**38**	**21**	<5.0	<5.0	<5.0	**53**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
n-Heptane	µg/m^3 Air	**53**	**20**	**5.7**	**450**	**11**	**240**	**31**	**15**	**2100**	**160**	<5.0	**66**	**170**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichloroethene	µg/m^3 Air	<5.0	<5.0	<5.0	**9.8**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dioxane	µg/m^3 Air	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5	<5.5
Bromodichloromethane	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**17**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,3-Dichloropropene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Methyl-2-pentanone	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	**45**	<5.0	<5.0	**110**	<5.0	<5.0	<5.0	**5.0**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,3-Dichloropropene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Toluene	µg/m^3 Air	**1600**	**71**	**64**	**910**	**62**	**150**	**140**	**72**	**2000**	**190**	**6.2**	**320**	**170**	<25	<25	<25	<25	<25	<25
1,1,2-Trichloroethane	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Hexanone	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dibromochloromethane	µg/m^3 Air	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5
Tetrachloroethene	µg/m^3 Air	<5.0	<5.0	**25**	**50**	<5.0	<5.0	<5.0	<5.0	<5.0	**19**	**5.5**	**15**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dibromoethane (EDB)	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chlorobenzene	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene	µg/m^3 Air	**23**	**9.9**	**76**	**140**	**15**	**38**	**17**	**11**	**340**	**55**	<5.0	**59**	**47**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
m,p,-Xylene	µg/m^3 Air	**32**	**17**	**42**	**270**	**34**	**82**	**26**	**20**	**690**	**100**	**5.0**	**130**	**84**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Styrene	µg/m^3 Air	**5.6**	<5.0	**7.3**	**22**	<5.0	<5.0	**9.5**	<5.0	<5.0	**10**	<5.0	**12**	**11**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
o-Xylene	µg/m^3 Air	**22**	**12**	**66**	**120**	**37**	**56**	**17**	**14**	**450**	**67**	<5.0	**64**	**68**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromoform	µg/m^3 Air	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**5.2**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	µg/m^3 Air	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
4-Ethyltoluene	µg/m^3 Air	**5.1**	<5.0	**36**	**26**	**13**	**17**	<5.0	<5.0	**100**	**21**	<5.0	**19**	**24**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3,5-Trimethlybenzene	µg/m^3 Air	<5.0	<5.0	**5.2**	**54**	**35**	**30**	**6.3**	<5.0	**230**	**26**	<5.0	**32**	**46**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,4-Trimethlybenzene	µg/m^3 Air	**19**	**18**	**59**	**110**	**57**	**70**	**20**	**15**	**340**	**91**	**10**	**84**	**92**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Dichlorobenzene	µg/m^3 Air	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzyl chloride	µg/m^3 Air	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	µg/m^3 Air	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	µg/m^3 Air	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Napthalene	µg/m^3 Air	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	µg/m^3 Air	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Hexachlorobutadiene	µg/m^3 Air	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11

Notes:
<# = Analyte was not detected above the Reporting Limit (#)
-- = Not applicable / Not analyzed
µg/L = micrograms per liter
µg/m^3 Air = microgram per cubic meter (volume)
Results highlighted with **Bold** font indicate results > RL

Table 34S
Soil Vapor Analytical Results 2009 Investigation
(Volatile Organic Compounds Measured by Method TO-15)
Gardena Sumps
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California

		µg/m3																													
Volatile	Notes	SV-111-SV-5' 07/17/2009	SV-111-SV-12.5' 07/17/2009	SV-116-VS-5' 07/16/2009	SV-116-VS-11' 07/16/2009	SV117-VS-5' 07/16/2009	SV-117-VS-10' 07/16/2009	SV-118-VS-5' 07/16/2009	SV-118-VS-12' 07/16/2009	SV-119-VS-10' 07/17/2009	SV120-VS-5' 07/16/2009	SV120-VS-11' 07/16/2009	SV-121-5' 08/10/2009	SV-121-5' DUP 08/10/2009	SV-121-15' 08/10/2009	SV-122-VS-5' 07/16/2009	SV-122-VS-11' 07/16/2009	SV123-VS-5' 07/16/2009	SV123-VS-13' 07/16/2009	SV-124-VS-5' 07/16/2009	SV-124-VS-10' 07/16/2009	SV-124-VS-10' DUP 07/16/2009	SV125-VS-5' 07/16/2009	SV125-VS-12' 07/16/2009	SV-126-VS-5' 07/16/2009	SV-126-VS-12' 07/16/2009	SV127-VS-5' 07/17/2009	SV128-VS-5' 07/17/2009	SV128-VS-8' 07/17/2009	SV-129-VS-5' 07/17/2009	SV-129-VS-8' 07/17/2009	SV-131-VS-5' 07/17/2009
1,1-Difluoroethane (LLC)		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**22 J**	**30 J**	**31**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**85**	<5.0	<5.0	<5.0	<5.0
Propene		<10	**150**	<10	**47**	**150**	**37**	**5,400**	**14**	<10	**220**	**300**	<10	<10	<10	<10	<10	<10	<10	**80**	<10	**57**	**49**	<10	**20**	<10	**170**	**6,800**	**480**	**860**	<10	**34**	**130**
Dichlorodifluoromethane		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**18**	**33**	**17**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**85**	**9.1**	<5.0	<5.0	<5.0
Dichlorotetrafluoroethane		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl chloride		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Butadiene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**140**	<5.0	**21**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**310**	**26**	**11**	<5.0	<5.0	**8.2**
Trichlorofluoromethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**5.7**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2-Trichlorotrifluoroethane		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene chloride		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	**11**	<10	<10	<10	<10
Carbon disulfide		**130**	**390**	**8.0**	**110**	**130**	**180**	**460**	**15**	**240**	**24**	**87**	<5.0	<5.0	<5.0	<5.0	**6.7**	**15**	**67**	<5.0	**170**	**170**	<5.0	**15**	<5.0	**310**	**2,600**	**2,000**	**35**	**35**	**70**	**40**
trans-1,2-Dichloroethene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl acetate		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
n-Hexane		<5.0	**71**	<5.0	**6.0**	**310**	**35**	**2,600**	**11**	**1,200**	**27**	**290**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**15**	**16**	<5.0	**11**	**9.7**	**8.8**	**270**	**180**	**930**	<5.0	**12**	**66**
cis-1,2-Dichloroethene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethyl acetate		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroform		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**16**	<5.0	<5.0	<5.0	<5.0	**6.2**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Tetrahydrofuran		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,1-Trichloroethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloroethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**34**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzene		<5.0	**120**	<5.0	**7.2**	**22**	**21**	**250**	**5.5**	**340**	<5.0	**8.0**	<5.0	<5.0	<5.0	**22**	<5.0	**5.4**	<5.0	<5.0	**16**	**11**	<5.0	<5.0	**33**	**21**	**380**	**66**	**110**	<5.0	**15**	**19**
Carbon tetrachoride		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cyclohexane		<10	**76**	<10	**28**	**350**	**39**	**1,500**	**32**	**420**	**63**	**190**	<10	<10	<10	<10	**28**	<10	**130**	<10	**32**	**33**	<10	**22**	<10	**23**	**15,000**	**170**	**580**	**26**	**97**	**60**
n-Heptane		<5.0	**91**	<5.0	<5.0	**320**	**58**	**2,600**	**24**	**4,500**	**51**	**470**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**10**	**11**	<5.0	<5.0	**9.6**	**11**	**2,800**	**220**	**1,400**	<5.0	**17**	**77**
Trichloroethene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**7.9**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**10**	**10**	<5.0	<5.0	<5.0	**8.3**	<5.0	<5.0	<5.0	<5.0	<5.0	**11**
1,2-Dichloropropane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dioxane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**8.0**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromodichloromethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**5.1**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,3-Dichloropropene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,3-Dichloropropene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Toluene		**57**	**500**	**5.5**	**51**	**120**	**240**	**680**	**65**	**3,800**	**9.8**	**110**	**7.1**	**6.1**	**7.2**	**39**	**8.7**	**11**	**10**	**6.7**	**95**	**95**	<5.0	**9.8**	**130**	**73**	**1,700**	**220**	**830**	**280**	**80**	**51**
1,1,2-Trichloroethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dibromochloromethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Tetrachloroethene		**57**	**29**	**5.7**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**5.5**	<5.0	<5.0	<5.0	**23**	<5.0	<5.0	<5.0	<5.0	<5.0	**38**	<5.0	<5.0	**14**	**12**	**32**	**73**
1,2-Dibromoethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,1,2-Tetrachloroethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chlorobenzene		<5.0	**8.5**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene		**47**	**140**	<5.0	**11**	**49**	**74**	**170**	**54**	**410**	**8.0**	**65**	<5.0	<5.0	<5.0	**45**	<5.0	**15**	**6.1**	<5.0	**33**	**33**	<5.0	<5.0	**40**	**41**	**260**	**60**	**210**	<5.0	**19**	**18**
m,p-Xylene		**87**	**440**	**7.9**	**26**	**250**	**300**	**240**	**110**	**2,200**	**34**	**200**	<5.0	<5.0	<5.0	**130**	**7.2**	**54**	**14**	**20**	**110**	**110**	<5.0	**6.9**	**170**	**150**	**690**	**150**	**490**	**13**	**68**	**36**
Styrene		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
o-Xylene		**51**	**180**	<5.0	**8.5**	**74**	**93**	**120**	**53**	**450**	**23**	**68**	<5.0	<5.0	<5.0	**34**	<5.0	**8.3**	<5.0	**7.7**	**32**	**29**	<5.0	<5.0	**63**	**60**	**230**	**61**	**180**	**5.6**	**33**	**15**
Bromoform		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<20	<20	<20	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Ethyltoluene		**18**	**26**	<5.0	<5.0	**19**	**29**	**25**	**15**	**100**	**8.2**	**13**	<5.0	<5.0	<5.0	**7.0**	<5.0	<5.0	<5.0	<5.0	**5.4**	<5.0	<5.0	<5.0	<5.0	**6.5**	**53**	**15**	**37**	<5.0	**6.1**	<5.0
1,3,5-Trimethylbenzene		**15**	**44**	**17**	<5.0	**1,100**	**510**	**28**	**16**	**100**	**14**	**20**	<5.0	<5.0	<5.0	**7.6**	<5.0	<5.0	<5.0	<5.0	**5.6**	<5.0	<5.0	<5.0	**7.6**	**11**	**190**	**51**	**170**	<5.0	**9.6**	**16**
1,2,4-Trimethylbenzene		**28**	**110**	**6.7**	<5.0	**220**	**210**	**29**	**48**	**270**	**19**	**47**	<5.0	<5.0	<5.0	**20**	<5.0	**12**	**12**	<5.0	**14**	**12**	<5.0	<5.0	**27**	**32**	**190**	**60**	**140**	**8.2**	**26**	**14**
1,3-Dichlorobenzene		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzyl chloride		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dichlorobenzene		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Napthalene		<10	<10	<10	<10	**10**	**13**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	**12**	<10	<10	<10	<10
1,2,4-Trichlorobenzene		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorobutadiene		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methyl tert-butyl ether		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone		**27**	**75**	**14**	**33**	**330**	<10	<10	**66**	**150**	<10	**220**	**27**	<20	**36**	**18**	**19**	**71**	**130**	**16**	**32**	**28**	<10	<10	**23**	**23**	**7,400**	**43**	<10	**34**	**45**	**91**
2-Butanone		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**5.5**	**19**	**120**	<5.0	**8.9**	<5.0	<5.0	<5.0	<5.0	<5.0	**8.1**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**4,800**	**5.5**	**10**	**21**	**8.5**	**5.1**
4-Methyl-2-pentanone		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**15**	**9.4**	**67**	<5.0	**13**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**860**	<5.0	**75**	<5.0	**5.3**	<5.0
2-Hexanone		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Notes:

µg/m^3 Air = microgram per cubic meter (volume)
AA = Ambient air sample
< = Analyte was not detected at or above the Reporting Limit (RL)
-- = Not applicable / Not analyzed
Results highlighted with **Bold** font indicate results > RL
J = Analyte was detected between the MDL and the Reporing Limits (RL)

Table 34S (continued)
Soil Vapor Analytical Results 2009 Investigation
(Volatile Organic Compounds Measured by Method TO-15)
Gardena Sumps
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California

	µg/m3																				
Volatile	SV-131-VS-10' 07/17/2009	SV-132-VS-7' 07/17/09	SV132-VS-12' 07/17/2009	SV-133-VS-5' 07/17/2009	SV-133-VS-11' 07/17/2009	SV-133-VS-11' DUP 07/17/2009	SV-134-5' 08/10/2009	SV-134-5' Dup 08/10/2009	SV-134-10' 08/10/2009	SV-135-5' 08/10/2009	SV-135-15' 08/10/2009	SV-136-5' 08/10/2009	SV-136-15' 08/10/2009	SV-137-5' 08/10/2009	SV-137-15' 08/10/2009	AA 20090716 (E907055-20)	AA 20090717 (E907059-09)	Trip Blank (E907055-21) 07/16/2009	Trip Blank (E907059-17) 07/17/2009	Trip Blank (E908025-10) 08/10/2009	Trip Blank (E908038-04) 08/10/2009
1,1-Difluoroethane (LLC)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**9.8**	<5.0	<5.0	<5.0	<5.0	**20**	**25**	**16**	<5.0	**250**	<5.0	<5.0	<5.0	NA	NA
Propene	**39**	**24**	**310**	**12**	**16**	**15**	<10	<10	**15**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dichlorodifluoromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloromethane	<5.0	<5.0	**15**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dichlorotetrafluoroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl chloride	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Butadiene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichlorofluoromethane	**9.6**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2-Trichlorotrifluoroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	**21**	<10	<10	<10	<10	<10
Methylene chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon disulfide	**9.4**	**120**	**350**	**180**	**200**	**200**	**28**	**28**	**120**	**32**	<5.0	**24**	<5.0	**51**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,2-Dichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl acetate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
n-Hexane	**22**	**9.5**	**79**	<5.0	**6.1**	**5.9**	<5.0	<5.0	**5.1**	**18**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**8.9**	<5.0	<5.0	<5.0	<5.0
cis-1,2-Dichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethyl acetate	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroform	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**7.8**	<5.0	**5.8**	**40**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Tetrahydrofuran	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,1-Trichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzene	**12**	<5.0	<5.0	**<5.0**	**6.2**	**6.4**	**5.0**	<5.0	<5.0	**50**	<5.0	<5.0	<5.0	<5.0	<5.0	**5.2**	**18**	<5.0	<5.0	<5.0	<5.0
Carbon tetrachoride	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cyclohexane	**42**	**48**	**290**	<10	**27**	**26**	<10	<10	**28**	**120**	<10	<10	<10	**29**	<10	<10	<10	<10	<10	<10	<10
n-Heptane	**31**	**15**	**57**	**6.4**	**8.5**	**9.0**	<5.0	<5.0	<5.0	**22**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**13**	<5.0	<5.0	<5.0	<5.0
Trichloroethene	**9.5**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**13**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dioxane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromodichloromethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Toluene	**21**	**46**	**16**	**120**	**100**	**100**	**33**	**23**	**30**	**240**	**6.3**	<5.0	<5.0	**12**	**26**	**11**	**54**	<5.0	<5.0	<5.0	<5.0
1,1,2-Trichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dibromochloromethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Tetrachloroethene	**92**	<5.0	<5.0	**24**	**16**	**17**	<5.0	<5.0	<5.0	**16**	**19**	<5.0	**14**	**6.2**	**7.2**	<5.0	**350**	<5.0	<5.0	<5.0	<5.0
1,2-Dibromoethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,1,2-Tetrachloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene	**14**	**32**	**6.6**	**60**	**41**	**41**	**5.7**	<5.0	<5.0	**37**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**24**	<5.0	<5.0	<5.0	<5.0
m,p-Xylene	**40**	**110**	**22**	**200**	**150**	**150**	**27**	**17**	**18**	**160**	<5.0	<5.0	<5.0	**8.7**	**14**	**15**	**120**	<5.0	<5.0	<5.0	<5.0
Styrene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
o-Xylene	**15**	**38**	**7.3**	**62**	**41**	**41**	**7.7**	<5.0	<5.0	**64**	<5.0	<5.0	<5.0	<5.0	<5.0	**5.3**	**54**	<5.0	<5.0	<5.0	<5.0
Bromoform	<10	<10	<10	<10	<10	<10	<20	<20	<20	<20	<20	<20	<20	<20	<20	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Ethyltoluene	<5.0	**12**	<5.0	**18**	**11**	**11**	<5.0	<5.0	<5.0	**11**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3,5-Trimethylbenzene	**29**	**20**	<5.0	**17**	**9.6**	**9.9**	<5.0	<5.0	<5.0	**11**	<5.0	<5.0	<5.0	<5.0	<5.0	**7.6**	**13**	<5.0	<5.0	<5.0	<5.0
1,2,4-Trimethylbenzene	**15**	**38**	**8.8**	**50**	**31**	**32**	**9.4**	**6.0**	**5.3**	**35**	<5.0	<5.0	<5.0	**5.5**	<5.0	**6.7**	**19**	<5.0	<5.0	<5.0	<5.0
1,3-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzyl chloride	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Napthalene	<10	<10	<10	<10	<10	<10	<10	<10	<10	**11**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methyl tert-butyl ether	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone	**52**	**46**	**87**	**58**	**52**	<10	**71**	**53**	**51**	<20	<20	<20	**27**	**94**	**45**	**22**	**38**	<10	<10	<10	<10
2-Butanone	**5.8**	<5.0	<5.0	<5.0	**5.7**	**5.2**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**5.1**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Methyl-2-pentanone	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**9.9**	**6.4**	**13**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Hexanone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Notes:
µg/m^3 Air = microgram per cubic meter (volume)
AA = Ambient air sample
< = Analyte was not detected at or above the Reporting Limit (RL)

Results highlighted with **Bold** font indicate results > RL
J = Analyte was detected between the MDL and the Reporing Limits (RL)
-- = Not applicable / Not analyzed

Table 35S
Soil Vapor Analytical Results 2009 Investigation
(Purge Volume Testing - VOCs, Methane, and H2S)
Gardena Sumps
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California

Volatile	Notes	µg/m3									
		SV119-VS-6', 1PV,P139cc 07/15/2009	SV119-VS-6', 3PV, P417cc 07/15/2009	SV119-VS-6', 7PV, P973cc 07/15/2009	Ambient Air (E907049-04) 07/15/2009	SV128-VS-5', 1PV, P134cc 07/15/2009	SV128-VS-5', 3PV, P402cc 07/15/2009	SV128-VS-5', 7PV, P938cc 07/15/2009	SV128-VS-8', 1PV, P149cc 07/15/2009	SV128-VS-8', 3PV, P447cc 07/15/2009	SV128-VS-8', 7PV, P1043cc 07/15/2009
1,1-Difluoroethane (LLC)	µg/L	<10	<10	<10	<10	--	--	--	--	--	--
Propene		<50	**1,800**	**960**	<50	--	--	--	--	--	--
Dichlorodifluoromethane		<15	<38	<38	<15	--	--	--	--	--	--
Chloromethane		<10	<25	<25	<10	--	--	--	--	--	--
Dichlorotetrafluoroethane		<25	<62	<62	<25	--	--	--	--	--	--
Vinyl chloride		<10	<25	<25	<10	--	--	--	--	--	--
1,3-Butadiene		<10	<25	<25	<10	--	--	--	--	--	--
Bromomethane		<20	<50	<50	<20	--	--	--	--	--	--
Chloroethane		<15	<38	<38	<15	--	--	--	--	--	--
Trichlorofluoromethane		<30	<75	<75	<30	--	--	--	--	--	--
1,1-Dichloroethene		<15	<38	<38	<15	--	--	--	--	--	--
1,1,2-Trichlorotrifluoroethane		<20	<50	<50	<20	--	--	--	--	--	--
Methylene chloride		<10	<25	<25	<10	--	--	--	--	--	--
Carbon disulfide		**1,100**	**1,500**	**770**	<10	--	--	--	--	--	--
trans-1,2-Dichloroethene		<10	<25	<25	<10	--	--	--	--	--	--
Vinyl acetate		<20	<50	<50	<20	--	--	--	--	--	--
1,1-Dichloroethane		<20	<50	<50	<20	--	--	--	--	--	--
n-Hexane		<15	<38	<38	<15	--	--	--	--	--	--
cis-1,2-Dichloroethene		<10	<25	<25	<10	--	--	--	--	--	--
Ethyl acetate		<20	<50	<50	<20	--	--	--	--	--	--
Chloroform		<10	<25	<25	<10	--	--	--	--	--	--
Tetrahydrofuran		<40	<100	<100	<40	--	--	--	--	--	--
1,1,1-Trichloroethane		<15	<38	<38	<15	--	--	--	--	--	--
1,2-Dichloroethane		<15	<38	<38	<15	--	--	--	--	--	--
Benzene		**1,100**	**740**	**700**	**16**	--	--	--	--	--	--
Carbon tetrachoride		<10	<25	<25	<10	--	--	--	--	--	--
Cyclohexane		**5,800**	**4,800**	**4,400**	<20	--	--	--	--	--	--
n-Heptane		**17,000**	**16,000**	**17,000**	<50	--	--	--	--	--	--
Trichloroethene		<10	<25	<25	<10	--	--	--	--	--	--
1,2-Dichloropropane		<15	<38	<38	<15	--	--	--	--	--	--
1,4-Dioxane		<40	<100	<100	<40	--	--	--	--	--	--
Bromodichloromethane		<15	<38	<38	<15	--	--	--	--	--	--
cis-1,3-Dichloropropene		<10	<25	<25	<10	--	--	--	--	--	--
trans-1,3-Dichloropropene		<10	<25	<25	<10	--	--	--	--	--	--
Toluene		**4,100**	**4,100**	**3,500**	**30**	--	--	--	--	--	--
1,1,2-Trichloroethane		<15	<38	<38	<15	--	--	--	--	--	--
Dibromochloromethane		<15	<38	<38	<15	--	--	--	--	--	--
Tetrachloroethene		<15	<38	<38	<15	--	--	--	--	--	--
1,2-Dibromoethane (EDB)		<10	<25	<25	<10	--	--	--	--	--	--
1,1,1,2-Tetrachloroethane		<20	<50	<50	<20	--	--	--	--	--	--

Table 35S
Soil Vapor Analytical Results 2009 Investigation
(Purge Volume Testing - VOCs, Methane, and H2S)
Gardena Sumps
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California

Volatile	Notes	µg/m3									
		SV119-VS-6', 1PV,P139cc 07/15/2009	SV119-VS-6', 3PV, P417cc 07/15/2009	SV119-VS-6', 7PV, P973cc 07/15/2009	Ambient Air (E907049-04) 07/15/2009	SV128-VS-5', 1PV, P134cc 07/15/2009	SV128-VS-5', 3PV, P402cc 07/15/2009	SV128-VS-5', 7PV, P938cc 07/15/2009	SV128-VS-8', 1PV, P149cc 07/15/2009	SV128-VS-8', 3PV, P447cc 07/15/2009	SV128-VS-8', 7PV, P1043cc 07/15/2009
Chlorobenzene		<10	<25	<25	<10	--	--	--	--	--	--
Ethylbenzene		**330**	**350**	**380**	<15	--	--	--	--	--	--
m,p-Xylene		**1,000**	**1,200**	**1,200**	**24**	--	--	--	--	--	--
Styrene		<10	<25	<25	<10	--	--	--	--	--	--
o-Xylene		**280**	**300**	**320**	<10	--	--	--	--	--	--
Bromoform		<50	<120	<120	<50	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane		<15	<38	<38	<15	--	--	--	--	--	--
4-Ethyltoluene		<10	<25	<25	<10	--	--	--	--	--	--
1,3,5-Trimethylbenzene		<10	<25	<25	<10	--	--	--	--	--	--
1,2,4-Trimethylbenzene		**120**	**110**	**120**	<10	--	--	--	--	--	--
1,3-Dichlorobenzene		<15	<38	<38	<15	--	--	--	--	--	--
Benzyl chloride		<10	<25	<25	<10	--	--	--	--	--	--
1,4-Dichlorobenzene		<15	<38	<38	<15	--	--	--	--	--	--
1,2-Dichlorobenzene		<15	<38	<38	<15	--	--	--	--	--	--
Napthalene		<20	<50	<50	<20	--	--	--	--	--	--
1,2,4-Trichlorobenzene		<15	<38	<38	<15	--	--	--	--	--	--
Hexachlorobutadiene		<20	<50	<50	<20	--	--	--	--	--	--
Methyl tert-butyl ether		<10	<25	<25	<10	--	--	--	--	--	--
Acetone		<50	<120	<120	**78**	--	--	--	--	--	--
2-Butanone		<50	<120	<120	<50	--	--	--	--	--	--
4-Methyl-2-pentanone		**140**	**150**	**150**	<50	--	--	--	--	--	--
2-Hexanone		<50	<120	<120	<50	--	--	--	--	--	--
Hydrogen sulfide		--	--	--	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methane		--	--	--	--	**46**	**12**	<10	--	--	--

Notes:

µg/m^3 Air = microgram per cubic meter (volume)

µg/L = micrograms per liter

< = Analyte was not detected at or above the Reporting Limit (RL)

-- = Not applicable / Not analyzed

Results highlighted with **Bold** font indicate results > RL

EPA Method TO-15

Table 36S
Soil Vapor Analytical Results 2009 Investigation
(Methane and H2S)
Gardena Sumps
Southwest Corner of West Artesia Boulevrd and Normandie Avenue
Gardena, California

Test Method		Jerome GFD	8015M
Sample ID	Date Sampled	Hydrogen Sulfide (ppmv)	Methane (ppmv)
SV111-VS-5', P534cc	7/17/2009	<0.50	<10
SV111-VS-12.5', P569cc	7/17/2009	<0.50	**38**
SV116-VS-5', P534cc	7/16/2009	<0.50	<10
SV116-VS-11', P564cc	7/16/2009	<0.50	<10
SV117-VS-5', P534cc	7/16/2009	<0.50	**13**
SV117-VS-10', P559cc	7/16/2009	<0.50	**14**
SV118-VS-5', P534cc	7/16/2009	<0.50	**90**
SV118-VS-12', P569cc	7/16/2009	<0.50	**11**
SV119-VS-6', P134cc	7/17/2009	<0.50	**520**
SV119-VS-10', P559cc	7/17/2009	<0.50	**86**
SV120-VS-5', P534cc	7/17/2009	<0.50	<10
SV120-VS-11', P564cc	7/16/2009	<0.50	**26**
SV121-5', P534cc	8/10/2009	<0.50	<10
SV121-15', P579cc	8/10/2009	<0.50	<10
SV122-VS-5', P534cc	7/16/2009	<0.50	<10
SV122-VS-11', P564cc	7/16/2009	<0.50	**18**
SV123-VS-5', P534cc	7/16/2009	<0.50	**12**
SV123-VS-13', P574cc	7/16/2009	<0.50	<10
SV124-VS-5', P534cc	7/16/2009	<0.50	<10
SV124-VS-5' DUP, P734cc	7/16/2009	<0.50	<10
SV124-VS-10', P559cc	7/16/2009	<0.50	<10
SV125-VS-5', P534cc	7/16/2009	<0.50	<10
SV125-VS-12', P569cc	7/16/2009	<0.50	<10
SV126-VS-5', P534cc	7/16/2009	<0.50	<10
SV126-VS-12', P569cc	7/16/2009	<0.50	<10
SV127-VS-5', P534cc	7/17/2009	<0.50	**320**
SV129-VS-5', P534cc	7/17/2009	<0.50	**11**
SV129-VS-8', P549cc	7/17/2009	<0.50	**18**
SV131-VS-5', P534cc	7/17/2009	<0.50	**35**
SV131-VS-10', P559cc	7/17/2009	**0.56**	**38**
SV132-VS-7', P544cc	7/17/2009	<0.50	<10
SV132-VS-12', P569cc	7/17/2009	<0.50	**79**
SV133-VS-5', P534cc	7/17/2009	<0.50	<10
SV133-VS-5' DUP, P734cc	7/17/2009	<0.50	<10
SV133-VS-11', P564cc	7/17/2009	<0.50	<10
SV134-5', P134cc	8/10/2009	<0.50	<10
SV134-10', P159cc	8/10/2009	<0.50	<10
SV135-5', P534cc	8/10/2009	<0.50	<10
SV135-15', P579cc	8/10/2009	<0.50	<10
SV136-5', P534cc	8/10/2009	<0.50	<10
SV136-15', P579cc	8/10/2009	<0.50	<10
SV137-5', P534cc	8/10/2009	<0.50	<10
SV137-15', P579cc	8/10/2009	<0.50	<10

Notes:

(ppmv) = Parts per million volume
cc = Cubic Centimeter
DUP = Duplicate Sample
< = Analyte was not detected at or above the Reporting Limit (RL)
Results highlighted with **Bold** font indicate results > RL

Table 37S
Soil Vapor Analytical Results 2009 Investigation
(Laboratory Naphthalene QA/QC Runs)
Gardena Sumps
Southwest Corner of West Artesia Boulevrd and Normandie Avenue
Gardena, California

		ug/m3																		
Volatile	Notes	CCV-6Liter (E907055-22) 07/16/2009	CCV-30-initial-EG91802 07/16/2009	CCV30-final-EG91802 07/16/2009	CCV30-initial-EG92101 07/16/2009	CCV30-final-EG92101 07/16/2009	CCV30-initial-EG92703 07/16/2009	CCV30-final-EG92703 07/16/2009	Blank-after-SV117-VS-5 07/16/2009	Blank-after-SV117-VS-10 07/16/2009	CCV30-initial-EG92107 07/17/2009	CCV30-final-EG92107 07/17/2009	Blank-after-SV127-VS-5 07/17/2009	CCV-30-initial (EH91805) 08/10/2009	CCV-30-final-(EH91805) 08/10/2009	CCV30-initial-(EH91806) 08/12/2009	CCV30-final-(EH91806) 08/12/2009	Blank after CCV30-initial (EH91805) 08/10/09	Blank after CCV30-final (EH91805) 08/10/09	Blank after CCV30-initial (EH91806) 08/12/09	Blank after CCV30-final (EH91806) 08/12/09
Napthalene	EPA TO-15	**22**	**27**	**25**	**24**	**25**	**28**	**21**	<10	<10	**27**	**34**	<10	**31**	**35**	**31**	**32**	<10	<10	<10	<10

Notes:
µg/m^3 Air = microgram per cubic meter (volume)
< = Analyte was not detected at or above the Reporting Limit (RL)
Results highlighted with **Bold** font indicate results > RL

APPENDIX A

AGENCY CORRESPONDENCE

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December 14, 2010

Mr. Greg Holmes
Southern California Cleanup Operations Branch
Cypress Office
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630-4732

RE: ADDENDUM TO THE AUGUST 22, 2008 REVISED DRAFT 2006
REMEDIAL INVESTIGATION REPORT
GARDENA SUMPS SITE, DTSC Project No. 400067
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California 90247
Stantec Project No. 211802132.300.113

Dear Mr. Holmes,

On behalf of Atlantic Richfield Company (ARC), Stantec Consulting (Stantec) is submitting this *Addendum to the August 22, 2008 Revised Draft 2006 Remedial Investigation Report* to the California Department of Toxic Substances Control (DTSC) per Section VI.D of the *Gardena Sumps/ARC Consent Decree,* CV04-7882-AHM(JTLx) (the Decree), effective November 4, 2004. The Gardena Sumps Site (the Site) is located at the southwest corner of West Artesia Boulevard and Normandie Avenue in the City of Gardena, California.

The enclosed report presents the results of work performed in accordance with Stantec's two Remedial Investigation Work Plan Addendums dated June 15, 2009 and June 15, 2010, and to address data gaps identified by the DTSC in their memorandums dated October 24, 2008, November 3, 2008, November 21, 2008, and February 25, 2009, the DTSC's letter dated July 19, 2010, by ARC in their responses to DTSC comments dated August 20, 2008, January 12, 2009, February 12, 2009, February 26, 2009, and April 13, 2010, and ARC correspondence to DTSC dated February 2, 2010 and June 14, 2010, as well as agreements made during meetings with DTSC, ARC and Stantec on January 8, 2009 and May 17, 2010.

The purpose of this Report is to present data collected in remedial investigations conducted in July and October 2009, and August 2010 to address identified data gaps identified in the June 15, 2009 and June 15, 2010 Remedial Investigation Work Plan Addendums, and to complete the remedial investigation activities associated with the Site. The identified data gaps that are addressed within the report are as follow:

- Delineation of the extent of sludge east of the Cooper property on Los Angeles County property, within the residential properties south and west of the Haack Rework Area and to the north and west of the Haack Sump;
- Validation and delineation, if needed, of the presence of arsenic detected in DPW10 during the 2006 RI;

- Assessment of the presence of metals and low pH near the warehouse building in the northwest corner of the Haack property;
- Installation of one additional groundwater monitoring well in the "A" groundwater horizon south (downgradient) of the Haack sump;
- Further assessment of groundwater quality in the "A" and "B" groundwater horizons;
- Evaluation of potential perched groundwater above the "A" groundwater horizon within discrete zones; and
- Further characterization of subsurface concentrations of volatile organic compounds (VOCs), hydrogen sulfide, and methane in the vapor phase at the Site.

Based on the results of the RI activities conducted at the Site, and in discussions during meetings with DTSC staff and outlined in the various correspondences, the identified data gaps have been addressed as appropriate and are each considered closed.

REQUIREMENTS NOT COMPLETED PER THE DECREE

To date all requirements have been initiated or completed per the Decree and DTSC-approved extensions.

POTENTIAL PROBLEMS IN COMPLYING WITH THE DECREE

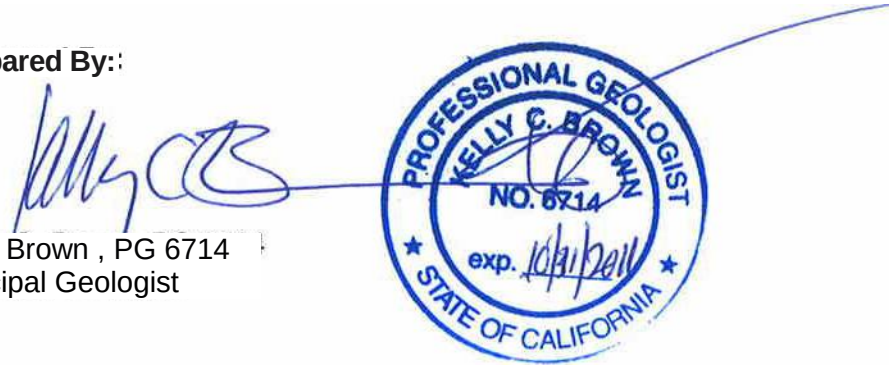
There are no potential problems at this time.

CLOSING

Should you have questions or need additional information regarding the current project status, please contact Mr. Kyle Christie with the Atlantic Richfield Company at (714) 670-5303.

Sincerely,
Stantec Consulting Corporation

Prepared By:



Kelly Brown , PG 6714
Principal Geologist

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ADDENDUM TO THE AUGUST 22, 2008 REVISED DRAFT 2006 REMEDIAL INVESTIGATION REPORT

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Prepared by:
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December 14, 2010

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1.0 Introduction

Stantec Consulting Corporation (Stantec), on behalf of Atlantic Richfield Company (ARC) is submitting this Addendum to the August 22, 2008 Revised Draft 2006 Remedial Investigation (RI) Report (RI Report) for the Gardena Sumps site (Site) to the California Department of Toxic Substances Control (DTSC) per section VII.F of the Gardena Sumps/ARC Consent Decree, CV04-7882-AJM(JTLx), effective November 4, 2004. The site is located at the southwest corner of Artesia Boulevard and Normandie Avenue in Gardena, California (Figures 1, 2A and 2AS). Locations of historic soil borings and U.S. Environmental Protection Agency (EPA) monitoring wells are shown on Figure 3B.

This report presents a summary of work performed in accordance with Stantec's two Remedial Investigation Work Plan Addendums dated June 15, 2009 and June 15, 2010, and to address additional data gaps identified by the DTSC in their memorandums dated October 24, 2008, November 3, 2008, November 21, 2008, and February 25, 2009, the DTSC's letter dated July 19, 2010, by ARC in their responses to DTSC comments dated August 20, 2008, January 12, 2009, February 12, 2009, February 26, 2009, and April 13, 2010, and ARC correspondence to DTSC dated February 2, 2010 and June 14, 2010 (Appendix A), as well as agreements made during meetings with DTSC, ARC and Stantec on January 8, 2009 and May 17, 2010.

The fieldwork performed in 2005 and 2006 is referred to as the 2006 RI. The fieldwork that was performed in 2009 and 2010 is referred to as the 2009 RI.

1.1 PURPOSE OF REPORT

The purpose of this document is to summarize data collected in recent investigations conducted in July and October 2009 and August 2010 to address data gaps and complete remedial investigation activities associated with the Site. The data gaps that are addressed herein are as follow:

- Delineation of the extent of sludge east of the Cooper property on Los Angeles County property, within the residential properties south and west of the Haack Rework Area and to the north and west of the Haack Sump;
- Validation and delineation, if needed, of the presence of arsenic detected in DPW10 during the 2006 RI (Figure 2A);
- Assessment of the presence of metals and low pH near the warehouse building in the northwest corner of the Haack property;
- Installation of one additional groundwater monitoring well in the "A" groundwater horizon south (downgradient) of the Haack sump;

- Further assessment of groundwater quality in the “A” and “B” groundwater horizons;
- Evaluation of potential perched groundwater above the “A” groundwater horizon within discrete zones; and
- Further characterization of subsurface concentrations of volatile organic compounds (VOCs), hydrogen sulfide, and methane in the vapor phase at the Site.

1.2 REPORT ORGANIZATION

Data gaps had been identified in the 2006 RI and during subsequent meetings and correspondence with the DTSC in three categories: soil and sludge delineation, groundwater characterization, and soil gas characterization. Each category of data will be addressed in the following sections with detailed discussion of the data gap, sampling locations, field methods, and analytical results. The headings for the discussions reference the corresponding headings in the 2006 RI Report. In addition, figure and table numbering has remained consistent with the 2006 RI Report. Figures that have been updated with 2009 RI data are denoted with a “S”. An update to the conceptual site model (CSM) is provided at the end of this RI Report Addendum.

Information pertaining to site background and description, previous RI activities, geologic and hydrogeologic settings, community relations, QAPP, SAP, and FSP are provided in the SECOR International Incorporated (SECOR) November 11, 2005 *Gardena Sumps Remedial Investigation/Feasibility Study Work plan*, and Stantec’s August 22, 2008 *Revised Draft 2006 Remedial Investigation Report*. A Glossary of terms and acronyms related to RI activities is provided in Appendix B.

1.3 QA/QC AUDITS AND VALIDATION

Field work was performed in accordance with the Quality Assurance/Quality Control, standard operating procedure (SOPs), audit and corrective action documents provided in SECOR’s November 11, 2005 Gardena Sumps Remedial Investigation/Feasibility Study Work Plan Appendices A and B, including the QAPP, SAP, and FSP documents. The Field measurements and sample collection were conducted in accordance with the use of those SOPs, audits, and corrective action.

1.4 SAMPLE ANALYSIS/VALIDATION

The type and reliability of methods to be used to analyze samples from field investigations is very important in ensuring that the data that is produced by this work is of a known and acceptable quality and that the data can be used for its intended purpose.

During performance of the 2006 RI, data validation was performed on a minimum of 10 percent of the overall sample set to verify whether an analytical method had been performed according to method and program specifications. Data validation involved reviewing the documentation,

instrument output, and analytical reports associated with selected samples or groups of samples.

In accordance with the QAPP, laboratory analytical data collected during the 2009 RI was validated by a third party, Environmental Standards. The findings of Environmental Standards evaluation are provided in Appendix C.

2.0 Soil Investigation and Delineation of Sludge (Section 3.1.4)

Soil borings and soil sampling was performed to provide delineation of sludge at locations east of the Cooper sumps, north and west of the Haack sump, and adjacent to the Haack Rework Area. Complete delineation of surface-spilled sludge, pinching out of thin sludge layers, and reworked impacted soil in these areas was not accomplished during previous RI activities described in the RI report.

- Data collected during additional field characterization activities was used to:
- Delineate the lateral extent of sludge at the site and determine whether sludge has migrated onto public right-of-ways at the northern and eastern edges of the Site;
- Augment the existing data for metals in shallow soil at the Site;
- Augment existing data for pH in shallow soils at the Site; and
- Provide additional input to the Baseline Risk Assessment, especially for risk evaluations involving the direct-contact exposure pathway for contaminated soil or sludge material with potential receptors.

2006 RI sampling locations are shown on Figure 9A, and 2009 RI sampling locations are shown on Figure 9AS. A summary of the borings completed during the 2006 RI and 2009 RI are presented in Tables 16 and 16S, respectively.

2.1 SLUDGE DELINEATION (SECTION 3.1.4.5)

Soil borings were drilled in the following areas to further delineate the extent of sludge at the Site (Figure 9AS):

East of Cooper Sumps

Additional soil borings were drilled on the eastern boundary of the Cooper sumps to delineate areas where near surface sludge was encountered during previous investigations adjacent to sump boundaries in borings DPW01 to DPW05 (Figure 2A). Six borings (DPW116 through DPW121; Figure 2AS) were drilled to a depth of 15 feet below ground surface (bgs) to the east of the Cooper sumps on the LACDPW property to delineate sludge.

Haack Rework Area

Thin layers of stained soil and localized sludge deposits were identified during previous investigations in the southern portion of the Haack Rework Area in borings RB01, RB02, and RB03 (Figure 2A). Four borings (RB104 through RB107; Figure 2AS) were drilled to 15 feet bgs

to define the southern and western extent of sludge occurrence in the Haack Rework Area. These four borings were drilled on the two easternmost residential properties.

North and West of Haack Sump

The northern boundary of the Haack property abuts the southern sidewalk of Artesia Boulevard. Previous RI borings in this area were situated approximately four to five feet south of this sidewalk and encountered layers of sludge. Four soil borings (AB100 through AB103; Figure 2AS) were drilled in the Artesia Boulevard right-of-way and five hydropunch borings (HPB113 through HPB117) were drilled in the vicinity of the western portion of the Haack sump to delineate sludge in these areas. Utilities above and below the Artesia Boulevard sidewalk required the borings planned to drilled through the sidewalk to be moved northward into Artesia Boulevard. AB100 through AB103 were drilled to 15 feet bgs. Borings AB102 and AB103 were drilled as step out borings based on sludge encountered in AB101. Borings HPB113 and HPB114 were drilled immediately east of the northwestern Haack building. Sludge was encountered in both these borings. Step out boring HPB115 was drilled south of HPB113 and step out borings HPB116 and HPB117 were drilled within the northwestern Haack building west of HPB113 and HPB114 to further delineate the sludge. The referenced boring locations are shown on Figure 9AS.

2.1.1 Field Methods

Sludge delineation borings were drilled using a Rhino M5T Wide Track drill rig using direct push methods operated by Gregg Drilling & Testing, Inc. The soil borings were logged by field geologists under the supervision of a California Professional Geologist in accordance with the Unified Soil Classification System (USCS; as applicable). The borings were continuously sampled with acetate liners which were visually inspected for the presence of sludge. Headspace analysis was performed using a photo-ionization detector on all collected samples. Soil samples were collected from the acetate liners by cutting the selected section, and capping the ends with Teflon tape and plastic end caps. The samples were labeled, logged on a Chain-of-Custody form and transported to Test America, a NELAP and California ELAP-certified laboratory, for analysis.

Values for pH of soil or sludge samples were determined in the field. Some soil and sludge samples were analyzed for pH by EPA Test Method 9045C at the laboratory. See Tables 20 and 20S for pH values of samples obtained during the 2006 and 2009 investigations, respectively.

The QAPP, SAP and FSP describe SOPs for this work including sampling protocols, chain-of-custody procedures, QA/QC protocols, laboratory analytical testing and decontamination activities, and investigation derived waste (IDW) disposal procedures are provided in SECOR's November 11, 2005 *Remedial Investigation/Feasibility Study Work plan*. Health and safety monitoring activities are described in the Site-Specific Health and Safety Plan (HASP) for the

Site. All laboratory analysis of soil/sludge samples were performed by Test America of Irvine. Laboratory analytical reports for soil and sludge samples are provided in Appendix D.

2.1.2 Sludge Delineation Results

Based on the documented field observations, the extent of sludge was defined during this assessment as follows:

- East of Cooper Sumps: Sludge material was not observed in the soil cores from DPW-116 through DPW-121; therefore, the extent of sludge has been defined and does not appear to extend onto Los Angeles County property to the east of the Cooper property line.

- Haack Rework Area: Sludge material was not observed in the soil cores from boring RB104 through RB107 and SV135. The extent of sludge in the Haack Rework Area has been defined to the south by borings RB105, RB106, SV135 and RB107 and to the west by boring RB104.

- North and West of the Haack Sump: Two borings (AB100 and AB101) were drilled within the southernmost lane of Artesia Boulevard. Trace quantities of small brick and sludge fragments were observed in a 0.5 foot thick reworked clay layer at a depth of 2.5 to 3.0 feet bgs in boring AB100. Approximately 0.75 feet of sludge was observed in AB101 between 5.5 and 6.25 feet bgs. Reworked clay and silt containing brick and sludge fragments of varying sizes were encountered at depths of 3.8 to 6.5 feet bgs above and below this sludge deposit indicating that this sludge material has also been reworked. Step out borings AB102 and AB103 were drilled to further delineate the sludge observed in boring AB101. No sludge material was observed in soil cores from either of these two borings. A limited quantity of reworked sludge material is present beneath Artesia Boulevard in the vicinity of AB101 but its extent is delineated by AB100, AB102 and AB103.

- Borings HPB113 and HPB114 were drilled to delineate the western extent of the Haack Sump. Sludge material was encountered in both borings. Step-out borings HPB116 and HPB117 were drilled further to the west inside the Haack Warehouse. Sludge was not observed in either of these borings. Borings HPB116 and HPB117 provide delineation of sludge west of the Haack Sump. Non-sludge hydrocarbon impacts were observed in these two borings which required additional hydrocarbon delineation. This hydrocarbon delineation is discussed later in the VOC and EFH Investigation in Section 2.3. Step out boring HPB115, drilled south of HPB113, did not encounter sludge.

The extent of sludge and sludge thickness are depicted on Figures 10AS through 10FS, 15S, 16S, and 17AS through 17KS. Laboratory and field pH measurements in soil and sludge are summarized on Tables 20S and 21S. 2006 RI and 2009 RI sludge volume calculations are summarized on Tables 22 and 22SA, respectively.

2.1.3 Data Gap Evaluation

The extent of sludge has been defined on the east side of the Cooper Sumps, in the Haack Rework Area, and north and west of the Haack Sump into Artesia Boulevard. Based on these results, the sludge delineation data gap identified in the August 22, 2008 RI Report has been closed.

2.2 METALS AND PH IN SOIL

Soil pH adjacent to sludge was identified as a data gap in 2008. As documented in the RI Report, Site pH values averaged 2.22 in sludge and averaged 6.57 in soil. An evaluation of pH adjacent to sludge-soil contacts showed that the extent of acidic pH values into soil adjacent to sludge material was limited and attenuated over a short distance from the sludge/soil contact. In January 2009, ARC provided the DTSC with a depth analysis of soil pH below and lateral to sludge (Appendix E). DTSC agreed that low pH values in soil attenuated over a relatively short distance from the contact with sludge. To confirm this observation, 2009 RI soil samples were evaluated in the field utilizing field instruments on the samples from the sludge delineation borings adjacent to the Haack northwestern warehouse (HPB114 through HPB117) and compared to laboratory measured pH values from sludge delineation boring HPB113 and HPB114. Field pH analysis was also performed on soil samples from many other 2009 RI borings. Soil sample pH values are found in Table 20S and 21S. Field pH values are included on the lithologic logs in Appendix F.

DTSC had requested additional characterization of metals in the northwestern portion of the Haack property. Soil samples were collected from four sludge delineation borings (HPB113, HPB114, HPB116 and HPB117) on the Haack property for analysis of Title 22 metals, mercury and chromium VI. Soil samples were collected from these borings at depths ranging from 2 to 22 feet bgs. Additionally, during the HHRA evaluation, it was noted that the chromium VI concentration from 1.5 feet bgs at boring RB01 (sampled in 2006) was significantly greater than the total chromium value from this soil sample. This location and depth was resampled (RB101) to validate the 2006 chromium VI concentration. Analytical results for metals in soil are presented on Table 19S.

2.2.1 pH Investigation

Sludge was present in Haack Sump delineation borings HPB113 and HPB114, therefore step-out delineation borings HPB115, HPB116 and HPB117 were drilled. One field pH value of 3 was obtained on a sludge sample from 9 to 10 feet bgs at boring HPB113. At boring HPB114, one field pH value of 7.1 was obtained from reworked sludge and field pH values ranging from 6.7 to 10.3 were obtained from silty soils above and below the reworked sludge. Fifteen field pH values were obtained from the three step-out delineation borings. Sludge or reworked sludge-

soil was not encountered in any of the three step-out borings. Field pH values in native soil from these borings ranged from 6.0 to 9.0 (Table 19S).

Four delineation borings (AB100 through AB103) were drilled in Artesia Boulevard to delineate the northern boundary of sludge from the Haack sump. Three materials were identified in these borings including road base, reworked sludge-soil material, and native soil. Four road base samples had field pH values ranging from 5.2 to 8.5. Eleven reworked material samples had field pH values ranging from 6.7 to 8.8. Eight native soil samples had pH values ranging from 7.1 to 8.5, and one native soil sample had a pH value of 5.7 (AB103 at 14.5).

Three borings (SV132, SV133 and MW-5A) were drilled near the southern boundary of the Haack sump. Nine field pH values were obtained from native soil in these borings with pH values ranging from 6.0 to 9.5.

Based on the evaluation of pH results, the extent of acidic pH values has been investigated and confirms that acidic pH values are limited to sludge or soil immediately adjacent to sludge. This evaluation confirms that acidic pH values attenuate in native soil within a few feet from the contact between sludge and soil.

2.2.2 Investigation of Metals in Soil

Soil samples from boring HPB113, HPB114, HPB 116 and HPB117 were analyzed for Title 22 metals by EPA Test Method 6020, mercury by EPA Test Method 7471 and Chromium VI by EPA Test Method 7199. These analyses were performed to evaluate metals concentrations near the west edge of the Haack Sump area and to supplement existing inorganic metals data for sludge and shallow soil. Metals results collected from these borings during the 2009 RI were compared to concentration ranges found in background borings (DPW6 through DPW15) and native soil during the 2006 RI investigations at the site.

A summary of metals analysis from the 2009 RI sampling is provided in Table 19AS. Table 26 of the RI Report (included herein) documented the range of metal concentrations in native soil and sludge. The highest metals concentrations reported during this investigation were reported from sludge material in boring HPB113 at 2 and 5 feet bgs. When compared to Table 26 of the RI Report, antimony, arsenic, barium, cadmium, copper, lead and zinc at the 2 foot depth sample (reworked silty sand above sludge) were all elevated above the range of metals concentrations commonly found in sludge during the 2006 RI activities. At the 5 foot depth sample (reworked sludge and silty sand) antimony, arsenic, barium and lead were elevated above the range of concentrations commonly found in sludge during the 2006 RI activities. All elevated metal concentrations at HPB113 had attenuated to levels found during the 2006 RI at a depth of 10 feet bgs. All of the other soil samples that were analyzed for metals from HPB114, HPB116 and HPB117 were collected from native or reworked soil. Metals concentrations from these three borings were within the ranges found during the 2006 RI for native soil although zinc concentrations for boring HPB116 and HPB117 were at the upper range for zinc. The highest

concentration in soil for mercury and chromium VI were 0.49 mg/kg and 0.37 mg/kg, respectively.

In 2006, a soil sample from a depth of 1.5 feet bgs in boring RB01 had a chromium VI result of 100 mg/kg. This concentration was significantly above the total chromium concentration value for this soil sample. To validate this chromium VI result, the location was resampled (boring RB101) at a depth of 1.5 feet bgs. The chromium VI result for the boring RB101 soil sample was < 1.0 mg/kg and the total chromium result was 17 mg/kg. The questionable chromium VI result of RB01 from the 2006 RI was not validated. Metals concentrations are summarized in Table 19S.

2.2.3 Metals and pH Data Gap Evaluation

An evaluation of soil conditions was completed to further characterize low pH and metals occurrence in sludge and soil adjacent to the northwestern warehouse on the Haack property. Following are the findings of the additional assessment:

- Based on the pH analysis from the additional soil borings, low pH has been confirmed to be limited to sludge and soils immediately adjacent to sludge. Therefore, this data gap is closed.

- In the northwestern Haack property, high concentrations of certain metals were reported from sludge - reworked soil material in boring HPB113 at 2 and 5 feet bgs. Sludge was also encountered in this boring at 10 feet bgs. All elevated metal concentrations at boring HPB113 had attenuated to within the range of concentrations reported during the 2006 RI at a depth of 10 feet bgs. Metals concentrations from borings HPB114, HPB116 and HPB117 were within the concentration ranges for native soil although zinc concentrations in boring HPB116 and HPB117 were at the upper range for zinc. Metals in soil and sludge in this area were to be assessed, there was not a data gap to be completed.

2.3 VOC AND EFH INVESTIGATION IN SOIL

Borings HPB116 and HPB117 were drilled inside the Haack Warehouse as step-out borings for sludge delineation. Sludge was not observed in these borings but soil samples below 10 feet bgs contained hydrocarbon odors. DTSC required that soil samples from these two soil borings be analyzed for gasoline range organics (GRO, C4-C12), diesel range organics (DRO, C13-C28), oil range organics (ORO, C29-C40) and extractable fuel hydrocarbons (EFH, C13-C40) by EPA Method 8015B. In addition, selected soil samples were also analyzed for VOCs by EPA Method 8260B. The results of these analyses are summarized in Table 17S. Ten soil samples were collected from borings HPB116 and HPB117. GRO was analyzed in four soil samples and was reported as j-flagged concentrations in two of the analyzed samples. DRO was analyzed in all of the soil samples and reported in seven samples at concentrations ranging from 4.3J mg/kg to 17,000 mg/kg. ORO was reported in six soil samples at concentrations ranging from 2,400

mg/kg to 15,000 mg/kg. EFH was reported in eight soil samples at concentrations ranging from 4.4J mg/kg to 32,000 mg/kg. Four soil samples were analyzed for VOCs. The following VOCs, at no concentration exceeding 0.035 mg/kg, were reported in one or more of the soil samples:

Compounds Reported	
Benzene	pIsopropyltoluene
Ethylbenzene	1,2,4-Trimethylbenzene
Toluene	1,3,5-Trimethylbenzene
Xylenes	Isopropylbenzene
sec-Butylbenzene	

Based on the reported concentrations in borings HPB116 and HPB117, the DTSC requested additional soil borings within (HPB118) and south (HPB119) of the Haack warehouse to horizontally delineate the extent of petroleum hydrocarbons and VOCs in soil and groundwater. DTSC had determined that vertical delineation was not necessary.

Soil boring HPB118 was drilled approximately 20 feet west of boring HPB116/GWP106. Soil boring HPB119 was drilled approximately 65 feet south (downgradient) of boring HPB116/GWP106. Soil samples were collected at 2, 5 10, 15 and 20 feet bgs and a hydropunch groundwater sample was collected at a depth of 20 feet bgs in both borings (HPB-118-GW and HPB-119-GW). Soil and groundwater samples were analyzed for GRO, DRO, ORO, EFH, VOCs, SVOCs, PAHs, Title 22 metals, mercury and chromium VI. Unfiltered and filtered metals analysis was performed on the groundwater samples. Analytical results are reported in Tables 17S, 18S, 18SA, and 19S.

Five soil samples were collected from HPB118. GRO, DRO, ORO, EFH, VOC, SVOC and PAH were not reported above laboratory reporting limits. The groundwater hydropunch sample from HPB118 had a detection of phenanthrene at 0.044 µg/l and J-flag detections of DRO (98 µg/l) and EFH (130 µg/l). Both unfiltered Title 22 metals and filtered Title 22 metals had detections below their MCLs.

Five soil samples were collected from HPB119. GRO, DRO, ORO, EFH, VOC, SVOC and PAH were not reported above laboratory reporting limits from these soil samples. DRO (8.6 mg/kg) and EFH (8.8 mg/kg) were detected at the two foot bgs sample. J-flag detections of GRO and 1,2,4-Trimethylbenzene were also detected at this sample depth. The groundwater hydropunch sample from HPB119 had a detection of phenanthrene at 0.077 µg/l and J-flag detections of DRO (190 µg/l), EFH (280 µg/l), benzyl alcohol (0.99 µg/l), diethyl phthalate (0.23 µg/l) and di-n-octyl phthalate. Unfiltered Title 22 metals had maximum concentration level (MCL) exceedance for arsenic, barium, beryllium, cadmium, chromium, lead and mercury but filtered Title 22 metals were all detected below MCLs.

Soil sample analytical results for VOCs and EFH are presented in Table 17S, and for selected SVOCs and PAHs in Tables 18S and 18SA, respectively.

2.3.1 VOC and EFH in Soil Data Gap Evaluation

Petroleum hydrocarbons and other compounds west and south of HPB116 and HPB117 have been delineated. This data gap has been closed.

2.4 BACKGROUND INORGANIC CONCENTRATIONS IN SOIL

2.4.1 Arsenic Investigation

An elevated arsenic concentration of 82 milligrams per kilogram (mg/kg) was reported for the soil sample from background soil boring DPW10 at a depth of 2 feet bgs in 2006. Four soil borings (DPW110, DPW110N, DPW110S and DPW110E) were drilled in 2009 to validate the 82 mg/kg concentration and to assess the extent of arsenic in soil in the vicinity of boring DPW10. Additionally, these four borings were to investigate soil pH on the LACDPW property south of the Cooper Sumps.

2.4.2 Arsenic Findings

During the 2009 RI activities, four borings were drilled at and around DPW10 to a depth of 5 feet bgs. Boring DPW110 was drilled at the location of boring DPW10. Borings DPW110N, DPW110S, and DPW110E were drilled approximately 10 feet away from DPW110 to the north, south and east. Soil samples were collected at 2.5 and 5 feet bgs from each boring. A duplicate soil sample was collected and analyzed for the boring DWP110 at 2.5 foot bgs soil sample. Arsenic concentrations ranged from 4.5 to 5.4 mg/kg in the two 2.5 foot soil samples analyzed from DPW110. Arsenic concentrations in soil samples collected from 2.5 feet bgs were less than the 2.5 mg/kg detection limit in borings DPW110N, DPW110S and DPW110E. Arsenic was reported in the 5.0 feet bgs soil sample from DPW110N at 3.4 mg/kg. Arsenic was less than the 2.5 mg/kg detection limit in the 5.0 feet bgs samples from borings DPW110, DPW110S and DPW110E (Table 19AS).

Based on the arsenic results in the soil samples from the four borings, the 82 mg/kg concentration reported from the 2006 RI at DPW10 was not replicated.

2.4.3 Soil pH on LACDPW Property Findings

Soil samples obtained at 2.5 feet bgs and 5 feet bgs from borings DPW110, DPW110N, DPW110S and DPW110E were submitted for laboratory pH determination. Split samples from DPW110 at 2.5 feet bgs reported pH values of 8.05 and 8.35. The remaining seven samples had laboratory pH values ranging from 7.44 to 8.14. Field pH analysis was not performed on these samples.

2.4.4 Background Arsenic Data Gap Evaluation

The arsenic results of the nine soil samples obtained during the 2009 RI investigation did not exceed 5.4 mg/kg, therefore the 82 mg/kg concentration reported in DPW10 during the 2006 RI was not replicated. DTSC has agreed with this conclusion and this data gap is closed.

3.0 Groundwater Characterization (Section 3.9.5)

Groundwater characterization data gaps included identification of potential perched water zones, investigate water quality of the "A" and "B" groundwater horizons at select locations, and investigate "A" horizon groundwater south of the Haack Sump. The intent of the groundwater characterization was to enhance the groundwater monitoring well network with the installation of one groundwater monitoring well (MW-5A) within the shallow "A" groundwater horizon and perform a Hydropunch™ groundwater investigation in order to assess groundwater quality in the "A" and "B" horizons.. The investigation of possible perched water is addressed in Section 4.5 of this report. 2006RI locations are shown on Figure 9A. The groundwater characterization activities were performed at the locations shown on Figure 9AS and as described below:

One "A" horizon groundwater monitoring well (MW-5A) was installed south (downgradient) of the Haack Sump; and

Collection of depth-discrete Hydropunch™ groundwater samples occurred at five locations within the "A" groundwater horizon and at two locations within the "B" groundwater horizon.

Groundwater sampling analytical results are presented in Tables 27S, 28SA, 28SB and 29S. Laboratory reports are provided in Appendix G. Groundwater at the Site is monitored quarterly and provided in quarterly groundwater monitoring reports. Groundwater elevation and analytical results for the upper (A) and lower (B) hydraulic zones are shown on Figures 18S and 20S, respectively. Groundwater rose diagrams are shown on Figure 19S. A summary of general groundwater chemistry for the A and B hydraulic zones is provided in Tables 9A through 9C and monitoring well specifications are provided in Table 14S.

3.1 HYDROPUNCH GROUNDWATER INVESTIGATION

Six hydropunch borings (GWP100 through GWP106) were sampled to further characterize groundwater quality in the "A" and "B" groundwater horizons. Groundwater quality was evaluated in the A horizon west of the Haack Sump (GWP106), south of the Haack Sump (GWP105), south of the Haack Rework Area (GWP101 and GWP100), and south of the South Cooper Sump (GWP104). GWP102 and GWP103 were sampled to assess groundwater quality in the "B" groundwater horizon along the eastern edge of the Cooper property. Locations of the hydropunch borings are shown on Figure 9AS.

Hydropunch™ groundwater samples were obtained in accordance with the proposed sampling depths prescribed in the work plan corresponding with the existing monitoring well screen intervals within the "A" and "B" groundwater horizons:

Groundwater Horizon	2009 RI Sampling Location	Location	Sample Depth (ft-bgs)	Sample Depth (ft-msl)
"A" Horizon	GWP105	West of SV01	18 – 21	-3.5 to 1.5
	GWP101	South of RB01	35.6 – 38.6	-3.5 to 1.5
	GWP100	South of RB03/SV21	33.3 – 36.3	-3.5 to 1.5
	GWP104	Between DPW8, 9, 13 and 14	25.5 – 28.6	-3.5 to 1.5
	GWP106	Adjacent to warehouse on Haack property, same boring as HPB116	17-22	-2.2 to 2.8
"B" Horizon	GWP103	DPW03	70 – 80	-62 to -52
	GWP102	DPW05	70 - 80	-62 to - 52

ft – bgs = feet below ground surface

GWP106 was added to the scope of work based on the presence of sludge in HPB113 and HPB114 adjacent to the Haack warehouse. This hydropunch was taken from the boring for HPB116. Two additional hydropunch groundwater samples were collected from HPB118 and HPB119 during supplemental investigation at the Haack warehouse in August 2010.

3.1.1 Field Methods

The hydropunch borings were completed using the Rhino M5T Wide Track drill rig or the Ramset rig using direct push methods. The drive rods were pushed to the desired depth interval for sample collection. Once the target depth was reached, the rods were retracted, exposing a filter screen and allowing groundwater to enter the inlet screen. Groundwater samples were collected using a small diameter bailer that was lowered through the rods for sample collection. Upon completion of sample collection, the drive rods and samplers were removed and the borings were grouted. Drilling and sampling equipment were decontaminated between drilling locations.

3.1.2 Hydropunch Groundwater Sample Analytical Results

Groundwater samples collected from the hydropunch borings were analyzed for VOCs by EPA Test Method 8260B and GRO, DRO, ORO, and EFH by EPA Test Method 8015B. The samples were also analyzed for SVOCs and PAHs by EPA Test Methods 8270C and 8310, and Title 22 metals by EPA Test Methods 6020, 7470 and 7199. Groundwater sample analytical results are summarized in Tables 27S, 27SA, 28S, 28SA, 28SB, 29S, 30S, and 30SA. A summary of the analytical results is provided below.

3.1.2.1 "A" Groundwater Horizon

In GWP100, no VOCs, SVOCs and PAHs were reported above the MCLs. The dissolved metal concentrations of beryllium, cadmium and nickel were reported above the MCLs. A laboratory pH value of 4.74 was measured. GWP100 was completed and sampled in an area of construction debris (see boring log RB03 in the RI Report).

In GWP101, no VOCs, SVOCs or PAHs were reported above MCLs. Dissolved selenium concentrations were reported above MCLs. A laboratory pH value of 6.74 was also reported.

In GWP104, no VOCs, SVOCs, PAHs or dissolved metals were reported above MCLs.

In GWP105, no VOCs, SVOCs or PAHs were reported above MCLs. Dissolved cadmium and selenium were reported above the MCLs. A laboratory pH value of 6.84 was also reported.

In GWP106, no VOCs were reported above the MCLs. Dissolved arsenic and barium were reported above the MCLs. A laboratory pH value of 7.44 was measured. SVOCs and PAHs were not analyzed due to insufficient water.

In HPB-118 and HPB-119, no VOCs, SVOCs, or EFH were reported above LRLs. Benzyl alcohol and phenanthrene were reported in both samples. Bis(2-ethylhexyl) phthalate and Di-n-octyl phthalate were reported in the groundwater sample from HPB-119. Dissolved selenium in HPB-118 was also above the MCL.

3.1.2.2 "B" Groundwater Horizon

No VOCs, SVOCs, PAHs were reported above the MCLs in GWP102 and GWP103. Dissolved arsenic, barium, and selenium were reported above the MCLs in GWP102. Laboratory pH was not analyzed.

3.1.3 "A" Horizon Monitoring Well MW-5A

The lack of a monitoring well screened in the "A" horizon to monitor groundwater quality down-gradient of the Haack Sump was identified as a data gap in the 2008 RI Report. Monitoring well MW-05A was installed to address this data gap.

3.1.3.1 Field Methods

The boring for well MW-5A was drilled on July 15, 2009 using a Rhino M5T Wide Track drill rig to a depth of approximately 30 feet bgs using 8-inch diameter hollow-stem augers. The well was constructed using 4-inch diameter Schedule 40 PVC casing with 10 feet of 0.010-inch well screen installed from approximately 13 to 23 feet bgs a silt trap consisting of a 5 foot length of solid casing was installed below the screen interval to a depth of approximate 28 feet bgs. The

filter pack consists of RMC #2/16 sand from approximately 11 to 30 feet bgs. A hydrated bentonite chip seal was installed from 8 to 11 feet bgs, and was topped with approximately 6.5 feet of bentonite grout. The well was completed at the ground surface with a 12-inch diameter traffic-rated well cover. During drilling, soils were logged in accordance with the USCS classification system, VOC vapors were measured with a PID, and field pH measurements were taken at selected depths. All of this information was documented on the field boring log and is shown on the boring log provide in Appendix F.

Well MW-5A was developed in accordance with standard procedures. Well stabilization parameters (turbidity, ORP, pH, specific conductivity, and temperature) were monitored and recorded during development. These parameters were allowed to stabilize within 10 percent prior to sampling. Turbidity will be allowed to reach less than 5 nephelometric turbidity units (NTUs) prior to sampling when possible; however, as noted by Puls and Barcelona (1996) there are instances where natural groundwater turbidity is greater than 5 NTU, and therefore the 10 percent stabilization will be followed in those instances with respect to turbidity as well as the other parameters.

Groundwater from Well MW-5A has been sampled using identical methods to those used during quarterly groundwater monitoring events for the other Site wells. A down-hole pump has been dedicated and installed into well MW-5A for groundwater sampling. Groundwater sample analytical results for MW-5A are summarized in Tables 27S, 28S, 29S, and 30S. Groundwater elevation data are summarized in Table 32S.

3.1.3.2 Soil Conditions

Soil encountered in MW-5A consisted of silt and silty sand from approximately 1 to 14 feet bgs. Poorly graded sand with thin interbeds of silt and clay were reported from 14 to 22 feet bgs. A layer of clay was reported from 22 to 26 feet bgs, which was underlain by silty sand with clay interbeds to the terminal depth of 30 feet bgs. Field PID measurements were taken from soil cores throughout the boring and the only reading above 0 parts per million (ppm) was reported at approximately 18 and 22 feet at 0.9 ppm. Field pH measurements were taken from the soil core at various depths and ranged from 7.0 to 9.5. Sludge was not observed in MW-5A. Groundwater was observed during drilling at a depth of 13 feet bgs.

3.1.3.3 Groundwater Sampling Results

Four groundwater sampling events have been performed at well MW-5A through June 2010. Groundwater sampling results are summarized on Tables 27S, 28S, 29S, and 30S. Groundwater collected from MW-5A is analyzed for GRO by EPA Test Method 8015 (modified), VOCs by EPA Test Method 8260B, and semivolatile organic compounds (SVOCs) and PAHs by EPA Test Method 8270C, total sulfides by EPA Test Method 376.2/SM-4500SD, chromium VI by EPA Test Method 7196A/7199, Title 22 Metals (total and dissolved) by EPA Test Method 6020, and mercury (total and dissolved) by EPA Test Method 7470A. Laboratory pH was

analyzed by EPA Test Method 9040B. Laboratory analytical reports for groundwater samples are included in Appendix G.

GRO concentrations in well MW-5A have ranged between of 170 micrograms per liter (µg/L) and 440 (µg/L). Detected VOCs have included benzene, xylenes, naphthalene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene. Benzene concentrations have ranged from 0.73 to 1.7 µg/L. No other VOCs, SVOCs or polynuclear aromatic hydrocarbons (PAHs) have been reported at concentrations at or above their MCLs in groundwater samples from this well. Total and dissolved concentrations of barium, beryllium, cadmium, cobalt, copper, nickel, selenium, vanadium, and zinc have been measured in groundwater samples obtained from MW-5A. Groundwater pH from Well MW-5A has ranged from 4.55 to 5.78 (laboratory measurement) and 4.53 to 5.41 (field measurement).

The following compounds have been reported above either the primary or secondary maximum contaminant levels (MCLs) for groundwater samples from well MW-5A:

VOCs	Total Metals Reported	Dissolved Metals Reported
Benzene (max 1.7 µg/L)	Beryllium, Cadmium, Nickel	Beryllium, Cadmium, Nickel

3.1.4 Discussion of Groundwater Results Downgradient of the Haack Sump

Groundwater samples from well MW-5A and hydropunch location GWP100 contained dissolved beryllium, cadmium and nickel above their MCLs due to the lower pH of the groundwater at these two locations, and an evaluation of delineation of these dissolved metals was requested by the DTSC.

During the 2009 RI activities, total and dissolved metals analyses were performed on groundwater samples obtained from well MW-5A and the seven hydropunch borings. The rationale for measuring both total and dissolved metals was that some of the hydropunch water samples contained high levels of sediment, which caused the total metals concentrations to be elevated. When the samples were filtered, the dissolved metals concentrations showed decreases, in some cases by orders of magnitude. Groundwater metals analysis during the 2006 RI hydropunch sampling was only for total metals and it is likely that past metals results were elevated due to high levels of sediment in the samples.

Stantec reviewed total metals values from the 2006 RI hydropunch locations (HPB10 and CPB25 through CPB27), and a correction factor (CF) was calculated using the 2009 RI total and dissolved metal concentrations from the seven groundwater hydropunch samples (GWP100 through GWP106). The CF was calculated by taking the average of the (dissolved/total metals) value for each metal. For example, the CF for cadmium was calculated using the (dissolved/total metals) values from the GWP water samples: (0.778 + 0.274 + 0.084 + 0.021 +

0.107 + 0.048 + 0.020) / 7 = 0.190. The calculated CFs for the metals are provided in the table below:

Metal	CF	Comment
Antimony	0.193	
Arsenic	0.097	
Barium	0.054	
Beryllium	--	Not calculated, 6 of 7 dissolved results below RL
Cadmium	0.190	
Chromium	0.006	
Cobalt	0.158	
Copper	0.017	
Lead	0.003	
Molybdenum	--	Not calculated, dissolved concentrations greater than total concentrations in 6 of 7 results
Nickel	0.166	
Selenium	0.425	
Silver	--	Not calculated, too many non detects
Thallium	--	Not calculated, too many non detects
Vanadium	0.006	
Zinc	0.046	

CF - Correction Factor

The appropriate CF for each metal was then multiplied by the 2006 RI concentration for each metal reported from each depth at HPB10 and CPB25 through CPB27 to calculate an extrapolated dissolved metal concentration. The total and dissolved metal results, including extrapolated dissolved metals values from the 2006 RI locations, are provided on the cross-sections in Figures H-2 through H-4 in Appendix H. Metals concentrations from the 2009 investigation are summarized in Tables 29S and 30S.

The following observations are made based on the 2006 extrapolated metals values and 2009 RI groundwater data with respect to reported VOCs, SVOCs and dissolved metals concentrations in the “A” groundwater horizon south of the Haack Sump:

- Delineation to the west by hydropunch locations GWP105 and GWP106 for VOCs, SVOCs, PAHs, and dissolved metals;

- Delineation to the east by CPB25 for VOCs and SVOCs. Reported concentrations of total metals included arsenic, chromium and nickel (just above the laboratory reporting limit [LRL]). Extrapolated dissolved metal concentrations using the CFs, provide delineation by CPB25;

- Delineation to the southeast by wells MW-4A and MW-4B for VOCs, SVOCs, PAHs, and dissolved metals, and CPB27 for VOCs, SVOCs. Only arsenic was reported in the total metals analysis in CPB27 at 78 feet bgs (“B” groundwater horizon); the 25

and 52 foot depth intervals sampled did not show any elevated total metals above the MCLs. Extrapolated dissolved metal concentrations using the CF provide delineation by CPB27;

- South by hydropunch location GWP100 and GWP101 for VOCs, SVOCs, PAHs, and dissolved metals, with the exception of GWP100 which has reported concentrations of dissolved metals (beryllium, cadmium, and nickel) above the MCLs.

Vertically, to depths of 80 feet bgs, the reported concentrations in well MW-5A are delineated by HPB10, which is located just south of well MW-5A, and to the east and southeast by CPB25, CPB26 and CPB27. CPB25, CPB26, and CPB27 were located in the west Cooper Sump berm east and southeast of well MW-5A. Cross Sections A-A', B-B' and C-C' provided in Appendix H show reported analytes in groundwater above the MCLs.

- HPB10 defines the vertical for VOCs and SVOCs to 71 feet bgs. Arsenic, chromium and nickel were reported in the total metals analysis above the MCLs. Extrapolated dissolved metal concentrations using the CF provide delineation by HPB10;

- To the east, CPB25 further defines the vertical direction for VOCs and SVOCs to 52 feet bgs. Arsenic, chromium and nickel (just above the LRL) were reported in the total metals analysis above the MCLs. Extrapolated dissolved metal concentrations using the CF provide delineation by CPB25;

- To the southeast, CPB26 and CPB27 further define the vertical direction for VOCs and SVOCs to a maximum depth of 80 feet bgs. In CPB26, total metals reported include arsenic, barium, beryllium, chromium, and nickel were reported above the MCLs, and in CPB27 only arsenic was reported above the MCL at (78 feet bgs). Extrapolated dissolved metal concentrations using the CF provide delineation by CPB26 and CPB27;

Based on these observations, impacts to groundwater south of the Haack Sump {with the exception of reported concentrations of dissolved metals (beryllium, cadmium, and nickel) above the MCLs at GWP100 are delineated laterally and vertically using analytical data from site groundwater monitoring wells MW-4A and MW-4B, 2009 groundwater hydropunch locations (GWP), and 2006 RI locations (HPB10 and CPB25 through CPB27).

Groundwater analytical data is provided in the Tables 27S through 32S.

3.1.5 Groundwater Characterization Data Gap Evaluation

Additional evaluation of groundwater quality in the A and B groundwater horizons was requested by DTSC at various locations around the site. No VOCs other than benzene has been reported above MCLs. SVOCs and PAHs were below their MCLs in the groundwater samples analyzed during the 2009 RI activities. One or more of dissolved arsenic, barium, beryllium, cadmium, nickel, or selenium were reported at or above MCLs in five of the hydropunch locations. DTSC has confirmed that groundwater has been sufficiently delineated south of the Haack Sump. This data gap is closed.

4.0 Active Soil Gas Investigation

Additional soil gas investigation was performed to further characterize subsurface vapor concentrations of VOCs, hydrogen sulfide and methane at the Site. Data collected from the soil vapor probes will be used to provide additional soil vapor concentrations of VOCs, hydrogen sulfide and methane for input to the Baseline Human Health Risk Assessment (BHHRA), specifically for risk evaluations involving the vapor intrusion to indoor air exposure pathway. The temporary soil vapor probe locations for the 2006 RI and 2009 RI are shown on Figures 25 and 25S, respectively

The soil gas characterization was planned to address the following concerns raised by DTSC about data collected during the 2008 RI:

- Naphthalene was not previously analyzed in the soil vapor samples even though it was detected in soil matrix and vapor flux samples;
- Soil vapor probes should be placed closer to the on-site building (Haack Administration Building) to provide more representative data for evaluating potential risk to current occupants of the building from indoor air exposure;
- Soil vapor samples were not collected from some of the locations with the highest reported PID readings in soil/sludge;
- Several field protocols were also implemented at DTSC's request including use of glass syringes, additional QA/QC processes for evaluating naphthalene, leaving the vapor probes in place for a longer period of time, and use of PEEK tubing; and
- Soil gas sample analytical results from the 2006 RI are presented on Table 34, and soil gas sample results from the 2009 RI are presented on Tables 33S and 34S. Laboratory reports are provided in Appendix I.

During the 2006 RI, in situ air permeability testing was performed to obtain site-specific air permeability data for input into the BHHRA. Data collected from the in situ air permeability testing suggested that soil pores at several of the test locations were saturated. In addition, at one test location (SV18), approximately 4 inches of standing water was measured in the bottom of the vapor probe. This raised concerns that perched water zones could be present beneath the site and the DTSC requested further evaluation of the presence and extent of perched water in letters dated March 4, April 28, and November 21, 2008. Evaluation of potential perched zones was to be performed by installing temporary monitoring well points near previous air permeability testing locations. Investigation of perched water is discussed in Section 4.5. In addition, 49 soil samples were collected and analyzed for grain size distribution and moisture

content to obtain site-specific geotechnical data for use in the BHHRA as described in Section 4.2.

4.1 FIELD METHODS

Twenty-four soil gas probes were installed and 22 of the 24 locations were sampled. Two of the locations (SV05/HPB08 and SV110) could not be sampled due to encountered water at the target sample depths. Soil vapor probes were installed at the locations listed in the following table and are shown on Figure 9AS.

2009 RI Soil Vapor Probe ID	Location	GPS Latitude	GPS Longitude	Target Sample Depths (ft-bgs)
	North Haack Sump			
SV132	Southeast of SV01/HPB03	33° 52' 21.16488"	-118° 18' 3.53"	7, 11-13
SV105A/B	SV05/HPB08	33° 52' 21.68472"	-118° 18' 3.67"	5, 8, 10
SV110	SV10	33° 52' 21.61776"	-118° 18' 2.95"	4, 10-12
SV111	SV11/HPB04	33° 52' 20.5608"	-118° 18' 2.58"	5, 12-13
SV133	West of HPB12	33° 52' 20..93088"	-118° 18' 2.9"	5, 10-12
SV134	South of SV06	33° 52' 20.88048	-118° 18' 3.65"	5, 10-12
SV131	Southwest of SV05/HPB08	33° 52' 21.40752"	-118° 18' 4.07"	5, 10-12
	Haack Rework Area			
SV121	SV21/RB03	33° 52' 18.53904"	-118° 18' 1.53"	5, 15
SV135	Northwest of Residence	33° 52' 18.09516"	n/a	5, 15
SV136	North of Residence	33° 52' 18.22836"	-118° 18' 1.92"	5, 15
SV137	Northeast of Residence	33° 52' 18.1488"	-118° 18' 1.59"	5, 15
	North Cooper Sump			
SV116	SV16	33° 52' 21.68652"	-118° 18' 1.45"	5, 10-12
SV117	SV17	33° 52' 20.84988"	-118° 18' 1.36"	5, 10
SV118	SV18	33° 52' 19.93944"	-118° 18' 1.08"	5, 11-13
SV122A/B	SV22/CPB23	33° 52' 21.73836"	-118° 18' 0.46"	5, 10-12
SV124	SV24/CPB24	33° 52' 21.74772"	-118° 17' 58.71"	5, 10-12
SV126	SV26	33° 52' 21.6264"	-118° 17' 57.8"	5, 11-13
SV127	SV27/CPB08	33° 52' 18.6554"	-118° 17' 57.72"	5, 7-9
	South Cooper Sump			
SV128	SV28/DPW04	33° 52' 19.32672"	-118° 17' 57.68"	5, 7-9

2009 RI Soil Vapor Probe ID	Location	GPS Latitude	GPS Longitude	Target Sample Depths (ft-bgs)
SV129	SV29/CPB06	33° 52’ 18.6654”	-118° 17’ 57.72”	5, 7-9
SV125	SV25/CPB22	33° 52’ 17.832”	-118° 17’ 58.8”	5, 11-13
SV123	SV23/CPB21	33° 52’ 17.85”	-118° 17’ 59.73”	5, 12-14
SV120	SV20/CPB27	33° 52’ 18.51564”	-118° 18’ 0.81”	5, 10-12
SV119A/B	SV19	33° 52’ 19.1874”	-118° 18’ 0.68”	5, 10

Each soil vapor probe location was located adjacent to previous soil gas boring locations using a GPS device or licensed surveyor. The soil vapor probes were drilled using a direct push drill rig with 1.5 to 2-inch core rods. Soil samples were collected during drilling and logged in accordance with the USCS with particular attention given to moisture. Soil samples collected from the depths specified in the table above were submitted for laboratory analysis for grain size distribution by ASTM Method D422, moisture content by ASTM Method D2216, and for VOCs, hydrogen sulfide and methane in soil gas.

Upon completion of drilling and soil sample collection, PEEK or Teflon tubing was attached to each soil gas implant and the implant was installed through the drill rods to the desired depth. The annular space around the soil gas implant was then backfilled with clean sand extending approximately 6 inches above and below the depth of the soil gas implant. Six to 12-inches of dry bentonite pellets were placed above the clean sand. Hydrated bentonite was placed above the dry bentonite to prevent ambient air intrusion from occurring.

4.1.1 Purge volume testing

Purge volume tests (PVTs) were planned to be performed at two locations, SV128 and SV105. Water was encountered in the boring at SV105, and it was agreed with the on-site DTSC geologist that the PVT could be moved to SV119. At location SV128, the PVT was to be conducted to analyze for hydrogen sulfide and methane and at SV119 the PVT was to be conducted to analyze for VOCs. Each PVT location was tested for 1, 3 and 7 purge volumes to determine the appropriate volume for soil gas sample collection. Based on the results of the PVTs, the 1 purge volume samples were determined to be the most representative and appropriate for sample collection. The PVT sample test results are provided in Table 35S.

4.1.2 Soil Gas Sample Collection

Soil gas samples were obtained one to two days after implant installation to allow subsurface conditions to equilibrate. Based on the results of the PVT, one volume of air was purged from each soil gas sampling location prior to sample collection. A leak test of the annular seal was

performed at each sampling location using 1,1-difluoroethane (1,1-DFA). The sampling was conducted at a flow rate of 100 to 200 milliliters per minute. Soil gas samples were collected from the designated depths at each location. The samples for VOCs, hydrogen sulfide and methane analysis were collected in Summa canisters and logged on a Chain-of-Custody form. Hydrogen sulfide and methane were analyzed using field instruments in accordance with DTSC guidelines (DTSC, 2005). Soil gas sampling and analyses were performed by H&P Mobile Geochemistry, Inc. (H&P) of Signal Hill using both mobile and stationary laboratory facilities. Soil gas samples were analyzed for VOCs within 48 hours by a California Department of Health Services-certified laboratory in accordance with EPA Test Method TO-15. As required by DTSC, a LRL of 10 µg/m^3 or lower was used for VOC analysis.

In the event that naphthalene was detected in the soil gas samples above the CHHSL for shallow soil gas for industrial/commercial settings of 106 µg/m^3 and residential level of 31.9 µg/m^3 (for samples near the residences), the sample locations would be resampled and analyzed in accordance with EPA Test Method TO-17/Tenax; however, no soil gas samples were reported above the commercial and residential CHHSLs for naphthalene.

Pursuant to DTSC's request, additional QA/QC vapor samples were analyzed at H&P's stationary laboratory. H&P prepared 30 µg/m^3 naphthalene standards in Summa canisters that were analyzed before and after each sample batch to verify that the system was capable of recovering naphthalene. Additionally, if there were any positive results for naphthalene, additional blanks were prepared and run after the reported results to detect potential carryover of naphthalene. In accordance with DTSC guidance, QA/QC samples including one duplicate soil gas sample were collected each day that sampling occurred.

4.2 RESULTS OF GEOPHYSICAL PROPERTIES ANALYSIS

4.2.1 Soil Grain Size and Moisture Content Analysis

Forty-nine (49) soil samples were analyzed for moisture content and grain size for use in the BHHRA. Laboratory analysis of these characteristics was performed by PTS Laboratories, Inc. of Santa Fe Springs. The average moisture content for all of the analyzed soil samples was 15.9 percent. The lowest moisture content value was 4.0 percent and the highest moisture content was 32.8 percent. Based on grain size analysis, the predominant grain sizes for the analyzed soil samples was silt or fine sand. Clay was generally reported to range from 10 to 20 percent with a low value of 1.58 percent, and a high value of 37.16 percent. Laboratory reports are provided in Appendix I.

4.3 RESULTS OF SOIL GAS SAMPLE ANALYSIS

Soil gas sample analyses were performed by H&P using both mobile and stationary laboratory facilities. Laboratory reports for soil gas analyses are provided in Appendix I. Soil gas analytical results are summarized in Tables 33S, 34S, 35S, 36S, and 37S.

4.3.1 Soil Vapor Leak Detection Compound Testing

The soil vapor leak detection compound 1,1-difluoroethane (1,1-DFA) was reported at eight soil vapor probe locations during sampling. The results for 1,1-DFA ranged between 9.8 to 85 micrograms per cubic meters (µg/m3), with 7 out of the 8 reported 1,1-DFA concentrations ranging between 9.8 and 31 µg/m3. H&P has stated that using a conservative concentration value of 7,500 µg/L of 1,1-DFA at the ground surface for the leak test, the 85 µg/m3 concentration of 1,1-DFA represents a leak rate of 0.0001%. A review of the volatile organic compound (VOC) soil vapor table also indicates that the reported 1,1-DFA concentrations do not suggest that there was a significant leak of ambient air during the soil vapor sampling at these eight soil vapor probes (Table 35S).

4.3.2 Hydrogen Sulfide and Methane Testing

Forty-three soil gas samples were analyzed for hydrogen sulfide and methane. Hydrogen sulfide was reported in one soil gas sample (SV131-VS-10') at a concentration of 0.56 parts per million by volume (ppmv). Methane was reported in 16 soil gas samples at concentrations ranging from 11 to 520 ppmv. Methane and hydrogen sulfide results are summarized on Table 36S.

4.3.3 VOCs Analysis

Forty-six soil gas samples were collected across the Site during the 2009 RI activities. The reported VOCs, number of detections, and applicable CHHSL value for shallow soil gas at commercial/industrial sites is provided in the table below:

Analyte	Number of Detections	Concentration Range (µg/m^3)	CHHSLs (µg/m^3)
Propane	25	12 - 6,800	--
Chloromethane	6	9.1 - 85	--
Chloroethane	6	8.2 - 310	--
Trichlorofluoromethane	2	5.7 - 9.6	--
1,1,2-Trichlorotrifuoromethane	1	21	--
Carbon Disulfide	35	6.7 - 2,600	--
n-Hexane	26	5.1 - 2,600	--
Chloroform	5	5.8 - 40	--
Cyclohexane	29	22 - 15,000	--
n-Heptane	24	6.4 - 4,500	--
Benzene	25	5 - 380	122
Toluene	41	5.5 - 3,800	378,000
Ethylbenzene	30	5.7 - 410	postponed
m,p-Xylenes	38	6.9 - 2,200	887,000
o-Xylenes	31	5.6 - 450	879,000
1,2,4-Trimethylbenzene	33	5.3 - 270	--
1,3,5-Trimethylbenzene	25	5.6 - 1,100	--

Analyte	Number of Detections	Concentration Range (µg/m^3)	CHHSLs (µg/m^3)
4-ethyltoluene	21	5.4 - 100	--
Chlorobenzene	2	8.5 - 9.5	--
1,4-Dioxane	1	8	--
Tetrachloroethene (PCE)	19	5.5 - 92	603
Trichloroethene (TCE)	7	7.9 - 13	--
Bromodichloromethane	1	5.1	--
Naphthalene	3	10 - 13	106
Acetone	34	14 - 7,400	--
2-Butanone	15	5.1 - 4,800	--
4-methyl-2-pentanone	9	5.3 - 860	--
1,1-Difluorethane (1,1-DFA)	7	9.8 - 85	--

Notes:

CHHSLs - California Human Health Screening Levels for shallow soil gas at commercial/industrial sites.
-- - None available

The only reported analyte above the CHHSLs for shallow soil gas at commercial/industrial sites was benzene. Out of 25 reported benzene concentrations, only three soil vapor concentrations were reported above the commercial/industrial CHHSL value of 122 µg/m^3. These benzene concentrations were reported in the following soil gas samples:

Sample ID	Concentration (µg/m^3)	Location
SV118-VS-5'	250	West berm at the SW corner of the North Cooper Sump, adjacent to TW105 and sludge interbeds.
SV119-VS-10'	340	Northwest corner of the South Cooper Sump and beneath sump sludge deposits.
SV127-VS-5'	380	East portion of the North Cooper Sump, adjacent to TW103 and beneath surficial sludge.

VOC results for soil vapor samples are summarized in Tables 33S and 34S.

4.3.4 Naphthalene Testing

Very low concentrations of naphthalene were reported in only three soil gas probe locations at 10 µg/m^3 (SV117-VS-5'), 12 µg/m^3 (SV127-VS-5'), and 13 µg/m^3 (SV117-VS-10'). These reported concentrations are all below the CHHSL for naphthalene in shallow soil gas at commercial/industrial sites.

4.3.5 Haack Administrative Building

The Haack Administrative Building is used as the office for various activities occurring on the Haack property. Based on review of the soil gas analytical data, soil gas samples collected adjacent to this building (SV111, SV132, SV133 and SV134) did not have detections of VOC concentrations greater than the CHHSLs for shallow soil gas at commercial/industrial sites.

4.3.6 Residence South of Haack Rework Area

Four soil-gas sampling locations (SV121, SV135, SV136, SV137) were located near the residence of the easternmost residential property south of the Haack Rework Area. Based on review of the soil gas analytical data, the soil gas sample collected from SV135 at 5 feet bgs had the only compound reported at a concentration (benzene at 50 µg/m^3) greater than its residential CHHSLs for shallow soil gas. Soil vapor probe SV135 is located in a vacant corral area approximately 40 feet west of the residential building. The past use of the area near SV135 is not known; however, inoperative vehicles are located in the general area.

4.4 SOIL GAS DATA GAP EVALUATION

All soil gas vapor data gaps have been addressed with the completion of the 2009 RI soil gas investigation.

- Based on the results of soil gas samples collected from vapor wells installed adjacent to the Haack administration building, no VOC detections above applicable commercial/ industrial CHHSL concentrations for shallow soil gas were detected.

- Naphthalene was analyzed in 43 soil gas samples and reported soil gas concentrations were below the CHHSL for commercial/industrial sites.

- Benzene concentrations were reported in three on-Site soil gas samples above the CHHSL for commercial/industrial sites. The three locations were along the margins of the North and South Cooper sumps.

- A benzene concentration, above the benzene residential CHHSLs for shallow soil, was reported in a soil gas sample (SV135 at 5 ft. bgs) on the residential property. This was the only VOC compound reported above its applicable residential CHHSLs for shallow soil gas and its sampling location was in a vacant corral area that is approximately 40 feet west of the residential structure.

This data will be used to supplement the BHHRA and further evaluate potential human health risk.

4.5 PERCHED WATER INVESTIGATION (3.12.6)

Upon review of the in-situ air permeability testing section in the RI Report, the DTSC commented that the possible occurrence of shallow perched groundwater was a data gap that needed to be addressed. The 2009 RI activities included the installation of temporary wells at 11 locations to assess the potential for perched water within discrete zones above the "A" groundwater horizon. These 11 temporary wells had their screened intervals at depths where sediments above the upper A hydraulic zone were noted in the 2006 RI as being "wet".

Several locations adjacent to or beneath the Cooper and Haack sumps were identified as areas that appeared to have transmissible water that could be representative of shallow perched water. To evaluate these potential perched water zones 11 temporary monitoring wells were installed at the following locations (Figure 9AS):

Location	Depth (ft-bgs)	Elevation (ft-msl)	Depth (ft-msl)
TW108 (SV01)	7 – 8	19.82	11.82 – 12.82
TW109 (SV05)	5 – 6	19.62	13.62 – 14.62
TW110 (SV10)	5 – 6	19.86	13.86 – 14.86
TW107 (SV11)	5 – 6	20.88	14.88 – 15.88
TW105 (SV18)	5 – 6	20.89	14.89 – 15.89
TW104 (SV20)	5 – 6	20.52	14.62 – 15.52
TW103A, TW103B (SV27)	5 – 6	17.52	11.52 – 12.52
TW101A, TW101B (SV28)	5 – 6	17.38	11.38 – 12.38
TW100 (CPB11R)	10.5 – 11.5	20.49	8.99 – 9.99
TW106A, TW106B (CPB14)	6.0 – 6.5	20.52	14.02 – 15.52
TW102A, TW102B (SV29)	10.5 – 12.5	20.52	8.02 – 10.02

ft – bgs = feet below ground surface ft-msl = feet to mean sea level datum

4.5.1 Field Methods

The temporary monitoring points were installed at the latitudinal/longitudinal coordinates of the 2006 RI locations with the Rhino M5T Wide Track drill rig using direct push methods. The drive rods were pushed to the desired depth and once the target depth was reached, a 1-inch diameter temporary well was installed with the appropriate screen interval (as listed in the table above). The wells were constructed with the appropriate sand pack and bentonite seal. The temporary wells were left in place for two weeks and were gauged for the presence of water several times over a two week period. If a measurable quantity of water was present, the wells were then sampled. Purging of the wells was not conducted due to the expected limited quantity of water and slow recharge into the wells.

Stantec used a BESST, Inc. Blatypus Mini Pump to sample the temporary wells that had sufficient water. Each temporary well that was sampled was outfitted with dedicated tubing that was connected to the pump and controller unit for sampling. The pump was decontaminated between sampling locations in accordance with the FSP. Equipment blanks were collected each day sampling was performed as an additional quality control check.

4.5.2 Evaluation of Perched Groundwater

After the two weeks only four of the 11 monitoring well locations (TW103, TW108, TW109 and TW110) contained sufficient water quantities to sample. A summary of the findings associated with the samples is provided below:

- Limited quantities of shallow water were identified in the northeast Cooper Sump area in Temporary Wells TW103A and TW103B. These two temporary wells are in an area that has the lowest surface elevation at the Site. Ponding of rainwater during storm events occurs at this location. During sampling, a limited quantity of water could be extracted from each well and only enough water to analyze VOCs was obtained. No VOCs were reported above the MCLs.

- Perched water was also identified in the Haack Sump area in Temporary Wells TW108, TW109, and TW110. The largest volumes of perched water were found in TW109 and TW110, both of which are located within the Haack Sump near the north Haack property boundary. A 12-inch water main runs beneath the sidewalk immediately north of the property boundary and is believed to be the source of the perched water. Sediments beneath Artesia Boulevard immediately north of the sidewalk at boring AB101 were observed to be wet as well.

- Concentrations of VOCs above the MCLs were identified only in TW108 with benzene reported at 1.6 µg/L, which is just above its MCL of 1.0 µg/L. Some SVOCs were reported in water samples collected from TW108, TW109 and TW110 at concentrations less than 100 µg/L or estimated (J-flagged) concentrations. No PAH concentrations were detected at a concentration exceeding 5 µg/L. Sufficient water was generated for laboratory pH analysis in temporary wells TW108 (lab pH of 3.82)

and TW110 (lab pH of 6.93). Field pH values were not obtained from water samples from these locations.

Concentrations of total metals were reported in water samples from TW108, TW109 and TW110, and dissolved metals were reported in water samples from TW109 and TW110. Not enough water could be collected from TW108 to analyze for dissolved metals. Concentrations of metals reported in water samples from TW108, TW109, and TW110 above either the primary and/or secondary MCLs are as follows:

Temporary Well	Total Metals	Dissolved Metals
TW108	Beryllium, Cadmium, Chromium, Lead, Nickel, Selenium, Zinc	Not Analyzed
TW109	Antimony, Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Nickel, Zinc	Nickel, Zinc
TW110	Barium, Lead, Nickel	No metals exceeded MCLs

Groundwater sampling analytical results are presented on Tables 27SA, 28SA, and 30SA. Laboratory reports are provided in Appendix G.

4.5.3 Perched Groundwater Data Gap Evaluation

Limited quantities of perched water were identified in two areas of the Site: the northeast portion of the Cooper property and the northern portion of the Haack property. The presence of perched water in the northeast corner of the Cooper property is attributed to the area's low elevation and ponding of water during rain events. The presence of perched water on the Haack property is believed to be attributed to a nearby water main beneath the sidewalk immediately north of the Haack property. The perched zones appear to be limited in lateral extent. The DTSC has commented that, although some parameters were detected above MCLs, no additional perched water investigation is necessary. The perched groundwater data gap is closed.

5.0 Updated Site Conceptual Model (Section 4.0)

The additional RI activities performed during 2009 and 2010 addressed the remaining data gaps identified during the 2006 RI activities and allowed completion of the Site Conceptual Model.

5.1 TOPOGRAPHY AND SURFACE WATER

5.1.1 Topography

Early topographic maps of the Site area indicate that the Site consisted of an elevated area (upland) south and east of a topographic low (former Dominguez slough). This upland area had a general downhill slope from north (approximately 35 feet msl) to the south. Excavation activity during the 1920s and possibly into the 1930s created a significant surface depression within the north-central (Haack sump area) and northeastern portions (both Cooper sump locations) of the Site. These areas were excavated to depths of approximately 12 to 14 feet msl. The uplands on the Cooper property had been completely excavated by 1929. Additional soil excavations into the upland had occurred throughout the eastern portion of the Haack property during the 1930s. Between 1938 and 1942, localized portions of the Haack and Cooper sump areas may have been excavated to depths near the water table of the upper hydraulic A zone (approximately 7 to 9 feet msl) to create the Haack and Cooper sumps and sump berms. Excavation activity into the upland in the central portion of the Haack property occurred between 1942 and the early 1950s as the northern portion of the Haack property was developed.

A significant topographic change occurred between 1956 and 1957 when the Dominguez Channel was relocated and constructed through the uplands south of the Site. The construction and creation into a concrete lined channel removed a considerable quantity of soil south of the Site. Between 1958 and 1962, further excavation of the Haack upland occurred as the central portion of the Haack property was developed to match the present-day topography. The surface topography of the Haack Rework area has been modified at various times between the early 1960s and the mid-2000s as development of this area has changed.

Presently, the Site's topographic high is in the southwest and south-central portion (residential parcels) of the Site. Relatively flat surfaces occupy the northern portion of the Haack property and most of the Cooper property. The Site's topographic low is in the northeast corner of the Cooper property (Figure 2AS).

5.1.2 Surface Water

Surface water at the Site occurs periodically during rain events on the Cooper property as puddles on the geosynthetic liner above the two Cooper sumps and on the geosynthetic liner along the low lying area of the eastern Cooper property immediately west of the LACDPW property. Most of the puddled surface water evaporates.

The Dominguez Channel, a concrete-lined channel, immediately south of the Site is the most significant surface water feature in the vicinity of the Site. Water quality in the Dominguez Channel is worse than the quality of the groundwater immediately beneath the Site. The channel construction (presence of weep holes at the base of the concrete channel) has altered the groundwater flow of the upper A groundwater horizon. The water table of the A groundwater horizon is intercepted by the channel weep holes and results in a southward flow direction for the upper A groundwater horizon beneath the Site.

VOC's, including tetrachloroethene and trichloroethene, have been measured in surface water within the Dominguez Channel both upgradient and downgradient of the Site. These VOCs are not present in groundwater beneath the Site. The concentrations of the dissolved metals, arsenic, barium, copper, lead and molybdenum in channel surface water samples are approximately 2 to 4 times higher than concentrations in the upper hydraulic A zone beneath the Site while the dissolved concentration of antimony in the channel surface water is approximately 10 times the concentration in groundwater immediately beneath the Site. None of the total metal concentrations measured in groundwater from the upper hydraulic A zone exceeded the total metals concentrations found in the channel surface water. Additionally, Dominguez Channel surface water pH both upgradient and downgradient of the Site is approximately 9.0 which is higher than the pH values found in the upper hydraulic A zone groundwater beneath the Site (approximately 4.5 to 7.1).

The Site groundwater that migrates into the Dominguez Channel does not impact the water quality of the Dominguez Channel south of the Site (Figure 2AS).

5.2 SUMPS AND SLUDGE

5.2.1 Distribution of Sludge

The vast majority of Site sludge material is present within the original three sumps and within the Haack Rework Area. East of the two Cooper sumps, overflow of sludge material across the eastern Cooper berms and into the topographic low resulted in occurrences of sludge at the surface and at shallow depths. The eastern lateral barrier of sludge migration was near the base of the railroad grade slope located on the LACDPW property. The southern barrier of the Cooper South sump is the berm immediately north of the LACDPW property line. The northern barrier of the Cooper North sump is the berm immediately south of the Artesia Boulevard sidewalk. There is a berm that separates the two Cooper sumps.

The Haack sump is delineated to the east by the Haack - Cooper berm. The elevation of this berm was apparently constructed as the sludge elevation within the Haack sump increased. There are thin layers of sludge, sandwiched between reworked soils within this berm. Therefore Figure 9AS does not illustrate the presence of this berm between the Haack and Cooper sumps. This berm is visibly present in air photographs taken in 1941. Sludge extends beneath Artesia Boulevard along the eastern portion of the Haack property. Much of the sludge material beneath Artesia Boulevard in this area is a mixture of sludge fragments within fine-grained sediments.

Such an occurrence identifies reworked materials. It is probable that during road widening of Artesia Boulevard in the early 1950s, the Haack berm and sludge in the northern-most portion of the Haack sump were encountered and these materials were redeposited in the Artesia Boulevard to raise the surface grade in this area.

The western delineation of sludge within the Haack sump is immediately east of the northeastern side of the present Haack northwestern structure and the sump's southern boundary lies just north of the Haack administration building within the center of this property. The remainder of the Haack sump occupies the northeastern portion of the Haack property (Figure 9AS). Between 1946 and 1951 the western and central portions of the Haack sump were reworked and mixed with soil from the bluffs south of the sump to create a parking lot. The eastern portion of the Haack sump is presently covered by a concrete slab.

Sludge distribution as observed in the December 1941 air photo (Appendix J) within the Haack Rework Area has been significantly disrupted by surface scouring deposition of excavated soils and regrading that has occurred in this area during the past 70 years. Sludge in this area occurs in the northern portion of the two easternmost Residential lots, and in an irregular boundary in the southeastern corner of the Haack property. Figure 15S does not illustrate the presence of a berm that existed between the Cooper South sump and the elevated sludge deposits west of the Cooper South sump. Over time, sludge has interfingered within the reworked sediments of this berm as a result of the weight of the present overlying soil. This, the potential overlapping of sludge over the berm during sludge disposal operations and the presence of existing geosynthetic cover prevents a definitive delineation of sludge between the Cooper South sump and the Haack Rework Area.

The thickness of sludge in the sumps and Haack Rework Area is variable due to uneven basal surfaces and interlayered reworked sand deposits. Typical total thickness of sludge in the Cooper North sump is approximately 6 feet with a maximum thickness of 15.5 feet. Typical total thickness of sludge in the Cooper South sump is approximately 4 to 5 feet with a maximum thickness of 11.5 feet. Typical total thickness of sludge in the Haack sump is approximately 4 to 5 feet with a maximum thickness of 12 feet. Sludge deposits in the Haack Rework Area slope and thicken to the northeast, obtaining a maximum thickness of 6 feet. There are approximately 16,600 cubic yards of sludge present at the Site. Sludge thickness contours are illustrated on Figures 15S and 16S.

5.2.2 Characteristics of Sludge

Overall the sludge at the Site are similar in chemical composition, are highly viscous and exhibit solid-like properties although the sludge are subject to gradual deformation and viscoelastic flow when placed under stress. The sludge within the Cooper North and Cooper South sumps possess similar physical properties although the Cooper North sludge has a slightly lower viscosity, lower ASTM D36 softening point and lower acidity content. The sludge treatability testing and Stantec's field experience indicate the viscosity of the sludge is temperature

dependant. Changes in ambient temperature of 20 or 30 degrees Fahrenheit affect the viscosity of the sludge and that the sludge in the Cooper North sump deforms quicker than the sludge in the Cooper South sump.

Bench scale treatability testing of the sludge suggests that the sludge material is unsuitable for use as recycled asphalt for road construction or roofing since it has high viscosity, high solids content, and no ductility. Although treatability testing shows that the sludge can be effectively treated, treatment would require disturbance of the sludge. Hydrogen sulfide and sulfur dioxide entrained in the sludge will be released if it is actively disturbed.

5.3 UNSATURATED ZONE

5.3.1 Vadose Zone and Perched Water

The RI activities documented that the vadose zone across the Site ranges from an approximate elevation of 5 to 8 feet msl which is approximately 12 to 15 feet bgs in the vicinity of the Haack sump and the two Cooper sumps. The subsurface investigations of this RI have confirmed that the near surface sediment beneath the Site, which is part of the Bellflower Aquiclude, was primarily laid down by fluvial processes. The undisturbed vadose zone sediments predominantly consist of fine grained clay and silt with some silty sand deposits. Where disturbed by human activity (berms and reworked soil) the vadose zone typically consists of silts and silty sands occasionally containing brick and/or sludge fragments. The Haack Rework Area also contains near surface re-deposited sand.

In 2006 and 2009 investigations identified that the vadose zone had localized wet sediments that contained perched water. The wet soil conditions in these vadose soil samples were not indicative of significant perched groundwater due to the limited lateral extent of the observed wet conditions. The 2009 investigation determined that perched water which could be purged from temporary wells were located in the northeastern corner of the Cooper property in an area that has the lowest surface topography at the Site and in the Haack sump area near the north Haack property boundary. It is believed that a water line leak is contributing to the perched water conditions in the northern portion of the Haack property. These two perched water areas are where 3 of 4 shallow soil-gas samples could not be obtained during the 2006 RI activities.

Based on the chemical analyses of more than 300 sludge and soil samples, pH leaching and migration of hydrocarbons from the sludge into the soil is not extensive. While there are a few isolated areas where some migration of hydrocarbons has occurred, the migration of these hydrocarbon compounds into the adjacent soil is typically limited to a distance of a few feet from the soil/sludge contact. The attenuation of low soil pH adjacent to sludge also typically occurs over a distance of 2 to 4 feet from the soil/sludge contact (Appendix E). Migration of sludge constituents does not appear to be laterally or vertically extensive.

Perched groundwater within the Haack sump, having been in contact with sludge, may exhibit low pH and low concentrations of some SVOCs compounds. Nickel, zinc and possibly other metals may exceed groundwater MCLs in their dissolved state.

5.3.2 Vadose Soil-Gas Conditions

The 2009 soil-gas investigation documented that the five most detected VOCs were toluene, m,p-xylenes, carbon disulfide, 1,2,4- trimethylbenzene and o-xylenes. Hydrogen sulfide was detected in only one sample and naphthalene was detected in only 3 samples above 10 µg/m^3.

The results of in-situ air permeability testing, active soil gas testing, and surface vapor flux testing suggest that vapors could migrate through the vadose zone. However, the generation and off-gassing of vapors from the sludge in its present undisturbed state does not impact the environment. Hydrogen sulfide and other vapors would be released from the sludge if it were actively disturbed.

5.4 SATURATED ZONES

5.4.1 Groundwater Conditions

Site sediments below approximately 5 to 8 feet msl are saturated and have variable permeability. Two zones of higher permeability have been identified beneath the Site, the shallow hydraulic A zone and the deeper hydraulic B zone. The upper hydraulic A zone is partially confined and represents the top of the saturated zone beneath the Site. The upper hydraulic A zone varies in thickness across the Site but generally occurs from 5 feet to -5 feet msl. Approximately 50 feet of saturated, predominantly clay, silty clay and silt separate the upper A and lower B hydraulic zones. There is a distinctive shell layer, which is several inches thick, at approximately -30 feet msl within these less permeable sediments. The deeper hydraulic B zone is laterally continuous across the Site and occurs at an approximate elevation ranging between -45 and -70 feet msl.

Field investigations performed by Stantec, including slug tests of the monitoring wells in the vicinity of the Site, indicate that the both hydraulic zones have relatively low hydraulic conductivities. The average hydraulic conductivity of the upper hydraulic A zone is 2.8 feet per day (ft/d) (9.0E-04 cm/sec) and is slightly greater for the lower hydraulic B zone, at 17 ft/d (6.0E-03 cm/sec). Both values are typical of silty sediments. A potentiometric surface can be measured and used to define groundwater flow directions and velocities for each hydraulic zone. The hydraulic gradient of the A zone is 0.003 to 0.005 with a flow direction ranging along an azimuth from 145 to 190 degrees. The hydraulic gradient of the B zone is 0.0045 to 0.0055 with a flow direction along an azimuth of 95 to 105 degrees. Beneath the surface of the two Cooper sumps the depth to groundwater in the upper A zone is approximately 12 to 14 feet bgs while in the lower B zone the depth to groundwater is approximately 16.5 to 18.5 feet bgs.

Vertical migration of groundwater is a consideration because there is a potentiometric head differential between the upper and lower hydraulic zones that suggests the possibility of vertical downward migration of groundwater. The low hydraulic conductivity of the fine grained sediments separating the upper A and lower B hydraulic zones apparently minimizes communication between the two hydraulic zones. The two hydraulic zones have different hydraulic heads, flow directions and inorganic groundwater chemistry.

The 85 day transducer test indicated that both the upper A and lower B hydraulic zones are isolated from the Silverado Aquifer beneath the site. The Silverado Aquifer is a major groundwater supply source in the vicinity of the Site. The CSM block diagram shown in Figure 26S depicts the juxtaposition of the upper and lower hydraulic zones with respect to the screened interval of the Dalton supply well, which is completed in the Silverado Aquifer.

5.4.2 Groundwater Impacts from Sludge

Localized deep excavations within the three sumps contain sludge a depths below the water table of the upper hydraulic A zone. However, groundwater quality beneath much of the Site is not impacted by GRO, VOCs, SVOCs or PAHs as minimal (very low µg/l) to no detections above the various compound's reporting limits have been observed since quarterly groundwater monitoring recommenced in 2006. Occasional compound detections have been qualified by the laboratory but subsequent monitoring has not reproduced those detections. Dissolved metals have been below their MCLs in groundwater obtained from wells MW-1A, MW-1B, MW-2A, MW-2B, MW-3A, MW-3B, MW-4A, MW-4B and G-4.

Groundwater in the upper hydraulic A zone is impacted by sludge at and downgradient of well MW-5A (low pH, elevated GRO and dissolved barium, beryllium, cadmium and nickel above MCLs). The low groundwater pH causes the dissolution of certain metals into the groundwater. The areal extent of low pH is defined vertically and laterally but extends in a downgradient direction to hydropunch location GWP100 where groundwater has a low pH and dissolved beryllium, cadmium and nickel remain above MCLs. This low pH groundwater does not appear to impact surface water quality in Dominguez Channel.

5.5 HAACK PROPERTY FINDINGS

The Haack property has been developed and used as an industrial - manufacturing property since the late 1940s or early 1950s (S&L Manufacturing Company, Aircraft Magnesium Company) whereas the Cooper property has been undeveloped, with the exception of the DTSC's geosynthetic liner placement in July 1993, and not historically used for any activity since the mid-1940s. There are a few notable differences in impacts between the two properties.

Certain metals at the Site can have wide ranges in their soil concentrations. Rarely, will a metal concentration be far beyond the typical range for that metal (an "outlier"). However, it is rarer to have two or more metal outliers associated with one soil sample. This situation is found for

seven soil samples representing six sampling locations; five of the locations are associated with the Haack property. The Haack property locations are HPB113 at 2 feet (antimony, arsenic, barium, cadmium, chromium, copper, lead, nickel and zinc), and from the re-deposited soil in the Haack Rework Area at HPB05 at 1.5 feet (copper, zinc), HPB06 at 1.5 feet (antimony, arsenic, chromium, cobalt, copper, molybdenum, nickel), HPB07 at 1.5 feet (antimony, copper) and 5 feet (antimony, chromium, copper, molybdenum, nickel) and RB01 at 1.5 feet (lead, zinc).

There is an occurrence of low pH groundwater in the upper hydraulic A zone immediately downgradient of the Haack sump (well MW-5A, GWP100). There is not a similar occurrence of low pH groundwater in the upper hydraulic A zone adjacent to or downgradient of the two Cooper sumps (well MW-2A, MW-3A, GWP104 and MW-4A).

5.6 SUMMARY

Based on the results from previous investigations and the extensive field work performed as part of this RI, the current CSM suggests that:

- The undisturbed sludge at the site does not pose a substantial threat to either surface or groundwater quality in the vicinity of the Site;
- The undisturbed sludge at the Site does not pose a substantial threat to the air quality in the immediate vicinity of the Site if the sludge remains undisturbed. However, isolation of the sludge from temperature fluctuations above approximately 100 degrees would further minimize this potential impact; and
- The undisturbed sludge does not pose a threat of continued soil contamination from the leaching of hydrocarbons or metals out of the adjacent sludge into the soil.

6.0 Statement of Limitations

This report was prepared in accordance with the scope of work outlined in Stantec's contract and with generally accepted professional engineering and environmental consulting practices existing at the time this report was prepared and applicable to the location of the site. It was prepared for the exclusive use of Atlantic Richfield Company, for the express purpose stated above. Any re-use of this report for a different purpose or by others not identified above shall be at the user's sole risk without liability to Stantec. To the extent that this report is based on information provided to Stantec by third parties, Stantec may have made efforts to verify this third party information, but Stantec cannot guarantee the completeness or accuracy of this information. The opinions expressed and data collected are based on the conditions of the site existing at the time of the field investigation. No other warranties, expressed or implied are made by Stantec.

Prepared by:

Carole M. Farr

Carole M. Farr, PG No. 7434
Principal Geologist

All information, conclusions, and recommendations provided by Stantec in this document regarding the Subject Property have been prepared under the supervision of and reviewed by the Licensed Professional whose signature appears below:

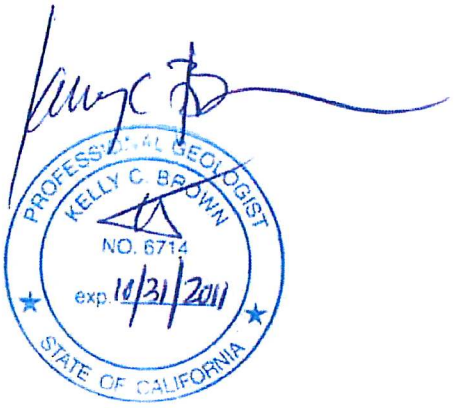
Licensed Approver:

Name: **Kelly C. Brown, PG No. 6714**
Principal Geologist

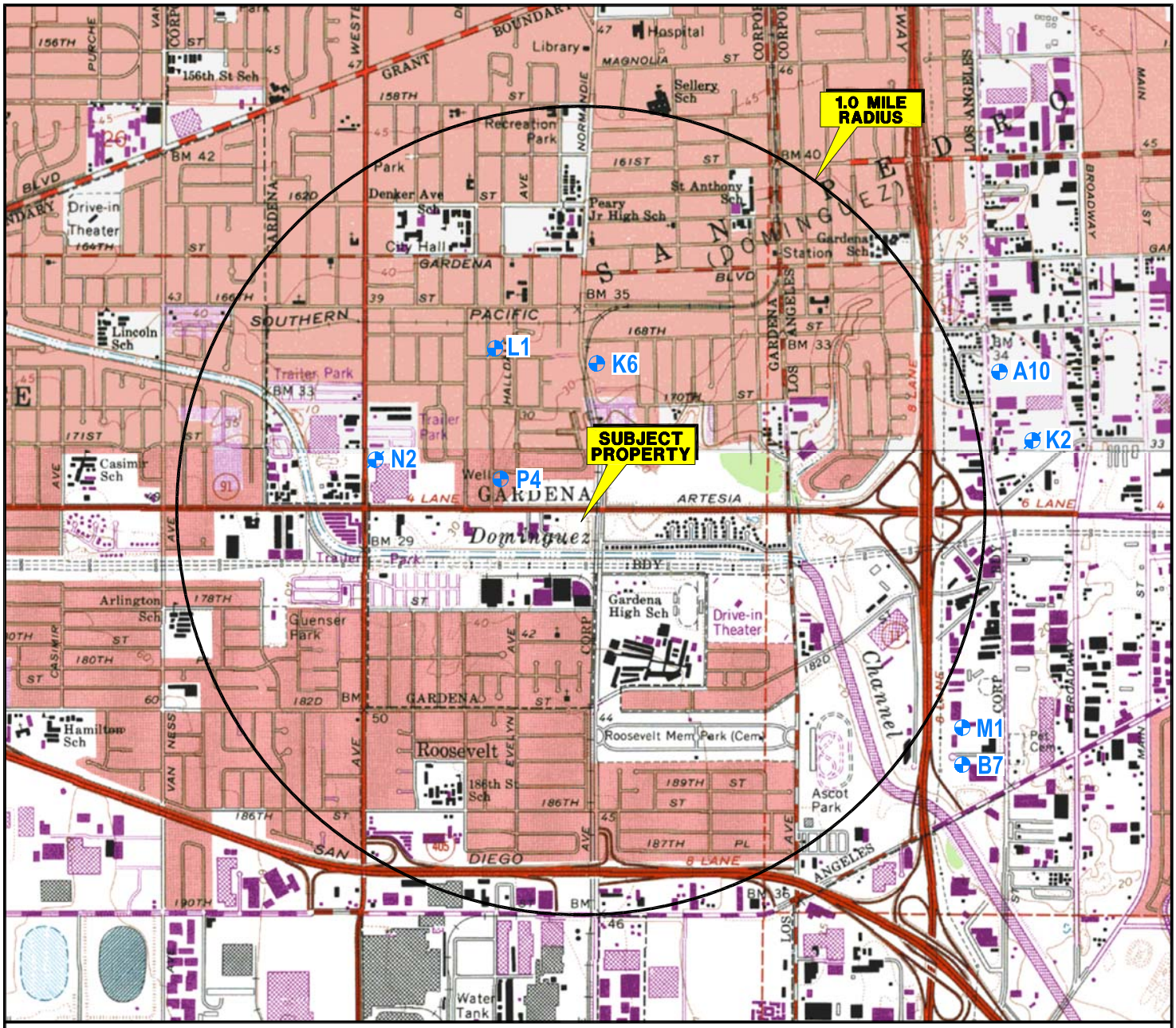
Signature:

Date: 12.14.2010

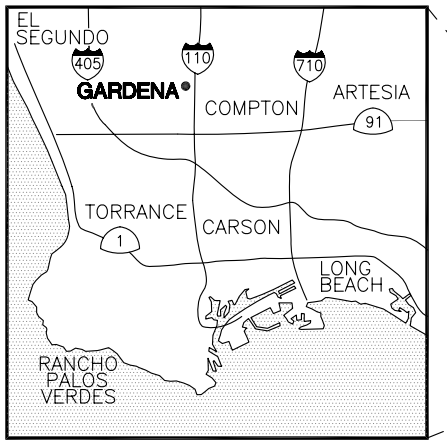
Stamp:

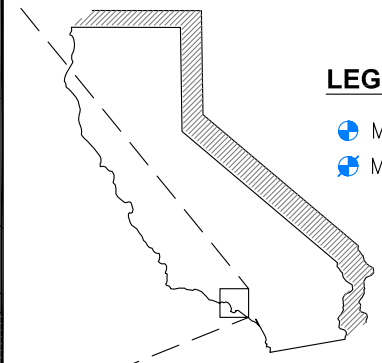


FIGURES



SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC MAP, TORRANCE QUADRANGLE, 1964
PHOTOREVISED 1981
INGLEWOOD QUADRANGLE, 1964
PHOTOREVISED 1981





LEGEND

- MUNICIPAL SUPPLY WELL–ACTIVE
- MUNICIPAL SUPPLY WELL–INACTIVE

N

0 2000 4000

APPROXIMATE SCALE (FEET)

Stantec
290 Conejo Ridge Avenue
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FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

SITE LOCATION MAP WITH WELLS IDENTIFED WITHIN A ONE-MILE RADIUS

FIGURE: 1

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.16.3236	R. Roman	S. Montrose	P. Kinney	05/08/08

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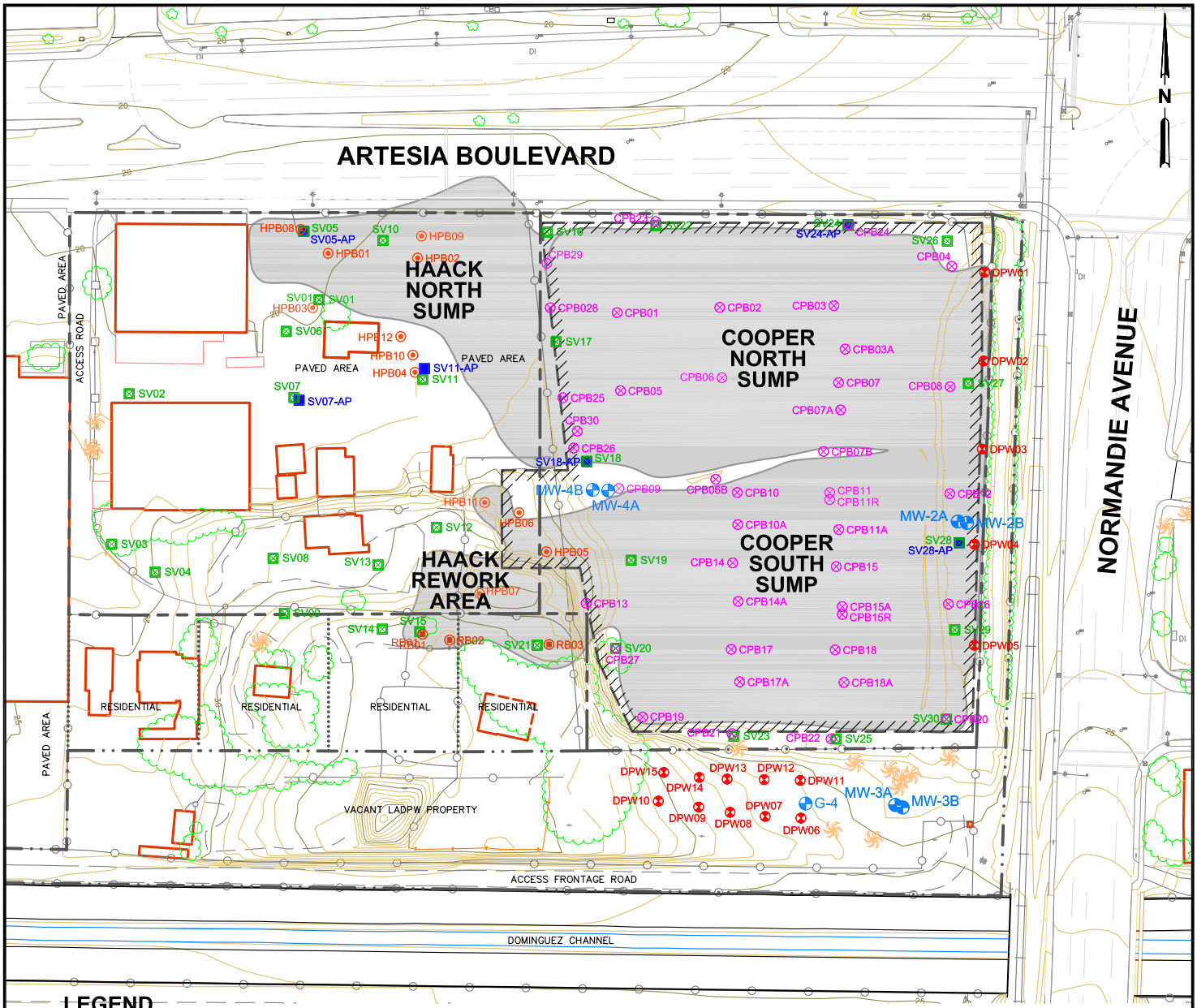


LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- APPROXIMATE SUMP LOCATION
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-2A MW-2B — CLUSTER WELLS (A&B)
- CPB01 — COOPER PROPERTY SOIL/SLUDGE SAMPLES
- DPW01 — LA COUNTY DEPARTMENT OF PUBLIC WORKS SOIL SAMPLES
- HPB01 — HACK PROPERTY SOIL/SLUDGE SAMPLE
- RB01 — PRIVATE RESIDENTIAL PROPERTY SOIL/SLUDGE SAMPLES
- SV01 — SOIL VAPOR SAMPLES
- SV05-AP — AIR PERMEABILITY SAMPLES

GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.

0 120 240

APPROXIMATE SCALE (FEET)

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
(805) 230-1266/230-1277 (Fax)

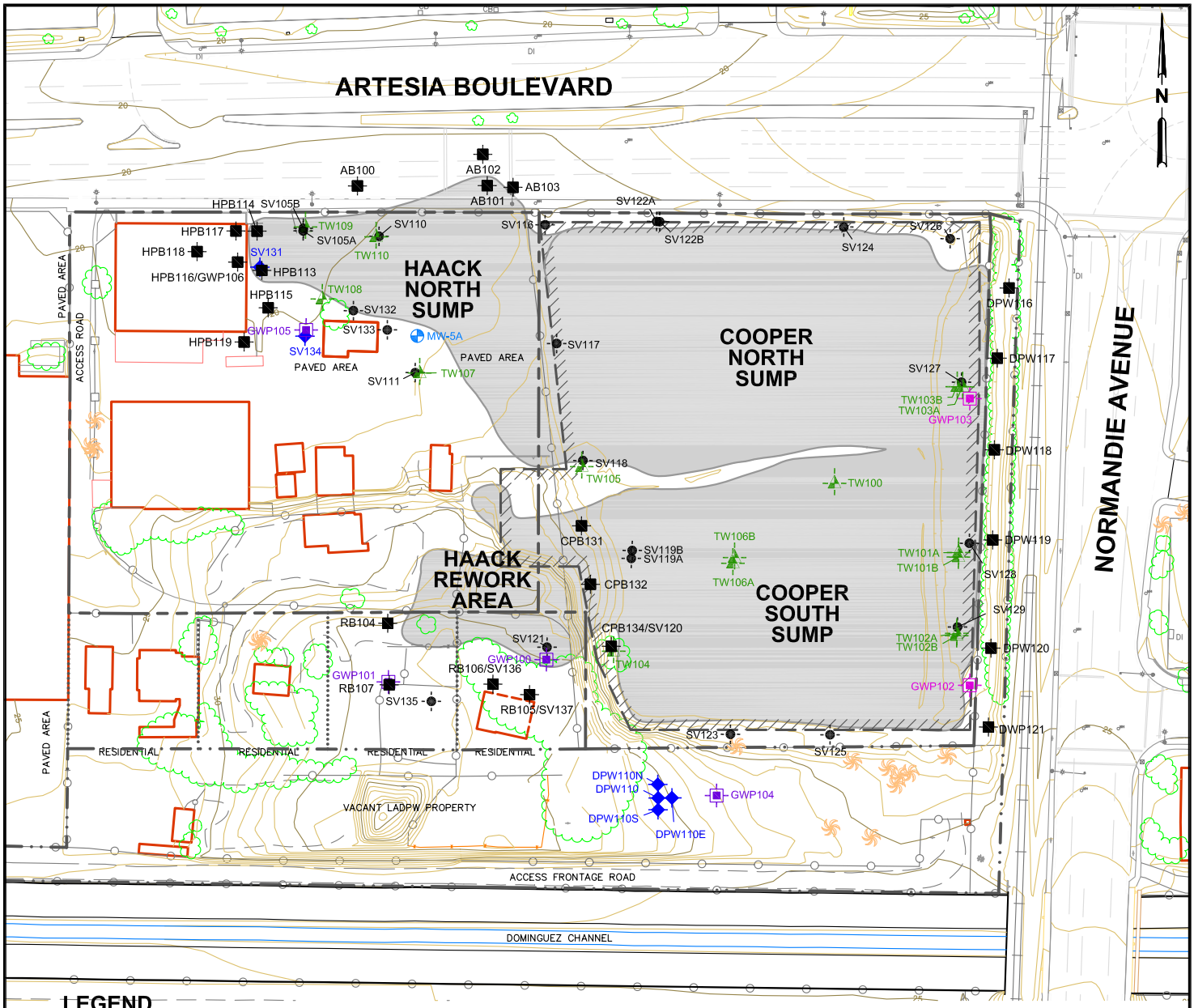
FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

SITE PLAN WITH 2005/2006 REMEDIAL INVESTIGATION LOCATIONS

FIGURE: **2A**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	11/22/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\GS-RI_FIG2A.dwg|TRoman|Nov 22, 2010 at 12:38|Layout: FIG2A



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN-LINK FENCE
- APPROXIMATE SUMP LOCATION
- SOIL BORING FOR METAL AND pH
- SOIL BORING FOR SLUDGE DELINEATION
- TEMPORARY GROUNDWATER MONITORING WELL
- GROUNDWATER MONITORING WELL (A WATER-BEARING ZONE)
- SOIL VAPOR SAMPLING LOCATION
- GROUNDWATER HYDROPUNCH SAMPLE LOCATION (A WATER-BEARING ZONE)
- GROUNDWATER HYDROPUNCH SAMPLE LOCATION (B WATER-BEARING ZONE)

GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. 2009/2010 REMEDIAL INVESTIGATION LOCATIONS SURVEYED BY W.M. HOLDINGS INC., DATED AUGUST 10, 2009, OCTOBER 29, 2009, AND SEPTEMBER 9, 2010. NAD 83 CALFORNIA STATE PLANES, ZONE 5 (FT.). SITE FEATURES AND LOCATIONS ARE APPROXIMATE.

0 120 240

APPROXIMATE SCALE (FEET)

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
(805) 230-1266/230-1277 (Fax)

FOR:
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

LOCATIONS OF SELECTED SITE FEATURES AND 2009/2010 INVESTIGATION BORINGS AND MONITORING WELLS

FIGURE: **2AS**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	10/15/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\GS-RI_FIG2AS.dwg|troman|Oct 15, 2010 at 13:55|Layout: FIG2AS

DALTON
(APPROXIMATE LOCATION OF MUNICIPAL SUPPLY WELL)

MW-1A
MW-1B

CP-01
CP-02
CP-03
G-1

ARTESIA BOULEVARD

G-3
G-2

NORMANDIE AVENUE

W. CASSIDY ST

PAVED AREA
ACCESS ROAD
PAVED AREA
PAVED AREA
PAVED AREA

B-10 [6.0] EE-1 [7.0]
[2.0] B-3A
B-3 [2.5]
B-4 [0.5]
EE-2 [3.3]
B-11 [6.5]
HA-1 [1.0]
B-5
B-2
B-1
EE-5 [5.0]
S-1 [3.0]
[3.0] S-2
EE-6 [0.5]
CP-04
B-9 [4.0]
CP-11
B-8 [2]
[2.5] HA-2
B-7
MW-4B
MW-4A
EE-4 [4.0]
MW-2A
MW-2B
CP-12
B-14
B-13
B-12 [0.5]
B-15 B-16 [1.5]
[3] B-6
B-17 [4.5]
CP-05
S-3 [4.5]
EE-3 [1.5]
S-5 [5.5]
S-4 [3.0]
CP-06

RESIDENTIAL
RESIDENTIAL
RESIDENTIAL
RESIDENTIAL

VACANT LADPW PROPERTY

G-4
MW-3A
MW-3B
CP-07

ACCESS FRONTAGE ROAD
CP-10
ACCESS FRONTAGE ROAD
CP-09
CP-08

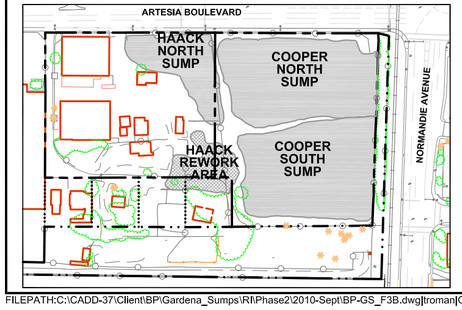
DOMINGUEZ CHANNEL
DOMINGUEZ CHANNEL

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 EPA GROUNDWATER MONITORING WELL
- MW-2A,B CLUSTER WELLS (A&B)
- G-2 ABANDONED EPA GROUNDWATER MONITORING WELL (ECOLOGY & ENVIRONMENT, 10/86 REPORT)
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION OF HAACK REWORK AREA
- B-8 ● SOIL BORING (DTSC, 11/94 REPORT)
- CP-07 ⊗ CONE PENETROMETER BORING (URS, 11/94 REPORT)
- HA-1 ⊙ HAND AUGER BORINGS (METCALF & EDDY 1/92 REPORT)
- S-3 ▼ SUMP SAMPLES (METCALF & EDDY, 1/92 REPORT)
- EE-4 ● SOIL BORING (ECOLOGY & ENVIRONMENT, 12/87 REPORT)
- [#.#] ESTIMATED TOTAL SLUDGE THICKNESS IN FEET

SUMP LOCATIONS

SCALE: 1"= 250'



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE WERE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.

0 80 160
APPROXIMATE SCALE (FEET)

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
(805) 230-1266/230-1277 (Fax)

FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

PRE-RI SOIL BORING LOCATIONS (APPROXIMATE) AND LOCATIONS OF USEPA MONITORING WELLS

FIGURE: **3B**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	10/28/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\BP-GS_F3B.dwg|troman|Oct 28, 2010 at 12:29|Layout: FIG3B

DALTON
(APPROXIMATE LOCATION OF MUNICIPAL SUPPLY WELL)

MW-1A
MW-1B

G-1

G-3

G-2

N

ARTESIA BOULEVARD

NORMANDIE AVENUE

W. CASSIDY ST

PAVED AREA

ACCESS ROAD

RESIDENTIAL

VACANT LADPW PROPERTY

ACCESS FRONTAGE ROAD

UG-CHAN

DOMINGUEZ CHANNEL

DG-CHAN

MW-4B
MW-4A
MW-2A
MW-2B
MW-3A
MW-3B
G-4

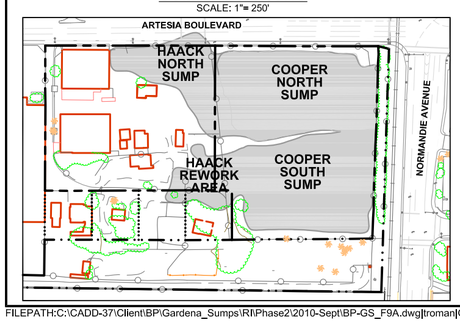
HPB08 SV05 SV05-AP HPB01 SV10 HPB09 HPB02 SV16 CPB23 SV22 SV24 SV24-AP CPB24 SV26 CPB04 CPB29 DPW01
SV01 HPB03 SV06 HPB12 HPB10 HPB04 SV11-AP SV11 SV07 SV07-AP SV02 SV17 PAVED AREA
CPB028 CPB01 CPB02 CPB03 CPB03A CPB06 CPB07 CPB08 SV27 DPW02
CPB25 CPB05 CPB07A CPB30 CPB26 SV18-AP SV18 CPB07B DPW03
HPB11 HPB06 SV12 SV03 SV08 SV13 SV04 HPB05 SV19 CPB14 CPB09 CPB09B CPB10 CPB11 CPB11R CPB12 CPB10A CPB11A SV28 SV28-AP DPW04
HPB07 SV09 SV14 SV15 RB01 RB02 SV21 RB03 SV20 CPB27 CPB13 CPB14A CPB15A CPB15R CPB16 SV29 DPW05
CPB17 CPB18 CPB17A CPB18A CPB19 SV30 CPB20 CPB21 SV23 CPB22 SV25
DPW15 DPW14 DPW10 DPW09 DPW13 DPW12 DPW11 DPW07 DPW08 DPW06

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 EPA GROUNDWATER MONITORING WELL
- MW-2A,B CLUSTER WELLS (A&B)
- DG-CHAN SURFACE WATER SAMPLING LOCATION (APPROXIMATE)/(ONLY SAMPLED FIRST QUARTER OF 2006)
- G-1 ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SUMP LOCATIONS
- CPB01 COOPER PROPERTY SOIL/SLUDGE SAMPLES
- DPW01 LA COUNTY DEPARTMENT OF PUBLIC WORKS SOIL SAMPLES
- HPB01 HACK PROPERTY SOIL/SLUDGE SAMPLE
- RB01 PRIVATE RESIDENTIAL PROPERTY SOIL/SLUDGE SAMPLES
- SV01 SOIL VAPOR SAMPLES
- SV05-AP AIR PERMEABILITY SAMPLES

SUMP LOCATIONS

SCALE: 1"= 250'



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE WERE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.
4. BORING AND SAMPLE LOCATIONS WERE SURVEYED BY W.M. HOLDINGS INC., ON JANUARY 23, 2006 (CPB AND DPW BORINGS), FEBRUARY 17, 2006 (HPB AND RB BORINGS), AND MARCH 30, 2006 (SV BORINGS).
5. SUPPLIMENTAL BORING AND SAMPLE LOCATIONS; AND GROUND WATER MONITORING WELL LOCATIONS AND ELEVATIONS (MW–04A/B) WERE SURVEYED BY W.M. HOLDING INC. ON MARCH 1, 2007

0 80 160
APPROXIMATE SCALE (FEET)

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
(805) 230-1266/230-1277 (Fax)

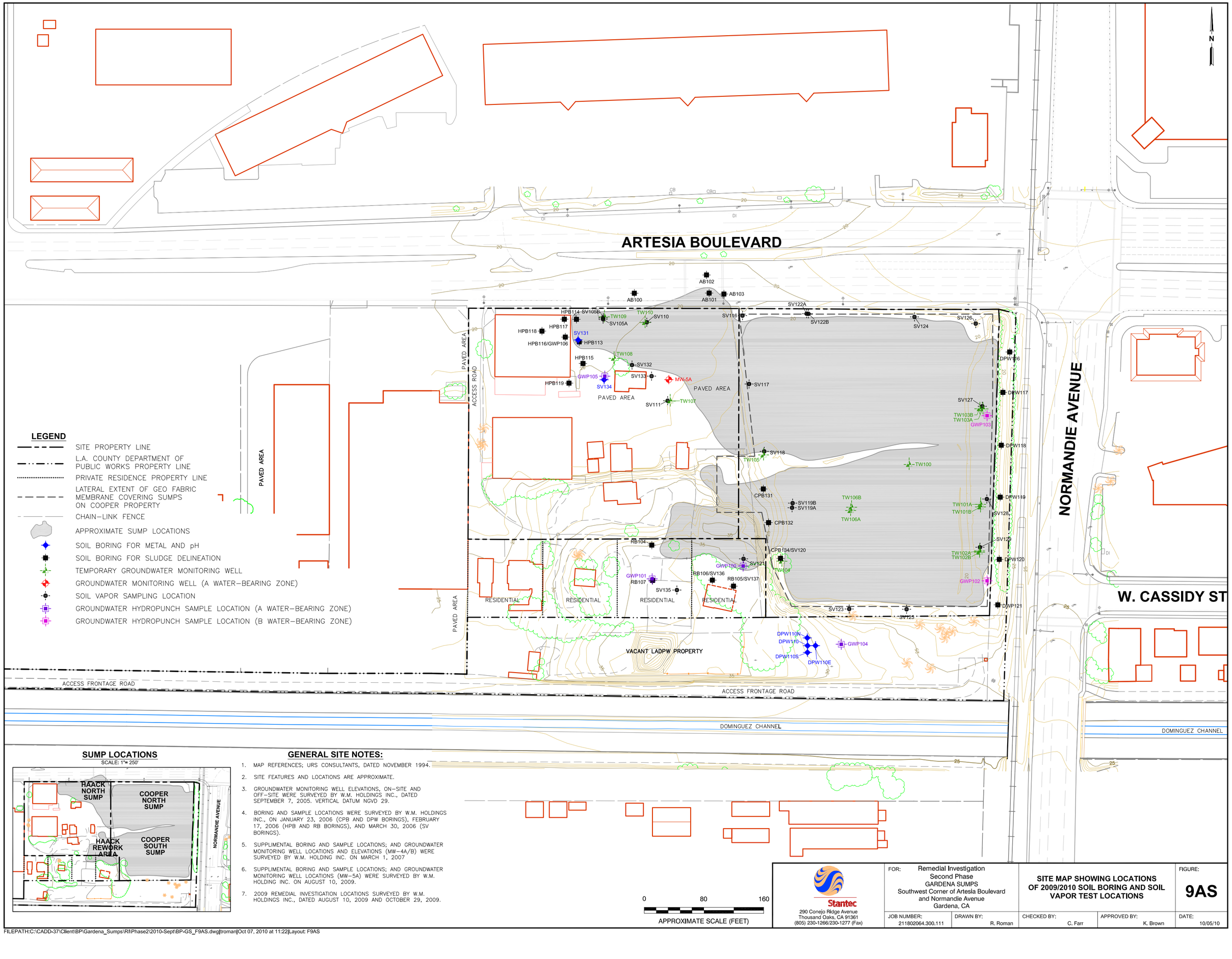
FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

SITE MAP SHOWING LOCATIONS OF 2005 INVESTIGATION CPT LOCATIONS, SOIL AND SUMP BORINGS, AND SOIL VAPOR TEST LOCATIONS

FIGURE: **9A**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	C. Farr	K. Brown	P. Kinney	10/07/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\BP-GS_F9A.dwg|troman|Oct 07, 2010 at 11:19|Layout: FIG9A



LEGEND

- SITE PROPERTY LINE
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- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- APPROXIMATE SUMP LOCATIONS
- SOIL BORING FOR METAL AND pH
- SOIL BORING FOR SLUDGE DELINEATION
- TEMPORARY GROUNDWATER MONITORING WELL
- GROUNDWATER MONITORING WELL (A WATER–BEARING ZONE)
- SOIL VAPOR SAMPLING LOCATION
- GROUNDWATER HYDROPUNCH SAMPLE LOCATION (A WATER–BEARING ZONE)
- GROUNDWATER HYDROPUNCH SAMPLE LOCATION (B WATER–BEARING ZONE)

SUMP LOCATIONS

SCALE: 1"= 250'

GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE WERE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.
4. BORING AND SAMPLE LOCATIONS WERE SURVEYED BY W.M. HOLDINGS INC., ON JANUARY 23, 2006 (CPB AND DPW BORINGS), FEBRUARY 17, 2006 (HPB AND RB BORINGS), AND MARCH 30, 2006 (SV BORINGS).
5. SUPPLIMENTAL BORING AND SAMPLE LOCATIONS; AND GROUNDWATER MONITORING WELL LOCATIONS AND ELEVATIONS (MW–4A/B) WERE SURVEYED BY W.M. HOLDING INC. ON MARCH 1, 2007
6. SUPPLIMENTAL BORING AND SAMPLE LOCATIONS; AND GROUNDWATER MONITORING WELL LOCATIONS (MW–5A) WERE SURVEYED BY W.M. HOLDING INC. ON AUGUST 10, 2009.
7. 2009 REMEDIAL INVESTIGATION LOCATIONS SURVEYED BY W.M. HOLDINGS INC., DATED AUGUST 10, 2009 AND OCTOBER 29, 2009.

0 80 160

APPROXIMATE SCALE (FEET)

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290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
(805) 230-1266/230-1277 (Fax)

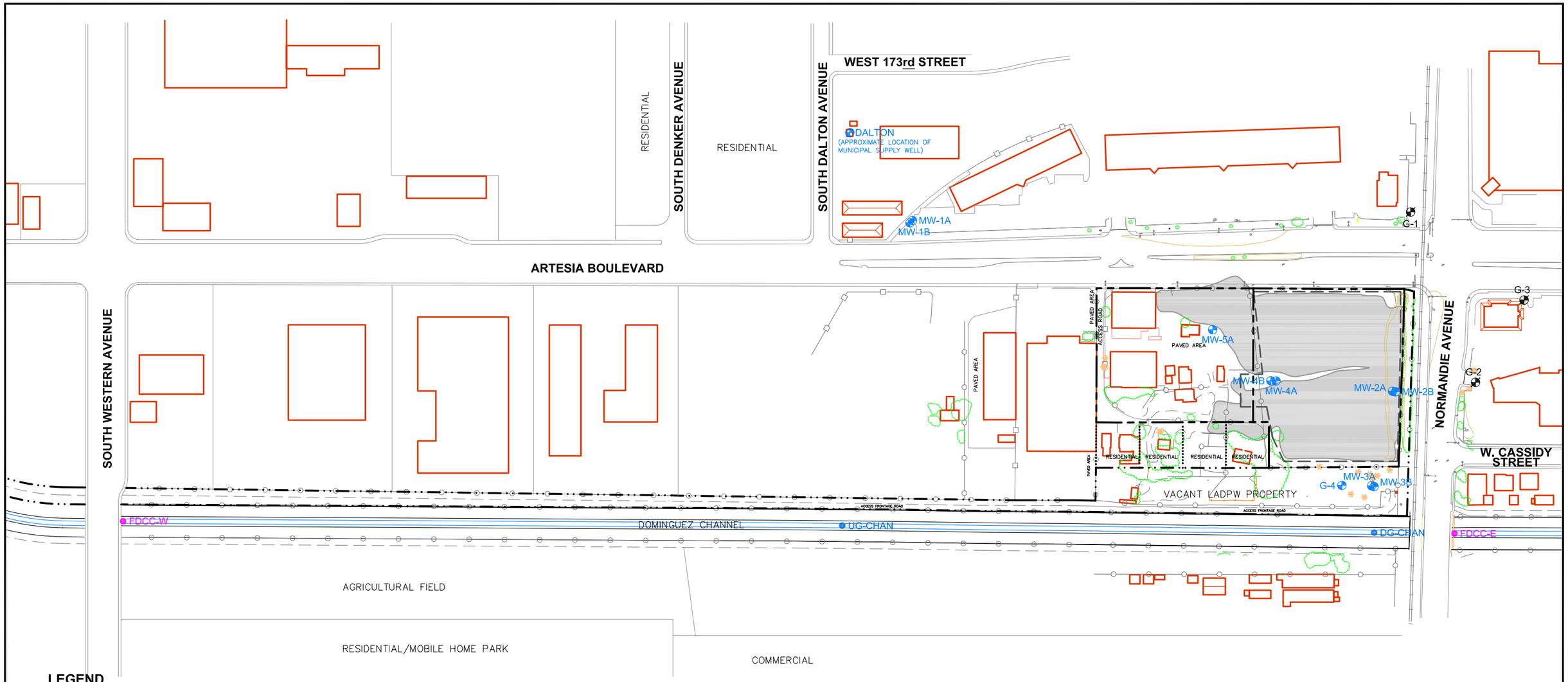
FOR: Remedial Investigation
Second Phase
GARDENA SUMPS
Southwest Corner of Artesia Boulevard
and Normandie Avenue
Gardena, CA

SITE MAP SHOWING LOCATIONS OF 2009/2010 SOIL BORING AND SOIL VAPOR TEST LOCATIONS

FIGURE: **9AS**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	10/05/10

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\BP-GS_F9AS.dwg|troman|Oct 07, 2010 at 11:22|Layout: F9AS



LEGEND

- SITE PROPERTY LINE
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- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-1A,B — CLUSTER WELLS (A&B)
- DG-CHAN — 2006 SURFACE WATER SAMPLING LOCATION
- FDCC-W — 2008 SURFACE WATER SAMPLING LOCATION
- G-1 — ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SUMP LOCATION

N

0 225 450

APPROXIMATE SCALE (FEET)

GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE ARE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.

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FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

SITE VICINITY MAP SHOWING GROUNDWATER MONITORING WELLS AND SURFACE WATER SAMPLE LOCATIONS

FIGURE: **9BS**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	10/07/10

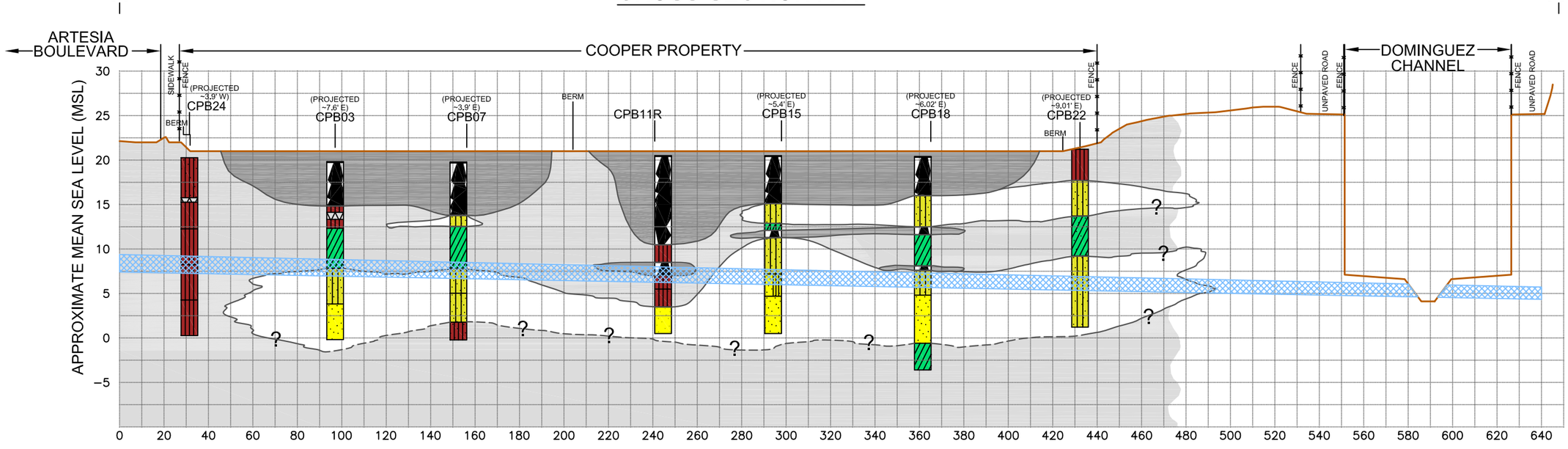
FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\RI\Phase2\2010-Sept\BP-GS_SVM.dwg|troman|Oct 07, 2010 at 11:32|Layout: FIG9BS

CROSS-SECTION A-A'

NORTH A — SOUTH A'

CROSS-SECTION VERTICAL SCALE (FEET)

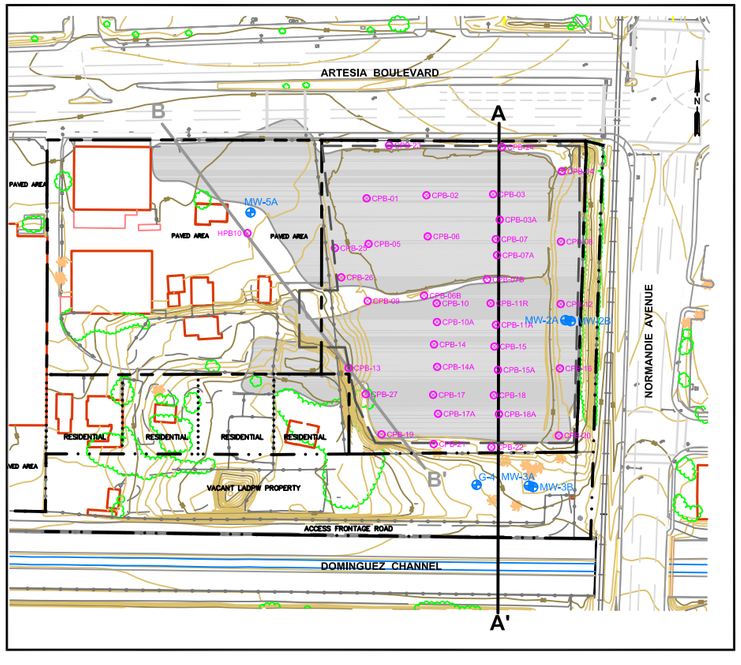
0 — 12.5 — 25



CROSS-SECTION INDEX MAP LEGEND

SITE PROPERTY LINE

CROSS-SECTION INDEX MAP



CROSS-SECTION INDEX MAP LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-01A,B — CLUSTER WELLS (A&B)
- CPB01 — SOIL/SLUDGE SAMPLE
- APPROXIMATE SLUDGE DISTRIBUTION

0 — 200 — 400

APPROXIMATE SCALE (FEET)

0 — 50 — 100

CROSS-SECTION HORIZONTAL SCALE (FEET)

CROSS-SECTION LEGEND

—— ? —— APPROXIMATE LITHOLOGIC CONTACT, QUERIED (?) WHERE UNCERTAIN

RANGE OF GROUNDWATER ELEVATION FROM JANUARY 2006 TO AUGUST 2010

- UPPER SATURATED ZONE

GENERALIZED HYDROSTRATIGRAPHY

- SLUDGE DEPOSITS
- LOW PERMEABILITY, VERY FINE TO FINE GRAINED CLAYEY SILT, LOCALIZED INTERFINGERING OF SILTY SAND LENSES
- VERY LOW PERMEABILITY, SILTY CLAY TO CLAY

LITHOLOGY GRAPHICS

- SLUDGE
- SAND
- SAND WITH SILT
- SILTY SAND
- SILT
- LOW PLASTICITY CLAY

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290 Conejo Ridge Avenue
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FOR: Revised Draft - Report on 2006 Remedial Investigation
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

GEOLOGIC CROSS-SECTION A-A' (NORTH-SOUTH COOPER PROPERTY)

FIGURE: **10AS**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802064.300.111	R. Roman	C. Farr	K. Brown	10/28/10

FILEPATH:M:\CADDIGIS-US1331\Projects 2010\BP Arco\Gardena_Sumps\Geologic cross-sections\GS-CSX(BSM)-R1.dwg|rocampo|Dec 10, 2010 at 13:58|Layout: FIG10AS

Geosyntec consultants

924 Anacapa Street, Suite 4A
Santa Barbara, CA 93101
PH 805.897.3800
FAX 805.899.8689
www.geosyntec.com

01 June 2011

Mr. Greg Holmes
c/o Joseph Cully, Hazardous Substance Scientist
Southern California Cleanup Operations Branch
Cypress Office, Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630

RE: TRANSMITTAL – Gardena Sumps Site Human Health Risk Assessment Revision Package
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California
DTSC Site No. 400067

Dear Mr. Holmes:

Geosyntec, on behalf of the Atlantic Richfield Company (ARC), submits this revision package for the Gardena Sumps Site Human Health Risk Assessment to the California Department of Toxic Substances Control (DTSC) per §VIIG of the Gardena Sumps/ARC Consent Decree, CV04-7882-AHM (JTLx) (the Decree), effective November 4, 2004. The Gardena Sumps Site (the Site) is located at the southwest corner of West Artesia Boulevard and Normandie Avenue in the City of Gardena, California.

This revision package was prepared in response to DTSC comments dated July 23, 2010 received via letter and DTSC comments dated November 4, 2010 received via e-mail on March 9, 2011. ARC's response to comments were accepted by DTSC in the November 4, 2010 e-mail with the exception of two comments pertaining to the presentation of a discussion regarding elevated detection limits for carcinogenic PAHs in soil and the presentation of sample concentrations above the arsenic background level of 12 mg/kg. A discussion about elevated detection limits has been added to the attached revised text and the attached figures have been modified to show sample locations where elevated detection limits are present for non detect samples. In addition, the figures have been revised to show locations where arsenic concentrations are above the background level of 12 mg/kg.

The revision package includes the following items:

1. Response to Comment Table for DTSC comments dated July 23, 2010
2. Revised Text
3. Revised Figures 2, 7, 8, 9, and 11
4. Revised Appendix A Tables
5. Revised Appendix D – Table D-1

It should be noted that the revision to Figure 10 referenced in the response to comment table previously submitted to DTSC should have been to Figure 9. The revision package only includes those portions of the HHRA that were modified in response to DTSC comments. Refer to the HHRA dated May 2010 for the following portions not affected by the DTSC comments: (1) Tables 1 – 12; (2) Figures 1, 3, 4, 5, 6 and 10; (3) Appendices B and C; and (4) Appendix Table D-2.

If you have questions or require additional information about the attached table, please contact Mr. Kyle Christie with ARC at 714-670-5303.

Sincerely,

Ruth Custance

Ruth Custance, M.P.H.
Principal Scientist
Geosyntec Consultants

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Southern California Cleanup Operations Branch
Cypress Office
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630-4732

Dr. Efrem Neuwirth
Southern California Cleanup Operations Branch
Cypress Office

Department of Toxic Substances Control
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Cypress, CA 90630-4732

Mr. Greg Sweel
Southern California Cleanup Operations Branch
Cypress Office
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630-4732

Mr. Kyle A. Christie
Atlantic Richfield Company
LPR 4-440
4 Centerpointe Drive
La Palma, CA 90623-1066

Mr. Kelly Brown
Stantec
305 Paramount Boulevard, Suite 255
Lakewood, California
97712-4139

RESPONSE TO COMMENT TABLE

RESPONSE TO DTSC COMMENTS DATED JULY 23, 2010 ON
HUMAN HEALTH RISK ASSESSMENT, GARDENA SUMP SITE
SOUTHWEST CORNER OF ARTESIA BOULEVARD AND NORMANDIE AVENUE
GARDENA, CALIFORNIA

DTSC COMMENT	**RESPONSE**
General Comments:	
Comment 1: *HERO recommends a revised description and depiction of the extent of the sludge material on and off-Site. Sampling performed in the data gap analysis indicates that the sludge material is not localized to the historic sumps but is continuous and extended off-Site.*	**Response:** The delineation of sludge, of any thickness, has been accomplished during the Site remedial investigation activities. The forthcoming draft Addendum to the Revised Draft 2006 Remedial Investigation Report will contain a figure that depicts the occurrence of any sludge material at and adjacent to the Site. The figures in the HHRA were not intended to show the delineation of sludge but were intended to illustrate the locations where the vast majority of the sludge is found. Figure 2 will be revised to show the distribution of sludge in the vicinity of the Site.
Comment 2: *HERO recommends that in addition to the chronic toxic effects which are evaluated in the HHRA, additional criteria should be considered in future decision making regarding the sludge material in order to protect residents and commercial/industrial workers. HERO also recommends that the proper precautions be taken to protect future construction workers. HERO notes that the corrosiveness of the material is not addressed in the HHRA. In addition the material is a complex mixture which may have acute dermal health effects similar to those seen with other materials (for instance coal tar pitch). These potential effects are also not evaluated in the HHRA. Most seriously, there may also be acute inhalation health effects if the material is disturbed. HERO notes that the flux data studies provided in the RI report indicate that disturbing the waste material can result in a very high flux of sulfur dioxide which HERO estimates under the right circumstances could approach the OSHA permissible exposure level (PEL) of 5 mg/m³.*	**Response:** As pointed out in the comment, the HHRA evaluated chronic effects and not acute or shorter term exposures. The points raised in this comment are important in the remedial action planning for the site and will be address during the feasibility study and remedial action plan preparation. Measures that will be considered for future remedial activities when there is a potential for sludge to be disturbed or contacted include engineering controls such as the use of personal protective equipment and dust and odor suppression and institutional controls such as a land use restriction preventing future excavation and a soil management plan should excavation be needed.

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HUMAN HEALTH RISK ASSESSMENT, GARDENA SUMP SITE
SOUTHWEST CORNER OF ARTESIA BOULEVARD AND NORMANDIE AVENUE
GARDENA, CALIFORNIA

DTSC COMMENT	RESPONSE
Comment 3: *HERO recommends revising the uncertainty section to discuss the high detection limits for the polycyclic aromatic hydrocarbons (PAHs) or any similarly affected chemicals in the sludge samples, and the possible effects on the outcome of the HHRA. For example the maximum benzo(a)pyrene concentration may potentially be greater than the highest concentration listed in Table 1a (170 mg/kg). For instance at location CBP18-1.5 the detection limit for benzo(a)pyrene was 990 mg/kg (see specific comment 5).*	**Response:** The uncertainty section will be revised to address the uncertainty in the PAH detection limits as follows: "There is also uncertainty in that some samples exhibit elevated detection limits, in particular for the carcinogenic PAHs. For the majority of samples, PAH analyses were conducted using two methods (1) EPA Method 8270 and EPA Method 8310. EPA Method 8310 was used to achieve lower detection limits. However, there is a subset of samples in which only EPA Method 8270 was used and some of these samples do exhibit elevated detection limits. Since the elevated detection limits are higher than the maximum detected value, the maximum site concentration may be actually higher than reported. Since the majority of samples were analyzed by EPA Method 8310, the occurrence of elevated detection limits only effect a small proportion of the Site data. However, to address this uncertainty the samples with elevated detection limits were identified and evaluated in Section 7."
Comment 4: *HERO recommends an addition to the discussion of uncertainty for the ambient air exposure assessment. The sludge material is not soil and it is not clear how estimates of exposure using the volatilization factor (VF) approach may under or over-estimate risk. The flux chamber data for undisturbed sludge indicates that there may be exposure to the low levels of VOCs in ambient air through this pathway. However HERO also notes that levels of VOCs measured on-site in ambient air do not correlate well with the flux chamber data and potential risks through this pathway are likely considerably lower that the background risks from exposure to Urban air.*	**Response:** The uncertainty section will be revised to include the following paragraph. "An additional source of uncertainty involves the outdoor air and indoor air volatilization models used in the HHRA and the type of material present at the Site. Some areas of the site include sludge material which has different physical properties as compared to soil. Because the volatilization models are based on transport of chemicals through a soil medium, in areas where sludge material is present the effect of volatilization may be over or under estimated. In areas where sludge is not present the modeling is considered to provide an adequate characterization of potential volatilization from the subsurface "

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DTSC COMMENT	RESPONSE
Comment 5 *HERO recommends adding a discussion of the limitations of using the indoor-air evaluation for the sludge material. HERO does not recommend using the quantitative evaluations of indoor air risk provided in the HHRA for current or future buildings built directly over the sludge material for any risk management decisions. HERO notes that the sludge material is not soil and therefore the Johnson and Ettinger is not relevant to evaluating indoor air risk. HERO notes that the flux chamber measurements did find VOCs which might pose potential risks to future building users, however, there is no way accurate way to quantify risks from these VOCs at this time. Rather HERO recommends that future buildings built over the sludge containing areas should be built with mitigation systems and that monitoring should be performed in an appropriate way to demonstrate that unacceptable levels of VOCs are not migrating into these hypothetical buildings, consistent with the DTSC Vapor intrusion Mitigation Advisory (VIMA), available at http://www.dtsc.ca.gov/SiteCleanup/upload/VI Mitigation Advisory Apro9.pdf..*	**Response:** The uncertainty section will be revised as shown in Comment #4 to address the uncertainty of volatilization modeling for sludge material. It should be noted that all on-site and off-site structures that are occupied for relevant periods of time (ie not a storage shed where short term exposures may occur) are not known to have sludge beneath them. Therefore the J&E modeling is considered to provide an adequate characterization of potential volatilization from the subsurface into indoor air for current occupied structures. The results of the modeling indicate that vapor intrusion outside the sludge material should not be a significant pathway. If buildings are to be built over sludge material in the future, engineering controls and the DTSC Vapor Intrusion Mitigation Advisory will be considered.
Comment 6 *HERO recommends indentifying any structures which may currently be built over sludge material and evaluating indoor air and if appropriate to the structures, sampling sub-slab soil gas.*	**Response:** The Site remedial investigation activities have not identified any structures that are built over sludge. Sludge is interpreted to extend to near the eastern edge of northwestern-most Haack structure. Surficial sludge occurs within a few feet (boring SV132) of the northern edge of the Haack building immediately south of the Haack sump but does not underlie this structure. Soil gas investigation probes SV132, SV133 and SV134 were installed at the request of DTSC and HERD to obtain soil gas information immediately adjacent to this building. This information was to be used to deduce if indoor air within this building would adversely affect people. While VOCs were detected in the soil gas samples from these probes, the concentrations were below the maximum detected on-site concentrations which were used in the HHRA. The HHRA results indicated that even using the maximum soil gas concentrations detected on-site, estimated incremental cancer risks were below levels of concern for commercial workers, the current and anticipated future receptor population for the site.

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DTSC COMMENTS **Specific Comments:**	**RESPONSE**
Comment 1 *HERO recommends identifying which samples were utilized for the evaluation of the off-site residences. HERO recommends including a figure in the risk assessment which shows these samples. If any sample that is on immediately adjacent to the properties were not utilized for the HHRA then please provide a justification. HERO is concerned that some soil-gas samples next to the properties may have been excluded from the risk assessment even though they were the closest samples to the property available.*	**Response:** Only samples that were collected within the boundary of the off-site residential area were used in the HHRA to evaluate potential off-site residential exposures. We believe the figures clearly show the boundaries and sample locations for on-site and off-site properties. However we propose to include more discussion after the first sentence in the last paragraph in Section 2.1 – Data Review that clearly discusses what data was used for on-site and off-site exposures and for each receptor group as follows: "For offsite residential exposures soil and soil gas locations collected within the boundaries of the off-property residential properties were included. The locations include RB01 – RB03 for soil and SV14, SV15, SV21, SV121, SV135, SV136 and SV 137 for soil gas. All other locations were considered on-site with the exception of the sample collected in the LADPW right-of-way." A review of the adjacent onsite samples was conducted to determine if potential higher concentrations were present in the samples that may have influence the offsite risk characterization. For soil samples, SV09, CPB13 and HPB07 were reviewed; for soil gas SV09 and SV120 were reviewed. The results of the review indicate that for those chemicals with higher concentrations in the onsite locations, the differences were generally no more than 3-fold higher with the exception of PAHs in soil and chloromethane and in soil gas. For the primary risk-driving chemical in soil, (B(a)P-eq, the maximum offsite B(a)P-eq concentration in soil was 9.6 mg/kg where as the maximum concentration in the three on-site locations reviewed was 42 mg/kg. While the onsite concentration is higher, including the data in the risk assessment does not significantly impact the risk characterization since both concentrations are well above the background value of 0.9 mg/kg. For soil gas, the maximum offsite concentration of chloromethane was 0.007 ug/l where as the maximum concentration in the onsite locations was 0.033 ug/L. While the nearby onsite maximum was higher, chloromethane is not a risk-driving chemical for the Site (offsite hazard quotient estimate of $5x10^{-5}$) and using the higher value would not result in a significant change in the overall risk estimates. For the primary risk-driving chemical in soil gas, benzene, the offsite concentration was higher than in the onsite locations reviewed. The above discussion will be added to the uncertainty section of the document.

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DTSC COMMENTS **Specific Comments:**	**RESPONSE**
Comment 2 *Please explain why the concentration of ethylbenzene measured at SPB-18 at 1.5 ft (which according to the RFI Table 17 was 450 mg/kg) was not included in the HHRA*	**Response:** ARC's February 26, 2009 letter to the DTSC addressed the inaccurate ethylbenzene concentration for the soil sample obtained from CPB-18 at 1.5 feet on page 5 of 7, response (4). ARC's response (4) stated: The ethylbenzene concentration for sample CPB18 at a depth of 1.5 feet bgs is reported incorrectly in Table 17 of the revised draft RI report. The non-validated ethylbenzene concentration of the sample was 450 micrograms/kilograms [ug/kg] (j-flagged). The validated ethylbenzene concentration of the sample was 500 ug/kg (J-flagged) and should have been reported in Table 17 as such. See page 20 of 3532 of Appendix I in the revised draft RI report for the validated analytical documentation of the ethylbenzene concentration. Table 17 will be revised in the forthcoming draft Addendum to the Revised Draft 2006 Remedial Investigation Report to correct this inaccuracy. Since this sample did not represent the maximum concentration the results were not used in the HHRA calculations.
Comment 3 *HERO recommends correcting the summary Table A-1d for the SVOCs and any other tables or calculations which may utilize the corrected information. HERO notes that the results listed in this Table do not match Table 18 in the RI report where multiple PAHs were detected in multiple samples. The values shown seem to be all non-detects. As a single example CBP14-1 5 in the RI report is listed as having 9.4 mg/kg benzo(a)pyrene, but in Table A-1d it reads <25 mg/kg. Also, please identify the source (report, table, page and analysis) for the maximum naphthalene concentration used in Table 1b or the off-site residences. HERO was unable to find the concentration used.*	**Response:** The results in HHRA table A-1d present the USEPA Method 8270 SVOC results which include PAHs. USEPA Method 8310 results for PAHs are presented in HHRA Table A-1b. This table contains the detected results that the HERO comment notes. The detected PAH results were used in the HHRA calculations. The maximum naphthalene concentration value of 3.6 mg/kg used in the HHRA was verified in the laboratory appendix in the RI and the project database. The RI table for VOC analysis only presented the data for select chemicals and does not include naphthalene. While the result was verified in the laboratory report and database, the appendix table A-1c does not reflect the correct value possibly due to a database report error. A review of the data presented in the tables will be conducted and the appendix tables will be corrected as needed. Revised tables will be provided as necessary.

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DTSC COMMENTS **Specific Comments:**	**RESPONSE**
Comment 4 *HERO recommends correcting Table A-1e providing the benzo(a)pyrene equivalents[B(a)P-eq]. It appears that within a single sample the same compound is listed multiple times (with more than one concentration). For instance, see samples HBP-09, and RB-03. This may have lead to use of the wrong maximum B(a)P-eq concentration in the risk assessment and in mapping out samples in excess of RBCs or background levels.*	**Response:** Because PAHs were analyzed by two methods for many of the samples (Method 8270 and Method 8310) there are multiple results for the same chemical for a given sample. The B(a)P-eq were calculated using the maximum value for each chemical result and results for the same chemicals were not added. All the data was presented to show the difference between the results from the two methods. However, we understand that this presentation is confusing and will only show the result that was used in the calculation in the final HHRA. A revised Table A-1e will be provided.
Comment 5 *HERO also recommends modifying the evaluation and the discussion of locations where the RBC or [B(a)P-eq] background levels are exceeded to incorporate the understanding that detection limits were high. In order to evaluate the samples with high detection limits which were non-detect, HERO recommends that [B(a)P-eq] be calculated using ½ the detection limit for the carcinogenic PAHs. HERO also suggests indentifying the sampling locations and/or depths whose toxicity is due to use of ½ the detection limit on modified Figures 7-11.*	**Response:** For the majority of samples, PAH analyses were conducted using two methods (1) EPA Method 8270 and EPA Method 8310. EPA Method 8310 was used to achieve lower detection limits. However, there is a subset of samples in which only EPA Method 8270 was used and some of these samples which are nondetect do exhibit elevated detection limits as pointed out by DTSC. To address this issue, the discussion presented in response to General Comment #3 above will be added to the uncertainty section regarding elevated detection limits. In addition, B(a)P-eq will be calculated for these nondetect samples using ½ the detection limit and Figures 7-11 will be revised to identify those locations that would exceed the background level or RBC as appropriate.
Comment 6 *HERO recommends use of the OEHHA unit risk factor for benzene of 2.9 × $10^{-5}(ug/m^3)^{-1}$ rather than the IRIS value of 7.8 × 10^{-6} in the HHRA. HERO also recommends use of the unit risk factor for naphthalene of 3.4 ×10^{-5} $(ug/m^3)^{-1}$, and ethylbenzene of 2.5 × 10^{-6} $(ug/m^3)^{-1}$. While Table 7 indicates that these toxicity values were used in the HHRA, the Johnson and Ettinger spreadsheets in Appendix C indicate otherwise for the indoor-air assessment, at least.*	**Response:** As noted on the last paragraph on Page 35 of the report, the J&E spreadsheets were used to calculate the indoor air concentration and were not used to calculate risk. The indoor air concentration was taken from the model spreadsheet and input into the risk calculation workbooks presented in Appendix B to calculate risk using OEHHA toxicity values and following the hierarchy presented in the HHRA

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DTSC COMMENTS **Specific Comments:**	**RESPONSE**
Comment 7 *HERO notes that a hexavalent chromium oral cancer slope factor has not yet been adopted in California and it is acceptable to evaluate chromium VI risks using only the inhalation route of exposure.*	**Response:** HERO's comment is acknowledged. However given that California has used the oral cancer slope factor in the derivation of a draft Public Health Goal and the United States Environmental Protection Agency Regional Screening Levels (RSLs) include the oral cancer slope factor we would like to retain the evaluation in the HHRA as a conservative risk characterization. Text will be added to the uncertainty section that states "For hexavalent chromium, the oral cancer slope factor has not been adopted by California yet but was included as a conservative measure in anticipation of the derivation of a value based on the recently concluded NTP study."
Comment 8 *HERO recommends including an evaluation for lead hazards in the HHRA through comparison with the recently enacted commercial/industrial and residential screening levels of 320 and 80 mg/kg respectively. HERO notes that lead levels were mostly below 80 but one location was as high as 1200 mg/kg. HERO also recommends further investigating the distribution of lead on the residential properties. HERO notes that moderately elevated levels were found in the Haack rework soil on the residential property and in the adjacent Haack soil (maximum of 160 mg/kg at RB01-1.5). Step-out levels or cleanup goals would be 2-times the CHHSL, and the site-wide 95% UCL concentration for lead should be at or below the CHHSL.*	**Response:** The risk characterization section will be revised to include comparing site data to the CHHSL values for lead. The maximum value will be presented as well as the 95UCL concentration for on-site and off-site soils. As a point of reference the 95UCLconcetration for off-site soil samples is 75 mg/kg. For on-site soil samples, the 95UCL concentration is 79 mg/kg. No additional investigation will be conducted to evaluate lead. As noted in the DTSC comment the maximum off-site value is 160 mg/kg, however all other samples are well below the residential CHHSL value of 80 mg/kg. In addition, the 95UCLfor off-site samples is 75 mg/kg, which is below the residential CHHSL.
Comment 9 *Page 52: HERO recommends modifying the text under Section 5.5 to indicate that the distributions of chemicals were indentified where risks were individually greater than the thresholds presented rather than those which contributed to a risk over the thresholds. HERO notes that the RBCs for each chemical were set at the cancer risk threshold of 1×10^{-5} for a worker and 1×10^{-6} for a resident and trespasser. Other COPCs with risks below these levels may cumulatively contribute to risks above the risk thresholds.*	**Response:** Section 5.5 will be revised to explain that the focus of the evaluation was on individual chemicals that exceeded the target risk thresholds. It is acknowledged that other chemicals may contribute to cumulative risk. However given the nature of the impacts at the site and that PAHs are the primary chemicals contributing to risk, we believe the existing presentation provides sufficient information on what locations are driving risk at the Site for consideration in future documents such as the Feasibility Study.

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DTSC COMMENTS **Specific Comments:**	**RESPONSE**
Comment 10 *Table D-1: HERO appreciates that comparisons were made for B(a)P-eq and arsenic with both the risk based concentration or the regional background levels. HERO does not recommended use of the risk based concentrations for arsenic but only making the comparison with the regional background level. HERO concurs with comparing the B(a)P-eq with the RBC if the RBC is a higher concentration than the regional background level.*	**Response:** Normally if a RBC is above the background level, then the RBC is used as the comparison. Since the arsenic concentrations in 3 samples were above background but below RBCs for most receptors they were included in Table D-1 and noted on the figures. To address DTSC comments, the figures will be revised to also show where concentrations were above the background concentration as well.
Comment 11 *Table D-1 HERO notes that the presentation of sampling locations with concentrations in excess of calculated risk based concentrations is very useful, however HERO may not agree with the specific risk based concentrations currently presented. The RBCs sometimes differed HEROs calculation (using the same target risk levels and exposure factors) by two or three-fold for reasons which are currently not completely clear. HERO may recommend revisiting the RBCs when clean up goals are discussed in future feasibility studies. Examples where the RBCs presented in the HHRA are higher than those calculated by HERO for a commercial /industrial scenario include benzene (HERO-7.9 mg/kg, HHA-24 mg/kg), naphthalene (HERO-120mg/kg, HHRA-250 mg/kg). The ratio was similar between HERO and HHA calculations for the residential scenario.*	**Response:** Comment acknowledged. Additional supporting information for proposed cleanup levels will be provided as an appendix to the Feasibility Study for HERO review.
Comment 12 *HERO recommends adding the necessary text descriptions and figure annotations showing locations where benzene in soil is in excess of RBCs. Benzene in soil contributes to site risks for residents at or above 1×10^{-6} for residents and has an RBC calculated in table D-1. HERO also recommends adding to Table D-1 the RBC for benzene in soil-gas. Benzene in soil-gas is identified in the text and in figures as contributing in one location to elevated risks on site but the RBC is not presented.*	**Response:** There are only two samples, RB03-SL-10 and CPB17-2SL-1.5, that have concentrations at or just above the residential RBC of 0.48 mg/kg. RB03-SL-10 is a sample that was collected at 10 feet below ground surface and it had a benzene concentration of 0.49 mg/kg, just above the RBC. CPB17-2SL-1.5 had a concentration of 0.48 mg/kg – equal to the RBC. Since the calculated risk from these concentrations is not above the $1x10^{-6}$ threshold when considering significant figures, they were not included on the figure. We will notate the one location, RB03, where concentrations were just above the RBC on Figure 9. The RBC for benzene in soil gas will be added to Table D-1.

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DTSC COMMENTS **Specific Comments:**	**RESPONSE**
Comment 13 *HERO recommends presenting cumulative risks and hazards including both indoor and outdoor exposures for the residents and commercial/industrial workers to help inform risk management decisions although HERO acknowledges that this overestimate cumulative risks and hazards.*	**Response:** Section 5 will be revised to include a presentation of cumulative risks and hazards summing the indoor and outdoor exposures. A discussion will also be included as to the conservatism of adding these types of exposures.

REVISED TEXT

Prepared for
Atlantic Richfield Company
6 Centerpointe Drive
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HUMAN HEALTH RISK ASSESSMENT

Gardena Sumps
1440 West Artesia Boulevard
Gardena, California

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Project Number SC0467

May 2011

HUMAN HEALTH RISK ASSESSMENT

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1440 West Artesia Boulevard
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May 2011

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LIST OF ACRONYMS

95UCL 95% Upper Confidence Limit on the Mean
ADD Average Daily Dose
AER Air Exchange Rate
ATSDR Agency for Toxic Substances and Disease Registry
BaP-eq benzo(a)pyrene toxicity equivalent concentration
bgs below ground surface
Cal-EPA California Environmental Protection Agency
COPC Chemical of Potential Concern
CSF Cancer Slope Factor
CSM Conceptual Site Model
CTR California Toxics Rule
DTSC Department of Toxic Substances and Control
EPC Exposure Point Concentration
HHRA Human Health Risk Assessment
HI Hazard Index
HQ Hazard Quotient
HSAA California Hazardous Substances Account act
IRIS USEPA Integrated Risk Information System
J&E Johnson and Ettinger Subsurface Vapor Intrusion Model
LADD Lifetime Average Daily Dose
MDL Method Detection Limit
NCP National Oil and Hazardous Substances Pollution Contingency Plan
OEHHA Cal-EPA Office of Environmental Health Hazard Assessment
RBC Risk-Based Concentration

REL	Reference Exposure Level
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
RSL	Regional Screening Level
URF	Unit Risk Factor
USEPA	United States Environmental Protection Agency
VF	Volatilization Factor
VOC	Volatile Organic Compound

1 INTRODUCTION

On behalf of Atlantic Richfield Company (ARC), Geosyntec Consultants (Geosyntec) has prepared this Human Health Risk Assessment (HHRA) for the Gardena Sumps Site (the "Site"), located at the southwest corner of the intersection of Artesia Boulevard and Normandie Avenue in the City of Gardena, Los Angeles County, California. A Site location map is provided as **Figure 1**. Geosyntec conducted this HHRA to estimate potential human health risks associated with residual chemicals detected in soil, soil gas, and groundwater at the Site and to provide information for use in a Feasibility Study (FS) to evaluate alternatives necessary to select a remedy appropriate for the Site.

The area evaluated in this HHRA includes the Cooper and Haack properties within the Site boundary and the four adjacent, offsite residential properties located to the south of the Site boundary (**Figure 2**). This HHRA includes an evaluation of commercial/industrial worker, construction worker, hypothetical future residential, and trespasser exposures, prior to any remediation efforts at the Site. In addition, a current residential scenario has been included for the adjacent offsite residential area. Although the Site will likely remain commercial/industrial in nature, a more conservative hypothetical future residential scenario was included to evaluate potential risks under an unrestricted land use scenario. The methodology used in this HHRA is consistent with current United States Environmental Protection Agency (USEPA) and California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC) guidance. The lead agency providing oversight for this HHRA is the Cal-EPA DTSC.

The following subsections provide a summary of the Site background information and a summary of the risk assessment objectives and approach.

1.1 Site Background Information

The Site is approximately 6.5 acres and is subdivided into seven privately owned parcels. Two of the largest parcels include the Cooper property (approximately 3 acres) and the Haack property (approximately 2.6 acres). The southwestern portion of the Site consists of four residential parcels. The Site is bordered on the south by Los Angeles County Department of Public Works property and the concrete-lined Dominguez Flood Channel and to the west by commercial and residential buildings (**Figure 2**). Properties surrounding the Cooper Property and Haack Property consist of mixed residential, commercial, and light industrial development areas. Two large sumps containing

primarily petroleum refining wastes (referred to as 'sludge') occupy approximately 80% of the Cooper property. A smaller sump containing sludge underlies the northeastern portion of the Haack property. There is also an area south of this sump that partially underlies a portion of the Haack Property and a small portion of the residential parcels that is referred to as the Haack Rework Area in the draft Remedial Investigation (RI) report (Stantec, 2008). The Haack Rework area contains sludge material, brick and concrete debris and soil disturbed by excavation and replacement (Stantec, 2008). The three sumps and the Haack Rework Area constituted the areas of concern for the RI (**Figure 2**) as well as for this HHRA.

Historical use of the Site appears to have begun in the late 1920's when it had been owned by A.H. and Florence Vaughan. The Vaughan's leased the property to George McGhee in 1925 who subsequently assigned the lease in 1926 to the Moneta Brick Company for use as a clay mine. The clay mine operated through the late 1930's excavating clay from four pits on the Site (Stantec, 2008). Although the original total depths of the pits were never documented, the current RI investigation indicates that the depths of the sumps are typically less than 10 ft in depth with minor localized excavations to 15 ft in depth. The presence of groundwater limited the depth of the sumps. In 1939, the property consisting of the future Haack, Cooper, and residential properties was granted by the Vaughans to Denys Goddard (Stantec, 2008).

In the 1940s, these pits were alleged to have been used as a disposal location for acidic oil sludge and tank bottom sludge from Southern California petroleum refining operations of one or more oil companies. Between the 1940s and 1960s, the properties passed through a number of parties (Stantec, 2008):

- 1947 – Wendell and Golda Hopkins (future Haack and Cooper Properties)
- 1948 – S&L Manufacturing Company (future Haack and Cooper Properties):
- 1953 – Residential Properties are distributed by Goddard to various individuals;
- 1957 – Los Angeles Flood Control District (Southern Property)
- 1958 – Charles Warfel (future Haack and Cooper Properties)
- 1959 – William Ward (future Haack and Cooper Properties)
- Late 1950s to early 1960s – Aircraft Magnesium Corporation, which leased and operated a metal casting facility on the future Haack Property;
- 1960 – Clarence and Genevieve Haack acquired the western 2.6-acre property from S&L Manufacturing;
- 1966 – Normandie-Artesia Property Company (future Cooper Property)
- 1975 – William Ward (future Cooper Property)

- 1977 – Mr. Thomas Cooper.

Currently, the western and eastern properties are owned by the Clarence Haack living trust and Mr. Cooper, respectively (Stantec, 2008).

Two of the three pits originally constructed during the clay mining operations remain on the Cooper Property, and are currently capped by geosynthetic material. This capped area is fenced with no development of the Cooper property to date. Several industrial buildings have been constructed on the Haack Property. The remaining portion of the Haack Property has been paved with asphalt and concrete. The southeastern portion of the Haack Property contains soil mixed with oily waste, referred to as the Haack rework area. A fence separates the Haack and Cooper Properties. Currently the Haack Property is leased to various tenants who operate small businesses, among them a U-Haul rental agency, a metal fabricating, a sand blasting, a painting company, and an auto body repair shop. Three buildings and numerous small trailer-type storage structures are present on the Haack Property (Stantec, 2008).

Additional background information regarding the Site is presented in the *Revised Draft 2006 Remedial Investigation Report* (Stantec, 2008).

1.1.1 Previous Investigations

This summary of previous investigations is from the Revised Draft 2006 Remedial Investigation Report. Gardena Sumps Site prepared by Stantec (Stantec, 2008). Environmental investigations at the Site commenced in early 1981 after a citizen complained about the condition of the sumps to the California Department of Health Services (Cal-DHS), DTSC's precursor agency. Cal-DHS obtained and analyzed seven liquid and sludge samples from the two sumps on the Cooper Property and identified several hazardous chemicals warranting further investigation. During 1982, USEPA conducted three separate investigations at the Site. The first investigation was unsuccessful due to invalid sampling and analysis. USEPA in their second investigation collected samples located on the eastern portion of the two sumps on the Cooper Property. But again, these samples were deemed invalid due to laboratory quality assurance issues. During their third investigation later in 1982, USEPA constructed four groundwater monitoring wells that were assumed to be hydraulically downgradient from the Site. These wells were intended to monitor groundwater underlying the Site. Sampling and analytical results for organic compounds indicated that no significant concentrations of contaminants were present in groundwater. Based on the three

investigations, the Site was determined by the USEPA to pose no immediate threat to human health or the environment.

Groundwater samples were also collected from four wells within a 1,000-foot radius of the Site and were analyzed for Volatile Organic Compounds (VOCs). No VOCs were identified in the water samples collected from these offsite wells. Two grab samples from the sumps located on the Cooper Property were also sampled during this investigation. Analytical results for the sump grab samples indicated the presence of trichloroethene (TCE), benzene, ethyl benzene, and toluene. DTSC in a follow-up investigation of the four groundwater MWs concluded that the groundwater quality conditions were not being significantly impacted by contaminants found in the sumps.

In 1992, a focused RI was conducted which included four sludge borings on the Cooper Property, two borings on the Haack Property, and ambient and flux chamber air emission monitoring. The sludge samples from the Cooper Property confirmed results from earlier investigations on the chemical composition of the sludge, and the borings on the Haack Property identified that sumps existed beneath concrete, soil fill, and asphalt on the eastern portions of that property. The air monitoring and flux sampling indicated that significant emissions of compounds contained in the sludge were not occurring.

In 1993-1994, URS conducted a groundwater RI at the Site to assess subsurface conditions along the Site perimeter. URS installed three clusters of groundwater monitoring wells (MWs) (i.e., one 30- or 40-foot deep A-series well and one 90-foot deep B-series well per cluster, designated MW-01A/B, MW-02A/B, and MW-03A/B). Wells MW-01A/B through MW-03A/B were sampled by DTSC periodically through early 2002. During the sampling event in 1994, tetrachloroethylene (PCE) exceeded the Maximum Contaminant Level (MCL) in one well (G-4 with 17 μg/L), and total xylene isomers were detected at 17.8 μg/L in MW-03B. All other analytes were either non-detect or detected at concentrations less than laboratory Method Detection Limits (MDLs).

During the same 1993/1994 period, DTSC placed a geotextile cover over the two Cooper sumps and a portion of the Haack Rework Area. DTSC then investigated subsurface conditions (particularly soil and waste sludge) in borings on the Haack Property, and obtained 15 surface soil samples around the sumps located on the Cooper Property. DTSC confirmed the presence of the sumps on the Haack Property, and found the waste to be viscous, soft to hard, black organic sludge interbedded with soil

layers. The sludge contained high concentrations of polynuclear aromatic hydrocarbon (PAH) compounds and exhibited low pH with locally elevated concentrations of metals.

In 1995, DTSC contracted with Tetra Tech, Inc. (Tetra Tech) to perform a Baseline HHRA (Tetra Tech, 1995). The purpose of the BHHRA was to estimate the potential health risk posed by the compounds that were found by previous investigations to occur in soil and sludge, groundwater, and air at the Site. The BHHRA considered industrial and residential property use and accounted for several exposure pathways (e.g., soil/sludge ingestion; dermal contact with soil/sludge; inhalation of vapors emitted by soil/sludge). The BHHRA concluded minimal risks to current workers from soil and sludge because of the fencing and cover on sumps located on the Cooper Property, and the asphalt/concrete over the sumps on the Haack Property. Tetra Tech also concluded that the fence and geomembrane cap on the Cooper Property and/or the asphalt cover on the Haack Property had to be maintained to preclude future potential exposures. The principal contaminants associated with both soil and sludge cancer risk estimates included the PAHs: chrysene, benzo(b)fluoranthene, and benzo(a)pyrene. The principal contaminant associated with air emission cancer risk estimates was benzene. The BHHRA found that potential exposure by hypothetical future Cooper Property residents to indoor air containing hydrogen sulfide gas could result in an air emission hazard index exceeding one. Inhalation exposures were shown to not present a hazard to offsite receptors for either current or future conditions and future groundwater exposures did not pose a cancer risk or a hazard (Stantec, 2008).

1.1.2 Remedial Investigation

In late 2005 and 2006, Stantec Consulting Corporation (Stantec), performed an RI field activities at the Site. The purpose of this RI was to: 1) obtain detailed technical data on the sludge for a Feasibility Study of remedial alternatives and to update the Baseline Risk Assessment; 2) to determine the depth and lateral and vertical extent of the sludge at the Site; 3) to develop a groundwater monitoring program to evaluate prior reported detects of dissolved metals; 4) to obtain data for use in an updated baseline human health risk assessment that will add to previous risk assessment evaluations using the more recently developed Johnson and Ettinger Model involving subsurface vapor intrusion into buildings (Stantec, 2008).

The findings of the 2006 RI included the following: The sludge contains elevated concentrations of SVOC's, in particular, PAH's. The sludge has low pH ranging from 1.3 to 3.7 and contains sulfides, residual sulfuric acid, and entrained sulfur dioxide gas. Several compounds and metals were detected in the soil and sludge samples including:

anthracene, benzene, chromium, copper, hydrogen sulfide, lead, methyl anthracene isomers, methyl ethyl benzene, methyl fluorine, nickel, phenanthrene, pyrene, sulfur dioxide, toluene, trimethylbenzene, and trimethylnaphthalene isomers. The RI concluded that the three main COPCs from soil and soil sludge are chrysene, benzo(b)fluoranthene, and benzo(a)pyrene. The COPC's related to potential vapor emissions included benzene and hydrogen sulfide. No COPC's were identified for groundwater beneath the site (Stantec, 2008).

The results from the 2006 RI resulted in the conclusions that the undisturbed sludge: 1) does not pose a threat to either surface or groundwater quality in the vicinity of the Site and 2) does not pose a substantive threat to the air quality in the immediate vicinity of the Site (however, isolation of the sludge from temperature fluctuations above approximately 100 degrees would further minimize this potential impact); and 3) does not pose a threat to further contamination of soil surrounding the sludge by leaching of COPCs from the sludge (Stantec, 2008).

In 2009, Stantec performed additional RI field activities at the Site. The 2009 RI activities included sampling of soil, sludge, groundwater, and soil gas to fill data gaps identified from the 2006 RI. Samples were tested for inorganics, metals, PAHs, SVOCs, VOCs, and TPH (Stantec, 2009). The 2009 RI data generally confirmed the results of previous RI data and provided additional sludge delineation and characterization.

In addition to the 2009 sampling, Stantec in 2010 reoccupied a location in the residential area to verify the presence of an elevated concentration of hexavalent chromium. The detection was suspect as the total chromium concentrations were almost a third lower than the hexavalent chromium concentration (33 mg/kg versus 100 mg/kg). Results of the resample indicated concentrations of 17 mg/kg and non-detect (<1 mg/kg) for total and hexavalent chromium, respectively. This non-detect resampling result suggests that the RB-01 hexavalent chromium result was suspect since similar results could not be duplicated.

1.1.3 Local Geology and Hydrogeology

The Site is underlain by a thick sequence of marine and continental sediments that were deposited in a board synclinal depression. This depression is generally referred to as the Los Angeles Basin. According to boring logs from previous investigations, sediments underlying the Site, to the maximum explored depth of 92 feet bgs, consist primarily of a mixture of clays and silts with small lenses of sand (Stantec, 2008).

Regionally, surface waters drain to the Dominguez Channel, a concrete-lined flood-control structure that lies approximately 100 to 150 feet south of the Site. The upstream portion of modern day Dominguez Channel originates several miles west-northwest of the Site, and it drains surface water to the southeast where it discharges to the Cerritos Channel of the Los Angeles Harbor. Surface water at the Site generally drains towards the east following Site topography, and is intercepted by a flood control storm drain located at the northeast corner of the Site adjacent to the intersection of Artesia Boulevard and Normandie Avenue. Historically, the Dominguez Channel flowed along a natural channel bed located approximately several hundred feet north and east of the Site where it flowed into Laguna Dominguez and then emptied again into a natural channel bed flowing to the southeast. This led to speculation that shallow groundwater flow would have been to the northeast in the Site vicinity prior to the re-channelization and concrete-lining of Dominguez Channel from north and east of the Site to the south and southeast of the Site in the early 1960s (Secor, 2005).

Screened intervals for the monitoring wells (MWs) at the Site and in the immediate Site vicinity cover three subsurface elevation intervals (Secor, 2005):

1) "A" series wells - a shallow zone between approximately ten-feet above mean sea level (msl) and -13 feet msl;
2) Well G-4 - an intermediate zone between approximately -17 feet msl and -28 feet msl; and
3) "B" series wells – a deeper zone between approximately -51 feet msl and -62 feet msl.

The depth to groundwater measured in Site MWs has ranged between 12.87 feet to 20.08 feet in the shallow zone wells, between 17.62 feet to 25.02 feet for the deeper zone wells, and 21 to 22 feet in well G-4 (Secor, 2005). The flow directions and gradients of the site groundwater horizons are discussed in the RI (Stantec, 2008).

Additional details regarding the Site geology and hydrogeology is presented in the *Revised Draft 2006 Remedial Investigation Report* (Stantec, 2008).

Additional groundwater elevation information has been collected as a part of the 2009 RI work conducted by Stantec in 2009. The presence of perched water was investigated by installing temporary wells at several locations on the site. In the few wells that perched groundwater was encountered, the depth to water ranged from 1.74 to 10.09 feet below top of casing. The shallowest perched groundwater depth was observed in TW109 and TW110 which are along the northern boundary of the Haack Property.

These shallow water levels are thought to be anomalous and potentially due to other water contributions such as leaking water lines in the adjacent street (personal communication, Stantec 2009).

1.2 Risk Assessment Objectives and Approach

The objective of the HHRA is to evaluate potential health risks associated with exposure to chemicals in soil, soil gas, and groundwater at the Site. The HHRA is a predictive tool used to assess the potential human health risks associated with releases of Site-related chemicals. This information will be used in the remedial decision-making process to determine if further action is warranted and to establish cleanup criteria.

The overall approach that was used in this HHRA was based on United States Environmental Protection Agency (USEPA) and Cal-EPA guidance documents (USEPA, 1989; 1991; 2002a, b; 2004; Cal-EPA, 1997; 1999; 2005a, b).

The HHRA consists of five major components and are summarized briefly as follows:

- **Data Quality Review and Evaluation:** A review of available Site data which defines the nature and extent of environmental impacts identified at the Site and used to identify chemicals of potential concern (COPCs) (defined as potentially hazardous chemicals associated with the Site that are present at concentrations higher than background levels).
- **Exposure Assessment:** An assessment of the magnitude, frequency, duration, and routes of potential human exposures to COPCs detected at the Site and the offsite residential area. The exposure assessment considers both current and likely future uses of the Site, and is based on complete exposure pathways to actual or probable human receptors (i.e., general groups that could come in contact with COPCs). The exposure scenarios are summarized in the Conceptual Site Model (CSM), which includes the sources, affected media, release mechanisms, and exposure pathways for each identified receptor population. The exposure assessment includes fate and transport modeling using agency-approved fate and transport models to estimate the movement of COPCs from soil to outdoor air, soil gas into indoor air, as well as from groundwater into indoor and outdoor air. Both the Johnson and Ettinger Model (Cal-EPA, 2005a) and the Soil Screening Guidance (USEPA, 2002a) are used.
- **Toxicity Assessment:** A presentation of available information to identify the nature and degree of toxicity and to characterize the dose-response relationship

(the relationship between magnitude of exposure and magnitude of potential adverse health effects on each receptor) for each COPC.

- **Risk Characterization:** A synthesis of exposure and toxicity information to yield quantitative estimates of potential cancer risks and noncancer hazards to defined receptor populations.
- **Uncertainty Analysis:** Discussion of the uncertainties associated with each of the five previous steps to assist decision-makers in evaluating the HHRA results in the context of the assumptions and variability in the data used.

The HHRA addresses potential adverse impacts to potential onsite receptors: current/future commercial/industrial workers, construction workers, hypothetical future residents, and trespassers, as well as to offsite receptors: current offsite resident. Potential exposures to chemicals detected in shallow soils were evaluated for direct contact pathways and inhalation of volatile chemicals and fugitive dust in outdoor air. Additionally, the potential for volatile chemicals to migrate from the subsurface (using soil gas and groundwater data) into above ground structures was evaluated for an onsite commercial/industrial worker, a hypothetical future onsite resident, as well as for a current offsite resident. For the construction worker scenario, shallow groundwater was also evaluated assuming that outdoor vapor inhalation and dermal contact could potentially occur with groundwater in an open excavation.

This quantitative HHRA was conducted using a mixture of default and Site-specific exposure parameter assumptions to yield an estimate of potential health risk. These exposure parameters are considered to be adequately conservative and are consistent with typical values recommended and approved by regulatory agencies, including DTSC. Reasonable maximum exposure (RME) estimates of exposure were developed for the identified exposure scenarios. For RME estimates of exposure, reasonable conservative modeling assumptions (those which tend to overestimate exposure point concentrations) and upper-bound (or high) default values for most exposure parameters were used.

This HHRA was prepared in accordance with Site-specific requests made by DTSC in the following correspondence:

- Risk Assessment Approach 25 September 2008 Teleconference Meeting Minutes;
- Response to the following DTSC comments dated 12 February 2009

  - Response to HERD comments on teleconference minutes dated 30 October 2008; and
  - Response to HERD comments on the Revised Draft, 2006 Remedial Investigation dated 21 November 2008.
- Response to Risk Assessment Approach Teleconference Meeting Minutes (9/25/08) and Revised Draft, 2006 Remedial Investigation Response dated 2 April 2009.
- Response to the DTSC comments dated 23 July 2010 and 4 November 2010.

2 DATA REVIEW AND EVALUATION

An initial step in the HHRA process is an evaluation of available data to: 1) characterize the Site; 2) develop a data set for use in the HHRA; and 3) identify media-specific COPCs. Appropriate Site data must be available to support the characterization of chemical levels and media relevant to transport processes and exposure pathways. Federal (USEPA, 1989) and state (Cal-EPA, 1999) recommended methods were used to select chemicals with the potential to contribute to overall human health. This section discusses the data evaluation steps that were used in the HHRA, as well as the methodology that was used to identify the COPCs for the Site.

2.1 Data Review

A variety of samples have been collected during the 2006 and 2009 investigations by Stantec Consulting Corporation. The primary goal of the RI was:

- provide characterization data of the physical and chemical properties of the sludge, surrounding soil, groundwater, and surficial vapor emissions;
- determine extent and depth of the sumps; and
- determine treatability characteristics of the sludge.

Data collected during the RI was intended to be used in assessing potential human health risk and in evaluating feasible remedial options. All of the RI data collected from 2006 to 2009 were considered for this risk assessment as reported by Stantec and the primary laboratories, Test America and H&P with the exception of one sample. The hexavalent chromium detection in the offsite residential area was suspect as the total chromium concentrations were almost a third lower than the hexavalent chromium concentration (33 mg/kg versus 100 mg/kg). Stantec in 2010 reoccupied the location in the offsite residential area to verify the presence of the elevated concentration of hexavalent chromium. In the follow-up sample, hexavalent chromium was not detected indicating that the original result was suspect; therefore, the original value was not included in this risk assessment.

Analytical results for soil samples collected between 0 and 12 feet bgs were used to evaluate the direct contact pathway and inhalation of outdoor air vapors and dust. This soil interval was evaluated based on the assumption that 12 feet would be the likely maximum depth of disturbance during redevelopment, and Site use and maintenance

activities and is therefore the maximum depth of soil to which current and future populations could be directly exposed.

VOCs can also migrate from beneath the subsurface and impact indoor air; therefore, potential indoor air exposures were evaluated using soil gas and groundwater samples collected at the Site and at the offsite residential area south of the Haack Property. All available soil gas and groundwater data collected in 2006 and 2009 was retained for evaluation in this HHRA.

Because soil gas data are preferred over soil data for the evaluation of the vapor intrusion pathway (Cal-EPA, 2005a), potential indoor air exposures estimated from soil samples were not included in this HHRA. Potential exposure to VOCs in soil for the vapor intrusion pathway was evaluated using soil gas data.

Sample locations for soil, soil gas, and groundwater are presented on **Figures 3**, **4**, and **5**, respectively. For offsite residential exposures, soil and soil gas locations collected within the boundaries of the off-site residential properties were included. The locations include RB01, RB02, and RB03 for soil and SV14, SV15, SV21, SV121, SV135, SV136 and SV 137 for soil gas. All other locations were considered onsite with the exception of the samples collected in the LADPW right-of-way. Statistical summaries of analytical results for chemicals detected in soil, soil gas, and groundwater samples collected from the Site are presented in **Tables 1a**, **2a**, and **3a**, respectively. Statistical summaries of analytical results for chemicals detected in soil, soil gas, and groundwater samples collected from the offsite residential area to the south of the Site are presented in **Tables 1b**, **2b**, and **3b**, respectively. A statistical summary of the chemicals detected in background soil samples are presented in **Table 1c**. The analytical results used in the HHRA for these three media are presented in **Appendix A**.

2.2 Hazard Identification

The hazard identification section of this HHRA entailed identifying chemicals that were evaluated further in the HHRA as COPCs. USEPA risk assessment guidance (1989) presents a methodology for identifying which detected chemicals should be included in a quantitative HHRA. These are defined by USEPA (1989) as chemicals potentially related to the Site whose data are of sufficient quality for use in a quantitative HHRA. USEPA guidance states that the preliminary list of chemicals to be evaluated should include all chemicals that were:

1) Positively detected in at least one sample;

2) Detected above levels of the same chemicals found in associated blank samples;
3) Tentatively identified but may be associated with the Site based on historical information;
4) Transformation products of detected chemicals; and
5) Detected above naturally occurring levels (background).

The COPC screening process for inorganic compounds included a comparison to Site background, with only those compounds exceeding background being selected as COPCs. For organic compounds, all organic chemicals positively detected in at least one sample were included as COPCs. Essential nutrients (e.g., calcium, magnesium) were not evaluated as COPCs. Statistical summaries for soil matrix, soil gas, and groundwater collected on and off site are presented in **Tables 1** through **3**, respectively.

2.2.1 Background Metals Evaluation

An evaluation of the analytical data was conducted to determine if metals detected in soils at the Site should be considered as COPCs. Typically, if chemical concentrations are within background for an area, the chemical is not selected as a COPC for the site and, therefore, is not carried forward in the HHRA.

The maximum Site metals data were compared to the background concentrations. If the maximum Site concentration was below the maximum background concentration, then that metal was not considered further in the HHRA. **Table 1c** presents a statistical summary of the background data. For this HHRA, all metals were considered to be above background levels. Although the maximum offsite residential area concentration of arsenic (8.5 mg/kg) was above site-specific background, it is below the DTSC screening level of 12 mg/kg used as background for southern California sites (Cal-EPA DTSC, 2007).

2.2.2 Carcinogenic PAHs

Carcinogenic PAHs (cPAHs) were considered COPCs in this HHRA but were evaluated using the benzo(a)pyrene toxicity equivalent (BaP-eq) concentration in accordance with the request by DTSC during discussions of the risk assessment approach presented in teleconference and meeting minutes dated 30 October 2008. BaP-eq concentrations were calculated for each soil sample using a toxicity equivalency factor (TEF) approach as described below.

Because cPAHs have similar carcinogenic effects and since information from experimental studies on the toxicity of PAHs have suggested that most are considerably less potent than benzo(a)pyrene, these compounds are generally discussed as a group using benzo(a)pyrene as the indicator. Benzo(a)pyrene is by far the most extensively studied of the PAHs, is one of the most carcinogenic, and the only PAH with sufficient quantitative information to derive an oral cancer slope factor (ATSDR, 1995).

TEFs are based on shared characteristics that can be used to rank the class of chemicals by carcinogenic potency. The ranking procedure is accomplished by referencing the chemicals to the characteristics and potency of benzo(a)pyrene, which is often used as the reference chemical for expressing the carcinogenic potency of the other cPAHs. Therefore, the cPAHs are indexed to benzo(a)pyrene to generate their TEFs. The TEFs are listed below for the seven cPAHs.

The TEFs were multiplied by the concentrations of the individual cPAHs. The seven adjusted concentrations were then added together to yield a total BaP-eq concentration. Thus, the cPAHs were quantitatively evaluated in this HHRA as COPCs using total BaP-eq concentrations derived for each soil sample.

cPAHs	TEFs
Benzo(a)anthracene	0.1
Benzo(a)pyrene	1.0
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.1
Chrysene	0.01
Dibenz(a,h)anthracene	0.34
Indeno(1,2,3-cd)pyrene	0.1

3 EXPOSURE ASSESSMENT

The objectives of an exposure assessment are to identify receptors (populations) that may be exposed to chemicals in environmental media, the exposure pathways and the route of potential intake. In addition, for pathways considered complete, the chemical concentrations to which the receptors are potentially exposed (exposure point concentrations) and the frequency, magnitude, and duration of these potential exposures (exposure parameters) need to be estimated. This exposure assessment focuses on the COPCs detected in soil, soil gas, and groundwater at the Site and at the offsite residential area. The following steps are considered in the exposure assessment:

- Identification of potentially exposed receptor populations;
- Identification of complete exposure pathways;
- Estimation of exposure point concentrations for specific pathways; and
- Estimation of chemical intakes for receptor populations associated with each complete exposure pathway.

The end product of the exposure assessment is a measure of chemical intake as an average daily dose (ADD) that integrates the exposure parameters for the receptors of concern (e.g., contact rates, exposure frequency, and duration) with the exposure point concentrations (EPCs) for the media of concern. These ADDs are then used in conjunction with chemical-specific toxicity values (e.g., reference doses and cancer slope factors) to arrive at an estimate of potential health risks for the receptors.

3.1 Conceptual Site Model

The CSM identifies potential chemical sources, release mechanisms, transport media, routes of chemical migration through the environment, exposure media, and potential receptors. A risk assessment typically considers the current and the anticipated future use of a site when developing a CSM. Potential receptors that may be exposed to Site-related chemicals currently and in the future are identified to help assess the likelihood and extent of their potential exposures.

The general CSM was constructed based on a review of the available Site information regarding the environmental setting and chemical distribution in environmental media. The CSM, presented in **Figure 6**, represents the current understanding of the sources of COPCs, the means by which they may be released and transported within and among

media, and the exposure pathways and routes by which they may contact human receptors.

3.1.1 Chemical Sources and Potential Transport Mechanisms

Potential exposure to chemicals detected in soil, soil gas, and groundwater at the Site and at the offsite residential area is partly dependent on the type of chemicals that are present and the respective exposure media. Potential exposure routes to be considered include both direct and indirect contact with soil, soil gas, and groundwater. For example, if volatile chemicals are detected in soil, indirect exposures from vapors migrating from the subsurface may occur.

The statistical summary of analytical results (**Tables 1** through **Table 3**) indicates that metals, SVOCs, including PAHs, TPH, and several VOCs were detected in soil matrix, soil gas, and groundwater samples collected from the Site and at the offsite residential area. As a result, both indirect and direct exposure routes were considered in this HHRA.

3.1.2 Identification of Potentially Exposed Populations and Exposure Pathways

To determine whether the levels of chemicals present in soil, soil gas, and groundwater at the Site and at the offsite residential area would pose a risk to human populations, it is necessary to identify the populations that may potentially be exposed to these chemicals, and determine the pathways by which the exposures may occur. Identification of the potentially exposed populations requires consideration of the range of potential land uses of the Site.

The current land use is commercial/industrial and will likely continue to remain so in the future. Although residential use of the Site may be restricted, this scenario was included in this HHRA to provide an evaluation of potential risks for an unrestricted land use. The receptors that were evaluated in this HHRA consist of (1) a current and future commercial/industrial worker; (2) a construction worker, (3) a hypothetical future onsite resident; (4) current offsite resident; and (5) a trespasser. Potential offsite residential exposures were evaluated using the data collected within the residential property boundaries located on the southern boundary of the Haack and Cooper properties.

The receptors and exposure pathways selected for evaluation in this HHRA were based on these considerations and are discussed in more detail below.

3.1.2.1 Current/Future Commercial/Industrial Worker

The Site is currently used for commercial/industrial activities and will likely remain so in the future. Potential exposures via incidental soil ingestion, dermal contact with soils, and outdoor air inhalation of volatile chemicals and/or fugitive dust were evaluated for a current/future commercial/industrial worker in this HHRA. In addition, the potential exists for vapor migration into indoor air from chemicals detected in soil gas and groundwater. Therefore, potential indoor air exposures to a commercial/industrial worker were also quantitatively evaluated in this HHRA.

It was assumed that the commercial/industrial workers will be both outdoors and indoors for the full exposure duration. This is conservative as the worker could not be both indoors and outdoors at the same time but would likely spend a portion of the day in each location. It was also assumed that the current/future commercial/industrial worker will be working for 8 hours each day, 5 days per week for 50 weeks (250 days per year) for 25 years.

3.1.2.2 Construction Worker

Construction workers will likely be involved in maintenance of the existing facilities and/or site grading and excavation for footings and utility lines if the Site is redeveloped. Due to the depth of typical footings and utilities, it was assumed that construction workers may potentially be exposed to chemicals in the top 12 feet of soil. The construction worker may be exposed to chemicals in the shallow zone soil via dermal contact and ingestion. They may also be exposed via inhalation to volatile chemicals which migrate from soil into outdoor air and to chemicals present in airborne dust generated by wind erosion and by intrusive soil-handling activities. In addition, since perched or shallow groundwater is present at the site, potential construction worker exposure could also include outdoor vapor inhalation and dermal contact with groundwater.

It was assumed that this worker will be onsite for 250 days per year for 1 year. Although their exposures were evaluated in this HHRA, it is anticipated that potential exposure to construction workers would be minimized by adherence to Health and Safety plans that may potentially be required for work on the Site during any potential redevelopment.

3.1.2.3 Hypothetical Future Onsite Resident

A hypothetical residential land use scenario was evaluated to provide a risk assessment for unrestricted land use. Potential exposures that were evaluated include indoor inhalation of volatiles from soil gas and groundwater, direct contact to soils (incidental ingestion and dermal contact with soils) and outdoor air inhalation of volatile chemicals and/or fugitive dust. It was assumed that the hypothetical resident will be living onsite for 350 days a year for 30 years.

3.1.2.4 Current Offsite Resident

A current residential land use scenario was evaluated to provide a risk assessment for the residential properties located to the south of the Haack and Cooper property boundaries. Potential exposures that were evaluated include indoor inhalation of volatiles from soil gas and groundwater, direct contact to soils (incidental ingestion and dermal contact with soils) and outdoor air inhalation of volatile chemicals and/or fugitive dust. It was assumed that the offsite resident will be living adjacent to the Site for 350 days a year for 30 years.

3.1.2.5 Trespasser

A trespasser scenario was evaluated in this HHRA. It was conservatively assumed that middle school- and high school-aged children (11-17 year olds) may trespass on the Site, even though portions of the Cooper and Haack Properties are fenced. The trespasser may be exposed to chemicals in the shallow zone soil via dermal contact, incidental ingestion, as well as outdoor air inhalation of volatile chemicals and/or fugitive dust. It was assumed that children ages 11 to 17 may trespass on the Site once a month, for 4 hours at a time, for up to 7 years.

3.1.3 Exposure Assumptions

Exposure assumptions used to evaluate potential exposures are consistent with those recommended by Cal-EPA and USEPA and reviewed and approved by DTSC. These assumptions are presented in **Table 4**.

3.2 Soil Exposure Pathways

Analytical results indicate that COPCs detected in soil at the Site and at the residential properties located to the south of the Haack and Cooper property boundaries include metals, SVOCs, PAHs, TPH, and VOCs. Statistical summaries of chemicals that were

detected in onsite and offsite soils are presented in **Tables 1a** and **1b**, respectively. The potential exists for humans to contact these chemicals via inhalation, dermal contact with the soil, and incidental soil ingestion.

3.3 Water Exposure Pathways

It is unlikely that the receptor groups will come into direct contact with VOCs at depths greater than 12 feet below ground surface. Therefore, incidental ingestion and dermal contact with groundwater were not quantitatively evaluated in this HHRA for commercial/industrial, residential, and trespasser receptor groups. However, due to the potential vapor migration of VOCs from groundwater into above-ground structures, the vapor intrusion pathway was evaluated for commercial/industrial workers, hypothetical future onsite residents, and current offsite residents. There is also potential for construction workers to come into contact with chemicals through dermal contact with shallow groundwater and/or volatilization of shallow groundwater chemicals into outdoor air. Therefore, these pathways were quantitatively evaluated in this HHRA**.**

3.4 Air Exposure Pathways

VOCs were detected in soil, soil gas, and groundwater samples collected onsite and offsite (see **Tables 1**, **2**, and **3**, respectively). Because these compounds are volatile, commercial/industrial workers, hypothetical future onsite residents, and current offsite residents may come in contact with vapors migrating from subsurface to indoor air. The indoor air pathway was evaluated for these receptors using soil gas and groundwater data. The use of soil gas data addresses potential sources of VOCs in shallow soil. Although potential exposure to outdoor air vapors emanating from soil is considered insignificant due to the large amount of ambient air dilution that likely occurs, this pathway was further evaluated for commercial/industrial workers, construction workers, residents, and trespassers in this HHRA.

3.5 Summary of Selected Exposure Pathways

The following table summarizes the receptor groups, exposure medium and exposure pathways that were quantitatively evaluated in this HHRA.

Receptor Population	Exposure Medium	Potentially Complete Exposure Pathway
Current and Future Commercial/Industrial Worker	Shallow Soil (0 -12 ft bgs)	• Incidental Ingestion • Dermal Contact • Outdoor Air Inhalation
	Soil Gas Groundwater	• Vapor Inhalation in Indoor Air
Construction Worker	Shallow Soil (0 -12 ft bgs)	• Incidental Ingestion • Dermal Contact • Outdoor Air Inhalation
	Groundwater	• Dermal Contact • Outdoor Air Inhalation
Hypothetical Future Onsite Resident	Shallow Soil (0 -12 ft bgs)	• Incidental Ingestion • Dermal Contact • Outdoor Air Inhalation
	Soil Gas Groundwater	• Vapor Inhalation in Indoor Air
Current Offsite Resident	Shallow Soil (0 -12 ft bgs)	• Incidental Ingestion • Dermal Contact • Outdoor Air Inhalation
	Soil Gas Groundwater	• Vapor Inhalation in Indoor Air
Trespasser	Shallow Soil (0 -12 ft bgs)	• Incidental Ingestion • Dermal Contact • Outdoor Air Inhalation

3.6 Exposure Point Concentrations

Exposure point concentrations (EPCs) are the concentrations of chemicals in environmental media to which receptors may be exposed through defined exposure pathways considered complete in the CSM (**Figure 3**). For the purposes of this HHRA,

maximum detected COPC concentrations were used as the EPCs for each of the following environmental media:

- shallow soil (0 to 12 feet bgs);
- soil gas; and
- groundwater

Evaluating data collected from shallow soils (less than 12 feet bgs) accounts for potential future exposure to the subsurface soils if the Site become reconfigured and deeper soils are brought to the surface and made available for direct contact exposures (e.g., via incidental ingestion, dermal contact) and outdoor air inhalation. While individuals are unlikely to have direct contact with impacted soil at depths greater than 12 feet bgs, the potential does exist for VOCs to migrate from beneath the subsurface. Therefore, soil gas and groundwater samples were used to evaluate the indoor air inhalation pathways. Finally, because shallow perched groundwater is present at the Site, shallow groundwater samples were used to evaluate construction worker exposures to groundwater.

For current offsite residential exposures, data collected within the boundaries of the residential properties to the south of the Haack and Cooper properties were used in this HHRA.

Depending on the nature of the exposure, an EPC may be estimated at a specific point, or may be averaged about an exposure area, using the 95% Upper Confidence Limit on the Mean (95UCL). In this HHRA, EPCs were characterized by using the data maximum. In future evaluations of post-remedial risk, EPCs may be characterized using the 95UCL.

3.7 EPCs for Fugitive Dust Air Pathway

Metals and SVOCs, including PAHs, were detected in soils at the Site and within the boundaries of the residential properties to the south of the Haack and Cooper properties. It was assumed that these chemicals may become airborne due to fugitive dust emissions and therefore, exposure to these chemicals may occur via inhalation of fugitive dust. Inhalation exposure to non-volatile compounds is typically minor in fugitive dust when compared to direct ingestion exposure (USEPA, 2002a). Nevertheless, a relationship can be estimated between the chemical concentration in soil and the corresponding concentration in air (secondary media) attributable to fugitive dust emissions from soil.

Potential exposure to airborne dust is estimated using a particulate emission factor (PEF) that relates the chemical concentration in soil to the concentration of dust particles in air. The PEF represents an annual average emission rate based on wind erosion. The PEF equation can be found in Section 4.2.3 (Equation 4-5: Derivation of the PEF) of the *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA, 2002a). The emissions part of the PEF equation is based on the "unlimited reservoir" model developed to estimate PM_{10} emissions (particulate matter less than 10 micrometers in diameter [PM_{10}]) due to wind erosion (Cowherd et al., 1985).

3.7.1 Commercial/Industrial Worker, Hypothetical Future Onsite Resident, Current Offsite Resident, and Trespasser

The PEF was derived using the following equation for the commercial/industrial worker, hypothetical future residential, current offsite residential, and trespasser scenarios (USEPA, 2002a):

$$PEF_{commW,res,tres} = \frac{(Q/C \times 3600)}{[(0.036 \times (1 - G) \times (U_m/U_t)^3 \times F_x]}$$

Where:

PEF	=	particulate emission factor cubic meters per kilogram (m^3/kg);
Q/C	=	inverse of mean concentration at center of source (g/m^2-s per kg/m^3)
G	=	fraction of vegetative or other cover (0.5, unitless)
U_m	=	mean annual wind speed (4.69 m/s, USEPA 2002a default)
U_t	=	equivalent threshold value of wind speed at 7 meters (11.32 m/s, USEPA 2002a default)
F_x	=	function dependent on U_m/U_t derived using Cowherd et al. (1985) (0.194 unitless, USEPA 2002a default)
0.036	=	respirable fraction (g/m^2-hr).

The dispersion part of the PEF equation includes a dispersion coefficient (Q/C) in units of grams per square meter-second per kilogram per cubic meter (g/m^2-s per kg/m^3). The Q/C term was generated using the Industrial Source Complex model and varies depending on the source area, city, and climatic zone. This term accounts for the

dispersion of particulate matter, once emitted and was estimated using the following equation (USEPA, 2002a):

$$(Q/C) = A \times \exp\left[\frac{(\ln A_{SITE} - B)^2}{C}\right]$$

Where:

Q/C	=	inverse of mean concentration at center of source (g/m^2-s per kg/m^3);
A_{SITE}	=	areal extent of soil impact (default 0.5-acre source, USEPA, 2002a);
A	=	coefficient; default = 11.911, based on air dispersion modeling for specific climate zones (unitless, USEPA, 2002a);
B	=	coefficient; default = 18.4385 (unitless, USEPA, 2002a); and
C	=	coefficient; default = 209.7845 (unitless, USEPA, 2002a).

The coefficients A, B, and C are for the Los Angeles area and are published in the *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA, 2002a). A Q/C value of 68.18 g/m^2-s per kg/m^3 was estimated as the inverse of the mean concentration at the center of a 0.5-acre source. The PEF for the commercial/industrial worker, hypothetical future onsite resident, current offsite resident, and trespasser was estimated at $9.9\times10^{+8}$ m^3/kg (**Table 5**).

Using soil EPCs and the estimated PEF, outdoor air concentrations were estimated as follows:

$$EPC_{oa} = \frac{EPC_s}{PEF}$$

Where:

EPC_{oa}	=	exposure point concentration of COPC in outdoor air (mg/m^3);
EPC_s	=	exposure point concentration of COPC in soil (mg/kg); and
PEF	=	particulate emission factor (mg/kg per mg/m^3, or m^3/kg).

Derivation of the commercial/industrial worker, hypothetical future onsite residential, current offsite residential, and trespasser PEF is presented in **Table 5**.

3.7.2 Construction Worker Scenario

Fugitive dust can also be generated during the use of heavy equipment such as graders and backhoes during property redevelopment. For this HHRA, two PEFs were derived to estimate the outdoor air EPCs of chemicals in fugitive dust: (1) a default PEF of 1×10^{-6} kg/m^3 based on DTSC recommendations and (2) a Site-specific weighted PEF based on the assumption that only a fraction of the construction time would have elevated dust levels.

The DTSC default PEF corresponds to a respirable dust concentration of 1 mg/m^3 and is based on a maximum concentration of dust in air of 10 mg/m^3 recommended by the American Conference of Governmental Industrial Hygienists (ACGIH 2004, Threshold Limit Values and Biological Exposure Indices), and the assumption that 10 percent of the mass of particles are in the respirable PM_{10} range (Cal-EPA, 2005b).

An important component of the construction-phase PEF is the duration and type of anticipated construction activities. During times of intrusive activities, such as site grading, fugitive dust emissions are expected to be higher. During other times, such as building construction, fugitive dust emissions are expected to be lower due only to wind-blown dust. The site-specific weighted PEF was developed to account for these differences in emission mechanisms coupled with the estimated time in which intrusive or non-intrusive construction activities would take place. For example, it was assumed that intrusive soil handling would occur for the first 60 days of construction when Site soils will be graded. During the remaining 190 working days of the total 250 working days, it was assumed that emissions for dust would primarily be due to the more passive emission mechanisms (i.e., wind-blown dust). Therefore, the PEF for construction-related activities was adjusted for these durations into a time-weighted average value which considers both the intrusive and non-intrusive phases of construction.

The PEF is defined as the ratio of the chemical concentration in outdoor air to the chemical concentration in soil:

$$PEF = \frac{EPC_s}{EPC_{oa}}$$

Where:

PEF	=	particulate emission factor (mg/kg per mg/m^3, or m^3/kg);
EPC_s	=	exposure point concentration of COPC in soil (mg/kg); and
EPC_{oa}	=	exposure point concentration of COPC in outdoor air (mg/m^3).

The PEF is related to the concentration of particulate matter (dust) in air:

$$PEF = \frac{1}{CD}$$

Where:

CD = concentration of dust in air (kg/m^3).

Two mechanisms for particulate emissions are considered here. During redevelopment of the Site, intrusive construction activities including soil excavation, dumping, and hauling by truck may potentially generate relatively high levels of dust. Additionally, wind erosion of surface soil is expected to generate lower levels of dust. The total dust concentration, and therefore the site-specific weighted PEF, is the sum of the contributions from these two sources:

$$PEF = \frac{1}{CD_{TOT}} = \left(CD_{INTR} + CD_{WIND}\right)^{-1}$$

Where:

CD_{TOT} = total concentration of airborne dust (kg/m^3);

CD_{INTR} = concentration of airborne dust resulting from intrusive soil-handling activities (kg/m^3); and

CD_{WIND} = concentration of airborne dust resulting from wind erosion (kg/m^3).

The construction worker is assumed to perform both intrusive soil-handling activities and other non-intrusive activities while on the Site. Based on professional judgment, it is assumed that the intrusive soil-handling activities will be conducted for 60 days and non-intrusive work will be conducted during the other remaining 190 days of the 250-day exposure period.

The dust concentration resulting from excavation, dumping, hauling, and other soil-handling activities during the 90 days intrusive work is assumed to be equal to 1 mg/m^3 or 1×10^{-6} kg/m^3 (Cal-EPA, 2005b):

$$CD_{INTR} = 1\times10^{-6}\,\text{kg/m}^3$$

The concentration of dust in air resulting from wind erosion is calculated using the approach presented in the *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA, 2002a). From this guidance, the concentration of windblown dust is calculated as:

$$CD_{WIND} = \frac{0.036 \times (1 - G) \times \left(\frac{U_M}{U_T}\right)^3 \times F_x \times F_D}{CF} \times \frac{1}{(Q/C)_{SR}}$$

Where:

CD_{WIND} = concentration of airborne dust resulting from wind erosion (kg/m^3);

0.036 = empirical constant ($g/m^2 \cdot hr$);

G = fraction of vegetative or other cover (0, unitless);

U_M = mean annual wind speed (4.69 m/s, USEPA, 2002a default);

U_T = equivalent threshold value of wind speed at 7 meters above ground surface (11.32 m/s, USEPA, 2002a default);

Fx = function dependent on U_M/U_T derived using Cowherd et al. (1985) (0.194, unitless, USEPA, 2002a);

F_D = dispersion correction factor (0.188, unitless; USEPA 2002a);

CF = units conversion factor (3600 s/hr); and

$(Q/C)_{SR}$ = inverse of 1-hr average concentration at the center of the square particulate emission source (eqn E-19, USEPA 2002a) ($g/m^2 \cdot s$ per kg/m^3).

The first term of the equation represents the emission rate of particulate matter from the ground surface to air (i.e., erosion). This flux is a function of wind speed and surface vegetation. The 0% coverage assumes that source area is essentially exposed where bare soil is available for contact. The subchronic dispersion correction factor, F_D, was included to adjust for the 1-year construction duration. The F_D was estimated using the following equation (USEPA, 2002a).

$$F_D = 0.1852 + \frac{5.3537}{tc} + \frac{-9.6318}{(tc)^2}$$

Where:

F_D = dispersion correction factor (0.193, unitless, USEPA 2002a);

0.1852 = constant (unitless, USEPA 2002a);

5.3537 = constant (unitless, USEPA 2002a);

9.6318 = constant (unitless, USEPA 2002a); and

t_C = duration of construction (250 days/year x 8 hours/day = 2,000 hours).

The second term of the equation for CD_{WIND} is the inverse of the ratio of the 1-hour geometric mean air concentration and the emission flux along a straight road segment bisecting a square site. The subchronic Q/C_{SR} term of the equation accounts for the dispersion of particulate matter, once emitted and was estimated using the following equation (Equation 5-6 in USEPA, 2002a):

$$(Q/C)_{SR} = A \times \exp\left[\frac{(\ln A_{SITE} - B)^2}{C}\right]$$

Where:

A_{SITE} = areal extent of soil impact (default 0.5-acre source in Los Angeles, USEPA, 2002a);

A = coefficient; default = 12.9351, based on air dispersion modeling for specific climate zones (unitless, USEPA, 2002a);

B = coefficient; default = 5.7383 (unitless, USEPA, 2002a); and

C = coefficient; default = 71.7711 (unitless, USEPA, 2002a).

A subchronic Q/C_{SR} dispersion factor of 23.02 g/m^2-s per kg/m^3 was estimated as the inverse of the mean concentration at the center of a default 0.5-acre square source in Los Angeles, California (CA). The PEF for the onsite construction worker was estimated as a time-weighted average:

$$PEF = \left(\frac{\left[(CD_{INTR,HIGH}) \times \left(\frac{8\,hr}{8\,hr}\right) \times (60\,d)\right] + \left[(CD_{WIND}) \times \left(\frac{8\,hr}{8\,hr}\right) \times (190\,d)\right]}{250\,d}\right)^{-1}$$

This equation results in a Site-specific PEF of $4.2\times10^{+6}$ m^3/kg for a construction worker and was incorporated into the estimation of outdoor air EPCs. The inverse of the PEF equation results in a dust concentration (CD) of 2.4×10^{-7} kg/m^3, or 240 µg/m^3 of dust (**Table 5**).

3.8 EPCs for Vapor Emissions from Soil to Outdoor Air Pathway

VOCs were detected in soil samples collected at the Site and within the boundaries of the residential properties to the south of the Haack and Cooper properties (see **Table 1a** and **1b**). Because these compounds are volatile, humans could potentially be exposed to vapors migrating through the soil to outdoor air. Outdoor vapor concentrations are typically negligible considering the significant quantity of ambient air diluting the vapor emissions. Although this pathway is considered potentially insignificant, outdoor air exposure to VOCs detected in soil matrix was quantitatively evaluated in this HHRA consistent with the DTSC PEA and USEPA guidance, as discussed below.

Potential migration of vapors from shallow soil to outdoor air is estimated using the volatilization factor (VF) (Equation 4-8: *Derivation of the VF*), as presented in Section 4.2.3 of the *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA, 2002a). The chemical-specific VFs were used in this HHRA to estimate outdoor air concentrations of vapors for commercial/industrial workers, construction workers, hypothetical future onsite residents, current offsite residents, and trespassers.

Chemical-specific VFs were used in the risk calculations for only those VOCs detected in the top 12 feet of soil (**Table 1**). Based on DTSC recommendation, the default soil physical properties using soil type loam were used to derive Default VFs. For comparison, Site-specific soil physical properties were used to derive Site-specific VFs. Chemical-specific VFs used in this HHRA are presented in **Table 5** and were derived using the following Default and Site-specific soil physical properties data:

Parameter	Default Loam	Site-specific	Units
Water-filled soil porosity (θ_w)	1.48E-01	2.44E-01	(Lwater-Lsoil)
Total soil porosity (θ_T)	3.99E-01	3.89E-01	(Lpore-Lsoil)
Air-filled soil porosity (θ_a)	2.51E-01	1.45E-01	(Lair-Lsoil)
Soil bulk density (Pb)	1.59	1.63	g/cm^3

3.8.1 Commercial/Industrial Worker, Hypothetical Future Onsite Resident, Current Offsite Resident, and Trespasser

Chemical-specific VFs for commercial/industrial workers, hypothetical future onsite residents, current offsite residents, and trespassers were derived using the following equation (USEPA, 2002a):

$$VF = \frac{Q/C \times \left(10^{-4} \frac{m^2}{cm^2}\right) \times \left(3.14 \times D_A \times T\right)^{1/2}}{\left(2 \times Pb \times D_A\right)}$$

Where:

VF = chemical-specific volatilization factor (m^3/kg);

Q/C = inverse of mean concentration at center of source (g/m^2-s per kg/m^3);

D_A = chemical-specific apparent diffusivity (cm^2/s) based on Default Loam and Site-specific soil properties (see table above);

T = exposure interval (7.9E+08 sec for a commercial/industrial worker, 9.5E+08 sec for a resident, and 2.2E+08 sec for a trespasser); and

Pb = soil bulk density (Default = 1.59; Site-specific = 1.63 g/cm^3).

The dispersion part of the VF equation includes the dispersion coefficient (Q/C) in units of grams per square meter-second per kilogram per cubic meter (g/m^2-s per kg/m^3), which was also calculated for the PEF in **Section 3.7.1** above:

$$\left(Q/C\right) = A \times \exp\left[\frac{\left(\ln A_{SITE} - B\right)^2}{C}\right]$$

Default parameters for the Los Angeles Area were used, which resulted in a Q/C value of 68.18 g/m^2-s per kg/m^3 as the inverse of the mean concentration at the center of a 0.5-acre source.

The chemical-specific apparent diffusivity based on Default and Site-specific soil physical parameters was estimated using the following equation:

$$D_A = \frac{\left(\frac{D_i \times \theta_a^{3.33}}{\theta_T^{2}}\right) + \left(\frac{D_w \times \theta_w^{3.33}}{H' \times \theta_T^{2}}\right)}{(Pb \times Koc \times foc) + \theta_w + (\theta_a \times H')}$$

Where:

D_i = chemical-specific vapor diffusion coefficient in air (cm^2/s);

D_w = chemical-specific molecular diffusion coefficient in water (cm^2/s);

θ_a = soil air content (Default = 0.251; Site-specific = 0.145 cm^3-air/cm^3-soil);

θ_w = soil water content (Default = 0.148; Site-specific = 0.244 cm^3-water/cm^3-soil);

θ_T = total soil porosity (Default = 0.399; Site-specific = 0.389 cm^3-air/cm^3-soil);

H' = chemical-specific Henry's law coefficient (unitless);

Pb = soil bulk density (Default = 1.59; Site-specific = 1.63 g/cm^3);

Koc = chemical-specific soil organic carbon partition coefficient (cm^3/g); and

foc = fraction organic carbon in soil (0.002 g/g).

The chemical-specific VFs based on Default and Site-specific soil physical properties were used in this HHRA for a commercial/industrial worker, a hypothetical future onsite resident, current offsite resident, and a trespasser and are presented in **Table 5**. These VFs were used in this HHRA to estimate inhalation exposures to outdoor air vapors at the Site for onsite receptors and within the boundaries of the residential properties to the south of the Haack and Cooper properties for offsite receptors. Outdoor air concentrations for the volatile COPCs were estimated as follows:

$$EPC_{oa} = \frac{EPC_s}{VF}$$

Where:

EPC_{oa} = exposure point concentration of COPC in outdoor air (mg/m^3);

EPC_s = exposure point concentration of COPC in soil (mg/kg); and

VF = chemical-specific volatilization factor (m^3/kg).

3.8.2 Construction Worker

For the construction worker scenario, a subchronic Q/C_{sa} dispersion factor of 14.31 g/m^2-s per kg/m^3 was estimated as the inverse of the mean concentration at the center of a 0.5-acre square source using the following equation (USEPA, 2002a):

$$(Q/C)_{sa} = A \cdot \exp\left[\frac{(\ln A_{SITE} - B)^2}{C}\right]$$

Where:

A_{SITE} = areal extent of soil impact (default 0.5-acre source, USEPA, 2002a);

A = coefficient; default = 2.4538, based on air dispersion modeling for specific climate zones (unitless, USEPA, 2002a);

B = coefficient; default = 17.566 (unitless, USEPA, 2002a); and

C = coefficient; default = 189.0426 (unitless, USEPA, 2002a).

Similar to the Site-specific PEF for a construction worker in **Section 3.7.2** discussed above, a correction factor, F_D, is included to account for the one-year construction duration considered in this scenario (USEPA, 2002a). Chemical-specific VFs for construction worker exposures were derived using the following equation (USEPA, 2002a):

$$VF_{constW} = Q/C_{sa} \times \left(\frac{1}{F_D}\right) \times \frac{\left(10^{-4}\ \frac{m^2}{cm^2}\right) \times \left(3.14 \times D_A \times T_{constW}\right)^{1/2}}{\left(2 \times Pb \times D_A\right)}$$

Where:

VF = chemical-specific volatilization factor (m^3/kg);

Q/C_{sa} = inverse 1-hour average air concentration at center of square volatile emission source (14.31 g/m^2-s per kg/m^3);

F_D = dispersion correction factor (0.188, unitless);

D_A = chemical-specific apparent diffusivity (cm^2/s) based on Default Loam and Site-specific soil properties (see table above in **Section 3.8**);

T_{constW} = exposure interval (3.2E+07 sec); and

Pb = soil bulk density (Default = 1.59; Site-specific = 1.63 g/cm^3).

The estimated chemical-specific VFs based on Default and Site-specific soil physical properties were used in this HHRA for a construction worker and are presented in **Table 5**.

3.9 EPCs for Vapor Emissions from Groundwater to Outdoor Air Pathway

Exposure concentrations for the emissions from groundwater during construction activities (e.g., installation of subsurface utilities that will intercept groundwater) were calculated using the mass transfer equation for estimating volatilization from surface impoundments (USEPA, 1995) with a box model to estimate mixing in the breathing zone. The emission rate from groundwater in the bottom of an excavation was estimated using the following equation:

$$ER = A_{Exc} \times C_{GW} \times K \times CF$$

Where:

ER = chemical emission rate from groundwater (mg/s)

A_{Exc} = area of the excavation, (m^2). Assume 3 meters long by 1 meter wide.

C_{GW} = chemical concentration in groundwater (mg/L)

K = chemical-specific overall mass transfer coefficient (cm/s)

CF = units conversion factor (10 L/cm/m^2)

The overall mass transfer coefficient was estimated by:

$$\frac{1}{K} = \frac{1}{k_l} + \frac{1}{k_g}\frac{RT}{H}$$

Where:

k_l = liquid-phase mass transfer coefficient (cm/s)

k_g = gas-phase mass transfer coefficient (cm/s)

R = ideal gas constant, 8.2E-5 atm-m^3/(mol ºK)

T = liquid temperature (290 ºK)

H = chemical-specific Henry's law coefficient (atm-m^3/mol)

The liquid-phase mass transfer coefficient was estimated by:

$$k_l = \left(\frac{MW_{O2}}{MW_i}\right)^{0.5} \times \left(\frac{T}{298}\right) \times k_{lo2}$$

Where:

MW_{O2} = molecular weight of oxygen (32 g/mol)

MW_i = molecular weight of the constituent (g/mol)

k_{lo2} = liquid-phase mass transfer coefficient for oxygen (0.002 cm/s)

The gas-phase mass transfer coefficient was estimated by:

$$k_g = \left(\frac{MW_{H2O}}{MW_i}\right)^{0.335} \times \left(\frac{T}{298}\right)^{1.005} \times k_{gH2O}$$

Where:

MW_{H2O}= molecular weight of water (18 g/mol)

k_{gH2O} = gas-phase mass transfer coefficient for water vapor (0.833 cm/s)

COPC concentrations in the breathing zone were estimated using the following equation:

$$C_{a-gw} = \frac{ER}{U_m \times W \times H}$$

Where:

$C_{a\text{-}gw}$ = concentration in air (mg/m^3)

U_m = mean annual wind speed (0.469 m/s, assumed 1/10 of the default wind speed to represent the reduced airflow expected in a shallow trench)

W = width of the excavation perpendicular to the wind direction (m, professional judgment, assume average of length [3 m] and width [1 m] of trench = 2 meters for utility trench)

H = breathing zone height above the bottom of the excavation (2 m)

An average of the length and width of a trench is conservatively assumed for the width of the excavation perpendicular to the wind direction (W). The derivation of groundwater to outdoor air concentrations, $C_{a\text{-}gw}$, is presented in **Appendix B** (**Table B-9**).

3.10 EPCs for Vapor Emissions into Indoor Air Pathway

The potential exists for VOCs to volatilize from the subsurface into indoor air. Potential migration to indoor air was evaluated using the Johnson and Ettinger (J&E) subsurface vapor intrusion model (Johnson and Ettinger, 1991 and Cal-EPA, 2005a) to estimate potential migration of subsurface vapors from subsurface soil and groundwater into indoor air. The model accounts for the diffusion of chemicals through the subsurface, the advection of chemicals through soil and concrete slabs due to pressure differentials between the soil and buildings, and the mixing in indoor air caused by heating and ventilation systems.

The J&E vapor intrusion model may be applied using soil matrix, soil gas, or groundwater concentration data. For chemicals that are detected in more than one media, the potential exists for over-representing the flux to indoor air. In other words, chemicals volatilizing from soil and groundwater may contribute to the shallow soil gas volatilization potential. Soil gas data are typically the preferred medium from which to evaluate the vapor intrusion pathway (Cal-EPA, 2005a). However, the cumulative risk and hazard were tabulated separately for the soil gas- and groundwater- to indoor air pathways to determine the potential contribution from these two exposure media. Potential indoor air exposure to VOCs in soil for the vapor intrusion pathway was evaluated through the use of the soil gas data.

The J&E vapor intrusion model requires the characterization of several building-specific parameters including building size (area and floor height), slab thickness, crack fraction (the ratio of crack area to building area), ventilation rate, and volumetric flow rate of soil gas into the building.

The DTSC default building dimensions were used (1000 centimeters, cm × 1000 cm) for both the commercial/industrial and the residential scenarios with a proposed ceiling height of 12 feet (366 cm) for a commercial/industrial building and 8 feet (244 cm) for a hypothetical future residence (see **Table 6**). A commercial/industrial air exchange rate (AER) of 1.0 exchange per hour and the DTSC residential default AER of 0.5 exchanges per hour were used in the model. The DTSC default Qsoil value of 5 liters

per minute (l/min) per 100 m^2 of floor space was used to represent the flow rate of chemicals from directly below the building foundation into indoor air. A default fraction organic carbon of 0.002 was used in the model (USEPA, 2002a). Based on DTSC recommendation, default soil physical parameters (e.g., soil bulk density and total soil porosity) for soil type Loam were used in the J&E model. These Default values are presented in the DTSC version of the J&E model spreadsheet for that soil type. For comparison, Site-specific soil physical properties were also used in the model.

For the current commercial/industrial and hypothetical future onsite residential scenarios, soil gas and groundwater data collected throughout the Site were used to evaluate the indoor air pathway. Maximum groundwater EPCs were used in the model with a depth to groundwater of 13 feet bgs (see **Section 1.1.3**). For the current offsite residential scenario, soil gas and groundwater data were used from the offsite area encompassed by the residential area to the south of the Haack and Cooper properties.

Maximum soil gas EPCs detected at each sampling depth (e.g., 5-, 10-, 13-, and 15-ft bgs) were used in the model. The highest predicted indoor air concentrations across all sample depths (see **Table C-1** in **Appendix C**) were selected as the EPCs in the calculation of potential risk and hazard. Note: the maximum detected value in soil gas did not always yield the highest predicted indoor air concentration. For example, the predicted indoor air concentration of 3.4E-06 milligrams per cubic meter (mg/m^3) for chloroform using the maximum soil gas result of 0.023 mg/m^3 detected at 13-ft-bgs was less than the predicted indoor air concentration of 5.6E-06 mg/m^3 using the next highest soil gas value of 0.018 mg/m^3 detected at 5-ft-bgs. Therefore, the latter was used in the risk calculations for chloroform.

The input parameters used in the J&E model to evaluate the indoor air pathway are presented in **Table 6**. The J&E model spreadsheets including the model inputs, intermediate calculations, and predicted indoor air concentrations are presented in **Appendix C** for soil gas and groundwater. The J&E model spreadsheets are used only to model indoor air concentrations and not to estimate potential risk. The predicted indoor air concentrations from the model were used as EPCs in the estimation of potential risk and hazard, as presented in **Appendix B**. The approach used to estimate risk for the vapor intrusion pathway is described below.

3.11 Estimating Chemical Intake

The exposure assessment quantifies the magnitude, frequency, and duration of chemical intake (daily intake) by receptor populations. Estimates of exposure or chemical intake are calculated based on assumptions regarding exposure pathways and exposure parameters. Daily intakes are estimated as being either an "Average Daily Dose" (ADD) or "Lifetime Average Daily Dose" (LADD), depending on whether the chemical under consideration is a carcinogen or a noncarcinogen: LADDs are estimated for carcinogens and ADDs are estimated for noncarcinogens (USEPA, 1989). They differ primarily in the length of time over which the exposure to the chemical is assumed to be averaged.

ADDs and LADDs are expressed as the amount of a substance taken into the body per unit body weight per time, or mg/kg-day. The LADD is averaged over a lifetime (70 years) for carcinogens, and the ADD is averaged over the expected exposure duration for noncarcinogens. The duration of exposure is assumed to vary depending on whether exposure occurs to a working population or residential population. LADDs and ADDs are estimated from the concentration of the chemical at the exposure point, the exposure frequency (i.e., number of times during a week or year), the exposure duration (i.e., the number of days, weeks, or years the exposure persists), and the physical characteristics of the receptor (such as body weight).

The ADD or LADD is estimated by multiplying an intake factor by the selected EPC (COPC concentration). The intake factor combines the Site-specific and receptor-specific assumptions for a given exposure pathway and is expressed as the amount of media (e.g., soil) taken into the body per unit concentration of chemical in the media. Multiplying the intake factor by the selected EPC yields the ADD or LADD (mg/kg-day) for that receptor population and exposure pathway. The following is a generic equation used to estimate the daily dose:

$$\text{ADD or LADD (mg/kg - day)} = \text{Selected EPC} \times \text{Summary Intake Factor}$$

Separate intake factors are calculated for each complete exposure pathway. The values and assumptions used to estimate each intake factor are dependent on the exposure pathway and receptor population being evaluated. A more detailed description of the values used for the intake calculations is presented below. The exposure parameters used in this HHRA are summarized in **Table 4**.

3.11.1 Incidental Soil Ingestion

The rate of soil ingestion is based on the amount of soil a child or adult inadvertently swallows in a given day from all sources. Exposure to COPCs, via incidental ingestion of soil, is estimated using the following variables: (1) the rate of ingestion; (2) the fraction of ingested soil that is impacted; and (3) the frequency and duration of exposure. Individuals may ingest soil through incidental contact of the mouth with hands and clothing. To estimate the LADDs and ADDs of COPCs (units of mg/kg-day) via incidental ingestion of soil, the following equation was used:

$$\text{ADD or LADD} = \frac{EPC_s \times IngR \times ABS \times EF \times ED \times CF}{BW \times AT}$$

Where:

EPC_s	=	exposure point concentration of COPC in soil (mg/kg);
IngR	=	ingestion rate of soil (mg/day);
ABS	=	percent absorption (assumed to be 100 percent);
EF	=	exposure frequency (days/year);
ED	=	exposure duration (years);
CF	=	conversion factor for soil (10^{-6} kg/mg);
BW	=	body weight (kg);
AT	=	averaging time (days): cancer effects: 70 years x 365 days; and noncancer effects: ED x 365 days.

Under the residential exposure scenarios, potential cancer risks are estimated using an age-adjusted factor for the soil ingestion pathway, since ingestion rates are different for children and adults in their first 30 years of life. The age-adjusted factor approximates the integrated exposure for small children and adults by combining their intake rates, body weights, and exposure frequency and duration. The following equation was used to estimate the age-adjusted ingestion factor:

$$IngF_{adj} = \left(\frac{ED_c \times IngR_c}{BW_c}\right) + \left(\frac{ED_a \times IngR_a}{BW_a}\right)$$

Where:

$IngF_{adj}$ = age-adjusted ingestion factor (mg-year/kg-day);
ED = exposure duration (years);
IngR = ingestion rate of soil (mg/day);
BW = body weight (kg);
a = adult exposure parameter; and
c = child exposure parameter.

The $IngF_{adj}$ was used in the following equation to estimate the LADDs and ADDs of COPCs via incidental ingestion of soil:

$$ADD_{adj} \text{ or } LADD_{adj} = \frac{EPC_s \times IngF_{adj} \times ABS \times EF \times CF}{AT}$$

Where:

EPC_s = exposure point concentration of COPC in soil (mg/kg);
$IngF_{adj}$ = age-adjusted ingestion factor (mg-year/kg-day);
ABS = percent absorption (assumed to be 100 percent);
EF = exposure frequency (days/year);
CF = conversion factor for soil (10^{-6} kg/mg);
AT = averaging time (days):
cancer effects: 70 years x 365 days; and
noncancer effects: ED x 365 days.

Adjusting for age is also considered for the other exposure pathways of concern (see Sections below). The exposure parameters that were used to estimate intake of COPCs via incidental soil ingestion are provided in **Table 4**.

3.11.2 Dermal Contact with Soil

COPCs in soil may come into contact with skin, and then become absorbed across the skin into the bloodstream. The amount of absorption into the body depends upon the amount of soil in contact with the skin, COPC concentrations in soil, the skin surface area exposed, and the potential for the chemical to be absorbed across the skin. To

estimate the steady-state dose absorbed across the skin, the following equation was used:

$$\text{ADD or LADD} = \frac{EPC_s \times SA \times AF \times EF \times ED \times CF \times DAF}{BW \times AT}$$

Where:

EPC_s	=	exposure point concentration of COPC in soil (mg/kg);
SA	=	skin surface area exposed to soil per day (cm^2/day);
AF	=	soil-skin adherence factor (mg/cm^2);
EF	=	exposure frequency (days/year);
ED	=	exposure duration (years);
CF	=	conversion factor for soil (10^{-6} kg/mg);
BW	=	body weight (kg);
AT	=	averaging time (days): cancer effects: 70 years x 365 days; and noncancer effects: ED x 365 days.

Under the residential exposure scenarios, potential cancer risks were estimated using an age-adjusted factor for the dermal contact pathway, since dermal exposure factors are different for children and adults in their first 30 years of life. The following equation was used to estimate the age-adjusted dermal factor:

$$DF_{adj} = \left(\frac{ED_c \times SA_c \times AF_c}{BW_c}\right) + \left(\frac{ED_a \times SA_a \times AF_a}{BW_a}\right)$$

Where:

DF_{adj}	=	age-adjusted dermal factor (mg-year/kg-day);
ED	=	exposure duration (years);
SA	=	skin surface area exposed to soil per day (cm^2/day);
AF	=	soil-skin adherence factor (mg/cm^2);
BW	=	body weight (kg);
a	=	adult exposure parameter; and
c	=	child exposure parameter.

The DF_{adj} was used in the following equation to estimate the LADDs and ADDs of COPCs via dermal contact with soil:

$$ADD_{adj} \text{ or } LADD_{adj} = \frac{EPC_s \times DF_{adj} \times ABS \times EF \times CF}{AT}$$

Where:

EPC_s	=	exposure point concentration of COPC in soil (mg/kg);
DF_{adj}	=	age-adjusted dermal factor (mg-year/kg-day);
ABS	=	percent absorption (assumed to be 100 percent);
EF	=	exposure frequency (days/year);
CF	=	conversion factor for soil (10^{-6} kg/mg);
AT	=	averaging time (days): cancer effects: 70 years x 365 days; and noncancer effects: ED x 365 days.

The exposure parameters that were used to estimate intake of COPCs via dermal contact with soil are provided in **Table 4**.

3.11.3 Inhalation of Vapors and Fugitive Dust

Inhalation of COPCs in outdoor air is a consideration for soil matrix and groundwater exposures. Inhalation of indoor air vapors is a consideration for soil gas and groundwater exposures.

3.11.3.1 Soil to Outdoor Air Pathway

The potential dose for inhalation of vapors and fugitive dust in outdoor air from soil was estimated using the following equation:

$$ADD \text{ or } LADD = \frac{EPC_s \times ABS \times EF \times ED \times ET}{AT \times (PEF \text{ or } VF)}$$

Where:

EPC_s = exposure point concentration of COPC in soil (mg/kg);
ABS = percent absorption (assumed to be 100 percent);
EF = exposure frequency (days/year);
ED = exposure duration (years);
ET = exposure time (8 hours/24 hours for workers; 24 hours/24 hours for a hypothetical resident; and 4 hours/24 hours for a trespasser);
AT = averaging time (days):
cancer effects: 70 years x 365 days;
noncancer effects: ED x 365 days; and
PEF = particulate emission factor (mg/kg per mg/m^3, or m^3/kg); and
VF = volatilization factor (m^3/kg).

Under the residential exposure scenarios, potential cancer risks are estimated using an exposure duration of 30 years (6 years as a child and 24 years as an adult) for the outdoor air inhalation pathway. The exposure parameters that were used to estimate intake of COPCs via outdoor inhalation of vapors are provided in **Table 4**.

3.11.3.2 Indoor Air Pathway

For the indoor air pathway, the modeled indoor air concentrations (EPC_{ia}) were used in the following intake equation:

$$\text{ADD or LADD} = \frac{EPC_{ia} \times EF \times ED \times ET}{AT}$$

Where:
EPC_{ia} = model-predicted, indoor air exposure point concentration (mg/m^3);
EF = exposure frequency (days/year);
ED = exposure duration (years);
ET = exposure time (8 hours/24 hours for a commercial/industrial worker; 24 hours/24 hours for a hypothetical resident);
AT = averaging time (days):
cancer effects: 70 years x 365 days; and
noncancer effects: ED x 365 days.

Under the residential exposure scenarios, potential cancer risks are estimated using an exposure duration of 30 years (6 years as a child and 24 years as an adult) for the indoor air inhalation pathway. The exposure parameters that were used to estimate intake of COPCs via indoor inhalation of vapors are provided in **Table 4.**

4 TOXICITY ASSESSMENT

The toxicity assessment characterizes the relationship between the magnitude of exposure to a COPC and the nature and magnitude of adverse health effects that may result from such exposure. Consistent with regulatory risk assessment policy, adverse health effects resulting from potential chemical exposures are classified into two broad categories: cancer effects and noncancer effects. The basis for the selection of toxicity values in each of these categories is described in more detail below.

The key dose-response criteria are cancer slope factors (CSFs) or inhalation unit risk factors (URFs) for calculating cancer risks from exposure to carcinogens and reference doses (RfDs) or inhalation reference concentrations (RfCs) for estimating hazard from exposure to noncarcinogens. In addition, Cal-EPA has developed chronic inhalation Reference Exposure Levels for noncancer effects. For this HHRA, chronic toxicity criteria were selected (in order of preference) from the following sources: 1) Cal-EPA Office of Environmental Health Hazard Assessment (OEHHA) Toxicity Criteria Database, online (Cal-EPA, 2010); 2) USEPA's (2010) Integrated Risk Information System (IRIS); or 3) USEPA Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites (USEPA, 2009a).

At the present time, Cal-EPA and USEPA have only developed CSFs for the oral and inhalation routes of exposure. In the absence of values specific to the dermal route, the oral toxicity criteria were used to evaluate dermal exposures to soil.

4.1 Cancer Effects

Certain chemicals are regulated as carcinogens based on the likelihood that exposure could cause cancer in humans. Numerical estimates of cancer potency for these chemicals are presented as cancer slope factors (CSFs) when evaluating risks from oral or dermal exposures or unit risk factors (URFs) when evaluating risk from inhalation exposures. These criteria represent the excess lifetime cancer risk due to a continuous, constant lifetime exposure to a specified level of a carcinogen. CSFs are generally reported as excess incremental cancer risk per milligram of chemical per kilogram body weight per day $(mg/kg \cdot day)^{-1}$. URFs are generally reported as excess incremental cancer risk per microgram of chemical in cubic meter of air $(\mu g/m^3)^{-1}$. If available, CSFs and URFs published by the Cal-EPA OEHHA (Cal-EPA, 2010) were used in preference over those published by other organizations. For chemicals where Cal-EPA has not

published a CSF nor a URF, the CSFs and URFs published by USEPA in their IRIS database (USEPA, 2010) or those listed in the RSL table (USEPA, 2009a) were used.

The CSFs and URFs used in this HHRA are presented in **Table 7**.

4.2 Noncancer Effects

The toxicity assessment for noncancer effects requires the estimation of an exposure level below which no adverse health effects in humans are expected to occur. USEPA refers to these levels as Reference Doses (RfDs) for ingestion and dermal contact exposures and Reference Concentrations (RfCs) for inhalation exposures (USEPA, 1989). Cal-EPA has developed chronic Reference Exposure Levels (RELs), which correspond to the airborne level of a chemicals which would pose no significant health risk to individuals exposed indefinitely to that chemical. The chronic RELs developed by Cal-EPA are the functional equivalent of the USEPA RfCs, although the Cal-EPA RELs are not always the numerical equivalent of the USEPA inhalation RfCs. Consistent with DTSC recommendations, the lower of either the Cal-EPA RELs referenced in the OEHHA toxicity criteria database (Cal-EPA, 2010) or the inhalation RfCs reported by USEPA (2009a; 2010) were used in this HHRA.

For some of the chemicals detected onsite and offsite (e.g., 4-isopropyltoluene), neither Cal-EPA nor USEPA have identified a noncancer toxicity value to be used in quantitative HHRAs. In order to conservatively account for the contribution of these COPCs to the total cumulative noncancer hazard, a surrogate chemical approach was employed in which the toxicity value developed for a structurally similar compound was assigned to the chemical which is lacking the toxicity value.

The RfDs and RfCs (or RELs) used in this HHRA are presented in **Table 7**.

5 RISK CHARACTERIZATION

The risk characterization process integrates the quantitative and qualitative results of the data evaluation, exposure and toxicity assessments to estimate potential cancer risks, and adverse noncancer health effects associated with exposure to COPCs detected at the Site. This integration provides quantitative estimates of potential risk and noncancer hazard that are then compared to target risk levels. The results are used to make summary judgments about the nature of the health threat to the defined receptor populations.

The process of a HHRA is iterative where site, receptor, and chemical-specific data are used when available. When specific data are not available, conservative (i.e., health protective) assumptions are utilized. The use of repeated, conservative assumptions can lead to overly conservative estimations of potential risk, but certainly provides an upper-bound estimate of the actual risk. Thus, for any site, the estimated risk level reflects an upper-bound estimate of the most probable risk. The most probable risk is likely to be much less, perhaps as low as zero, and probably not measurable in the potentially exposed population.

5.1 Risk Management Thresholds

Various demarcations of acceptable risk have been established by regulatory agencies. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 CFR 300) risk range of one in one hundred million (1×10^{-4}) to one and one million (1×10^{-6}) is used by EPA to manage risks at Superfund sites. If the cumulative cancer risk at a site is less than 1×10^{-4} and the noncancer hazard index is less that 1, action is generally not warranted (USEPA, 1991). The California Hazardous Substances Account Act (HSAA) incorporates the NCP by reference, and thus also incorporates the acceptable risk range set forth in the NCP. The Resource Conservation and Recovery Act (RCRA) Corrective Action program incorporates this same range of potential health risks as the "acceptable risk range" for determining whether corrective action is warranted at RCRA facilities and for closure purposes. The Safe Drinking Water and Toxic Enforcement Act of 1986 (California's Proposition 65; Cal Prop 65) regulates chemical exposures to the general population and is based on an acceptable risk level of 1×10^{-5}. The DTSC considers the 1×10^{-6} risk level as the generally accepted point of departure for unrestricted land use.

Thus, in general excess cumulative cancer risks in the range of 1×10^{-6} to 1×10^{-4} are considered to be acceptable with excess cancer risks less than 10^{-6} considered insignificant. The risk range between 10^{-6} and 10^{-4} is commonly called the "discretionary risk range." These ranges of acceptable risk are in contrast to the background risk of Americans in the general population developing cancer. The background risk is approximately one chance in three (0.33 or 3.3×10^{-1}) for every American of eventually developing some form of cancer (ACS, 2006).

For the purposes of this section, a cumulative risk of 1×10^{-5} and noncancer hazard index of 1 is used to compare industrial/commercial and construction worker risk estimates. For potential residential and trespasser exposures, a risk level of 1×10^{-6} and noncancer hazard index of 1 is used. These risk levels are used to provide context to the risk results and to support the following discussion which focuses on those pathways and chemicals that contribute the majority to the risk estimates. It is acknowledged that additional risk management considerations such as technical feasibility, economic, social, political, and legal factors may be part of the final risk management decision. The results of the risk characterization are really the starting point for risk management considerations for a site (USEPA, 1995).

5.2 Cancer Risks

The chemical-specific exposure estimate (i.e., the lifetime average daily dose or LADD) is multiplied by the chemical- and route-specific slope factor to arrive at a unitless probability (e.g., 1×10^{-4}) of an individual developing cancer.

In the risk characterization step of this HHRA, excess cancer risk was estimated by multiplying the lifetime average daily dose, or LADD, by the chemical-specific cancer slope factor (CSF) or the inhalation unit risk factor (URF). The following equation was used to estimate the excess cancer risk per each COPC:

$$\text{Excess Cancer Risk} = \text{LADD} \times (\text{CSF or URF})$$

The chemical-specific excess cancer risks were then summed to yield a cumulative cancer risk, which are subsequently compared to risk management criteria (e.g., the DTSC target risk goal of 1×10^{-6} for unrestricted land use).

5.3 Noncancer Hazards

The potential for noncancer effects due to exposure to an individual chemical is expressed as the hazard quotient (HQ). Chemical-specific HQs were estimated by calculating the ratio of the ADD to the corresponding chronic reference dose (RfD) or the inhalation reference exposure level (REL) for noncancer effects. The following equation was used to estimate the noncancer HQ:

$$\text{Hazard Quotient} = \frac{\text{ADD}}{(\text{RfD or REL})}$$

Implicit in the HQ is the assumption of a threshold level of exposure below which no adverse effects are expected to occur. For example, if the HQ exceeds unity (i.e., is greater than 1), site-specific exposure exceeds the RfD (or REL), then the potential for noncancer adverse effects may exist.

To assess the overall potential for adverse noncancer health effects posed by exposure to multiple chemicals, the HQs for each COPC associated with a given exposure pathway are summed, resulting in what is referred to by the USEPA as the hazard index (HI). The HI is then compared to the DTSC's and USEPA's acceptable benchmark level of 1.

$$\text{HI}_{\text{tot}} = \left[\sum_{i=1}^{n}(HQ)\right]$$

Where a receptor may be exposed to COPCs via multiple exposure pathways (e.g., inhalation of particulate and soil ingestion), the individual HIs from all relevant pathways are summed to obtain the cumulative HI for that receptor. For multiple chemical exposures, the cumulative HI might exceed 1 even if no single chemical intake exceeds its RfD. If the cumulative HI is less than 1, cumulative exposures to the COPCs at the Site are judged unlikely to result in adverse noncancer health effects. If the sum is greater than 1, a more detailed and critical evaluation of potential noncancer health hazards may be warranted. Such additional evaluation may include the consideration of the specific target organ(s) affected and mechanism(s) of action of the COPCs.

For potential exposures to lead, the DTSC previously considered exceedances over 10 μg/dl of whole blood as levels that could indicate potential adverse effects consistent

with the Centers for Disease Control Lowest Observed Affect Level for lead of 10 μg/dl and 30 μg/dl for children and adults, respectively. More recently, the Cal-EPA OEHHA has developed a 1 μg/dL benchmark for source-specific incremental change in blood lead levels for protection of school children and fetuses (Cal_EPA, 2007b). This value is now being used by Cal-EPA for evaluating potential lead exposures. Based on the revised benchmark lead level of 1 μg/dL OEHHA derived California Human Health Screening Levels (CHHSLs) of 80 mg/kg and 320 mg/kg for residential and occupational exposures, respectively (Cal-EPA, 2009). These values were used in the risk characterization of commercial/worker and residential exposures below.

5.4 Results of the Risk Characterization

Chemical-specific and pathway-specific cancer risks and noncancer hazard indices for the Site and the adjacent offsite residential properties located to the south of the Site boundary are summarized in **Tables 8** through **12**. The detailed cancer risk and noncancer hazard calculation tables are presented in **Appendix B** while the J&E model spreadsheets for soil gas and groundwater are presented in **Appendix C**. The Default scenario refers to the use of default loam soil physical properties data whereas the Site-specific scenario refers to the use of Site-specific soil physical properties data. These parameters were used to estimate outdoor and indoor inhalation exposures. For the construction worker exposure to particulates, the Default scenario refers to the use of the DTSC default PEF and the Site-specific scenario refers to the use of the weighted PEF approach.

5.4.1 Commercial/Industrial Worker

Estimated cumulative cancer risks and noncancer hazards for the commercial/industrial worker are listed in **Table 8** for potential soil exposures, **Table 9** for potential indoor air exposures due to soil gas, and **Table 10** for potential indoor air exposures due to groundwater.

Using maximum COPC concentrations detected in soils (including sludge) at the Site, the total cancer risk from incidental ingestion, inhalation, and dermal contact of soil was estimated at 1×10^{-3} for both the Default and Site-specific scenarios (**Table 8**). These results are above the DTSC target risk goal of 1×10^{-6} based on unrestricted land use, but are also above the target goal of 1×10^{-5} commonly used for managing commercial/industrial land uses. The primary risk drivers are the cPAHs, and to a lesser extent arsenic. The maximum BaP-eq concentration of 194 mg/kg was detected at sample location CPB3 at a depth of 1.5-feet bgs. The total noncancer hazard from

incidental ingestion, inhalation, and dermal contact of soil was estimated at 0.5 for both the Default and Site-specific scenarios, which is less than the benchmark level of 1.

Using maximum model-predicted indoor air EPCs and Default soil properties, the total cancer risk from inhalation exposure to vapors emanating from soil gas into indoor air was estimated at 8×10^{-7} (**Table 9**). Using maximum model-predicted indoor air EPCs and Site-specific soil properties, the total cancer risk was estimated at 2×10^{-7} (**Table 9**). These results are both below the DTSC target risk goal of 1×10^{-6}. The total noncancer hazard for the soil gas to indoor air pathway was estimated at 0.009 for the Default scenario and at 0.002 for the Site-specific scenario, which are both significantly below the benchmark level of 1.

The total cancer risk from inhalation exposure to vapors emanating from groundwater into indoor air was estimated at 2×10^{-8} for the Default scenario and 1×10^{-8} for the Site-specific scenario (**Table 10**). The total cancer risks for this pathway are significantly below the target risk goal of 1×10^{-6}. The total noncancer hazard was estimated at 0.0008 for the Default scenario and at 0.0004 for the Site-specific scenario, which are both significantly less than the benchmark level of 1.

In accordance with DTSC's request, cumulative risks for indoor air exposures and outdoor air exposures have been combined to provide a total cumulative risk estimate. Summing the outdoor air risk estimate of 1×10^{-3} and the indoor air risk estimate of 8×10^{-7} gives a total cumulative risk of 1×10^{-3}. As mentioned above, the primary risk drivers are the cPAH compounds, and to a lesser extent, arsenic. The cumulative hazard estimate is 0.51, below the benchmark level of 1. Combining the indoor air and outdoor air risk estimates for a worker may overestimate risk as a worker cannot be both indoors and outdoors for the entire work day.

Lead concentrations in onsite soils ranged from 2 mg/kg to 1,200 mg/kg with a 95UCL concentration of 79 mg/kg. The highest lead concentration (1,200 mg/kg) was from the 2-foot sample at location HPB113. The duplicate result for this sample was 690 mg/kg. The next highest concentration was 130 mg/kg at the same location at 5 feet bgs. All other lead concentrations, as well as the 95UCL concentration, are below the occupational CHHSL of 320 mg/kg.

5.4.2 Construction Worker

Estimated cumulative cancer risks and noncancer hazards for the construction worker are listed in **Table 8** for potential soil exposures, **Table 11** for potential dermal contact to groundwater, and **Table 12** for potential outdoor air exposures due to groundwater.

Using maximum COPC concentrations detected in soils (including sludge) at the Site, the total cancer risk from incidental ingestion, inhalation, and dermal contact of soil was estimated at 2×10^{-4} for both the Default and Site-specific scenarios (**Table 8**). This result is above the DTSC target risk goal of 1×10^{-6} based on unrestricted land use, but is also above the target goal of 1×10^{-5} commonly used for managing commercial/industrial land uses. The primary risk drivers are the cPAHs, and to a lesser extent hexavalent chromium and arsenic. The maximum BaP-eq concentration of 194 mg/kg was detected in sludge at sample location CPB3 at a depth of 1.5-feet bgs. The total noncancer hazard from incidental ingestion, inhalation, and dermal contact of soil was estimated at 5 for the Default scenario and at 2 for the Site-specific scenario, which are both above the benchmark level of 1. For the Default scenario, aluminum, arsenic and cobalt each had a hazard quotient slightly above 1. However, for the Site-specific scenario, no chemical-specific hazard was above 1.

Using maximum COPC concentrations detected in groundwater at the Site, the total cancer risk from dermal contact to groundwater was 3×10^{-5} (**Table 11**). The total noncancer hazard was estimated at 1. The cPAHs contributed primarily to the cancer risk. No individual chemical had a hazard quotient above 1. The total cancer risk from inhalation of outdoor air vapors emanating from groundwater was estimated at 1×10^{-8} (**Table 12**). This result is less than the target risk goal of 1×10^{-5}. The total noncancer hazard was estimated at 0.009, which is significantly less than the benchmark level of 1.

5.4.3 Hypothetical Future Onsite Resident

Estimated cumulative cancer risks and noncancer hazards for the hypothetical future onsite resident are listed in **Table 8** for potential soil exposures, **Table 9** for potential indoor air exposures due to soil gas, and **Table 10** for potential indoor air exposures due to groundwater.

Using maximum COPC concentrations detected in soils (including sludge) at the Site, the total cancer risk from incidental ingestion, inhalation, and dermal contact of soil was estimated at 5×10^{-3} for both the Default and Site-specific scenarios (**Table 8**). The results for both scenarios are above the DTSC target risk goal of 1×10^{-6} based on

unrestricted land use. The primary risk drivers are the cPAHs and arsenic, and then to a lesser extent, naphthalene, hexavalent chromium, and benzene (based on the Default scenario). The maximum BaP-eq concentration of 194 mg/kg was detected at sample location CPB3 in sludge at a depth of 1.5-feet bgs. The total noncancer hazard from incidental ingestion, inhalation, and dermal contact of soil was estimated at 6 for both the Default and Site-specific scenarios, both of which are above the benchmark level of 1. Only arsenic had a chemical-specific hazard above 1.

Using maximum model-predicted indoor air EPCs and Default soil properties, the total cancer risk from inhalation exposure to vapors emanating from soil gas into indoor air was estimated at 1×10^{-5} (**Table 9**), which is above the DTSC target risk goal of 1×10^{-6}. The primary risk driver was benzene with a maximum soil gas concentration of 1.1 µg/l detected at sample location SV119 at a depth of 6-feet bgs. This sample was obtained from a probe that was screened 1 ft below the occurrence sludge. Using maximum model-predicted indoor air EPCs and Site-specific soil properties, the total cancer risk was estimated at 3×10^{-6} (**Table 9**), which is slightly above the DTSC target risk goal of 1×10^{-6}. The total noncancer hazard for the soil gas to indoor air pathway was estimated at 0.1 for the Default scenario and at 0.03 for the Site-specific scenario, which are both below the benchmark level of 1.

The total cancer risk from inhalation exposure to vapors emanating from groundwater into indoor air was estimated at 4×10^{-7} for the Default scenario and 2×10^{-7} for the Site-specific scenario (**Table 10**). The total noncancer hazard was estimated at 0.01 for the Default scenario and at 0.005 for the Site-specific scenario, which are both significantly below the benchmark level of 1.

In accordance with DTSC's request, cumulative risks for indoor air exposures and outdoor air exposures have been combined to provide a total cumulative risk estimate. Summing the outdoor air risk estimate of 5×10^{-3} and the indoor air risk estimate of 1×10^{-5} gives a total risk of 5×10^{-3}. As mentioned above, the primary risk drivers are the cPAH compounds and arsenic. The cumulative hazard estimate is 6, above the benchmark level of 1; arsenic was the only chemical with a hazard quotient greater than 1. Combining the indoor air and outdoor air risk estimates for a hypothetical future onsite resident may overestimate risk as a resident cannot be both indoors and outdoors for the entire work day.

Lead concentrations in onsite soils ranged from 2 mg/kg to 1,200 mg/kg with a 95UCL concentration of 79 mg/kg. The highest lead concentration (1,200 mg/kg) was from the 2-foot sample at location HPB113. The duplicate result for this sample was 690 mg/kg.

The next highest concentration was 130 mg/kg at the same location at 5 feet bgs. The majority of lead concentrations as well as the 95UCL concentration are below the residential CHHSL of 80 mg/kg.

5.4.4 Current Offsite Resident

Estimated cumulative cancer risks and noncancer hazards for the current offsite resident are listed in **Table 8** for potential soil exposures, **Table 9** for potential indoor air exposures due to soil gas, and **Table 10** for potential indoor air exposures due to groundwater.

Using maximum COPC concentrations detected in soils (including sludge) at the adjacent offsite residential properties located to the south of the Site boundary, the total cancer risk from incidental ingestion, inhalation, and dermal contact of soil was estimated at 3×10^{-4} for both the Default and Site-specific scenarios (**Table 8**). The results for both scenarios are above the DTSC target risk goal of 1×10^{-6} based on unrestricted land use. The primary risk drivers are the cPAHs and arsenic. The maximum BaP-eq concentration of 9.6 mg/kg was detected from sludge at sample location RB-03 at a depth of 10-feet bgs. Carcinogenic PAHs were not detected at the shallowest samples collected (1.5 ft bgs). The maximum concentration of arsenic (8.5 mg/kg in sample RB-3 at 5 feet bgs) is likely within regional background levels for southern California soils (Cal-EPA 2007). In addition, the maximum concentration of hexavalent chromium reported in the RI was 100 mg/kg in sample RB-01 at 1.5 feet bgs; all other detections were less than 0.1 mg/kg. The total chromium value was 33 mg/kg in this same sample, suggesting that the hexavalent chromium result is suspect as it is higher than the total chromium concentration. On March 18, 2010, this sampling location was resampled (designated as RB-101) at 1.5 ft bgs and analyzed for total chromium and hexavalent chromium. Results indicated sample concentrations of 17 mg/kg and non-detect (<1 mg/kg) for total and hexavalent chromium, respectively. This resampling result suggests that the RB-01 hexavalent chromium result was suspect since similar results could not be duplicated. Therefore the 100 mg/kg value was not used in the risk calculations. The total noncancer hazard from incidental ingestion, inhalation, and dermal contact of soil was estimated at 1 for both the Default and Site-specific scenarios, both of which are equivalent to the benchmark level of 1. No chemical-specific hazard was above 1.

Using maximum model-predicted indoor air EPCs and Default soil properties, the total cancer risk from inhalation exposure to vapors emanating from soil gas into indoor air was estimated at 8×10^{-7} (**Table 9**), which is below the DTSC target risk goal of 1×10^{-6}.

Using maximum model-predicted indoor air EPCs and Site-specific soil properties, the total cancer risk was estimated at 2×10^{-7} (**Table 9**), which is below the DTSC target risk goal of 1×10^{-6}. The total noncancer hazard for the soil gas to indoor air pathway was estimated at 0.009 for the Default scenario and at 0.002 for the Site-specific scenario, which are both significantly below the benchmark level of 1.

The total cancer risk from inhalation exposure to vapors emanating from groundwater into indoor air was estimated at 2×10^{-7} for the Default scenario and 9×10^{-8} for the Site-specific scenario, respectively (**Table 10**), which are both below the DTSC target risk goal of 1×10^{-6}. The total noncancer hazard was estimated at 0.003 for the Default scenario and at 0.001 for the Site-specific scenario, which are both significantly below the benchmark level of 1.

In accordance with DTSC's request, cumulative risks for indoor air exposures and outdoor air exposures have been combined to provide a total cumulative risk estimate. Summing the outdoor air risk estimate of 3×10^{-4} and the indoor air risk estimate of 8×10^{-7} gives a total cumulative risk of 3×10^{-4}. As mentioned above, the primary risk drivers are the cPAH compounds and arsenic. The cumulative hazard estimate is 1, equivalent to the benchmark level of 1; no chemical had a hazard quotient greater than 1. Combining the indoor air and outdoor air risk estimates for a resident may overestimate risk as a resident cannot be both indoors and outdoors for the entire work day.

Lead concentrations in offsite soils ranged from 3.3 mg/kg to 160 mg/kg with a 95UCL of 75 mg/kg. The highest lead concentration (160 mg/kg) was from the 1.5 foot sample at location RB01. All other lead concentrations as well as the 95 UCL concentration were below the residential CHHSL of 80 mg/kg.

5.4.5 Trespasser

Estimated cumulative cancer risks and noncancer hazards for the trespasser are presented in **Table 8**.

Using maximum COPC concentrations detected in soils (including sludge) at the Site, the total cancer risk from incidental ingestion, inhalation, and dermal contact of soil was estimated at 3×10^{-5} for both the Default and Site-specific scenarios (**Table 8**), which is above the DTSC target risk goal of 1×10^{-6}. The primary risk drivers are the cPAHs. The total noncancer hazard from incidental ingestion, inhalation, and dermal contact of

soil was estimated at 0.03 for both the Default and Site-specific scenarios, which is below the benchmark level of 1.

5.5 Chemical-Specific Evaluation of Risks

Several chemicals were identified in the risk characterization as having potentially significant risks depending on the land use assumption and receptor population and modeling scenario. The risk characterization focused on the maximum detected chemicals in environmental media, including known sump material. Therefore the risk assessment results are considered conservative in nature and not necessarily reflective of actual potential exposures. This section of the report was developed to present a spatial and more realistic discussion of the risk-driving chemicals in the context of environmental media and land use at the Site.

To evaluate the spatial distribution of risk driving chemicals, comparison criteria were developed for each chemical identified in the risk characterization as contributing significantly to risks based on each receptor group and assuming site-specific soil characteristics. For worker exposures (commercial/industrial and construction worker), individual chemicals that contributed to a risk greater than 1×10^{-5} were included, for residential and trespasser scenarios a 1×10^{-6} risk threshold was used. Chemicals selected for additional analysis include arsenic, BaP-eq, hexavalent chromium, and naphthalene in soil and benzene in soil gas. The chemical-specific comparison criteria were then used to identify samples where the individual chemical concentrations exceeded the comparison criteria as depicted on a series of maps.

Two types of comparison criteria were developed: (1) those based on background and (2) risk-based values or Risk-based Concentrations (RBCs). Risk-based concentrations represent chemical concentrations in the relevant environmental media (e.g., soil and soil gas) that would be consistent with a target risk level for the current land use under conservative (i.e., protective) exposure conditions. For those chemicals in which the risk-based concentrations are below background, the background concentration is used as the comparison criteria. This is the case for arsenic and residential and commercial worker scenarios and BaP-eq for the residential scenarios. For carcinogenic PAHs, there were some samples that exhibited elevated detection limits. For the majority of samples, PAH analyses were conducted using two methods (1) EPA Method 8270 and (2) EPA Method 8310. EPA Method 8310 was used to achieve lower detection limits. However, there is a subset of samples in which only EPA Method 8270 was used and some of these samples do exhibit elevated detection limits. Since the majority of samples were analyzed by EPA Method 8310, the occurrence of elevated detection

limits only effect a small proportion of the Site data. However, to address this uncertainty, the samples with elevated detection limits were identified and presented on the Figures discussed in this section.

For residential land use, background values as discussed in **Section 2.2** were used for arsenic and BaP-equivalents. In addition, RBCs were derived for hexavalent chromium and naphthalene in soil and benzene in soil gas. For all other types of land use/receptor groups, RBCs were derived for arsenic, BaP-equivalents and hexavalent chromium. In addition, a RBC was developed for construction worker dermal exposures to dibenz(a,h)anthracene in groundwater as incremental cancer risk estimates for this chemical and pathway were above 1×10^{-5}.

Deriving RBCs requires information regarding the level of human intake of the COPC (exposure assessment), the relationship between intake of the chemical and its toxicity (toxicity assessment), and the acceptable target risk. RBCs for soil, soil gas and groundwater were derived using the same methods that were used to estimate incremental cancer risks and noncancer hazards as presented in **Section 5**.

Various demarcations of acceptable risk have been established by regulatory agencies as discussed in **Section 5.1**. For the purposes of this risk assessment, a target risk of 1×10^{-5} and noncancer hazard index of 1 was used to derive industrial/commercial and construction worker RBCs. The target risk of 1×10^{-5} is the midpoint of the cancer risk range considerable acceptable to EPA (EPA 1991) and the target risk commonly used at commercial/industrial sites under DTSC oversight. For residential and trespasser receptor groups, a target risk level of 1×10^{-6} and noncancer hazard index of 1 was used. These risk levels are used to provide context to the risk results and to support a discussion which focuses on those media, chemicals and pathways that contribute the majority to the risk estimates and therefore should be carried forward into the remedial planning process. It is acknowledged that other chemicals may contribute to the cumulative risk estimates for the Site. However, as shown in **Section 5**, the chemicals selected above are the primary chemicals contributing to potential risk so that presenting the locations that exceed background or a RBC for these chemicals provides sufficient information for future remedial planning. Comparison criteria used to evaluate the chemical data are presented in **Table D-1** in Appendix D. **Figures 7** through **11** present sample locations where risk-driving chemical concentrations exceed the comparison criteria for each receptor group.

5.5.1 Commercial/Industrial Worker

Figure 7 presents the locations where chemicals exceeded RBCs for commercial/industrial land use or background concentrations. Arsenic was detected above the background concentration of 12 mg/kg in one location in the northwestern corner of the Site, HPB113, at a concentration of 42 mg/kg at a depth of 2 feet bgs. The carcinogenic PAHs as represented by BaP-eq is the primary chemical class contributing to locations that exceeded risk-based values. The majority of locations are associated with areas where known sump material is present in the Cooper and Haack Sumps and in the Haack Rework Area. Three locations, HPB05, HPB06 and HPB08 at a depth of 1.5 feet bgs, are located in reworked soil material. Twenty-one locations are located within the area that is currently covered. These samples were primarily obtained from sludge material, although soil samples between sludge deposits (CPB01 at 10 feet bgs and CPB03 at 5 feet bgs) or soil immediately adjacent to sludge deposits (HPB03, DPW02) also exceeded the RBC. The current commercial/industrial worker would primarily need to be working within sludge or reworked soil without personal protective equipment to potentially be at risk.

For potential offsite commercial/industrial exposures, BaP-eq was the only chemical that exceeded RBCs and/or background concentrations. BaP-eq concentrations exceeded the commercial/industrial worker RBC of 1.6 mg/kg in two locations, RB-01 and RB-03 at concentrations of 5.5 mg/kg and 9.6 mg/kg, respectively. These samples were collected at depths of 5 to 10 feet bgs; samples collected near the surface were nondetect.

5.5.2 Construction Worker

Figure 8 presents the locations where chemicals exceeded RBCs for potential construction worker exposures. The carcinogenic PAHs as represented by BaP-eq is the primary chemical class contributing to the exceedances. All sample locations are associated with areas where known sump material is present in the Cooper and Haack Sumps and in the Haack Rework Area. Twelve locations had BaP-eq concentrations in soil exceeded its target risk concentration. Eleven of these samples were obtained from sludge material and one sample (CPB01 at 10 feet bgs) was obtained from soil between sludge deposits. One sample location located in the Haack Rework Area, HBP07, contained a BaP-eq concentration of 42 mg/kg in the sample collected at a depth of 10 feet bgs. A future construction worker would need to be working within sludge without protective personal equipment to potentially be at risk.

For the potential construction worker exposure to groundwater, all cancer risk and noncancer hazard estimates were below regulatory thresholds with the exception of the cancer risk estimate for dermal exposures. The primary risk driver was dibenz(a,h)anthracene. **Figure 8** presents the location where dibenz(a,h)anthracene was detected as a concentration of 4.2 ug/l above its RBC of 2 ug/L in well MW-02A at a depth of 11 to 13 feet bgs.

5.5.3 Hypothetical Onsite Resident and Current Offsite Resident

Figure 9 presents the locations where chemicals exceeded RBCs and/or background concentrations for residential land use. The carcinogenic PAHs as represented by BaP-eq is the primary chemical class contributing to the exceedances. BaP-eq concentrations above the background concentration of 0.9 mg/kg in onsite soils were primarily associated with samples obtained from sludge material, although some soil samples between sludge deposits or soil immediately adjacent to sludge deposits also exceeded the BaP-eq background concentration. Many of the locations are located within the area that is currently covered. At three locations within the covered area, naphthalene concentrations exceeded the residential land use RBC of 4.9 mg/kg. Hexavalent chromium concentrations at two locations (CPB28 at 7 feet bgs and HPB06 at 5 feet bgs) exceeded the residential land use RBC, once again within areas that are under the cover. Arsenic was detected above the background concentration of 12 mg/kg in one location in the northwestern corner of the Site, HPB113, at a concentration of 42 mg/kg at a depth of 2 feet bgs.

For current offsite residential land use, BaP-eq was the only chemical that exceeded RBCs and/or background concentrations. BaP-eq concentrations ranged from 1.5 mg/kg to 9.6 mg/kg, above the background concentration of 0.9 mg/kg. These samples were collected at depths of 5 to 10.5 feet bgs in soil obtained from sludge material or in soil immediately beneath sludge. Samples collected near the surface were nondetect.

Under the present condition of the Site an existing or future resident would primarily need to encounter sludge or reworked soil to potentially be at risk.

For potential residential exposure to chemicals in indoor air from soil gas, all cancer risk and noncancer hazard estimates were below regulatory thresholds with the exception of the cancer risk estimate for benzene. **Figure 10** presents the locations where benzene soil gas concentrations exceeded its RBC of 0.43 ug/L for residential land use. As can be seen in the figure, only one location within the Cooper South

Sump, SV119 at a concentration of 1.1 ug/L, was above the RBC. This soil gas sample was obtained from a depth of 6 feet bgs, a foot below a 4 to 5 foot thick sludge deposit. All benzene concentrations in the offsite residential area were below the RBC.

5.5.4 Trespasser

Figure 11 presents the locations where chemicals exceeded RBCs for potential trespasser exposures. The carcinogenic PAHs as represented by BaP-eq is the primary chemical class contributing to the exceedances. These exceedances occurred in samples collected from sludge material present in the Cooper and Haack Sumps and in the Haack Rework Area. All but two locations are located within the area that is currently covered. The two locations, HBP07 and RB03, are located in the Haack Rework Area and contain BaP-eq concentrations exceeding the trespasser scenario RBC in the samples collected at a depth of 10 feet bgs. Under the present condition of the Site a trespasser would need to encounter sludge to potentially be at risk.

6 UNCERTAINTY ANALYSIS

The purpose of a HHRA is not to predict the actual risk of exposure to an individual. Rather, risk assessments are a management tool for developing conservative estimates of health hazards, which are unlikely to underestimate the true risk for potentially exposed populations.

As a result, the numerical estimates in a risk assessment (risk values) have associated uncertainties reflecting the limitations in available knowledge about Site concentrations, exposure assumptions (e.g., chronic exposure concentrations, intake rates, frequency of time spent at home), and chemical toxicity. Where necessary, conservative (erring on being over-protective) assumptions are made. In other words, although calculations of exposure often must be simplified to a few pathways or subgroups within a population, the simplifying assumptions should be more likely to overestimate rather than underestimate risk so that public health is protected regardless of other unknown conditions. Even when actual characteristics of a population are known, assumptions on exposure are often biased toward producing over-protective rather than under-protective health risk estimates for the majority of the population. Key uncertainties in this HHRA include:

- Maximum detected concentrations were used for the entire exposure duration of a receptor to estimate potential health risk.
- Assumed exposure durations used in this HHRA represent upper-bound estimates of the total amount of time that an individual may be in one location. For example, the vapor intrusion risk estimates assume the receptor is indoors the entire duration of the exposure period.
- The vapor intrusion model assumes that the source of contamination is infinite (i.e., not depleting). The actual source of contamination will deplete over time.
- For exposures via outdoor air inhalation, the outdoor air flux model assumes that the VOC is present at the surface and that construction workers will come into contact via outdoor air inhalation.
- The potential risks due to indoor and outdoor exposures were presented separately based on the assumption of continuous exposure for either of these scenarios. While it is possible for an individual to be exposed to VOCs during the time of the day spent indoors and outdoors, summing these potential risks could over-estimate the potential exposure and risk, because it is not possible to spend the entire exposure period both indoors and outdoors. Therefore, a

summation of the potential risks estimated for the soil and soil gas sources was not presented.

- An additional source of uncertainty involves the outdoor air and indoor air volatilization models used in the HHRA and the type of material present at the Site. Some areas of the Site include sludge material which has different physical properties as compared to soil. Because the volatilization models are based on transport of chemicals through a soil medium, in areas where sludge material is present the effect of volatilization may be over or under estimated. In areas where sludge is not present the modeling is considered to provide an adequate characterization of potential volatilization from the subsurface. It should be noted that all onsite and offsite structures that are occupied for relevant periods of time (i.e., not a storage shed where short term exposures may occur) are not known to have sludge beneath them. Therefore, the J&E modeling is considered to provide an adequate characterization of potential volatilization from the subsurface into indoor air for current occupied structures.
- There is some uncertainty in the evaluation of potential health risks in offsite locations due to the presence of nearby onsite soil and soil vapor samples that were not included in the offsite risk evaluation. A review of the adjacent onsite samples was conducted to determine if potential higher concentrations were present in the samples that may influence the offsite risk characterization. For soil samples, SV09, CPB13 and HPB07 were reviewed; for soil gas, SV09 and SV120 were reviewed. The results of the review indicate that for those chemicals with higher concentrations in the onsite locations, the differences were generally no more than 3-fold higher with the exception of PAHs in soil and chloromethane in soil gas. For the primary risk-driving chemical in soil, BaP-eq, the maximum offsite BaP-eq concentration in soil was 9.6 mg/kg whereas the maximum concentration in the three onsite locations reviewed was 42 mg/kg. While the onsite concentration is higher, including the data in the HHRA does not significantly impact the risk characterization since both concentrations are well above the background value of 0.9 mg/kg. For soil gas, the maximum offsite concentration of chloromethane was 0.007 ug/l whereas the maximum concentration in the onsite locations was 0.033 ug/L. While the nearby onsite maximum was higher, chloromethane is not a risk-driving chemical for the Site (offsite hazard quotient estimate of 5×10^{-5}) and using the higher value would not result in a significant change in the overall risk estimates. For the primary risk-driving chemical in soil gas, benzene, the offsite concentration was higher than in the onsite locations reviewed.

- Direct contact exposures to soil are likely to be far less intensive than what was assumed in this HHRA. If the Site remains commercial/industrial use, much of the soil would likely remain covered with asphalt pavement, buildings, landscape, and hardspace and thus, would prevent direct exposure to chemicals detected in soil.
- There are additional uncertainties associated with the soil parameters (e.g., porosity and moisture content) used in the HHRA. The soil lithology is likely to vary across the area of concern both vertically and horizontally which may lead to variation in flux from different areas, which results in uncertainty in the estimation of potential risks.
- Uncertainty in the toxicity assessment arises for those chemicals which rely on animal studies as the basis for determining the appropriate toxicity value for effects on humans. Toxicity values typically assume that adverse effects observed in animal toxicity experiments would also be observed in humans.
- For hexavalent chromium, the more conservative oral cancer slope factor used by Cal-EPA OEHHA to derive a draft Public Health Goal was used in the HHRA. This value has not been formally adopted by California but was included as a conservative measure in anticipation of the derivation of a formal value by OEHHA based on the recently concluded NTP study.
- There is also uncertainty in that some samples exhibit elevated detection limits, in particular for the carcinogenic PAHs. For the majority of samples, PAH analyses were conducted using two methods (1) EPA Method 8270 and (2) EPA Method 8310. EPA Method 8310 was used to achieve lower detection limits. However, there is a subset of samples in which only EPA Method 8270 was used and some of these samples do exhibit elevated detection limits. Since the elevated detection limits are higher than the maximum detected value, the maximum site concentration may be actually higher than reported. Since the majority of samples were analyzed by EPA Method 8310, the occurrence of elevated detection limits only effect a small proportion of the Site data. However, to address this uncertainty the samples with elevated detection limits were identified and evaluated in **Section 5**.

In summary, because a HHRA contains multiple sources of uncertainty, simplifying assumptions are often made so that potential health risks can be estimated quantitatively. Since the exact amount of uncertainty cannot be quantified, the HHRA is intended to overestimate rather than underestimate probable risk. The results of this

assessment, therefore, are likely to be protective of health despite the inherent uncertainties in the process.

7 SUMMARY AND CONCLUSIONS

7.1 Summary

This HHRA includes an evaluation of health risks to potentially exposed receptor populations consisting of: commercial/industrial workers, construction workers, hypothetical future residents, and trespassers. Potential exposures were evaluated for these populations assuming existing physical Site conditions (without the existence of the protective caps on the Cooper and Haack properties and prior to any future remediation efforts at the Site). In addition, a current residential scenario has been included for the immediate adjacent offsite residential area. Site exposure scenarios were agreed upon in previous discussions with the DTSC in the September 25, 2008 teleconference and subsequent DTSC comment letters and ARC responses to comments letters pertaining to this teleconference.

Although the Site will likely remain commercial/industrial in the immediate future, a more conservative hypothetical future residential scenario was included in this HHRA to evaluate potential risks under an unrestricted land use scenario. Future development of the Site and the immediate adjacent offsite residential area will be commercial as designated in the City of Gardena's report titled Artesia Corridor Specific Plan (TPC, 2006). For the construction worker scenario, shallow groundwater was also evaluated assuming that outdoor vapor inhalation and dermal contact could potentially occur when groundwater is exposed in an open excavation. The methodology used in this HHRA is consistent with current United States Environmental Protection Agency (USEPA) and California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC) guidance. The lead agency providing oversight for this HHRA is the Cal-EPA DTSC.

To evaluate the spatial distribution of risk driving chemicals, comparison criteria were developed for each chemical identified in the risk characterization. Two types of comparison criteria were developed: (1) those based on background and (2) risk-based values (RBCs) or target risk concentrations which are based on each receptor group and assuming site-specific soil characteristics and a target risk goal. For worker exposures (commercial/industrial and construction worker) a target risk goal of 1 in 100,000 (1×10^{-5}) was used. For residential and trespasser scenarios a 1 in 1,000,000 (1×10^{-6}) target risk goal was used. For those chemicals in which the risk-based concentrations are below background, the background concentration is used as the comparison criteria. Background values were evaluated in particular for arsenic and BaP-eq. For arsenic,

locations were identified that were above background for all receptor groups as requested by DTSC since the RBCs presented in this HHRA do not incorporate the more stringent arsenic oral slope factor derived by OEHHA as part of their derivation of a Public Health Goal for drinking water. For locations where samples were non-detect and had elevated cPAH detections limits, BaP-eqs were calculated and used in the comparison of background or RBCs to address this uncertainty as discussed in **Section 6**.

The results of the HHRA indicate that exposures to onsite soils may potentially exceed target risk goals for all potential receptor scenarios evaluated: commercial/industrial worker, construction worker, hypothetical future onsite/ current offsite resident, and trespasser. The primary contributors to the risk estimates were arsenic, hexavalent chromium, naphthalene and predominantly the carcinogenic PAHs as represented by the BaP-eq concentration. The majority of locations where concentrations of these chemicals were elevated occurred within areas of known sludge material which is currently covered.

Figure 7 illustrates locations where chemical concentrations exceeded either target risk concentrations or background concentrations for the commercial/industrial worker scenario. Location HPB113, at a depth of 2 feet bgs, was the only location where arsenic exceeded the background concentration. Locations HPB05, HPB06 and HPB08, at a depth of 1.5 feet bgs, were locations where the BaP-eq concentration exceeded its target risk concentration in reworked soil material. Twenty-one other locations had BaP-eq concentrations also exceeding its target risk concentration. These samples were primarily obtained from sludge material, although soil samples between sludge deposits (CPB01 at 10 feet bgs and CPB03 at 5 feet bgs) or soil immediately adjacent to sludge deposits (HPB03, DPW02) also exceeded the target risk concentration. The commercial/industrial worker would primarily need to be working within sludge or reworked soil without personal protective equipment to potentially be at risk.

Figure 8 illustrates locations in soil and groundwater where samples exceeded the target risk concentrations for the construction worker scenario. For the potential construction worker exposures to groundwater, all cancer risk and noncancer hazard estimates were below regulatory thresholds with the exception of the cancer risk estimate for dermal exposures to dibenz(a,h)anthracence at one location (MW-02A, at a depth of 11 to 13 feet bgs) on the eastern boundary of the Cooper Sumps. Twelve locations had BaP-eq concentrations in soil samples exceeding its target risk concentration. Eleven of these samples were obtained from sludge material and one

sample (CPB01 at 10 feet bgs) was obtained from soil between sludge deposits. A construction worker would need to be working within sludge without personal protective equipment to potentially be at risk.

Figure 9 illustrates locations where chemical concentrations exceeded either target risk concentrations or background concentrations for the hypothetical future onsite residential and offsite residential scenario. Onsite location HPB113, at a depth of 2 feet bgs, was the only location where arsenic exceeded the background concentration. Location CPB28 (at 7 feet bgs) and HPB06 (at 5 feet bgs) had chromium VI concentrations exceeding its target risk concentration. These two soil samples were located below sludge or former sludge deposits. Naphthalene exceeded its target risk concentration at three locations. These exceedences all occurred in sludge samples. BaP-eq concentrations exceed its background concentration in soil from locations that were primarily obtained from sludge material, although some soil samples between sludge deposits or soil immediately adjacent to sludge deposits also exceeded the (BaP-eq) background concentration. Under the present condition of the Site, a future resident would primarily need to encounter sludge or reworked soil to potentially be at risk.

For the current offsite residential scenario, the carcinogenic PAHs as represented by BaP-eq is the primary chemical class contributing to exceedances The maximum detected concentrations of BaP-eq were detected in sludge samples collected at 5 and 10 feet bgs or soil from beneath sludge. The sludge in the offsite residential area is currently unavailable for contact unless the subsurface soil is disturbed at those depths. Carcinogenic PAH concentrations were nondetect in the shallowest samples collected at 1.5 feet bgs in all three borings (RB01, RB02 and RB03). Under the present condition of the Site, a current offsite resident would primarily need to encounter sludge to potentially be at risk.

For potential indoor air exposures to chemicals emanating from onsite (Haack and Cooper properties) soil gas or groundwater, all estimated cancer risks and noncancer hazards were below regulatory thresholds with the exception of hypothetical onsite residential exposures to benzene in soil gas.

Figure 10 illustrates the one location (SV119) where elevated benzene concentrations occurred above its target risk concentration. The soil gas sample was obtained from a depth of 6 feet bgs, a foot below a 4 to 5 foot thick sludge deposit.

For potential offsite residential indoor air exposures to chemicals emanating from soil gas or groundwater, all estimated cancer risks and noncancer hazards were below regulatory thresholds.

Figure 11 illustrates locations where chemical concentrations exceeded target risk concentrations in soil for the trespasser scenario. All target risk concentration exceedances were for BaP-eq concentrations. These exceedances occurred in sludge material with the exception of two sample locations (HPB05 and HPB06) in the Haack Rework Area which contained sludge within the reworked soil. Under the present condition of the Site, a future trespasser would need to encounter sludge to potentially be at risk.

7.2 Conclusions

Based on the results of the HHRA, areas of the Site contain chemical concentrations of carcinogenic PAHs, and to a lesser extent arsenic, hexavalent chromium and naphthalene in onsite soil that may potentially pose an unacceptable health risk for commercial/industrial workers, construction workers, hypothetical future onsite residents, and trespassers. However, the majority of locations with elevated concentrations occur within areas of known sludge which are currently covered and are unavailable for contact. In addition, chemical concentrations present in deeper (5 to 10 feet bgs) offsite soils may potentially pose an unacceptable health risk for current offsite residents should the subsurface soils be brought to the surface. It is recommended that these chemicals and areas be further evaluated in the Feasibility Study for the Site.

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APPENDIX A

TABLES

Table A-1a
Summary of Soil Matrix Analytical Results, Metals
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Cobalt	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
onsite	CPB02	CPB02-SL-1.5	01/17/2006 8:30	1.5	mg/kg	17	<1	<0.5	0.25	<0.3	<0.5	1.2	0.41	0.97	0.74	130	37	<0.02	<1	9	0.29	<0.5	<0.5	2.3	<10
onsite	CPB02	CPB02-SL-5	01/17/2006 8:35	5	mg/kg	13000	0.17	1.5	80	0.4	0.1	15	<1	6.7	9.9	16000	6	<0.02	0.42	11	<1	<0.5	0.23	31	42
onsite	CPB02	CPB02-SL-10	01/17/2006 8:40	10	mg/kg	11000	0.054	1.2	89	0.32	0.13	13	<1	6.9	11	15000	3.3	0.013	0.19	8.1	<1	0.028	0.12	27	35
onsite	CPB04	CPB04-SL-1.5	01/18/2006 10:20	1.5	mg/kg	NA	0.13	1.2	92	0.36	0.19	24	<1	7.3	13	NA	9	0.05	0.35	7.9	<1	0.04	0.12	27	41
onsite	CPB04	CPB04-SL-5	01/18/2006 10:25	5	mg/kg	NA	0.18	1.4	93	0.4	0.18	20	<1	7.2	15	NA	13	<0.02	0.34	8.5	<1	0.044	0.12	28	55
onsite	CPB04	CPB04-SL-10	01/18/2006 10:30	10	mg/kg	NA	0.27	2.6	190	0.51	0.32	13	0.11	8.6	21	NA	6	0.05	0.31	10	0.21	0.066	0.14	30	41
onsite	CPB06	CPB06-SL-1.5	01/17/2006 10:00	1.5	mg/kg	NA	0.15	<0.5	3.5	0.08	0.025	1.1	0.046	0.57	2.1	NA	8.4	0.01	0.16	3	<1	<0.5	0.11	0.82	2.8
onsite	CPB06	CPB06-SL-5	01/17/2006 10:05	5	mg/kg	NA	0.39	2.4	150	0.68	0.28	22	<1	10	22	NA	7.7	0.066	0.34	16	0.37	0.074	0.29	42	56
onsite	CPB06	CPB06-SL-10	01/17/2006 10:10	10	mg/kg	NA	0.42	1.2	120	0.47	0.26	18	<1	7.8	17	NA	6.2	0.0083	0.35	12	0.25	0.056	0.22	30	43
onsite	CPB06	CPB06-2SL-10	01/17/2006 10:11	10	mg/kg	NA	0.31	0.75	90	0.36	0.17	13	0.027	6.2	11	NA	3.8	0.0095	0.24	8.4	<1	0.039	0.2	22	33
onsite	CPB08	CPB08-SL-1.5	01/17/2006 14:50	1.5	mg/kg	NA	0.19	1.1	140	0.44	0.22	16	0.33	7.8	16	NA	6.7	0.039	0.48	10	<1	0.066	0.13	30	41
onsite	CPB08	CPB08-SL-5	01/17/2006 14:55	5	mg/kg	NA	0.59	5.3	120	0.46	0.95	100	<1	7.5	26	NA	82	0.032	0.59	17	0.2	0.19	0.14	32	170
onsite	CPB08	CPB08-SL-10	01/17/2006 15:00	10	mg/kg	NA	0.12	<0.5	81	0.31	0.14	9.4	<1	6.4	8	NA	3.1	0.0062	0.41	6.5	<1	0.022	<0.5	20	26
onsite	CPB1	CPB1-SL-1.5	01/19/2006 8:45	1.5	mg/kg	NA	0.066	<0.5	0.51	<0.3	<0.5	0.67	0.73	0.74	0.76	NA	26	<0.02	<1	7.5	0.23	<0.5	<0.5	2	0.83
onsite	CPB1	CPB1-SL-5	01/19/2006 8:50	5	mg/kg	NA	0.064	<0.5	19	0.1	0.034	4.7	0.59	1.9	4	NA	85	<0.02	0.18	4.7	<1	<0.5	<0.5	8.9	11
onsite	CPB1	CPB1-SL-10	01/19/2006 8:55	10	mg/kg	NA	0.052	0.4	33	0.21	0.042	7	0.48	3.4	6.8	NA	48	0.0083	0.2	6.1	0.34	<0.5	<0.5	15	17
onsite	CPB10	CPB10-SL-1.5	01/10/2006 11:20	1.5	mg/kg	NA	<1	<0.5	0.63	<0.3	<0.5	0.93	<1	0.42	1.1	NA	3.1	<0.02	<1	4	<1	<0.5	<0.5	0.6	1.9
onsite	CPB10	CPB10-SL-5	01/10/2006 11:25	5	mg/kg	NA	<1	<0.5	0.096	<0.3	<0.5	0.87	0.1	0.064	4.5	NA	2.8	<0.02	<1	1.2	0.2	0.056	<0.5	<1	3.2
onsite	CPB10	CPB10-SL-10	01/10/2006 11:35	10	mg/kg	NA	0.086	0.85	81	0.26	0.13	12	0.14	5.9	11	NA	2.5	0.0067	0.61	6.5	0.24	0.094	<0.5	23	29
onsite	CPB11	CPB11-SL-1.5	12/22/2005 12:50	1.5	mg/kg	48	0.032	<0.5	0.73	<0.3	<0.5	1.3	<1	0.55	2	150	21	<0.02	<1	6.5	0.35	<0.5	<0.5	1.7	1.9
onsite	CPB11	CPB11-SL-5	12/22/2005 12:55	5	mg/kg	17	0.044	<0.5	0.19	<0.3	<0.5	1.3	<1	0.18	1.2	150	14	0.0035	<1	3	0.51	<0.5	<0.5	0.86	1.4
onsite	CPB11	CPB11-SL-10	12/22/2005 13:00	10	mg/kg	9700	0.37	2.9	140	0.22	0.14	18	0.1	6.5	50	6700	3.9	0.078	0.84	14	0.31	0.14	<0.5	25	19
onsite	CPB11R	CPB11R-SL-1.5	01/10/2006 14:15	1.5	mg/kg	NA	<1	<0.5	0.84	<0.3	<0.5	0.83	<1	0.31	0.39	NA	7.9	<0.02	<1	2.7	<1	0.072	<0.5	0.44	1.5
onsite	CPB11R	CPB11R-SL-5	01/10/2006 14:25	5	mg/kg	NA	0.052	<0.5	0.7	<0.3	<0.5	23	<1	0.4	3.7	NA	8.9	0.003	2.7	5.6	0.23	0.07	<0.5	0.58	2.8
onsite	CPB11R	CPB11R-SL-10	01/10/2006 14:45	10	mg/kg	NA	0.11	0.63	95	0.36	0.13	15	<1	10	16	NA	4.2	0.028	0.52	12	<1	0.046	0.12	21	32
onsite	CPB12	CPB12-SL-1.5	01/17/2006 14:00	1.5	mg/kg	NA	0.78	3.8	120	0.54	0.52	24	0.21	8.3	27	NA	17	0.047	0.91	21	<1	0.057	0.22	38	160
onsite	CPB12	CPB12-SL-5	01/17/2006 14:05	5	mg/kg	NA	0.5	3.8	180	0.62	0.31	22	<1	11	34	NA	8.1	0.14	0.97	16	0.21	0.073	0.25	44	96
onsite	CPB12	CPB12-SL-10	01/17/2006 14:10	10	mg/kg	NA	0.12	1.9	70	0.32	0.13	10	<1	7	11	NA	4	0.0078	0.77	8.4	<1	<0.5	0.24	30	31
onsite	CPB13	CPB13-SL-1.5	01/16/2006 10:05	1.5	mg/kg	NA	1.5	3	88	0.11	0.032	29	<1	4	43	NA	54	0.037	3.5	13	<1	0.098	0.12	25	82
onsite	CPB13	CPB13-SL-5	01/16/2006 10:10	5	mg/kg	NA	0.088	2.4	130	0.45	0.15	19	<1	9.5	18	NA	4.4	0.029	0.54	13	0.26	0.044	0.17	46	55
onsite	CPB13	CPB13-SL-10	01/16/2006 10:15	10	mg/kg	NA	1.2	2.5	110	0.41	0.22	26	0.12	9	31	NA	18	0.03	1.4	16	<1	0.072	0.16	45	63
onsite	CPB14	CPB14-SL-1.5	01/10/2006 9:50	1.5	mg/kg	NA	<1	0.34	0.13	<0.3	<0.5	0.4	<1	0.25	1.8	NA	8.9	<0.02	<1	2.8	<1	<0.5	<0.5	<1	1.4
onsite	CPB14	CPB14-SL-5	01/10/2006 10:00	5	mg/kg	NA	0.088	0.78	72	0.36	0.052	14	<1	7.2	11	NA	3.4	0.017	0.73	9.6	0.32	0.02	0.12	26	39
onsite	CPB14	CPB14-SL-10	01/10/2006 10:20	10	mg/kg	NA	0.12	1.7	110	0.42	0.1	19	0.15	10	14	NA	4.7	0.029	0.62	11	<1	0.026	0.15	39	45
onsite	CPB15	CPB15-SL-1.5'	12/20/2005 13:40	1.5	mg/kg	NA	<1	<0.5	0.6	<0.3	<0.5	0.72	0.072	0.42	0.26	NA	8.5	<0.02	<1	2.9	<1	<0.5	<0.5	0.6	1.1
onsite	CPB15	CPB15-SL-5'	12/20/2005 13:45	5	mg/kg	NA	<1	<0.5	0.6	<0.3	<0.5	3.7	<1	0.33	0.83	NA	27	<0.02	0.16	4.1	0.27	<0.5	<0.5	0.49	2.8
onsite	CPB15	CPB15-SL-10'	12/20/2005 14:50	10	mg/kg	NA	0.14	1.5	89	0.32	0.16	16	<1	5.7	63	NA	9.1	0.033	1	10	0.36	0.034	0.1	24	61
onsite	CPB15	CPB15-SL-11'	12/20/2005 14:55	11	mg/kg	NA	0.12	2.8	130	0.37	0.096	15	<1	9.9	13	NA	4.1	0.0085	0.68	9.9	<1	<0.5	0.14	40	40
onsite	CPB16	CPB16-SL-1.5	01/17/2006 13:00	1.5	mg/kg	NA	0.37	2.7	80	0.27	0.07	15	0.57	4.3	16	NA	24	0.02	0.32	7.6	<1	0.024	0.15	29	46
onsite	CPB16	CPB16-2SL-1.5	01/17/2006 13:01	1.5	mg/kg	NA	0.44	2.5	110	0.45	0.25	16	0.06	8.9	19	NA	19	0.026	0.57	12	<1	0.039	0.2	36	77
onsite	CPB16	CPB16-SL-5	01/17/2006 13:05	5	mg/kg	NA	0.39	2.4	120	0.45	0.24	18	<1	7.9	20	NA	6.5	0.061	0.65	12	0.32	0.056	0.2	35	47
onsite	CPB16	CPB16-SL-10	01/17/2006 13:10	10	mg/kg	NA	0.23	0.8	82	0.38	0.16	15	<1	6.8	12	NA	3.8	0.012	0.28	8.7	0.21	0.034	0.19	34	36
onsite	CPB17	CPB17-SL-1.5	01/09/2006 15:19	1.5	mg/kg	NA	<1	<0.5	0.18	<0.3	<0.5	<1	<1	0.2	0.66	NA	3.8	<0.02	<1	1.5	<1	<0.5	<0.5	<1	2.3
onsite	CPB17	CPB17-2SL-1.5	01/09/2006 15:20	1.5	mg/kg	NA	<1	0.27	0.17	<0.3	<0.5	<1	<1	0.31	0.56	NA	9.6	0.0047	<1	2.6	0.27	<0.5	<0.5	<1	3.3
onsite	CPB17	CPB17-SL-5	01/09/2006 15:35	5	mg/kg	NA	0.14	3.4	100	0.45	0.057	16	0.11	8.2	14	NA	5	0.025	0.56	10	<1	<0.5	0.17	40	41
onsite	CPB17	CPB17-SL-10	01/09/2006 15:45	10	mg/kg	NA	0.2	2.3	120	0.56	0.1	19	0.34	13	16	NA	5.5	0.016	0.81	14	0.69	<0.5	0.31	41	52
onsite	CPB18	CPB18-SL-1.5'	12/20/2005 9:28	1.5	mg/kg	NA	0.098	0.27	0.096	<0.3	<0.5	0.4	0.39	0.28	0.21	NA	5.8	<0.02	<1	1.9	<1	<0.5	<0.5	0.4	0.66
onsite	CPB18	CPB18-SL-5'	12/20/2005 9:40	5	mg/kg	NA	0.2	1	66	0.24	0.11	11	0.32	5.8	11	NA	3.8	0.0083	0.3	7	<1	0.024	0.18	24	29
onsite	CPB18	CPB18-SL-10'	12/20/2005 9:49	10	mg/kg	NA	0.16	1.4	96	0.32	0.18	15	0.37	7.8	12	NA	3.5	0.0089	0.37	9.4	<1	<0.5	0.16	32	36
onsite	CPB19	CPB19-SL-1.5	01/16/2006 9:00	1.5	mg/kg	NA	0.12	2.4	110	0.51	0.16	21	0.04	9.6	20	NA	4.4	0.034	0.45	13	<1	0.043	0.23	46	59
onsite	CPB19	CPB19-SL-5	01/16/2006 9:10	5	mg/kg	NA	0.16	2.8	140	0.52	0.24	23	0.04	11	23	NA	5.7	0.052	0.87	18	<1	0.052	0.21	53	59

Notes: "NA" not analyzed; "ft bgs" feet below ground surface

Table A-1a
Summary of Soil Matrix Analytical Results, Metals
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Cobalt	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
onsite	CPB19	CPB19-2SL-5	01/16/2006 9:11	5	mg/kg	NA	0.098	2.3	110	0.39	0.13	17	0.096	7.8	15	NA	4	0.057	0.34	12	<1	0.048	0.14	41	44
onsite	CPB19	CPB19-SL-10	01/16/2006 9:20	10	mg/kg	NA	0.1	1.9	140	0.46	0.12	21	0.055	8.7	21	NA	4.2	0.04	0.34	14	<1	0.038	0.19	44	57
onsite	CPB20	CPB20-SL-1.5	01/17/2006 11:15	1.5	mg/kg	NA	0.59	3.7	100	0.5	0.16	18	0.084	8.1	24	NA	26	0.048	0.68	13	<1	0.05	0.32	40	73
onsite	CPB20	CPB20-SL-5	01/17/2006 11:20	5	mg/kg	NA	0.31	2.3	90	0.36	0.18	15	0.12	7.6	13	NA	3.7	0.021	0.4	9	0.21	0.056	0.2	33	33
onsite	CPB20	CPB20-SL-10	01/17/2006 11:25	10	mg/kg	NA	0.31	2.2	110	0.52	0.12	16	0.13	8.5	15	NA	4.6	0.041	0.45	12	<1	0.03	0.19	37	38
onsite	CPB21	CPB21-SL-1.5	01/13/2006 8:40	1.5	mg/kg	NA	0.19	1.6	94	0.33	0.2	14	0.3	7.5	15	NA	5.5	0.029	0.52	9.9	<1	0.038	0.13	32	63
onsite	CPB21	CPB21-SL-5	01/13/2006 8:50	5	mg/kg	NA	0.12	2.1	75	0.41	0.076	17	0.13	8	14	NA	5.3	0.06	0.59	11	<1	0.03	0.13	41	42
onsite	CPB21	CPB21-SL-10	01/13/2006 9:00	10	mg/kg	NA	0.14	1.8	140	0.36	0.19	14	0.089	9.5	16	NA	4.7	0.031	0.74	12	<1	0.026	0.14	34	44
onsite	CPB22	CPB22-SL-1.5	01/12/2006 15:10	1.5	mg/kg	NA	0.2	0.79	62	0.25	0.12	6.8	<1	5.2	9	NA	18	0.024	0.27	5.4	0.44	0.028	<0.5	16	27
onsite	CPB22	CPB22-SL-5	01/12/2006 15:15	5	mg/kg	NA	0.12	1.8	73	0.34	0.092	9.9	0.17	6.4	9.6	NA	3.8	0.019	0.29	7.5	0.58	0.02	0.11	26	27
onsite	CPB22	CPB22-SL-10	01/12/2006 15:20	10	mg/kg	NA	0.16	1.3	99	0.41	0.064	14	0.063	8.2	10	NA	4.3	0.052	0.38	8.5	0.79	0.034	0.15	31	33
onsite	CPB23	CPB23-SL-1.5	01/18/2006 14:30	1.5	mg/kg	NA	0.23	1.5	89	0.3	0.25	13	0.13	6.4	58	NA	77	0.02	0.23	10	0.31	0.051	0.12	25	180
onsite	CPB23	CPB23-SL-5	01/18/2006 14:35	5	mg/kg	NA	<1	1.5	77	0.27	0.13	13	0.2	5.8	14	NA	5.7	0.0037	0.75	7.4	<1	0.026	0.1	21	34
onsite	CPB23	CPB23-SL-10	01/18/2006 14:40	10	mg/kg	NA	<1	1.2	90	0.38	0.12	13	<1	6.8	19	NA	4.2	0.013	<1	9.7	0.24	0.052	0.13	22	57
onsite	CPB24	CPB24-SL-1.5	01/20/2006 9:20	1.5	mg/kg	15000	0.24	2	140	0.44	0.26	17	0.24	7.4	130	18000	46	0.023	0.47	11	<1	0.11	0.14	31	290
onsite	CPB24	CPB24-SL-5.0	01/20/2006 9:25	5	mg/kg	9800	0.13	2.5	86	0.29	0.13	13	<1	6.1	29	9200	10	0.012	0.28	8.7	<1	0.064	0.12	26	69
onsite	CPB24	CPB24-SL-10.0	01/20/2006 9:30	10	mg/kg	23000	0.21	3.1	200	0.57	0.3	22	0.12	11	38	20000	10	0.079	0.85	15	0.21	0.11	0.19	47	75
onsite	CPB-28	CPB-28-SL-5-7	12/05/2006 14:50	7	mg/kg	NA	0.45	1.6	90	0.41	0.22	16	31	7.1	37	NA	4	<0.02	0.89	15	<5	<2.5	0.78	45	200
onsite	CPB-28	CPB-28-SL-9-11	12/05/2006 15:00	11	mg/kg	NA	<5	<2.5	94	0.45	0.23	17	<1	17	20	NA	4.2	0.017	<5	19	<5	<2.5	<2.5	36	80
onsite	CPB3	CPB3-SL-1.5	01/12/2006 14:00	1.5	mg/kg	12	<1	<0.5	0.14	<0.3	<0.5	0.55	<1	0.24	0.5	43	4.5	0.0052	<1	1	0.34	<0.5	<0.5	<1	1.9
onsite	CPB3	CPB3-SL-5	01/12/2006 14:10	5	mg/kg	2800	0.11	0.77	27	0.17	0.068	4	<1	2.5	4.9	4000	2.7	<0.02	0.28	3.3	0.27	<0.5	<0.5	11	15
onsite	CPB3	CPB3-SL-10	01/12/2006 14:15	10	mg/kg	9900	0.29	2.8	160	0.55	0.3	12	0.14	9.7	28	13000	6.7	0.11	0.86	12	0.59	0.091	0.17	31	47
onsite	CPB-30	CPB-30-SL-8-10	12/06/2006 10:10	10	mg/kg	NA	0.058	1.2	72	0.29	0.24	11	<1	7.1	16	NA	3.1	0.031	<1	7.8	<1	<0.5	0.11	26	49
onsite	CPB5	CPB5-SL-1.5	01/19/2006 14:25	1.5	mg/kg	NA	<1	<0.5	0.82	<0.3	<0.5	2.9	<1	0.35	160	NA	7	<0.02	0.26	6.8	<1	<0.5	<0.5	1.1	66
onsite	CPB5	CPB5-SL-5	01/19/2006 14:30	5	mg/kg	NA	0.076	0.81	61	0.26	0.1	11	<1	5.2	11	NA	4	0.0055	0.33	6.8	<1	0.054	0.12	23	28
onsite	CPB5	CPB5-SL-10	01/19/2006 14:35	10	mg/kg	NA	0.065	1.4	100	0.35	0.14	15	0.2	7.1	12	NA	3.8	<0.02	0.25	9.2	<1	0.064	0.15	32	36
onsite	CPB7	CPB7-SL-1.5	01/12/2006 10:45	1.5	mg/kg	8.6	0.03	<0.5	0.13	<0.3	<0.5	0.8	<1	0.18	1.1	130	2	<0.02	0.16	0.97	0.63	<0.5	<0.5	<1	1.8
onsite	CPB7	CPB7-2SL-1.5	01/12/2006 10:46	1.5	mg/kg	22	0.042	<0.5	0.14	<0.3	<0.5	<1	<1	0.16	0.24	150	3.6	<0.02	<1	1	0.84	<0.5	<0.5	<1	1.3
onsite	CPB7	CPB7-SL-5	01/12/2006 11:00	5	mg/kg	68	0.038	<0.5	0.23	<0.3	<0.5	2.7	<1	0.41	0.69	370	10	<0.02	0.3	3.6	0.8	<0.5	<0.5	<1	3.5
onsite	CPB7	CPB7-SL-10	01/12/2006 11:10	10	mg/kg	3700	0.11	0.43	94	0.29	0.14	6	0.18	4.3	11	5400	3.5	0.1	0.23	5.7	0.49	0.043	0.11	14	20
onsite	CPB9	CPB9-SL-1.5	01/13/2006 9:40	1.5	mg/kg	NA	0.12	2.1	97	0.37	0.074	14	0.094	9.9	13	NA	6.9	0.017	0.52	9.8	<1	0.027	0.14	37	42
onsite	CPB9	CPB9-SL-5	01/13/2006 9:45	5	mg/kg	NA	0.086	1.8	96	0.31	0.088	13	0.04	8.3	11	NA	3.6	0.012	0.54	9.4	<1	0.021	0.13	32	35
onsite	CPB9	CPB9-SL-10	01/13/2006 9:50	10	mg/kg	NA	0.11	2.1	130	0.46	0.1	17	0.14	13	14	NA	4.8	0.038	0.62	14	<1	0.03	0.16	39	45
onsite	DPW01	DPW01-SS-1.5	01/18/2006 13:10	1.5	mg/kg	NA	0.25	5.2	90	0.38	0.21	22	0.58	10	28	NA	46	0.039	0.31	10	0.21	0.077	0.14	30	99
onsite	DPW01	DPW01-SS-5	01/18/2006 13:15	5	mg/kg	NA	0.031	2	160	0.51	0.19	18	<1	10	22	NA	7.3	0.052	<1	13	0.29	0.086	0.21	34	50
onsite	DPW01	DPW01-SS-10	01/18/2006 13:20	10	mg/kg	NA	<1	2.7	97	0.5	0.061	16	0.099	11	16	NA	5.3	0.036	0.7	12	<1	0.046	0.18	40	41
onsite	DPW02	DPW02-SS-2	01/13/2006 10:25	2	mg/kg	NA	0.18	2.1	92	0.43	0.18	23	<1	9.8	17	NA	15	0.032	0.59	11	0.24	0.052	0.14	34	67
onsite	DPW02	DPW02-SS-5	01/13/2006 10:30	5	mg/kg	NA	0.26	3.5	230	0.71	0.35	21	0.19	12	31	NA	9.3	0.071	0.72	15	0.38	0.086	0.19	44	61
onsite	DPW03	DPW03-SS-2	01/13/2006 10:50	2	mg/kg	NA	0.13	2.2	100	0.51	0.22	24	0.1	6.1	16	NA	36	0.028	0.49	9.1	<1	0.032	0.14	32	120
onsite	DPW03	DPW03-SS-5	01/13/2006 11:00	5	mg/kg	NA	0.25	8.3	130	0.73	0.59	24	<1	12	24	NA	9.9	0.033	0.37	20	0.34	0.076	0.19	35	180
onsite	DPW04	DPW04-SS-2	01/13/2006 11:15	2	mg/kg	NA	0.072	0.9	29	0.15	0.02	4.9	0.11	1.9	12	NA	13	0.051	0.37	4.4	<1	<0.5	<0.5	12	18
onsite	DPW04	DPW04-SS-5	01/13/2006 11:20	5	mg/kg	NA	0.13	2.8	76	0.28	0.17	13	<1	6.7	13	NA	5.8	0.04	0.48	7.4	<1	0.029	0.1	25	30
onsite	DPW05	DPW05-SS-5	01/13/2006 11:35	5	mg/kg	NA	0.2	2.7	160	0.55	0.22	24	0.11	11	25	NA	5.9	0.03	0.82	15	0.29	0.063	0.25	46	55
bkgd; offsite LADPW	DPW06	DPW06-SS-2'	01/11/2006 8:20	2	mg/kg	NA	0.16	1.5	<0.5	0.06	0.046	<1	NA	0.055	16	NA	0.054	0.014	0.23	<1	<1	<0.5	0.15	<1	<10
bkgd; offsite LADPW	DPW06	DPW06-SS-10'	01/11/2006 8:50	10	mg/kg	NA	0.43	2.1	160	0.45	0.18	16	NA	10	22	NA	4.9	0.042	0.78	14	<1	0.026	0.31	39	55
bkgd; offsite LADPW	DPW07	DPW07-SS-2'	01/11/2006 9:10	2	mg/kg	NA	0.28	1.5	100	0.43	0.13	18	NA	8.3	16	NA	4.9	0.02	0.37	11	<1	0.032	0.2	40	45
bkgd; offsite LADPW	DPW07	DPW07-SS-10'	01/11/2006 9:20	10	mg/kg	NA	0.31	2.2	120	0.44	0.22	17	NA	9.2	24	NA	4.5	0.056	0.69	14	<1	0.032	0.19	42	48
bkgd; offsite LADPW	DPW08	DPW08-SS-2'	01/11/2006 9:25	2	mg/kg	NA	0.2	1.4	100	0.34	0.086	14	NA	7.1	17	NA	3.9	0.011	0.51	9.2	<1	0.024	0.15	32	37
bkgd; offsite LADPW	DPW08	DPW08-SS-10'	01/11/2006 9:30	10	mg/kg	NA	0.32	2.5	120	0.48	0.15	19	NA	9.7	20	NA	4.9	0.089	0.69	14	<1	0.04	0.18	41	59
bkgd; offsite LADPW	DPW09	DPW09-SS-2'	01/11/2006 9:50	2	mg/kg	NA	0.21	1.3	100	0.34	0.068	15	NA	5.7	14	NA	4	0.0067	0.65	8.2	<1	0.025	0.15	34	38
bkgd; offsite LADPW	DPW09	DPW09-SS-10'	01/11/2006 10:15	10	mg/kg	NA	0.18	1.3	91	0.35	0.17	15	NA	6.8	18	NA	3.5	0.049	0.31	9.6	<1	0.042	0.14	31	48

Notes: "NA" not analyzed; "ft bgs" feet below ground surface

Table A-1a
Summary of Soil Matrix Analytical Results, Metals
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Cobalt	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
bkgd; offsite LADPW	DPW10	DPW10-SS-2'	01/11/2006 10:20	2	mg/kg	NA	0.23	82	100	0.45	0.068	18	<1	8.7	26	NA	4.6	0.037	0.34	14	<1	0.033	0.16	43	45
bkgd; offsite LADPW	DPW11	DPW11-SS-2.0	01/20/2006 11:30	2	mg/kg	NA	0.22	3.4	110	0.36	0.77	25	0.39	8.5	33	NA	40	0.049	0.53	15	<1	0.16	0.14	35	110
bkgd; offsite LADPW	DPW11	DPW11-SS-10.0	01/20/2006 11:35	10	mg/kg	NA	0.073	2.1	98	0.44	0.072	22	<1	7.4	21	NA	4.2	0.022	0.31	13	<1	0.066	0.12	42	39
bkgd; offsite LADPW	DPW12	DPW12-SS-2.0	01/20/2006 11:15	2	mg/kg	NA	0.17	1.8	99	0.32	0.22	16	0.2	6.8	19	NA	57	0.05	0.39	12	<1	0.07	0.11	34	76
bkgd; offsite LADPW	DPW12	DPW12-SS-10.0	01/20/2006 11:20	10	mg/kg	NA	0.072	2.5	120	0.5	0.12	21	<1	8.7	30	NA	4.9	0.058	0.35	14	<1	0.082	0.16	44	57
bkgd; offsite LADPW	DPW13	DPW13-SS-2.0	01/20/2006 11:05	2	mg/kg	NA	0.2	1.9	78	0.16	0.33	37	<1	4.3	33	NA	24	0.066	0.78	8.4	0.21	0.08	<0.5	19	100
bkgd; offsite LADPW	DPW13	DPW13-SS-10.0	01/20/2006 11:10	10	mg/kg	NA	0.077	3	130	0.51	0.19	20	<1	9.9	24	NA	5.4	0.026	0.43	16	<1	0.098	0.17	44	52
bkgd; offsite LADPW	DPW14	DPW14-SS-2.0	01/20/2006 10:50	2	mg/kg	NA	0.2	1.9	120	0.29	0.33	31	<1	5.7	24	NA	23	0.051	0.46	10	<1	0.098	0.11	26	110
bkgd; offsite LADPW	DPW14	DPW14-SS-10.0	01/20/2006 10:55	10	mg/kg	NA	0.082	2.6	110	0.44	0.23	18	<1	10	25	NA	5.1	0.03	0.46	15	<1	0.096	0.18	44	53
bkgd; offsite LADPW	DPW15	DPW15-SS-2.0	01/20/2006 10:35	2	mg/kg	NA	0.21	1.6	120	0.38	0.096	16	0.084	8.3	25	NA	4.2	0.013	0.69	11	<1	0.068	0.29	35	41
bkgd; offsite LADPW	DPW15	DPW15-SS-10.0	01/20/2006 10:40	10	mg/kg	NA	0.17	2.1	110	0.32	0.065	14	<1	7.6	38	NA	3.5	0.031	0.53	11	<1	0.02	0.25	34	71
offsite LADPW	DWP110	DWP110-SS-2.5	07/10/2009 13:30	2.5	mg/kg	NA	<5	5.4	120	0.7	<2.5	21	0.72	10	15	NA	5.9	0.066	0.66	14	1.8	<2.5	<2.5	56	56
offsite LADPW	DWP110	DWP110-SS-2.5 DUP	07/10/2009 13:30	2.5	mg/kg	NA	<5	4.5	140	1.1	<2.5	23	0.68	10	15	NA	6.1	0.17	0.53	16	1.1	<2.5	<2.5	58	55
offsite LADPW	DWP110	DWP110-SS-5.0	07/10/2009 13:35	5	mg/kg	NA	0.74	<2.5	140	<1.5	0.69	24	<1	7.1	26	NA	61	0.062	1.3	14	1.3	<2.5	<2.5	33	170
offsite LADPW	DWP110E	DWP110E-SS-5.0	07/10/2009 13:45	5	mg/kg	NA	<5	<2.5	140	<1.5	0.71	46	<1	5.7	21	NA	25	0.06	0.75	9.9	1.1	<2.5	<2.5	27	150
offsite LADPW	DWP110E	DWP110E-SS-2.5	07/10/2009 13:50	2.5	mg/kg	NA	<5	<2.5	130	0.5	<2.5	19	0.31	10	17	NA	5.1	0.19	0.57	13	<5	<2.5	<2.5	51	57
offsite LADPW	DWP110N	DWP110N-SS-2.5	07/10/2009 13:20	2.5	mg/kg	NA	<5	<2.5	110	0.54	<2.5	15	0.32	10	14	NA	4.5	0.03	0.63	11	0.76	<2.5	<2.5	39	48
offsite LADPW	DWP110N	DWP110N-SS-5.0	07/10/2009 13:25	5	mg/kg	NA	<5	3.4	150	0.72	<2.5	18	0.33	9.7	15	NA	4.8	0.047	0.61	14	<5	<2.5	<2.5	44	69
offsite LADPW	DWP110S	DWP110S-SS-2.5	07/10/2009 13:55	2.5	mg/kg	NA	<5	<2.5	130	0.86	<2.5	23	0.55	12	18	NA	6.1	0.055	0.6	16	1.2	<2.5	<2.5	60	60
offsite LADPW	DWP110S	DWP110S-SS-5.0	07/10/2009 14:00	5	mg/kg	NA	<5	<2.5	100	<1.5	0.57	73	<1	5.7	19	NA	56	0.062	0.74	11	0.83	<2.5	<2.5	20	120
onsite	HPB01	HPB01-SL-1.5	02/08/2006 11:00	1.5	mg/kg	NA	1.3	1.4	100	0.3	0.15	14	0.1	7	45	NA	55	0.042	0.44	16	<1	0.024	0.12	33	270
onsite	HPB01	HPB01-SL-5	02/08/2006 11:05	5	mg/kg	NA	<1	0.8	75	0.23	3.5	9.5	0.032	5.4	12	NA	22	0.023	0.1	6.9	<1	<0.5	<0.5	31	180
onsite	HPB01	HPB01-SL-10	02/08/2006 11:15	10	mg/kg	NA	<1	0.67	76	0.18	0.026	8.2	0.17	4.8	8.6	NA	2.9	0.043	0.12	5.9	<1	<0.5	<0.5	24	32
onsite	HPB02	HPB02-SL-1.5	02/09/2006 10:00	1.5	mg/kg	NA	<1	1.6	84	0.27	0.058	14	0.23	4.1	47	NA	8.5	0.22	0.19	7.5	0.21	<0.5	0.11	29	72
onsite	HPB02	HPB02-SL-5	02/09/2006 10:20	5	mg/kg	NA	<1	1.4	85	0.36	0.055	12	0.095	8.3	12	NA	5	0.042	0.19	14	<1	<0.5	0.11	30	150
onsite	HPB02	HPB02-2SL-5	02/09/2006 10:21	5	mg/kg	NA	<1	1.4	91	0.32	0.049	11	0.15	8.6	21	NA	3.8	0.045	0.2	15	<1	0.02	0.11	29	160
onsite	HPB02	HPB02-SL-10	02/09/2006 10:30	10	mg/kg	NA	<1	2.2	120	0.067	<0.5	9.2	<1	1.2	4.5	NA	4.9	0.025	0.46	1.8	<1	<0.5	<0.5	15	14
onsite	HPB03	HPB03-SL-1.5	02/08/2006 14:00	1.5	mg/kg	NA	0.22	1.9	97	0.43	0.21	27	0.17	8.9	27	NA	16	0.047	0.6	20	<1	0.054	0.14	40	130
onsite	HPB03	HPB03-SL-5	02/08/2006 14:10	5	mg/kg	NA	<1	2.1	100	0.35	0.17	13	<1	7.3	17	NA	3.7	0.026	0.36	10	<1	<0.5	0.13	32	90
onsite	HPB03	HPB03-SL-10	02/08/2006 14:15	10	mg/kg	NA	<1	1.3	120	0.31	0.13	14	0.046	9.1	16	NA	3	0.056	0.3	12	<1	<0.5	0.14	32	64
onsite	HPB03	HPB03-2SL-10	02/08/2006 14:16	10	mg/kg	NA	0.046	3.4	110	0.4	0.19	16	0.15	9.8	20	NA	4.2	0.057	0.64	13	0.22	<0.5	0.13	37	75
onsite	HPB04	HPB04-SL-1.5	02/09/2006 14:25	1.5	mg/kg	NA	0.6	1.8	89	0.35	0.12	14	0.25	7.3	29	NA	27	0.039	0.59	14	0.21	<0.5	0.12	31	110
onsite	HPB04	HPB04-SL-5	02/09/2006 14:35	5	mg/kg	NA	0.032	2.3	140	0.39	0.13	16	0.23	9.1	18	NA	4.1	0.04	0.42	12	<1	<0.5	0.14	38	49
onsite	HPB04	HPB04-SL-10	02/09/2006 14:40	10	mg/kg	NA	<1	1.5	130	0.36	0.14	13	0.15	8.3	15	NA	3.2	0.047	0.32	11	<1	<0.5	0.12	29	46
onsite	HPB04	HPB04-2SL-10	02/09/2006 14:41	10	mg/kg	NA	0.46	1.4	130	0.4	0.2	16	0.15	8.5	17	NA	3.8	0.053	0.61	12	<1	0.028	0.23	36	46
onsite	HPB05	HPB05-SL-1.5	02/06/2006 11:10	1.5	mg/kg	NA	0.044	<0.5	1.5	0.074	0.17	2.3	<1	2.7	510	NA	4.1	0.013	0.12	14	0.31	<0.5	<0.5	1.1	500
onsite	HPB05	HPB05-SL-5	02/06/2006 11:25	5	mg/kg	NA	0.064	0.28	72	0.064	0.027	5.1	0.033	2.1	38	NA	27	0.035	0.12	4.7	0.33	<0.5	<0.5	3.9	30
onsite	HPB05	HPB05-2SL-5	02/06/2006 11:26	5	mg/kg	NA	0.052	0.35	80	0.13	0.032	8.9	<1	3.7	11	NA	2.6	0.037	<1	5	0.26	0.024	<0.5	17	24
onsite	HPB05	HPB05-SL-10	02/06/2006 11:40	10	mg/kg	NA	0.08	2.9	92	0.17	0.02	29	0.2	2.4	30	NA	4.3	0.024	0.66	4.9	<1	0.048	0.32	47	33
onsite	HPB06	HPB06-SL-1.5	02/06/2006 9:45	1.5	mg/kg	NA	3.3	11	41	0.1	0.063	150	0.09	21	250	NA	12	0.05	30	69	<2	0.18	0.28	14	30
onsite	HPB06	HPB06-SL-5	02/06/2006 10:00	5	mg/kg	NA	0.27	1.7	100	0.42	0.096	17	4.3	6.3	16	NA	4.2	0.081	0.67	11	0.22	0.04	0.25	39	48
onsite	HPB06	HPB06-SL-10	02/06/2006 10:10	10	mg/kg	NA	0.19	2.5	140	0.48	0.17	20	0.06	8.6	26	NA	4.6	0.048	0.57	17	<1	0.06	0.23	47	56
onsite	HPB07	HPB07-SL-1.5	02/06/2006 13:40	1.5	mg/kg	NA	1.5	3.4	84	0.26	0.16	24	0.034	6.2	100	NA	75	0.067	4.2	22	<2	0.12	<1	26	150
onsite	HPB07	HPB07-SL-5	02/06/2006 13:45	5	mg/kg	NA	1.5	6.3	98	0.36	0.42	110	0.043	13	180	NA	37	0.063	25	68	<3	0.21	<1.5	23	120
onsite	HPB07	HPB07-2SL-5	02/06/2006 13:46	5	mg/kg	NA	0.43	2.9	140	0.45	0.48	20	<1	8.7	23	NA	42	0.062	1	16	<1	0.089	0.13	26	190
onsite	HPB07	HPB07-SL-10	02/06/2006 13:50	10	mg/kg	NA	0.1	0.86	35	0.068	0.022	2.8	<10	1.3	5	NA	8.5	0.061	0.14	4.3	<1	<0.5	<0.5	5.9	11
onsite	HPB08	HPB08-SL-1.5	02/08/2006 9:00	1.5	mg/kg	NA	0.16	1.4	82	0.27	0.066	13	0.58	5	22	NA	23	0.031	0.21	9	<1	<0.5	0.11	31	63
onsite	HPB08	HPB08-SL-5	02/08/2006 9:05	5	mg/kg	NA	<1	1.5	93	0.37	0.16	15	0.57	7.1	15	NA	7.1	0.028	0.26	10	<1	<0.5	0.13	33	47
onsite	HPB08	HPB08-SL-10	02/08/2006 9:10	10	mg/kg	NA	<1	1.4	98	0.42	0.16	16	0.25	7.8	15	NA	6.9	0.03	0.22	11	<1	<0.5	0.14	36	48
onsite	HPB09	HPB09-SL-1.5	02/09/2006 9:10	1.5	mg/kg	NA	1.2	1.2	82	0.31	0.086	13	0.074	5.6	18	NA	16	0.038	0.24	9.9	<1	0.025	0.13	32	130
onsite	HPB09	HPB09-2SL-1.5	02/09/2006 9:11	1.5	mg/kg	NA	0.4	1.1	81	0.27	0.094	11	0.074	4.9	18	NA	22	0.056	0.22	9.1	<1	0.026	0.12	28	130

Notes: "NA" not analyzed; "ft bgs" feet below ground surface

Table A-1a
Summary of Soil Matrix Analytical Results, Metals
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Cobalt	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
onsite	HPB09	HPB09-SL-5	02/09/2006 9:15	5	mg/kg	NA	0.3	1.1	99	0.37	0.073	14	0.12	6.6	14	NA	7.4	0.093	0.27	8.7	<1	0.058	0.15	35	45
onsite	HPB09	HPB09-SL-10	02/09/2006 9:20	10	mg/kg	NA	0.23	2.7	140	0.26	0.031	21	<1	5.1	16	NA	4	0.041	0.42	9.3	<1	<0.5	0.26	36	46
onsite	HPB09	HPB09-2SL-10	02/09/2006 9:21	10	mg/kg	NA	0.19	1.2	84	0.33	0.19	12	<1	8.8	12	NA	3.9	0.042	0.27	11	<1	<0.5	0.12	33	120
onsite	HPB11	HPB11-SL-1.5	02/07/2006 13:40	1.5	mg/kg	NA	0.57	1.8	75	0.32	0.17	17	0.1	4.7	29	NA	16	0.057	0.83	9.3	<1	0.038	<0.5	25	88
onsite	HPB11	HPB11-SL-5	02/07/2006 13:45	5	mg/kg	NA	0.57	1.8	93	0.42	0.046	21	0.26	5.9	27	NA	36	0.1	0.85	11	<1	0.045	0.16	45	69
onsite	HPB11	HPB11-SL-10	02/07/2006 13:50	10	mg/kg	NA	0.29	2.5	120	0.26	0.037	22	0.98	5.4	30	NA	5.2	0.059	0.59	10	<1	0.028	0.24	47	70
onsite	HPB113	HPB113-SS-2	07/09/2009 8:50	2	mg/kg	NA	11	42	750	<1.5	7.2	38	<0.2	15	430	NA	690	0.014	3.3	56	<5	1.4	<2.5	19	1800
onsite	HPB113	HPB113-SS-2-DUP	07/09/2009 8:50	2	mg/kg	NA	11	33	920	<1.5	5.2	27	<0.2	6.2	360	NA	1200	0.016	1.4	19	0.85	1.3	<2.5	24	1900
onsite	HPB113	HPB113-SS-5	07/09/2009 9:00	5	mg/kg	NA	5.2	13	540	<1.5	0.59	23	<0.2	3.3	110	NA	130	<0.02	0.72	9.2	<5	<2.5	<2.5	6.7	690
onsite	HPB113	HPB113-SS-10	07/09/2009 9:05	10	mg/kg	NA	<5	3.6	91	<1.5	<2.5	15	<0.2	7.2	31	NA	9.7	<0.02	<5	11	0.93	<2.5	<2.5	37	62
onsite	HPB116	HPB116-SS-2	10/29/2009 8:25	2	mg/kg	NA	<4.9	<2.5	93	0.38	<2.5	18	<0.2	8.8	22	NA	3.8	0.49	0.62	16	<4.9	<2.5	<2.5	40	140
onsite	HPB116	HPB116-SS-5	10/29/2009 8:30	5	mg/kg	NA	<5	<2.5	110	0.37	<2.5	19	0.21	9.9	24	NA	3.8	0.036	0.57	15	<5	<2.5	0.79	45	160
onsite	HPB116	HPB116-SS-10	10/29/2009 9:10	10	mg/kg	NA	<5	<2.5	120	0.44	<2.5	16	<0.2	8.9	23	NA	3.8	0.044	<5	14	<5	<2.5	<2.5	35	150
onsite	HPB117	HPB117-SS-2	10/29/2009 11:35	2	mg/kg	NA	<4.9	<2.5	130	0.36	0.32	20	0.14	9.8	22	NA	4.1	0.036	<4.9	15	<4.9	<2.5	<2.5	45	160
onsite	HPB117	HPB117-SS-5	10/29/2009 11:40	5	mg/kg	NA	<5	<2.5	110	0.29	<2.5	15	<0.2	9.2	18	NA	3.4	0.023	<5	13	<5	<2.5	<2.5	40	150
onsite	HPB117	HPB117-SS-10	10/29/2009 12:05	10	mg/kg	NA	<5	<2.5	140	0.46	<2.5	23	0.22	10	22	NA	4.2	0.03	<5	15	<5	<2.5	<2.5	45	160
onsite	HPB-12	HPB-12-SL-5-7	12/04/2006 13:00	7	mg/kg	NA	0.15	1.3	90	0.36	0.11	14	<1	9	15	NA	3.7	0.057	0.39	9.8	<1	<0.5	0.23	33	39
onsite	HPB-12	HPB-12-SL-10-12	12/04/2006 13:05	12	mg/kg	NA	0.19	1.4	77	0.34	0.22	12	<1	8.1	14	NA	3.3	0.062	0.5	12	<1	<0.5	0.22	30	36
onsite	HPB-SS	HPB-SS-2'	07/22/2009 9:00	2	mg/kg	NA	<5	<2.5	87	<1.5	<2.5	19	0.37	8	19	NA	6.4	0.059	<5	12	<5	<2.5	0.7	45	59
offsite residential	RB01	RB01-SL-1.5	02/14/2006 9:40	1.5	mg/kg	NA	0.5	2.8	210	0.42	1	33	100	8.4	32	NA	160	0.075	1.1	17	<1	0.34	0.13	33	210
offsite residential	RB01	RB01-SL-5	02/14/2006 9:50	5	mg/kg	NA	0.29	1.5	50	0.08	0.036	7.1	<1	2.3	9.9	NA	16	0.0053	0.52	7.1	<1	0.033	<0.5	11	26
offsite residential	RB01	RB01-SL-10	02/14/2006 10:15	10	mg/kg	NA	0.14	1.3	110	0.4	0.042	17	<1	8.9	16	NA	4.6	0.052	0.3	12	<1	0.027	0.15	37	45
offsite residential	RB02	RB02-SL-1.5	02/14/2006 13:40	1.5	mg/kg	NA	0.52	7.5	130	0.35	0.13	18	0.064	8.5	21	NA	14	0.053	1.4	13	<1	0.058	0.23	36	57
offsite residential	RB02	RB02-SL-5	02/14/2006 13:55	5	mg/kg	NA	1.1	3.3	200	0.48	0.44	21	0.074	7.5	30	NA	53	0.29	1.2	12	<1	0.21	0.26	40	140
offsite residential	RB02	RB02-SL-10	02/14/2006 14:05	10	mg/kg	NA	0.21	1.2	84	0.36	0.043	14	0.064	9.2	12	NA	3.7	0.02	0.28	12	<1	0.024	0.17	33	40
offsite residential	RB02	RB02-SL-10.5	02/14/2006 15:10	10.5	mg/kg	NA	0.098	1.2	74	0.3	0.028	13	<1	6.7	12	NA	3.3	0.048	0.23	8.9	<1	0.022	0.13	32	36
offsite residential	RB03	RB03-SL-1.5	02/15/2006 9:15	1.5	mg/kg	NA	0.33	2.9	130	0.43	0.38	18	<1	7.7	18	NA	35	<0.02	0.6	14	<1	0.068	0.14	32	59
offsite residential	RB03	RB03-2SL-1.5	02/15/2006 9:16	1.5	mg/kg	NA	0.36	3	130	0.4	0.48	18	<1	7.4	19	NA	41	0.0068	0.59	14	<1	0.068	0.13	31	66
offsite residential	RB03	RB03-SL-5	02/15/2006 9:45	5	mg/kg	NA	0.6	8.5	92	0.31	0.82	17	<1	5.9	48	NA	61	<0.02	1.1	13	<1	7.2	0.17	32	160
offsite residential	RB03	RB03-SL-10	02/15/2006 9:50	10	mg/kg	NA	0.11	3.6	61	0.081	0.05	5.2	<1	2.1	7.2	NA	17	0.0069	0.29	4.4	<1	0.032	<0.5	9.4	28
onsite	SV02	SV02-SS-5	03/13/2006 13:20	5	mg/kg	NA	0.25	2	120	0.39	0.13	16	0.064	9.8	18	NA	5.3	0.037	0.62	13	<1	0.04	0.33	39	46
onsite	SV02	SV02-SS-10	03/13/2006 13:40	10	mg/kg	NA	0.22	1.7	110	0.36	0.13	13	0.1	8.5	15	NA	3.6	0.042	0.53	11	<1	0.034	0.28	34	40
onsite	SV03	SV03-SS-5	03/07/2006 11:20	5	mg/kg	NA	0.098	0.72	51	0.35	0.086	10	<1	6.7	10	NA	3.7	0.039	0.19	8	<1	0.057	0.15	25	28
onsite	SV03	SV03-2SS-5	03/07/2006 11:21	5	mg/kg	NA	0.13	1.3	78	0.37	0.096	11	0.067	7.1	11	NA	4.1	0.034	0.31	8.6	<1	0.07	0.17	30	31
onsite	SV04	SV04-SS-5	03/07/2006 13:40	5	mg/kg	NA	0.14	1.6	93	0.46	0.17	15	<1	9.5	16	NA	5	0.067	0.33	11	<1	0.058	0.2	36	41
onsite	SV06	SV06-SS-5	03/07/2006 9:25	5	mg/kg	NA	0.16	1.4	110	0.35	0.18	13	<1	7.9	15	NA	3.7	0.054	0.4	11	<1	0.11	0.19	33	39
onsite	SV07	SV07-SS-5	03/07/2006 10:10	5	mg/kg	NA	0.19	1.9	120	0.43	0.23	14	<1	10	17	NA	4.9	0.043	0.52	14	<1	0.044	0.22	36	44
onsite	SV08	SV08-SS-5	03/07/2006 14:10	5	mg/kg	NA	0.084	0.45	83	0.21	0.084	7.5	<1	5.3	8.4	NA	2.1	0.028	<1	5.9	<1	0.022	0.16	22	29
onsite	SV09	SV09-SS-05	03/08/2006 10:20	5	mg/kg	NA	0.15	1.5	60	0.45	0.066	15	<1	9.2	15	NA	4.7	0.036	0.35	12	<1	0.039	0.19	40	40
onsite	SV10	SV10-SS-5	03/13/2006 14:40	5	mg/kg	NA	0.05	<0.5	1.1	<0.3	0.02	0.74	<1	0.65	1.3	NA	20	<0.02	<1	5	0.31	<0.5	<0.5	0.94	5.3
onsite	SV10	SV10-SS-10	03/13/2006 14:50	10	mg/kg	NA	0.14	1.7	140	0.37	0.088	21	0.15	7.3	26	NA	5.2	0.027	0.52	13	<1	0.042	0.2	42	52
onsite	SV12	SV12-SS-05	03/08/2006 9:30	5	mg/kg	NA	0.19	0.64	59	0.12	0.057	8.6	0.14	4.4	9.8	NA	2.5	0.014	0.29	5.7	<1	<0.5	0.21	27	35
onsite	SV13	SV13-SS-5	03/07/2006 14:30	5	mg/kg	NA	0.1	0.51	82	0.25	0.08	8.4	<1	5.9	9.5	NA	3.1	0.03	0.1	6.7	<1	0.022	0.17	23	32

Notes: "NA" not analyzed; "ft bgs" feet below ground surface

Table A-1b
Summary of Soil Matrix Analytical Results, PAHs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenz(a,h) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
onsite	CPB02	CPB02-SL-1.5	01/17/2006 8:30	1.5	mg/kg	<190	<190	<19	26	<9.3	31	16	6.1	160	<37	<19	3.9	<19	<190	88	51
onsite	CPB02	CPB02-SL-5	01/17/2006 8:35	5	mg/kg	<5	<5	<0.5	3.9	<0.25	4.2	1.8	<0.5	17	<1	13	1.3	<0.5	<5	8.9	7.9
onsite	CPB02	CPB02-SL-10	01/17/2006 8:40	10	mg/kg	<2	<2	<0.2	0.39	0.81	0.48	0.19	0.093	2.2	0.034	<0.2	0.043	<0.2	<2	1	0.68
onsite	CPB04	CPB04-SL-1.5	01/18/2006 10:20	1.5	mg/kg	<0.5	<0.5	<0.05	<0.05	<0.025	0.0036	<0.05	<0.05	0.0091	<0.1	<0.05	<0.05	<0.05	<0.5	<0.025	<0.05
onsite	CPB04	CPB04-SL-5	01/18/2006 10:25	5	mg/kg	<1	<1	<0.1	<0.1	<0.05	<0.1	0.068	<0.1	<0.1	0.021	<0.1	<0.1	<0.1	<1	<0.05	<0.1
onsite	CPB04	CPB04-SL-10	01/18/2006 10:30	10	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	<0.005	<0.01
onsite	CPB06	CPB06-SL-1.5	01/17/2006 10:00	1.5	mg/kg	48	<380	<38	74	130	81	50	13	430	46	370	14	<38	15	150	160
onsite	CPB06	CPB06-SL-5	01/17/2006 10:05	5	mg/kg	6.8	<72	<7.2	18	<3.6	22	11	5	100	2.1	76	1.8	<7.2	<72	39	35
onsite	CPB06	CPB06-SL-10	01/17/2006 10:10	10	mg/kg	<1	<1	<0.1	0.21	0.066	0.54	0.28	0.057	1.4	0.31	0.98	0.052	<0.1	<1	0.31	0.44
onsite	CPB06	CPB06-2SL-10	01/17/2006 10:11	10	mg/kg	<1	<1	<0.1	0.24	0.078	0.68	0.23	0.058	1.6	<0.2	0.24	0.048	<0.1	<1	0.32	0.45
onsite	CPB08	CPB08-SL-1.5	01/17/2006 14:50	1.5	mg/kg	<12	<12	<1.2	1.9	0.47	3.8	1.4	0.27	9.4	0.19	1.4	0.28	<1.2	<12	2.8	3.9
onsite	CPB08	CPB08-SL-5	01/17/2006 14:55	5	mg/kg	<0.5	<0.5	<0.05	0.036	0.086	0.076	0.029	0.0059	0.16	0.0039	0.032	<0.05	<0.05	<0.5	0.053	0.057
onsite	CPB08	CPB08-SL-10	01/17/2006 15:00	10	mg/kg	<10	<10	0.17	0.59	<0.5	2.5	0.4	<1	6	<2	<1	<1	<1	<10	<0.5	0.98
onsite	CPB1	CPB1-SL-1.5	01/19/2006 8:45	1.5	mg/kg	19	<77	<7.7	30	56	49	15	6.4	170	1.9	160	5.8	<7.7	4.5	58	69
onsite	CPB1	CPB1-SL-5	01/19/2006 8:50	5	mg/kg	<15	<15	1.1	23	18	11	7.4	1.6	16	<3.1	79	3.5	<1.5	<15	29	32
onsite	CPB1	CPB1-SL-10	01/19/2006 8:55	10	mg/kg	10	<73	<7.3	20	34	20	11	4	110	<15	100	4	<7.3	<73	55	46
onsite	CPB10	CPB10-SL-1.5	01/10/2006 11:20	1.5	mg/kg	<36	<36	<3.6	17	8.7	27	16	3.2	170	<7.2	66	2.4	<3.6	<36	28	36
onsite	CPB10	CPB10-SL-5	01/10/2006 11:25	5	mg/kg	<74	<74	<7.4	51	7.2	59	19	<7.4	180	<15	300	15	<7.4	3.6	140	170
onsite	CPB10	CPB10-SL-10	01/10/2006 11:35	10	mg/kg	<0.2	<0.2	<0.02	0.053	<0.01	0.1	0.021	<0.02	0.21	<0.04	0.34	0.017	<0.02	<0.2	0.13	0.15
onsite	CPB11R	CPB11R-SL-1.5	01/10/2006 14:15	1.5	mg/kg	<37	<37	<3.7	27	7.1	40	16	4.3	140	<7.4	91	3.8	<3.7	<37	37	59
onsite	CPB11R	CPB11R-SL-5	01/10/2006 14:25	5	mg/kg	<38	<38	<3.8	22	<1.9	21	7.4	2.6	80	<7.5	170	5.7	<3.8	1.9	79	84
onsite	CPB11R	CPB11R-SL-10	01/10/2006 14:45	10	mg/kg	<0.1	<0.1	<0.01	0.0011	0.0035	0.0022	<0.01	<0.01	<0.01	<0.02	0.0013	<0.01	<0.01	<0.1	<0.005	<0.01
onsite	CPB12	CPB12-SL-1.5	01/17/2006 14:00	1.5	mg/kg	<0.1	<0.1	<0.01	0.00047	<0.005	0.00092	<0.01	<0.01	0.0031	<0.02	0.0036	<0.01	<0.01	<0.1	0.0017	0.0022
onsite	CPB12	CPB12-SL-5	01/17/2006 14:05	5	mg/kg	0.12	0.051	<0.05	0.16	0.048	0.31	0.2	0.023	0.91	0.18	0.14	0.017	<0.05	<0.5	0.23	0.3
onsite	CPB12	CPB12-SL-10	01/17/2006 14:10	10	mg/kg	<12	<12	0.39	4.9	<0.62	4.7	1.9	<1.2	16	<2.5	<1.2	0.83	<1.2	<12	1.6	1.8
onsite	CPB13	CPB13-SL-1.5	01/16/2006 10:05	1.5	mg/kg	1.4	<12	<1.2	5.1	0.83	8.1	2.3	0.55	15	2.8	25	0.34	<1.2	<12	13	12
onsite	CPB13	CPB13-SL-5	01/16/2006 10:10	5	mg/kg	1.2	<2	<0.2	<0.2	0.17	0.34	<0.2	<0.2	0.86	0.19	<0.2	0.24	<0.2	<2	0.69	<0.2
onsite	CPB13	CPB13-SL-10	01/16/2006 10:15	10	mg/kg	<5	0.24	<0.5	4.3	<0.25	3.8	0.9	<0.5	12	<1	<0.5	1.2	<0.5	<5	1.9	<0.5
onsite	CPB14	CPB14-SL-1.5	01/10/2006 9:50	1.5	mg/kg	<74	<74	<7.4	45	9.4	65	24	7.2	160	<15	170	10	<7.4	<74	68	99
onsite	CPB14	CPB14-SL-5	01/10/2006 10:00	5	mg/kg	<0.5	<0.5	<0.05	0.097	<0.025	0.16	0.048	0.0013	0.15	0.027	0.56	0.031	<0.05	0.013	0.27	0.29
onsite	CPB14	CPB14-SL-10	01/10/2006 10:20	10	mg/kg	<0.1	<0.1	<0.01	0.0023	0.0018	0.015	0.0042	0.00026	0.032	<0.02	0.044	<0.01	<0.01	<0.1	0.018	0.021
onsite	CPB15R	CPB15R-SL-1.5	01/20/2006 10:00	1.5	mg/kg	<180	<180	6.7	81	100	62	29	8.6	230	<36	480	18	<18	6.6	170	190
onsite	CPB16	CPB16-SL-1.5	01/17/2006 13:00	1.5	mg/kg	<2	<2	<0.2	0.59	0.15	1.1	0.5	0.088	2.4	0.045	0.28	<0.2	<0.2	<2	1.1	1.1
onsite	CPB16	CPB16-2SL-1.5	01/17/2006 13:01	1.5	mg/kg	<150	<150	<15	28	6.7	55	21	4.8	120	<30	140	4.3	<15	<150	64	61
onsite	CPB16	CPB16-SL-5	01/17/2006 13:05	5	mg/kg	<0.1	<0.1	<0.01	0.00053	0.00082	0.0015	<0.01	<0.01	0.0041	<0.02	0.0033	<0.01	<0.01	<0.1	0.002	0.0016
onsite	CPB16	CPB16-SL-10	01/17/2006 13:10	10	mg/kg	<0.5	<0.5	<0.05	0.016	<0.025	0.035	0.017	<0.05	0.075	0.018	0.013	<0.05	<0.05	<0.5	0.02	0.024
onsite	CPB17	CPB17-SL-1.5	01/09/2006 15:19	1.5	mg/kg	<36	<36	<3.6	45	<1.8	51	19	6.1	170	<7.3	270	13	<3.6	3.6	110	140
onsite	CPB17	CPB17-2SL-1.5	01/09/2006 15:20	1.5	mg/kg	<36	<36	<3.6	26	<1.8	28	13	3.9	96	<7.3	180	6.7	<3.6	<36	76	88
onsite	CPB17	CPB17-SL-5	01/09/2006 15:35	5	mg/kg	<0.1	<0.1	<0.01	0.002	<0.005	0.0034	<0.01	<0.01	0.013	<0.02	0.011	<0.01	<0.01	<0.1	0.0052	0.0047
onsite	CPB17	CPB17-SL-10	01/09/2006 15:45	10	mg/kg	<0.1	<0.1	<0.01	0.019	0.0047	0.032	0.011	0.0013	0.1	<0.02	0.12	0.0059	<0.01	<0.1	0.052	0.058
onsite	CPB18	CPB18-SL-10'	12/20/2005 9:49	10	mg/kg	<0.5	<0.5	<0.05	0.057	<0.025	0.13	0.029	0.0048	0.29	0.063	0.3	0.023	<0.05	<0.5	0.2	0.15
onsite	CPB19	CPB19-SL-1.5	01/16/2006 9:00	1.5	mg/kg	<2	<2	<0.2	0.8	<0.25	2.8	0.7	<0.2	6.5	<0.4	1.1	0.85	<0.5	<2	0.038	<0.2
onsite	CPB19	CPB19-SL-5	01/16/2006 9:10	5	mg/kg	<0.1	<0.1	<0.01	0.0036	<0.005	0.0071	0.006	<0.01	0.016	0.0059	<0.01	<0.01	<0.01	<0.1	0.0071	<0.01
onsite	CPB19	CPB19-2SL-5	01/16/2006 9:11	5	mg/kg	<0.2	<0.2	<0.02	0.0036	<0.01	0.027	<0.02	<0.02	0.012	0.01	<0.02	<0.02	<0.02	<0.2	0.0093	<0.02
onsite	CPB19	CPB19-SL-10	01/16/2006 9:20	10	mg/kg	<0.1	<0.1	<0.01	0.00096	0.0032	0.0011	<0.01	<0.01	0.0052	<0.02	<0.01	<0.01	<0.01	<0.1	0.0039	<0.01
onsite	CPB20	CPB20-SL-1.5	01/17/2006 11:15	1.5	mg/kg	<1	<1	<0.1	0.03	0.025	0.13	0.069	<0.1	0.13	0.074	<0.1	<0.1	<0.1	<1	0.016	0.042
onsite	CPB20	CPB20-SL-5	01/17/2006 11:20	5	mg/kg	<0.1	<0.1	<0.01	0.00081	0.00028	0.0013	<0.01	<0.01	0.0047	<0.02	<0.01	<0.01	<0.01	<0.1	0.0034	0.0015

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "PAHs" polynuclear aromatic hydrocarbons

Table A-1b
Summary of Soil Matrix Analytical Results, PAHs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenz(a,h) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
onsite	CPB20	CPB20-SL-10	01/17/2006 11:25	10	mg/kg	<0.1	<0.1	<0.01	0.0023	0.001	0.0077	<0.01	<0.01	0.013	<0.02	0.012	<0.01	<0.01	<0.1	0.0034	0.00093
onsite	CPB21	CPB21-SL-1.5	01/13/2006 8:40	1.5	mg/kg	0.0096	<0.1	<0.01	0.02	0.005	0.048	0.011	0.0038	0.12	0.0064	0.088	0.0052	<0.01	<0.1	0.038	0.045
onsite	CPB21	CPB21-SL-5	01/13/2006 8:50	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	0.0014	<0.02	<0.01	<0.01	<0.01	<0.1	0.0013	<0.01
onsite	CPB21	CPB21-SL-10	01/13/2006 9:00	10	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	0.00056	<0.01
onsite	CPB22	CPB22-SL-1.5	01/12/2006 15:10	1.5	mg/kg	<1	<1	<0.1	0.098	0.027	0.13	0.06	0.019	0.61	0.1	0.51	0.039	<0.1	<1	0.21	0.26
onsite	CPB22	CPB22-SL-5	01/12/2006 15:15	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	0.00088	<0.01
onsite	CPB22	CPB22-SL-10	01/12/2006 15:20	10	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	0.00022	<0.01
onsite	CPB23	CPB23-SL-1.5	01/18/2006 14:30	1.5	mg/kg	<1	<1	<0.1	0.02	0.013	0.028	0.04	<0.1	0.058	0.038	<0.1	<0.1	<0.1	<1	0.0075	<0.1
onsite	CPB23	CPB23-SL-5	01/18/2006 14:35	5	mg/kg	<0.5	<0.5	<0.05	0.017	0.011	0.051	0.03	0.0018	0.079	0.029	<0.05	<0.05	<0.05	<0.5	0.013	0.022
onsite	CPB23	CPB23-SL-10	01/18/2006 14:40	10	mg/kg	<0.1	<0.1	<0.01	0.00051	0.00021	0.0006	<0.01	<0.01	0.0032	<0.02	0.0022	<0.01	<0.01	<0.1	0.00095	<0.01
onsite	CPB24	CPB24-SL-1.5	01/20/2006 9:20	1.5	mg/kg	<0.2	<0.2	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	0.0055	<0.02	<0.2	0.08	<0.02
onsite	CPB24	CPB24-SL-5.0	01/20/2006 9:25	5	mg/kg	<2.5	<2.5	<0.25	4.4	<0.12	4.7	2.3	<0.25	18	0.92	<0.25	1.3	<0.25	<2.5	2.9	3.9
onsite	CPB24	CPB24-SL-10.0	01/20/2006 9:30	10	mg/kg	<0.5	<0.5	<0.05	1.1	<0.025	1.2	<0.05	<0.05	4.8	0.088	1.3	0.11	<0.05	<0.5	0.5	1.3
onsite	CPB3	CPB3-SL-1.5	01/12/2006 14:00	1.5	mg/kg	<190	<190	<19	84	170	100	70	15	410	<37	450	19	<19	13	270	210
onsite	CPB3	CPB3-SL-5	01/12/2006 14:10	5	mg/kg	<12	<12	<1.2	9.2	<0.62	7.9	3	<1.2	31	3	<1.2	2.6	<1.2	<12	9.5	9.3
onsite	CPB3	CPB3-SL-10	01/12/2006 14:15	10	mg/kg	<1	<1	<0.1	0.14	0.25	0.18	0.1	0.035	0.72	0.1	<0.1	0.031	<0.1	<1	0.22	0.22
onsite	CPB5	CPB5-SL-1.5	01/19/2006 14:25	1.5	mg/kg	<78	<78	<7.8	38	71	77	9.3	9.7	210	12	<7.8	7.6	<7.8	<78	93	67
onsite	CPB5	CPB5-SL-5	01/19/2006 14:30	5	mg/kg	<2.5	<2.5	<0.25	4.9	<0.12	4.6	1.5	<0.25	16	0.23	18	0.78	<0.25	<2.5	7.7	9.1
onsite	CPB5	CPB5-SL-10	01/19/2006 14:35	10	mg/kg	<0.1	<0.1	<0.01	0.011	0.023	0.02	<0.01	0.0022	0.051	0.0051	0.045	<0.01	<0.01	<0.1	0.017	0.021
onsite	CPB7	CPB7-SL-1.5	01/12/2006 10:45	1.5	mg/kg	<37	<37	<3.7	58	10	68	42	12	410	29	310	20	<3.7	<37	200	170
onsite	CPB7	CPB7-2SL-1.5	01/12/2006 10:46	1.5	mg/kg	<38	<38	<3.8	49	8.5	61	32	8.7	320	<7.5	320	12	<3.8	5.1	140	170
onsite	CPB7	CPB7-SL-5	01/12/2006 11:00	5	mg/kg	<38	<38	<3.8	38	7.6	48	16	7.3	240	<7.6	170	12	<3.8	<38	82	98
onsite	CPB7	CPB7-SL-10	01/12/2006 11:10	10	mg/kg	<2	<2	<0.2	1.7	0.12	2.3	0.48	<0.2	6.1	<0.4	0.32	0.4	<0.2	<2	0.24	0.79
onsite	CPB9	CPB9-SL-1.5	01/13/2006 9:40	1.5	mg/kg	<0.5	<0.5	<0.05	0.0056	0.016	0.0076	<0.05	<0.05	0.023	<0.1	<0.05	<0.05	<0.05	<0.5	0.01	<0.05
onsite	CPB9	CPB9-SL-5	01/13/2006 9:45	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	0.00018	<0.01
onsite	CPB9	CPB9-SL-10	01/13/2006 9:50	10	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	<0.005	<0.01
onsite	DPW01	DPW01-SS-1.5	01/18/2006 13:10	1.5	mg/kg	<1	<1	<0.1	0.066	0.052	0.13	0.18	<0.1	0.13	0.052	<0.1	<0.1	<0.1	<1	0.036	0.057
onsite	DPW01	DPW01-SS-5	01/18/2006 13:15	5	mg/kg	<0.5	<0.5	<0.05	<0.05	<0.025	<0.05	<0.05	<0.05	<0.05	0.082	<0.05	<0.05	<0.05	<0.5	<0.025	<0.05
onsite	DPW01	DPW01-SS-10	01/18/2006 13:20	10	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	0.00069	<0.01
onsite	DPW02	DPW02-SS-2	01/13/2006 10:25	2	mg/kg	1.7	0.26	0.44	1.2	1.3	0.83	0.5	0.46	1.3	0.79	4.7	<0.1	0.72	<1	1.2	3.2
onsite	DPW02	DPW02-SS-5	01/13/2006 10:30	5	mg/kg	<1	<1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	0.22	<0.1	<0.1	<0.1	<1	<0.05	<0.1
onsite	DPW03	DPW03-SS-2	01/13/2006 10:50	2	mg/kg	0.084	<1	<0.1	0.1	0.3	0.19	0.075	0.012	0.58	0.12	0.49	0.012	<0.1	<1	0.24	0.21
onsite	DPW03	DPW03-SS-5	01/13/2006 11:00	5	mg/kg	0.05	<1	<0.1	0.11	0.29	0.22	0.077	0.016	0.58	0.11	0.46	0.0092	<0.1	<1	0.15	0.2
onsite	DPW04	DPW04-SS-2	01/13/2006 11:15	2	mg/kg	<12	<12	<1.2	2.6	0.62	4.6	2	0.27	8.9	2.2	13	0.32	<1.2	<12	3.9	5
onsite	DPW04	DPW04-SS-5	01/13/2006 11:20	5	mg/kg	0.058	<1	<0.1	0.077	0.19	0.15	0.05	0.015	0.44	0.057	0.071	0.0068	<0.1	<1	0.11	0.14
onsite	DPW05	DPW05-SS-5	01/13/2006 11:35	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	0.00081	<0.01
onsite	HPB01	HPB01-SL-1.5	02/08/2006 11:00	1.5	mg/kg	<0.5	<0.5	<0.05	<0.05	<0.025	0.078	<0.05	<0.05	0.093	<0.1	0.062	<0.05	<0.05	<0.5	<0.025	<0.05
onsite	HPB01	HPB01-SL-5	02/08/2006 11:05	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	<0.005	<0.01
onsite	HPB01	HPB01-SL-10	02/08/2006 11:15	10	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	0.032	<0.02	<0.01	<0.01	<0.01	<0.1	0.0061	<0.01
onsite	HPB03	HPB03-SL-1.5	02/08/2006 14:00	1.5	mg/kg	<0.5	<0.5	<0.05	0.0058	0.002	0.017	<0.05	<0.05	0.032	<0.1	<0.05	<0.05	<0.05	<0.5	0.0079	0.0017
onsite	HPB03	HPB03-SL-5	02/08/2006 14:10	5	mg/kg	<2	0.35	<0.2	<0.2	<0.1	0.061	<0.2	<0.2	<0.2	0.32	<0.2	<0.2	<0.2	<2	<0.1	<0.2
onsite	HPB03	HPB03-SL-10	02/08/2006 14:15	10	mg/kg	<2.5	<2.5	1.1	3.4	<0.12	9.1	<0.25	2.9	28	<0.5	29	1.3	<0.25	<2.5	14	15
onsite	HPB05	HPB05-SL-1.5	02/06/2006 11:10	1.5	mg/kg	<12	<12	<1.2	2.7	8.7	6.8	<1.2	0.81	26	<2.5	52	3	<1.2	0.6	21	23
onsite	HPB05	HPB05-SL-5	02/06/2006 11:25	5	mg/kg	16	<25	<2.5	4	<1.2	11	<2.5	0.79	24	<5	99	4.7	<2.5	7.8	46	41
onsite	HPB05	HPB05-SL-10	02/06/2006 11:40	10	mg/kg	<0.5	<0.5	<0.05	0.023	0.11	0.084	<0.05	<0.05	0.18	<0.1	0.57	<0.05	<0.05	<0.5	0.15	0.27
onsite	HPB06	HPB06-SL-5	02/06/2006 10:00	5	mg/kg	<5	1.5	<0.5	<0.5	<0.25	6.3	1.8	<0.5	1.4	<1	<0.5	0.2	<0.5	0.59	0.018	0.36
onsite	HPB06	HPB06-SL-10	02/06/2006 10:10	10	mg/kg	<0.25	<0.25	<0.025	0.014	0.086	0.076	0.025	<0.025	0.12	0.037	0.2	<0.025	<0.025	<0.25	0.053	0.093

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "PAHs" polynuclear aromatic hydrocarbons

Table A-1b
Summary of Soil Matrix Analytical Results, PAHs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenz(a,h) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
onsite	HPB07	HPB07-SL-1.5	02/06/2006 13:40	1.5	mg/kg	<5	<5	<0.5	0.19	<0.25	1.9	0.89	<0.5	1.6	<1	<0.5	<0.5	<0.5	<5	0.14	0.5
onsite	HPB07	HPB07-SL-5	02/06/2006 13:45	5	mg/kg	<0.5	<0.5	<0.05	<0.05	<0.025	0.039	<0.05	<0.05	0.0069	<0.1	<0.05	<0.05	<0.05	<0.5	0.0035	<0.05
onsite	HPB07	HPB07-SL-10	02/06/2006 13:50	10	mg/kg	<50	<50	<5	8.9	36	36	9.9	2.9	79	<10	150	6.9	<5	<50	59	70
onsite	HPB08	HPB08-SL-1.5	02/08/2006 9:00	1.5	mg/kg	<5	<5	<0.5	0.91	2.9	2.2	<0.5	<0.5	4.3	<1	<0.5	<0.5	<0.5	<5	0.79	1.1
onsite	HPB08	HPB08-SL-5	02/08/2006 9:05	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	<0.005	<0.01
onsite	HPB08	HPB08-SL-10	02/08/2006 9:10	10	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	<0.005	<0.01
onsite	HPB09	HPB09-SL-1.5	02/09/2006 9:10	1.5	mg/kg	<5	<5	<0.5	0.56	<0.25	1.5	<0.5	<0.5	1.7	1	<0.5	<0.5	<0.5	<5	0.34	0.39
onsite	HPB09	HPB09-2SL-1.5	02/09/2006 9:11	1.5	mg/kg	<5	<5	<0.5	0.6	0.22	1.5	0.5	<0.5	2.1	0.6	<0.5	<0.5	<0.5	<5	0.46	0.6
onsite	HPB09	HPB09-SL-5	02/09/2006 9:15	5	mg/kg	<0.2	<0.2	<0.02	0.013	0.035	0.026	0.0071	0.0018	0.06	<0.04	0.054	<0.02	<0.02	<0.2	0.026	0.023
onsite	HPB09	HPB09-SL-10	02/09/2006 9:20	10	mg/kg	<0.2	1.9	<0.02	0.012	0.02	0.014	<0.02	0.0027	0.06	<0.04	0.04	<0.02	<0.02	0.11	0.012	0.038
onsite	HPB09	HPB09-2SL-10	02/09/2006 9:21	10	mg/kg	0.026	<0.2	<0.02	0.035	0.071	0.049	0.027	0.0067	0.19	<0.04	0.16	0.0057	<0.02	<0.2	0.07	0.073
onsite	HPB11	HPB11-SL-1.5	02/07/2006 13:40	1.5	mg/kg	<2	<2	<0.2	0.1	0.96	0.66	<0.2	<0.2	0.74	<0.4	0.85	<0.2	<0.2	<2	0.16	0.6
onsite	HPB11	HPB11-SL-5	02/07/2006 13:45	5	mg/kg	<1.2	0.5	<0.12	0.076	0.69	0.46	<0.12	<0.12	0.57	<0.25	0.92	<0.12	<0.12	<1.2	0.19	0.55
onsite	HPB11	HPB11-SL-10	02/07/2006 13:50	10	mg/kg	0.094	0.22	<0.05	0.018	0.12	0.093	<0.05	<0.05	0.15	<0.1	0.42	<0.05	<0.05	0.11	0.22	0.2
offsite residential	RB01	RB01-SL-5	02/14/2006 9:50	5	mg/kg	<25	<25	<2.5	2.9	2.2	11	3.4	1.7	44	<5	64	2.8	<2.5	0.88	36	8.8
offsite residential	RB01	RB01-SL-10	02/14/2006 10:15	10	mg/kg	0.022	<0.5	<0.05	0.051	<0.025	0.067	0.017	0.0077	0.15	<0.1	0.3	0.019	<0.05	<0.5	0.17	0.15
offsite residential	RB02	RB02-SL-5	02/14/2006 13:55	5	mg/kg	0.081	<1.2	<0.12	0.037	0.064	0.093	0.091	0.022	0.028	<0.25	<0.12	0.0095	0.24	<1.2	0.047	0.041
offsite residential	RB02	RB02-SL-10.5	02/14/2006 15:10	10.5	mg/kg	<1	0.22	0.0068	1.2	0.95	1	0.49	<0.1	3	0.72	2.4	0.057	0.32	<1	0.84	1.6
offsite residential	RB03	RB03-SL-5	02/15/2006 9:45	5	mg/kg	<1	<1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<1	0.0043	<0.1
offsite residential	RB03	RB03-SL-10	02/15/2006 9:50	10	mg/kg	<25	<25	<2.5	12	6.4	5.8	1.8	0.77	22	<5	48	1.9	<2.5	<25	19	20
onsite	SV03	SV03-SS-5	03/07/2006 11:20	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	<0.005	<0.01
onsite	SV03	SV03-2SS-5	03/07/2006 11:21	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	<0.005	<0.01
onsite	SV04	SV04-SS-5	03/07/2006 13:40	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	<0.005	<0.01
onsite	SV06	SV06-SS-5	03/07/2006 9:25	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	<0.005	<0.01
onsite	SV07	SV07-SS-5	03/07/2006 10:10	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	<0.005	<0.01
onsite	SV08	SV08-SS-5	03/07/2006 14:10	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	<0.005	<0.01
onsite	SV09	SV09-SS-05	03/08/2006 10:20	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	0.00023	<0.01
onsite	SV11	SV11-SS-5	03/13/2006 9:50	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	<0.005	<0.01
onsite	SV12	SV12-SS-05	03/08/2006 9:30	5	mg/kg	<0.5	<0.5	<0.05	<0.05	<0.025	0.0062	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.5	<0.025	<0.05
onsite	SV13	SV13-SS-5	03/07/2006 14:30	5	mg/kg	<0.1	<0.1	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.1	<0.005	<0.01

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "PAHs" polynuclear aromatic hydrocarbons

Table A-1c
Summary of Soil Matrix Analytical Results, VOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	1,1,1,2-Tetrachloroethane	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,1-Dichloropropene	1,2,3-Trichlorobenzene	1,2,3-Trichloropropane	1,2,4-Trichlorobenzene	1,2,4-Trimethylbenzene	1,2-Dibromo-3-chloropropane	1,2-Dibromoethane (EDB)	1,2-Dichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3,5-Trimethylbenzene	1,3-Dichlorobenzene
onsite	CPB02	CPB02-SL-1.5	01/17/2006 8:30	1.5	mg/kg	<0.42	<0.17	<0.17	<0.17	<0.17	<0.42	<0.17	<0.42	<0.83	<0.42	1.2	<0.42	<0.17	<0.17	<0.17	<0.17	1.3	<0.17
onsite	CPB02	CPB02-SL-5	01/17/2006 8:35	5	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0087	<0.0043	0.011	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	0.004	<0.0017
onsite	CPB02	CPB02-SL-10	01/17/2006 8:40	10	mg/kg	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0018	<0.0045	<0.0091	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	0.00092	<0.0018
onsite	CPB04	CPB04-SL-1.5	01/18/2006 10:20	1.5	mg/kg	<0.0044	<0.0017	<0.0017	<0.0017	<0.0017	<0.0044	<0.0017	<0.0044	<0.0087	<0.0044	<0.0017	<0.0044	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB04	CPB04-SL-5	01/18/2006 10:25	5	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0085	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB04	CPB04-SL-10	01/18/2006 10:30	10	mg/kg	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018	<0.0046	<0.0018	<0.0046	<0.0091	<0.0046	<0.0018	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB06	CPB06-SL-1.5	01/17/2006 10:00	1.5	mg/kg	<0.01	<0.0041	<0.0041	<0.0041	<0.0041	<0.01	<0.0041	<0.01	<0.02	<0.01	0.016	<0.01	<0.0041	<0.0041	<0.0041	<0.0041	0.0052	<0.0041
onsite	CPB06	CPB06-SL-5	01/17/2006 10:05	5	mg/kg	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0089	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB06	CPB06-SL-10	01/17/2006 10:10	10	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0087	<0.0043	0.0019	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	0.00073	<0.0017
onsite	CPB06	CPB06-2SL-10	01/17/2006 10:11	10	mg/kg	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018	<0.0046	<0.0018	<0.0046	<0.0092	<0.0046	0.002	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018	0.00079	<0.0018
onsite	CPB08	CPB08-SL-1.5	01/17/2006 14:50	1.5	mg/kg	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0095	<0.0047	0.037	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	0.029	<0.0019
onsite	CPB08	CPB08-SL-5	01/17/2006 14:55	5	mg/kg	<0.0049	<0.0019	<0.0019	<0.0019	<0.0019	<0.0049	<0.0019	<0.0049	<0.0097	<0.0049	0.003	<0.0049	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019
onsite	CPB08	CPB08-SL-10	01/17/2006 15:00	10	mg/kg	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0079	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB1	CPB1-SL-1.5	01/19/2006 8:45	1.5	mg/kg	<0.39	<0.16	<0.16	<0.16	<0.16	<0.39	<0.16	<0.39	<0.78	<0.39	0.63	<0.39	<0.16	<0.16	<0.16	<0.16	2.2	<0.16
onsite	CPB1	CPB1-SL-5	01/19/2006 8:50	5	mg/kg	<0.46	<0.18	<0.18	<0.18	<0.18	<0.46	<0.18	<0.46	<0.92	<0.46	4.9	<0.46	<0.18	<0.18	<0.18	<0.18	6.4	<0.18
onsite	CPB1	CPB1-SL-10	01/19/2006 8:55	10	mg/kg	<0.38	<0.15	<0.15	<0.15	<0.15	<0.38	<0.15	<0.38	<0.76	<0.38	3.3	<0.38	<0.15	<0.15	<0.15	<0.15	33	<0.15
onsite	CPB10	CPB10-SL-1.5	01/10/2006 11:20	1.5	mg/kg	<0.57	<0.23	<0.23	<0.23	<0.23	<0.57	<0.23	<0.57	<1.1	<0.57	0.95	<0.57	<0.23	<0.23	<0.23	<0.23	0.25	<0.23
onsite	CPB10	CPB10-SL-5	01/10/2006 11:25	5	mg/kg	<0.39	<0.16	<0.16	<0.16	<0.16	<0.39	<0.16	<0.39	<0.78	<0.39	2.1	<0.39	<0.16	<0.16	<0.16	<0.16	0.44	<0.16
onsite	CPB10	CPB10-SL-10	01/10/2006 11:35	10	mg/kg	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0081	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB11	CPB11-SL-1.5	12/22/2005 12:50	1.5	mg/kg	<0.44	<0.18	<0.18	<0.18	<0.18	<0.44	<0.18	<0.44	<0.88	<0.44	1.9	<0.44	<0.18	<0.18	<0.18	<0.18	0.47	<0.18
onsite	CPB11	CPB11-SL-5	12/22/2005 12:55	5	mg/kg	0.051	<0.2	<0.2	<0.2	<0.2	<0.49	<0.2	<0.49	<0.98	<0.49	6.1	<0.49	<0.2	<0.2	<0.2	<0.2	1.4	0.088
onsite	CPB11	CPB11-SL-10	12/22/2005 13:00	10	mg/kg	<0.0059	<0.0024	<0.0024	<0.0024	<0.0024	<0.0059	<0.0024	<0.0059	<0.012	<0.0059	<0.0024	<0.0059	<0.0024	<0.0024	<0.0024	<0.0024	<0.0024	<0.0024
onsite	CPB11R	CPB11R-SL-1.5	01/10/2006 14:15	1.5	mg/kg	<0.44	<0.17	<0.17	<0.17	<0.17	<0.44	<0.17	<0.44	<0.87	<0.44	1.4	<0.44	<0.17	<0.17	<0.17	<0.17	0.37	<0.17
onsite	CPB11R	CPB11R-SL-5	01/10/2006 14:25	5	mg/kg	<0.5	<0.2	<0.2	<0.2	<0.2	<0.5	<0.2	<0.5	<1	<0.5	5.4	<0.5	<0.2	<0.2	<0.2	<0.2	1.2	<0.2
onsite	CPB11R	CPB11R-SL-10	01/10/2006 14:45	10	mg/kg	<0.0064	<0.0025	<0.0025	<0.0025	<0.0025	<0.0064	<0.0025	<0.0064	<0.013	<0.0064	0.0031	<0.0064	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
onsite	CPB12	CPB12-SL-1.5	01/17/2006 14:00	1.5	mg/kg	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0082	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB12	CPB12-SL-5	01/17/2006 14:05	5	mg/kg	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0094	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019
onsite	CPB12	CPB12-SL-10	01/17/2006 14:10	10	mg/kg	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0085	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB13	CPB13-SL-1.5	01/16/2006 10:05	1.5	mg/kg	<0.0069	<0.0028	<0.0028	<0.0028	<0.0028	<0.0069	<0.0028	<0.0069	<0.014	<0.0069	0.068	<0.0069	<0.0028	<0.0028	<0.0028	<0.0028	0.019	<0.0028
onsite	CPB13	CPB13-SL-5	01/16/2006 10:10	5	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0086	<0.0043	0.00094	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	0.0016	<0.0017
onsite	CPB13	CPB13-SL-10	01/16/2006 10:15	10	mg/kg	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0079	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	0.081	<0.0016
onsite	CPB14	CPB14-SL-1.5	01/10/2006 9:50	1.5	mg/kg	<0.51	<0.2	<0.2	<0.2	<0.2	<0.51	<0.2	<0.51	<1	<0.51	2	<0.51	<0.2	<0.2	<0.2	<0.2	0.54	<0.2
onsite	CPB14	CPB14-SL-5	01/10/2006 10:00	5	mg/kg	<0.005	<0.002	<0.002	<0.002	<0.002	<0.005	<0.002	<0.005	<0.0099	<0.005	0.0028	<0.005	<0.002	<0.002	<0.002	<0.002	0.00062	<0.002
onsite	CPB14	CPB14-SL-10	01/10/2006 10:20	10	mg/kg	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0084	<0.0042	0.0096	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	0.002	<0.0017
onsite	CPB15	CPB15-SL-1.5'	12/20/2005 13:40	1.5	mg/kg	<0.51	<0.2	<0.2	<0.2	<0.2	<0.51	<0.2	<0.51	<1	<0.51	4.4	<0.51	<0.2	<0.2	<0.2	<0.2	1	<0.2
onsite	CPB15	CPB15-SL-5'	12/20/2005 13:45	5	mg/kg	<0.0049	<0.002	<0.002	<0.002	<0.002	<0.0049	<0.002	<0.0049	<0.0098	<0.0049	0.0088	<0.0049	<0.002	<0.002	<0.002	<0.002	0.0016	<0.002
onsite	CPB15	CPB15-SL-10'	12/20/2005 14:50	10	mg/kg	<0.0051	<0.002	<0.002	<0.002	<0.002	<0.0051	<0.002	<0.0051	<0.01	<0.0051	<0.002	<0.0051	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
onsite	CPB15	CPB15-SL-11'	12/20/2005 14:55	11	mg/kg	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0088	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB15R	CPB15R-SL-1.5	01/20/2006 10:00	1.5	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
onsite	CPB16	CPB16-SL-1.5	01/17/2006 13:00	1.5	mg/kg	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0084	<0.0042	0.00096	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	0.00093	<0.0017
onsite	CPB16	CPB16-2SL-1.5	01/17/2006 13:01	1.5	mg/kg	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0081	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB16	CPB16-SL-5	01/17/2006 13:05	5	mg/kg	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019	<0.0048	<0.0019	<0.0048	<0.0095	<0.0048	<0.0019	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019
onsite	CPB16	CPB16-SL-10	01/17/2006 13:10	10	mg/kg	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.008	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB17	CPB17-SL-1.5	01/09/2006 15:19	1.5	mg/kg	<0.44	<0.18	<0.18	<0.18	<0.18	<0.44	<0.18	<0.44	<0.89	<0.44	2.4	<0.44	<0.18	<0.18	<0.18	<0.18	0.48	<0.18
onsite	CPB17	CPB17-2SL-1.5	01/09/2006 15:20	1.5	mg/kg	<0.46	<0.19	<0.19	<0.19	<0.19	<0.46	<0.19	<0.46	<0.93	<0.46	6.6	<0.46	<0.19	<0.19	<0.19	<0.19	1.7	<0.19
onsite	CPB17	CPB17-SL-5	01/09/2006 15:35	5	mg/kg	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0016	<0.0039	<0.0078	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB17	CPB17-SL-10	01/09/2006 15:45	10	mg/kg	<0.0041	<0.0017	<0.0017	<0.0017	<0.0017	<0.0041	<0.0017	<0.0041	<0.0083	<0.0041	0.023	<0.0041	<0.0017	<0.0017	<0.0017	<0.0017	0.0057	<0.0017
onsite	CPB18	CPB18-SL-1.5'	12/20/2005 9:28	1.5	mg/kg	<2.6	<1	<1	<1	<1	<2.6	<1	<2.6	<5.1	<2.6	1.5	<2.6	<1	<1	<1	<1	0.35	<1
onsite	CPB18	CPB18-SL-5'	12/20/2005 9:40	5	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0087	<0.0043	0.00088	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB18	CPB18-SL-10'	12/20/2005 9:49	10	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0085	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB19	CPB19-SL-1.5	01/16/2006 9:00	1.5	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0087	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB19	CPB19-SL-5	01/16/2006 9:10	5	mg/kg	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.008	<0.004	0.00068	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB19	CPB19-2SL-5	01/16/2006 9:11	5	mg/kg	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0085	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "VOCs" volatile organic compounds

Table A-1c
Summary of Soil Matrix Analytical Results, VOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	1,1,1,2-Tetrachloroethane	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,1-Dichloropropene	1,2,3-Trichlorobenzene	1,2,3-Trichloropropane	1,2,4-Trichlorobenzene	1,2,4-Trimethylbenzene	1,2-Dibromo-3-chloropropane	1,2-Dibromoethane (EDB)	1,2-Dichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3,5-Trimethylbenzene	1,3-Dichlorobenzene
onsite	CPB19	CPB19-SL-10	01/16/2006 9:20	10	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0085	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB20	CPB20-SL-1.5	01/17/2006 11:15	1.5	mg/kg	<0.0059	<0.0023	<0.0023	<0.0023	<0.0023	<0.0059	<0.0023	<0.0059	<0.012	<0.0059	<0.0023	<0.0059	<0.0023	<0.0023	<0.0023	<0.0023	<0.0023	<0.0023
onsite	CPB20	CPB20-SL-5	01/17/2006 11:20	5	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0085	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB20	CPB20-SL-10	01/17/2006 11:25	10	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0086	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB21	CPB21-SL-1.5	01/13/2006 8:40	1.5	mg/kg	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0088	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB21	CPB21-SL-5	01/13/2006 8:50	5	mg/kg	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0081	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB21	CPB21-SL-10	01/13/2006 9:00	10	mg/kg	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0084	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB22	CPB22-SL-1.5	01/12/2006 15:10	1.5	mg/kg	<0.0049	<0.002	<0.002	<0.002	<0.002	<0.0049	<0.002	<0.0049	<0.0098	<0.0049	<0.002	<0.0049	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
onsite	CPB22	CPB22-SL-5	01/12/2006 15:15	5	mg/kg	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0093	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019
onsite	CPB22	CPB22-SL-10	01/12/2006 15:20	10	mg/kg	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019	<0.0048	<0.0019	<0.0048	<0.0096	<0.0048	<0.0019	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019
onsite	CPB23	CPB23-SL-1.5	01/18/2006 14:30	1.5	mg/kg	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0093	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019
onsite	CPB23	CPB23-SL-5	01/18/2006 14:35	5	mg/kg	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0018	<0.0045	<0.0089	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB23	CPB23-SL-10	01/18/2006 14:40	10	mg/kg	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0089	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB24	CPB24-SL-1.5	01/20/2006 9:20	1.5	mg/kg	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.008	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB24	CPB24-SL-5.0	01/20/2006 9:25	5	mg/kg	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0082	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB24	CPB24-SL-10.0	01/20/2006 9:30	10	mg/kg	<0.0059	<0.0024	<0.0024	<0.0024	<0.0024	<0.0059	<0.0024	<0.0059	<0.012	<0.0059	0.0028	<0.0059	<0.0024	<0.0024	<0.0024	<0.0024	<0.0024	<0.0024
onsite	CPB-28	CPB-28-SL-5-7	12/05/2006 14:50	7	mg/kg	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0016	<0.0039	<0.0078	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB-28	CPB-28-SL-9-11	12/05/2006 15:00	11	mg/kg	<0.0038	<0.0015	<0.0015	<0.0015	<0.0015	<0.0038	<0.0015	<0.0038	<0.0077	<0.0038	<0.0015	<0.0038	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
onsite	CPB3	CPB3-SL-1.5	01/12/2006 14:00	1.5	mg/kg	<1.1	<0.43	<0.43	<0.43	<0.43	<1.1	<0.43	<1.1	<2.2	<1.1	3.4	<1.1	<0.43	<0.43	<0.43	<0.43	20	<0.43
onsite	CPB3	CPB3-SL-5	01/12/2006 14:10	5	mg/kg	<0.0049	<0.002	<0.002	<0.002	<0.002	<0.0049	<0.002	<0.0049	<0.0099	<0.0049	0.0018	<0.0049	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
onsite	CPB3	CPB3-SL-10	01/12/2006 14:15	10	mg/kg	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018	<0.0046	<0.0018	<0.0046	<0.0092	<0.0046	<0.0018	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018	0.00079	<0.0018
onsite	CPB-30	CPB-30-SL-8-10	12/06/2006 10:10	10	mg/kg	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0079	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB5	CPB5-SL-1.5	01/19/2006 14:25	1.5	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
onsite	CPB5	CPB5-SL-5	01/19/2006 14:30	5	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0086	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB5	CPB5-SL-10	01/19/2006 14:35	10	mg/kg	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0079	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB7	CPB7-SL-1.5	01/12/2006 10:45	1.5	mg/kg	<0.35	<0.14	<0.14	<0.14	<0.14	<0.35	<0.14	<0.35	<0.7	<0.35	0.3	<0.35	<0.14	<0.14	<0.14	<0.14	0.082	<0.14
onsite	CPB7	CPB7-2SL-1.5	01/12/2006 10:46	1.5	mg/kg	<0.45	<0.18	<0.18	<0.18	<0.18	<0.45	<0.18	<0.45	<0.9	<0.45	0.62	<0.45	<0.18	<0.18	<0.18	<0.18	0.19	<0.18
onsite	CPB7	CPB7-SL-5	01/12/2006 11:00	5	mg/kg	<0.38	<0.15	<0.15	<0.15	<0.15	<0.38	<0.15	<0.38	<0.76	<0.38	0.44	<0.38	<0.15	<0.15	<0.15	<0.15	0.2	<0.15
onsite	CPB7	CPB7-SL-10	01/12/2006 11:10	10	mg/kg	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0016	<0.0039	<0.0079	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB9	CPB9-SL-1.5	01/13/2006 9:40	1.5	mg/kg	<0.0051	<0.002	<0.002	<0.002	<0.002	<0.0051	<0.002	<0.0051	<0.01	<0.0051	<0.002	<0.0051	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
onsite	CPB9	CPB9-SL-5	01/13/2006 9:45	5	mg/kg	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0081	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB9	CPB9-SL-10	01/13/2006 9:50	10	mg/kg	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0016	<0.0039	<0.0078	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	DPW01	DPW01-SS-1.5	01/18/2006 13:10	1.5	mg/kg	<0.0088	<0.0035	<0.0035	<0.0035	<0.0035	<0.0088	<0.0035	<0.0088	<0.018	<0.0088	<0.0035	<0.0088	<0.0035	<0.0035	<0.0035	<0.0035	<0.0035	<0.0035
onsite	DPW01	DPW01-SS-5	01/18/2006 13:15	5	mg/kg	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	0.0011	<0.0088	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
onsite	DPW01	DPW01-SS-10	01/18/2006 13:20	10	mg/kg	<0.0037	<0.0015	<0.0015	<0.0015	<0.0015	<0.0037	<0.0015	<0.0037	<0.0074	<0.0037	<0.0015	<0.0037	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
onsite	DPW02	DPW02-SS-2	01/13/2006 10:25	2	mg/kg	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0018	<0.0045	<0.0091	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
onsite	DPW02	DPW02-SS-5	01/13/2006 10:30	5	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0087	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	DPW03	DPW03-SS-2	01/13/2006 10:50	2	mg/kg	<0.0049	<0.002	<0.002	<0.002	<0.002	<0.0049	<0.002	<0.0049	<0.0098	<0.0049	0.0042	<0.0049	<0.002	<0.002	<0.002	<0.002	0.0034	<0.002
onsite	DPW03	DPW03-SS-5	01/13/2006 11:00	5	mg/kg	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018	<0.0046	<0.0018	<0.0046	<0.0092	<0.0046	<0.0018	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
onsite	DPW04	DPW04-SS-2	01/13/2006 11:15	2	mg/kg	<0.42	<0.17	<0.17	<0.17	<0.17	<0.42	<0.17	<0.42	<0.84	<0.42	1.2	<0.42	<0.17	<0.17	<0.17	<0.17	1	<0.17
onsite	DPW04	DPW04-SS-5	01/13/2006 11:20	5	mg/kg	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0016	<0.0039	<0.0079	<0.0039	0.003	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	0.003	<0.0016
onsite	DPW05	DPW05-SS-5	01/13/2006 11:35	5	mg/kg	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0018	<0.0045	<0.009	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
bkgd; offsite LADPW	DPW10	DPW10-SS-2'	01/11/2006 10:20	2	mg/kg	<0.0062	<0.0025	<0.0025	<0.0025	<0.0025	<0.0062	<0.0025	<0.0062	<0.012	<0.0062	<0.0025	<0.0062	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
onsite	HPB01	HPB01-SL-1.5	02/08/2006 11:00	1.5	mg/kg	<0.0055	<0.0022	<0.0022	<0.0022	<0.0022	<0.0055	<0.0022	<0.0055	<0.011	<0.0055	<0.0022	<0.0055	<0.0022	<0.0022	<0.0022	<0.0022	0.0062	<0.0022
onsite	HPB01	HPB01-SL-5	02/08/2006 11:05	5	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0085	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	HPB01	HPB01-SL-10	02/08/2006 11:15	10	mg/kg	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0095	<0.0047	0.021	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	0.23	<0.0019
onsite	HPB02	HPB02-SL-1.5	02/09/2006 10:00	1.5	mg/kg	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0081	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	HPB02	HPB02-SL-5	02/09/2006 10:20	5	mg/kg	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0089	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
onsite	HPB02	HPB02-2SL-5	02/09/2006 10:21	5	mg/kg	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0094	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019
onsite	HPB02	HPB02-SL-10	02/09/2006 10:30	10	mg/kg	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019	<0.0048	<0.0019	<0.0048	<0.0096	<0.0048	0.0078	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019	0.042	<0.0019
onsite	HPB03	HPB03-SL-1.5	02/08/2006 14:00	1.5	mg/kg	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0018	<0.0045	<0.0089	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
onsite	HPB03	HPB03-SL-5	02/08/2006 14:10	5	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0085	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	HPB03	HPB03-SL-10	02/08/2006 14:15	10	mg/kg	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0018	<0.0045	<0.009	<0.0045	0.091	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	0.17	<0.0018

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "VOCs" volatile organic compounds

Table A-1c
Summary of Soil Matrix Analytical Results, VOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	1,1,1,2-Tetrachloroethane	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,1-Dichloropropene	1,2,3-Trichlorobenzene	1,2,3-Trichloropropane	1,2,4-Trichlorobenzene	1,2,4-Trimethylbenzene	1,2-Dibromo-3-chloropropane	1,2-Dibromoethane (EDB)	1,2-Dichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3,5-Trimethylbenzene	1,3-Dichlorobenzene
onsite	HPB03	HPB03-2SL-10	02/08/2006 14:16	10	mg/kg	<0.0046	<0.0019	<0.0019	<0.0019	<0.0019	<0.0046	<0.0019	<0.0046	<0.0093	<0.0046	0.032	<0.0046	<0.0019	<0.0019	<0.0019	<0.0019	0.056	<0.0019
onsite	HPB04	HPB04-SL-1.5	02/09/2006 14:25	1.5	mg/kg	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0082	<0.0041	0.0011	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	0.0087	<0.0016
onsite	HPB04	HPB04-SL-5	02/09/2006 14:35	5	mg/kg	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0081	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	HPB04	HPB04-SL-10	02/09/2006 14:40	10	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0087	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	HPB04	HPB04-2SL-10	02/09/2006 14:41	10	mg/kg	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019	<0.0048	<0.0019	<0.0048	<0.0096	<0.0048	<0.0019	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019
onsite	HPB05	HPB05-SL-1.5	02/06/2006 11:10	1.5	mg/kg	<0.42	<0.17	<0.17	<0.17	<0.17	<0.42	<0.17	<0.42	<0.84	<0.42	1	<0.42	<0.17	<0.17	<0.17	<0.17	0.24	<0.17
onsite	HPB05	HPB05-SL-5	02/06/2006 11:25	5	mg/kg	<0.21	<0.083	<0.083	<0.083	<0.083	<0.21	<0.083	<0.21	<0.42	<0.21	0.28	<0.21	<0.083	<0.083	<0.083	<0.083	0.076	<0.083
onsite	HPB05	HPB05-2SL-5	02/06/2006 11:26	5	mg/kg	<0.29	<0.11	<0.11	<0.11	<0.11	<0.29	<0.11	<0.29	<0.57	<0.29	4.4	<0.29	<0.11	<0.11	<0.11	<0.11	1.4	<0.11
onsite	HPB05	HPB05-SL-10	02/06/2006 11:40	10	mg/kg	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0081	<0.0041	0.0031	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	0.00086	<0.0016
onsite	HPB06	HPB06-SL-1.5	02/06/2006 9:45	1.5	mg/kg	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0094	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019
onsite	HPB06	HPB06-SL-5	02/06/2006 10:00	5	mg/kg	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0083	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	HPB06	HPB06-SL-10	02/06/2006 10:10	10	mg/kg	<0.0038	<0.0015	<0.0015	<0.0015	<0.0015	<0.0038	<0.0015	<0.0038	<0.0075	<0.0038	<0.0015	<0.0038	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
onsite	HPB07	HPB07-SL-1.5	02/06/2006 13:40	1.5	mg/kg	<0.005	<0.002	<0.002	<0.002	<0.002	<0.005	<0.002	<0.005	<0.01	<0.005	0.0013	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
onsite	HPB07	HPB07-SL-5	02/06/2006 13:45	5	mg/kg	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0094	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019
onsite	HPB07	HPB07-2SL-5	02/06/2006 13:46	5	mg/kg	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0085	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	HPB07	HPB07-SL-10	02/06/2006 13:50	10	mg/kg	<0.35	<0.14	<0.14	<0.14	<0.14	<0.35	<0.14	<0.35	<0.69	<0.35	0.56	<0.35	<0.14	<0.14	<0.14	<0.14	0.14	<0.14
onsite	HPB08	HPB08-SL-1.5	02/08/2006 9:00	1.5	mg/kg	<0.0051	<0.002	<0.002	<0.002	<0.002	<0.0051	<0.002	<0.0051	<0.01	<0.0051	0.0017	<0.0051	<0.002	<0.002	<0.002	<0.002	0.024	<0.002
onsite	HPB08	HPB08-SL-5	02/08/2006 9:05	5	mg/kg	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.008	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	HPB08	HPB08-SL-10	02/08/2006 9:10	10	mg/kg	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0083	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	0.0007	<0.0017
onsite	HPB09	HPB09-SL-1.5	02/09/2006 9:10	1.5	mg/kg	<0.0038	<0.0015	<0.0015	<0.0015	<0.0015	<0.0038	<0.0015	<0.0038	<0.0075	<0.0038	0.00067	<0.0038	<0.0015	<0.0015	<0.0015	<0.0015	0.011	<0.0015
onsite	HPB09	HPB09-2SL-1.5	02/09/2006 9:11	1.5	mg/kg	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0095	<0.0047	0.0079	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	0.12	<0.0019
onsite	HPB09	HPB09-SL-5	02/09/2006 9:15	5	mg/kg	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0088	<0.0044	0.0013	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	0.024	<0.0018
onsite	HPB09	HPB09-SL-10	02/09/2006 9:20	10	mg/kg	<0.0049	<0.002	<0.002	<0.002	<0.002	<0.0049	<0.002	<0.0049	<0.0098	<0.0049	0.011	<0.0049	<0.002	<0.002	<0.002	<0.002	0.065	<0.002
onsite	HPB09	HPB09-2SL-10	02/09/2006 9:21	10	mg/kg	<0.0037	<0.0015	<0.0015	<0.0015	<0.0015	<0.0037	<0.0015	<0.0037	<0.0075	<0.0037	0.0038	<0.0037	<0.0015	<0.0015	<0.0015	<0.0015	0.02	<0.0015
onsite	HPB11	HPB11-SL-1.5	02/07/2006 13:40	1.5	mg/kg	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0018	<0.0045	<0.009	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
onsite	HPB11	HPB11-SL-5	02/07/2006 13:45	5	mg/kg	<0.0058	<0.0023	<0.0023	<0.0023	<0.0023	<0.0058	<0.0023	<0.0058	<0.012	<0.0058	0.0016	<0.0058	<0.0023	<0.0023	<0.0023	<0.0023	<0.0023	<0.0023
onsite	HPB11	HPB11-SL-10	02/07/2006 13:50	10	mg/kg	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0018	<0.0045	<0.0089	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
onsite	HPB-12	HPB-12-SL-5-7	12/04/2006 13:00	7	mg/kg	<0.0054	<0.0022	<0.0022	<0.0022	<0.0022	<0.0054	<0.0022	<0.0054	<0.011	<0.0054	<0.0022	<0.0054	<0.0022	<0.0022	<0.0022	<0.0022	<0.0022	<0.0022
onsite	HPB-12	HPB-12-SL-10-12	12/04/2006 13:05	12	mg/kg	<0.0052	<0.0021	<0.0021	<0.0021	<0.0021	<0.0052	<0.0021	<0.0052	<0.01	<0.0052	<0.0021	<0.0052	<0.0021	<0.0021	<0.0021	<0.0021	<0.0021	<0.0021
offsite residential	RB01	RB01-SL-1.5	02/14/2006 9:40	1.5	mg/kg	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0084	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
offsite residential	RB01	RB01-SL-5	02/14/2006 9:50	5	mg/kg	<0.37	<0.15	<0.15	<0.15	<0.15	<0.37	<0.15	<0.37	<0.75	<0.37	0.49	<0.37	<0.15	<0.15	<0.15	<0.15	0.12	<0.15
offsite residential	RB01	RB01-SL-10	02/14/2006 10:15	10	mg/kg	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0086	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
offsite residential	RB02	RB02-SL-1.5	02/14/2006 13:40	1.5	mg/kg	<0.0054	<0.0022	<0.0022	<0.0022	<0.0022	<0.0054	<0.0022	<0.0054	<0.011	<0.0054	<0.0022	<0.0054	<0.0022	<0.0022	<0.0022	<0.0022	<0.0022	<0.0022
offsite residential	RB02	RB02-SL-5	02/14/2006 13:55	5	mg/kg	<0.0061	<0.0025	<0.0025	<0.0025	<0.0025	<0.0061	<0.0025	<0.0061	<0.012	<0.0061	<0.0025	<0.0061	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
offsite residential	RB02	RB02-SL-10	02/14/2006 14:05	10	mg/kg	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0093	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019
offsite residential	RB02	RB02-SL-10.5	02/14/2006 15:10	10.5	mg/kg	<0.0061	<0.0024	<0.0024	<0.0024	<0.0024	<0.0061	<0.0024	<0.0061	<0.012	<0.0061	<0.0024	<0.0061	<0.0024	<0.0024	<0.0024	<0.0024	<0.0024	<0.0024
offsite residential	RB03	RB03-SL-1.5	02/15/2006 9:15	1.5	mg/kg	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0094	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019
offsite residential	RB03	RB03-2SL-1.5	02/15/2006 9:16	1.5	mg/kg	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0095	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019
offsite residential	RB03	RB03-SL-5	02/15/2006 9:45	5	mg/kg	<0.0066	<0.0026	<0.0026	<0.0026	<0.0026	<0.0066	<0.0026	<0.0066	<0.013	<0.0066	<0.0026	<0.0066	<0.0026	<0.0026	<0.0026	<0.0026	<0.0026	<0.0026
offsite residential	RB03	RB03-SL-10	02/15/2006 9:50	10	mg/kg	<0.38	<0.15	<0.15	<0.15	<0.15	<0.38	<0.15	<0.38	<0.77	<0.38	6.7	<0.38	<0.15	<0.15	<0.15	<0.15	1.9	<0.15
onsite	SV02	SV02-SS-5	03/13/2006 13:20	5	mg/kg	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0083	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017
onsite	SV02	SV02-SS-10	03/13/2006 13:40	10	mg/kg	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0094	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019
onsite	SV03	SV03-SS-5	03/07/2006 11:20	5	mg/kg	<0.0049	<0.002	<0.002	<0.002	<0.002	<0.0049	<0.002	<0.0049	<0.0098	<0.0049	<0.002	<0.0049	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
onsite	SV03	SV03-2SS-5	03/07/2006 11:21	5	mg/kg	<0.0052	<0.0021	<0.0021	<0.0021	<0.0021	<0.0052	<0.0021	<0.0052	<0.01	<0.0052	<0.0021	<0.0052	<0.0021	<0.0021	<0.0021	<0.0021	<0.0021	<0.0021
onsite	SV04	SV04-SS-5	03/07/2006 13:40	5	mg/kg	<0.0052	<0.0021	<0.0021	<0.0021	<0.0021	<0.0052	<0.0021	<0.0052	<0.01	<0.0052	<0.0021	<0.0052	<0.0021	<0.0021	<0.0021	<0.0021	<0.0021	<0.0021
onsite	SV06	SV06-SS-5	03/07/2006 9:25	5	mg/kg	<0.0053	<0.0021	<0.0021	<0.0021	<0.0021	<0.0053	<0.0021	<0.0053	<0.011	<0.0053	<0.0021	<0.0053	<0.0021	<0.0021	<0.0021	<0.0021	<0.0021	<0.0021
onsite	SV07	SV07-SS-5	03/07/2006 10:10	5	mg/kg	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.008	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
onsite	SV08	SV08-SS-5	03/07/2006 14:10	5	mg/kg	<0.0058	<0.0023	<0.0023	<0.0023	<0.0023	<0.0058	<0.0023	<0.0058	<0.012	<0.0058	<0.0023	<0.0058	<0.0023	<0.0023	<0.0023	<0.0023	<0.0023	<0.0023
onsite	SV09	SV09-SS-05	03/08/2006 10:20	5	mg/kg	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0088	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018
onsite	SV10	SV10-SS-5	03/13/2006 14:40	5	mg/kg	<0.39	<0.16	<0.16	<0.16	<0.16	<0.39	<0.16	<0.39	<0.78	<0.39	3.4	<0.39	<0.16	<0.16	<0.16	<0.16	31	<0.16
onsite	SV10	SV10-SS-10	03/13/2006 14:50	10	mg/kg	<0.0041	<0.0017	<0.0017	<0.0017	<0.0017	<0.0041	<0.0017	<0.0041	<0.0083	<0.0041	0.0091	<0.0041	<0.0017	<0.0017	<0.0017	<0.0017	0.085	<0.0017
onsite	SV12	SV12-SS-05	03/08/2006 9:30	5	mg/kg	<0.0056	<0.0022	<0.0022	<0.0022	<0.0022	<0.0056	<0.0022	<0.0056	<0.011	<0.0056	<0.0022	<0.0056	<0.0022	<0.0022	<0.0022	<0.0022	<0.0022	<0.0022
onsite	SV13	SV13-SS-5	03/07/2006 14:30	5	mg/kg	<0.0064	<0.0026	<0.0026	<0.0026	<0.0026	<0.0064	<0.0026	<0.0064	<0.013	<0.0064	<0.0026	<0.0064	<0.0026	<0.0026	<0.0026	<0.0026	<0.0026	<0.0026

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "VOCs" volatile organic compounds

Table A-1c
Summary of Soil Matrix Analytical Results, VOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	1,3-Dichloro propane	1,4-Dichloro benzene	2,2-Dichloro propane	2-Chloro toluene	4-Chloro toluene	Benzene	Bromo benzene	Bromo chloro methane	Bromo dichloro methane	Bromoform	Bromo methane	Carbon tetrachloride	Chloro benzene	Chloro ethane	Chloroform	Chloro methane	cis-1,2-Dichloro ethene	cis-1,3-Dichloro propene	Dibromo chloro methane	Dibromo methane
onsite	CPB02	CPB02-SL-1.5	01/17/2006 8:30	1.5	mg/kg	<0.17	<0.17	<0.17	<0.42	<0.42	<0.17	<0.42	<0.42	<0.17	<0.42	<0.42	<0.42	<0.17	<0.42	<0.17	<0.42	<0.17	<0.17	<0.17	<0.17
onsite	CPB02	CPB02-SL-5	01/17/2006 8:35	5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	0.0014	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB02	CPB02-SL-10	01/17/2006 8:40	10	mg/kg	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045	<0.0018	<0.0045	<0.0045	<0.0018	<0.0045	<0.0045	<0.0045	<0.0018	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB04	CPB04-SL-1.5	01/18/2006 10:20	1.5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0044	<0.0044	<0.0017	<0.0044	<0.0044	<0.0017	<0.0044	<0.0044	<0.0044	<0.0017	<0.0044	<0.0017	<0.0044	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB04	CPB04-SL-5	01/18/2006 10:25	5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB04	CPB04-SL-10	01/18/2006 10:30	10	mg/kg	<0.0018	<0.0018	<0.0018	<0.0046	<0.0046	<0.0018	<0.0046	<0.0046	<0.0018	<0.0046	<0.0046	<0.0046	<0.0018	<0.0046	<0.0018	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB06	CPB06-SL-1.5	01/17/2006 10:00	1.5	mg/kg	<0.0041	<0.0041	<0.0041	<0.01	<0.01	0.013	<0.01	<0.01	<0.0041	<0.01	<0.01	<0.01	<0.0041	0.0041	<0.0041	<0.01	<0.0041	<0.0041	<0.0041	<0.0041
onsite	CPB06	CPB06-SL-5	01/17/2006 10:05	5	mg/kg	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044	0.001	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0044	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB06	CPB06-SL-10	01/17/2006 10:10	10	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB06	CPB06-2SL-10	01/17/2006 10:11	10	mg/kg	<0.0018	<0.0018	<0.0018	<0.0046	<0.0046	<0.0018	<0.0046	<0.0046	<0.0018	<0.0046	<0.0046	<0.0046	<0.0018	<0.0046	<0.0018	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB08	CPB08-SL-1.5	01/17/2006 14:50	1.5	mg/kg	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047	0.0046	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0047	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019
onsite	CPB08	CPB08-SL-5	01/17/2006 14:55	5	mg/kg	<0.0019	<0.0019	<0.0019	<0.0049	<0.0049	<0.0019	<0.0049	<0.0049	<0.0019	<0.0049	<0.0049	<0.0049	<0.0019	<0.0049	<0.0019	<0.0049	<0.0019	<0.0019	<0.0019	<0.0019
onsite	CPB08	CPB08-SL-10	01/17/2006 15:00	10	mg/kg	<0.0016	<0.0016	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.004	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB1	CPB1-SL-1.5	01/19/2006 8:45	1.5	mg/kg	<0.16	<0.16	<0.16	<0.39	<0.39	<0.16	<0.39	<0.39	<0.16	<0.39	<0.39	<0.39	<0.16	<0.39	<0.16	<0.39	<0.16	<0.16	<0.16	<0.16
onsite	CPB1	CPB1-SL-5	01/19/2006 8:50	5	mg/kg	<0.18	<0.18	<0.18	<0.46	<0.46	0.21	<0.46	<0.46	<0.18	<0.46	<0.46	<0.46	<0.18	<0.46	<0.18	<0.46	<0.18	<0.18	<0.18	<0.18
onsite	CPB1	CPB1-SL-10	01/19/2006 8:55	10	mg/kg	<0.15	<0.15	<0.15	<0.38	<0.38	0.15	<0.38	<0.38	<0.15	<0.38	<0.38	<0.38	<0.15	<0.38	<0.15	<0.38	<0.15	<0.15	<0.15	<0.15
onsite	CPB10	CPB10-SL-1.5	01/10/2006 11:20	1.5	mg/kg	<0.23	<0.23	<0.23	<0.57	<0.57	0.086	<0.57	<0.57	<0.23	<0.57	<0.57	<0.57	<0.23	<0.57	<0.23	<0.57	<0.23	<0.23	<0.23	<0.23
onsite	CPB10	CPB10-SL-5	01/10/2006 11:25	5	mg/kg	<0.16	<0.16	<0.16	<0.39	<0.39	0.12	<0.39	<0.39	<0.16	<0.39	<0.39	<0.39	<0.16	<0.39	<0.16	<0.39	<0.16	<0.16	<0.16	<0.16
onsite	CPB10	CPB10-SL-10	01/10/2006 11:35	10	mg/kg	<0.0016	<0.0016	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.004	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB11	CPB11-SL-1.5	12/22/2005 12:50	1.5	mg/kg	<0.18	<0.18	<0.18	<0.44	<0.44	0.16	<0.44	<0.44	<0.18	<0.44	<0.44	<0.44	<0.18	<0.44	<0.18	<0.44	<0.18	<0.18	<0.18	<0.18
onsite	CPB11	CPB11-SL-5	12/22/2005 12:55	5	mg/kg	<0.2	<0.2	<0.2	<0.49	<0.49	0.39	0.088	<0.49	<0.2	<0.49	<0.49	<0.49	0.086	<0.49	<0.2	<0.49	<0.2	<0.2	0.056	<0.2
onsite	CPB11	CPB11-SL-10	12/22/2005 13:00	10	mg/kg	<0.0024	<0.0024	<0.0024	<0.0059	<0.0059	<0.0024	<0.0059	<0.0059	<0.0024	<0.0059	<0.0059	<0.0059	<0.0024	<0.0059	<0.0024	<0.0059	<0.0024	<0.0024	<0.0024	<0.0024
onsite	CPB11R	CPB11R-SL-1.5	01/10/2006 14:15	1.5	mg/kg	<0.17	<0.17	<0.17	<0.44	<0.44	0.16	<0.44	<0.44	<0.17	<0.44	<0.44	<0.44	<0.17	<0.44	<0.17	<0.44	<0.17	<0.17	<0.17	<0.17
onsite	CPB11R	CPB11R-SL-5	01/10/2006 14:25	5	mg/kg	<0.2	<0.2	<0.2	<0.5	<0.5	0.39	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.2	<0.5	<0.2	<0.5	<0.2	<0.2	<0.2	<0.2
onsite	CPB11R	CPB11R-SL-10	01/10/2006 14:45	10	mg/kg	<0.0025	<0.0025	<0.0025	<0.0064	<0.0064	<0.0025	<0.0064	<0.0064	<0.0025	<0.0064	<0.0064	<0.0064	<0.0025	<0.0064	<0.0025	<0.0064	<0.0025	<0.0025	<0.0025	<0.0025
onsite	CPB12	CPB12-SL-1.5	01/17/2006 14:00	1.5	mg/kg	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0041	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB12	CPB12-SL-5	01/17/2006 14:05	5	mg/kg	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0047	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019
onsite	CPB12	CPB12-SL-10	01/17/2006 14:10	10	mg/kg	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0042	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB13	CPB13-SL-1.5	01/16/2006 10:05	1.5	mg/kg	<0.0028	<0.0028	<0.0028	<0.0069	<0.0069	0.0022	<0.0069	<0.0069	<0.0028	<0.0069	<0.0069	<0.0069	<0.0028	<0.0069	<0.0028	<0.0069	<0.0028	<0.0028	<0.0028	<0.0028
onsite	CPB13	CPB13-SL-5	01/16/2006 10:10	5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	0.0028	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB13	CPB13-SL-10	01/16/2006 10:15	10	mg/kg	<0.0016	<0.0016	<0.0016	<0.004	<0.004	0.049	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.004	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB14	CPB14-SL-1.5	01/10/2006 9:50	1.5	mg/kg	<0.2	<0.2	<0.2	<0.51	<0.51	0.25	<0.51	<0.51	<0.2	<0.51	<0.51	<0.51	<0.2	<0.51	<0.2	<0.51	<0.2	<0.2	<0.2	<0.2
onsite	CPB14	CPB14-SL-5	01/10/2006 10:00	5	mg/kg	<0.002	<0.002	<0.002	<0.005	<0.005	<0.002	<0.005	<0.005	<0.002	<0.005	<0.005	<0.005	<0.002	<0.005	<0.002	<0.005	<0.002	<0.002	<0.002	<0.002
onsite	CPB14	CPB14-SL-10	01/10/2006 10:20	10	mg/kg	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0042	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB15	CPB15-SL-1.5'	12/20/2005 13:40	1.5	mg/kg	<0.2	<0.2	<0.2	<0.51	<0.51	0.28	<0.51	<0.51	<0.2	<0.51	<0.51	<0.51	<0.2	<0.51	<0.2	<0.51	<0.2	<0.2	<0.2	<0.2
onsite	CPB15	CPB15-SL-5'	12/20/2005 13:45	5	mg/kg	<0.002	<0.002	<0.002	<0.0049	<0.0049	0.00075	<0.0049	<0.0049	<0.002	<0.0049	<0.0049	<0.0049	<0.002	<0.0049	<0.002	<0.0049	<0.002	<0.002	<0.002	<0.002
onsite	CPB15	CPB15-SL-10'	12/20/2005 14:50	10	mg/kg	<0.002	<0.002	<0.002	<0.0051	<0.0051	<0.002	<0.0051	<0.0051	<0.002	<0.0051	<0.0051	<0.0051	<0.002	<0.0051	<0.002	<0.0051	<0.002	<0.002	<0.002	<0.002
onsite	CPB15	CPB15-SL-11'	12/20/2005 14:55	11	mg/kg	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0044	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB15R	CPB15R-SL-1.5	01/20/2006 10:00	1.5	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
onsite	CPB16	CPB16-SL-1.5	01/17/2006 13:00	1.5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0042	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB16	CPB16-2SL-1.5	01/17/2006 13:01	1.5	mg/kg	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0041	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB16	CPB16-SL-5	01/17/2006 13:05	5	mg/kg	<0.0019	<0.0019	<0.0019	<0.0048	<0.0048	<0.0019	<0.0048	<0.0048	<0.0019	<0.0048	<0.0048	<0.0048	<0.0019	<0.0048	<0.0019	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019
onsite	CPB16	CPB16-SL-10	01/17/2006 13:10	10	mg/kg	<0.0016	<0.0016	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.004	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB17	CPB17-SL-1.5	01/09/2006 15:19	1.5	mg/kg	<0.18	<0.18	<0.18	<0.44	<0.44	0.095	<0.44	<0.44	<0.18	<0.44	<0.44	<0.44	<0.18	<0.44	<0.18	<0.44	<0.18	<0.18	<0.18	<0.18
onsite	CPB17	CPB17-2SL-1.5	01/09/2006 15:20	1.5	mg/kg	<0.19	<0.19	<0.19	<0.46	<0.46	0.46	<0.46	<0.46	<0.19	<0.46	<0.46	<0.46	<0.19	<0.46	<0.19	<0.46	<0.19	<0.19	<0.19	<0.19
onsite	CPB17	CPB17-SL-5	01/09/2006 15:35	5	mg/kg	<0.0016	<0.0016	<0.0016	<0.0039	<0.0039	<0.0016	<0.0039	<0.0039	<0.0016	<0.0039	<0.0039	<0.0039	<0.0016	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB17	CPB17-SL-10	01/09/2006 15:45	10	mg/kg	<0.0017	<0.0017	<0.0017	<0.0041	<0.0041	0.0022	<0.0041	<0.0041	<0.0017	<0.0041	<0.0041	<0.0041	<0.0017	<0.0041	<0.0017	<0.0041	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB18	CPB18-SL-1.5'	12/20/2005 9:28	1.5	mg/kg	<1	<1	<1	<2.6	<2.6	<1	<2.6	<2.6	<1	<2.6	<2.6	<2.6	<1	<2.6	<1	<2.6	<1	<1	<1	<1
onsite	CPB18	CPB18-SL-5'	12/20/2005 9:40	5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB18	CPB18-SL-10'	12/20/2005 9:49	10	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB19	CPB19-SL-1.5	01/16/2006 9:00	1.5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB19	CPB19-SL-5	01/16/2006 9:10	5	mg/kg	<0.0016	<0.0016	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.004	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB19	CPB19-2SL-5	01/16/2006 9:11	5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0042	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "VOCs" volatile organic compounds

Table A-1c
Summary of Soil Matrix Analytical Results, VOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	1,3-Dichloro propane	1,4-Dichloro benzene	2,2-Dichloro propane	2-Chloro toluene	4-Chloro toluene	Benzene	Bromo benzene	Bromo chloro methane	Bromo dichloro methane	Bromoform	Bromo methane	Carbon tetrachloride	Chloro benzene	Chloro ethane	Chloroform	Chloro methane	cis-1,2-Dichloro ethene	cis-1,3-Dichloro propene	Dibromo chloro methane	Dibromo methane
onsite	CPB19	CPB19-SL-10	01/16/2006 9:20	10	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB20	CPB20-SL-1.5	01/17/2006 11:15	1.5	mg/kg	<0.0023	<0.0023	<0.0023	<0.0059	<0.0059	<0.0023	<0.0059	<0.0059	<0.0023	<0.0059	<0.0059	<0.0059	<0.0023	<0.0059	<0.0023	<0.0059	<0.0023	<0.0023	<0.0023	<0.0023
onsite	CPB20	CPB20-SL-5	01/17/2006 11:20	5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB20	CPB20-SL-10	01/17/2006 11:25	10	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB21	CPB21-SL-1.5	01/13/2006 8:40	1.5	mg/kg	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0044	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB21	CPB21-SL-5	01/13/2006 8:50	5	mg/kg	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0041	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB21	CPB21-SL-10	01/13/2006 9:00	10	mg/kg	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0042	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB22	CPB22-SL-1.5	01/12/2006 15:10	1.5	mg/kg	<0.002	<0.002	<0.002	<0.0049	<0.0049	<0.002	<0.0049	<0.0049	<0.002	<0.0049	<0.0049	<0.0049	<0.002	<0.0049	<0.002	<0.0049	<0.002	<0.002	<0.002	<0.002
onsite	CPB22	CPB22-SL-5	01/12/2006 15:15	5	mg/kg	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0047	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019
onsite	CPB22	CPB22-SL-10	01/12/2006 15:20	10	mg/kg	<0.0019	<0.0019	<0.0019	<0.0048	<0.0048	<0.0019	<0.0048	<0.0048	<0.0019	<0.0048	<0.0048	<0.0048	<0.0019	<0.0048	<0.0019	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019
onsite	CPB23	CPB23-SL-1.5	01/18/2006 14:30	1.5	mg/kg	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0047	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019
onsite	CPB23	CPB23-SL-5	01/18/2006 14:35	5	mg/kg	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045	<0.0018	<0.0045	<0.0045	<0.0018	<0.0045	<0.0045	<0.0045	<0.0018	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB23	CPB23-SL-10	01/18/2006 14:40	10	mg/kg	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0044	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB24	CPB24-SL-1.5	01/20/2006 9:20	1.5	mg/kg	<0.0016	<0.0016	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.004	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB24	CPB24-SL-5.0	01/20/2006 9:25	5	mg/kg	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041	0.00042	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0041	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB24	CPB24-SL-10.0	01/20/2006 9:30	10	mg/kg	<0.0024	<0.0024	<0.0024	<0.0059	<0.0059	<0.0024	<0.0059	<0.0059	<0.0024	<0.0059	<0.0059	<0.0059	<0.0024	<0.0059	<0.0024	<0.0059	<0.0024	<0.0024	<0.0024	<0.0024
onsite	CPB-28	CPB-28-SL-5-7	12/05/2006 14:50	7	mg/kg	<0.0016	<0.0016	<0.0016	<0.0039	<0.0039	<0.0016	<0.0039	<0.0039	<0.0016	<0.0039	<0.0039	<0.0039	<0.0016	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB-28	CPB-28-SL-9-11	12/05/2006 15:00	11	mg/kg	<0.0015	<0.0015	<0.0015	<0.0038	<0.0038	<0.0015	<0.0038	<0.0038	<0.0015	<0.0038	<0.0038	<0.0038	<0.0015	<0.0038	<0.0015	<0.0038	<0.0015	<0.0015	<0.0015	<0.0015
onsite	CPB3	CPB3-SL-1.5	01/12/2006 14:00	1.5	mg/kg	<0.43	<0.43	<0.43	<1.1	<1.1	0.25	<1.1	<1.1	<0.43	<1.1	<1.1	<1.1	<0.43	<1.1	<0.43	<1.1	<0.43	<0.43	<0.43	<0.43
onsite	CPB3	CPB3-SL-5	01/12/2006 14:10	5	mg/kg	<0.002	<0.002	<0.002	<0.0049	<0.0049	<0.002	<0.0049	<0.0049	<0.002	<0.0049	<0.0049	<0.0049	<0.002	<0.0049	<0.002	<0.0049	<0.002	<0.002	<0.002	<0.002
onsite	CPB3	CPB3-SL-10	01/12/2006 14:15	10	mg/kg	<0.0018	<0.0018	<0.0018	<0.0046	<0.0046	<0.0018	<0.0046	<0.0046	<0.0018	<0.0046	<0.0046	<0.0046	<0.0018	<0.0046	<0.0018	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018
onsite	CPB-30	CPB-30-SL-8-10	12/06/2006 10:10	10	mg/kg	<0.0016	<0.0016	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.004	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB5	CPB5-SL-1.5	01/19/2006 14:25	1.5	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
onsite	CPB5	CPB5-SL-5	01/19/2006 14:30	5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	CPB5	CPB5-SL-10	01/19/2006 14:35	10	mg/kg	<0.0016	<0.0016	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.004	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB7	CPB7-SL-1.5	01/12/2006 10:45	1.5	mg/kg	<0.14	<0.14	<0.14	<0.35	<0.35	<0.14	<0.35	<0.35	<0.14	<0.35	<0.35	<0.35	<0.14	<0.35	<0.14	<0.35	<0.14	<0.14	<0.14	<0.14
onsite	CPB7	CPB7-2SL-1.5	01/12/2006 10:46	1.5	mg/kg	<0.18	<0.18	<0.18	<0.45	<0.45	0.065	<0.45	<0.45	<0.18	<0.45	<0.45	<0.45	<0.18	<0.45	<0.18	<0.45	<0.18	<0.18	<0.18	<0.18
onsite	CPB7	CPB7-SL-5	01/12/2006 11:00	5	mg/kg	<0.15	<0.15	<0.15	<0.38	<0.38	0.065	<0.38	<0.38	<0.15	<0.38	<0.38	<0.38	<0.15	<0.38	<0.15	<0.38	<0.15	<0.15	<0.15	<0.15
onsite	CPB7	CPB7-SL-10	01/12/2006 11:10	10	mg/kg	<0.0016	<0.0016	<0.0016	<0.0039	<0.0039	<0.0016	<0.0039	<0.0039	<0.0016	<0.0039	<0.0039	<0.0039	<0.0016	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB9	CPB9-SL-1.5	01/13/2006 9:40	1.5	mg/kg	<0.002	<0.002	<0.002	<0.0051	<0.0051	<0.002	<0.0051	<0.0051	<0.002	<0.0051	<0.0051	<0.0051	<0.002	<0.0051	<0.002	<0.0051	<0.002	<0.002	<0.002	<0.002
onsite	CPB9	CPB9-SL-5	01/13/2006 9:45	5	mg/kg	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0041	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016
onsite	CPB9	CPB9-SL-10	01/13/2006 9:50	10	mg/kg	<0.0016	<0.0016	<0.0016	<0.0039	<0.0039	<0.0016	<0.0039	<0.0039	<0.0016	<0.0039	<0.0039	<0.0039	<0.0016	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016
onsite	DPW01	DPW01-SS-1.5	01/18/2006 13:10	1.5	mg/kg	<0.0035	<0.0035	<0.0035	<0.0088	<0.0088	<0.0035	<0.0088	<0.0088	<0.0035	<0.0088	<0.0088	<0.0088	<0.0035	<0.0088	<0.0035	<0.0088	<0.0035	<0.0035	<0.0035	<0.0035
onsite	DPW01	DPW01-SS-5	01/18/2006 13:15	5	mg/kg	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0044	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018
onsite	DPW01	DPW01-SS-10	01/18/2006 13:20	10	mg/kg	<0.0015	<0.0015	<0.0015	<0.0037	<0.0037	<0.0015	<0.0037	<0.0037	<0.0015	<0.0037	<0.0037	<0.0037	<0.0015	<0.0037	<0.0015	<0.0037	<0.0015	<0.0015	<0.0015	<0.0015
onsite	DPW02	DPW02-SS-2	01/13/2006 10:25	2	mg/kg	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045	<0.0018	<0.0045	<0.0045	<0.0018	<0.0045	<0.0045	<0.0045	<0.0018	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018
onsite	DPW02	DPW02-SS-5	01/13/2006 10:30	5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	DPW03	DPW03-SS-2	01/13/2006 10:50	2	mg/kg	<0.002	<0.002	<0.002	<0.0049	<0.0049	<0.002	<0.0049	<0.0049	<0.002	<0.0049	<0.0049	<0.0049	<0.002	<0.0049	<0.002	<0.0049	<0.002	<0.002	<0.002	<0.002
onsite	DPW03	DPW03-SS-5	01/13/2006 11:00	5	mg/kg	<0.0018	<0.0018	<0.0018	<0.0046	<0.0046	<0.0018	<0.0046	<0.0046	<0.0018	<0.0046	<0.0046	<0.0046	<0.0018	<0.0046	<0.0018	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018
onsite	DPW04	DPW04-SS-2	01/13/2006 11:15	2	mg/kg	<0.17	<0.17	<0.17	<0.42	<0.42	0.11	<0.42	<0.42	<0.17	<0.42	<0.42	<0.42	<0.17	<0.42	<0.17	<0.42	<0.17	<0.17	<0.17	<0.17
onsite	DPW04	DPW04-SS-5	01/13/2006 11:20	5	mg/kg	<0.0016	<0.0016	<0.0016	<0.0039	<0.0039	0.00062	<0.0039	<0.0039	<0.0016	<0.0039	<0.0039	<0.0039	<0.0016	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016
onsite	DPW05	DPW05-SS-5	01/13/2006 11:35	5	mg/kg	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045	<0.0018	<0.0045	<0.0045	<0.0018	<0.0045	<0.0045	<0.0045	<0.0018	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018
bkgd; offsite LADPW	DPW10	DPW10-SS-2'	01/11/2006 10:20	2	mg/kg	<0.0025	<0.0025	<0.0025	<0.0062	<0.0062	<0.0025	<0.0062	<0.0062	<0.0025	<0.0062	<0.0062	<0.0062	<0.0025	<0.0062	0.00065	<0.0062	<0.0025	<0.0025	<0.0025	<0.0025
onsite	HPB01	HPB01-SL-1.5	02/08/2006 11:00	1.5	mg/kg	<0.0022	<0.0022	<0.0022	<0.0055	<0.0055	<0.0022	<0.0055	<0.0055	<0.0022	<0.0055	<0.0055	<0.0055	<0.0022	<0.0055	<0.0022	<0.0055	<0.0022	<0.0022	<0.0022	<0.0022
onsite	HPB01	HPB01-SL-5	02/08/2006 11:05	5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	HPB01	HPB01-SL-10	02/08/2006 11:15	10	mg/kg	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047	0.0055	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0047	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019
onsite	HPB02	HPB02-SL-1.5	02/09/2006 10:00	1.5	mg/kg	<0.0016	<0.0016	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.004	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016
onsite	HPB02	HPB02-SL-5	02/09/2006 10:20	5	mg/kg	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0044	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018
onsite	HPB02	HPB02-2SL-5	02/09/2006 10:21	5	mg/kg	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0047	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019
onsite	HPB02	HPB02-SL-10	02/09/2006 10:30	10	mg/kg	<0.0019	<0.0019	<0.0019	<0.0048	<0.0048	0.0046	<0.0048	<0.0048	<0.0019	<0.0048	<0.0048	<0.0048	<0.0019	<0.0048	<0.0019	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019
onsite	HPB03	HPB03-SL-1.5	02/08/2006 14:00	1.5	mg/kg	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045	0.00067	<0.0045	<0.0045	<0.0018	<0.0045	<0.0045	<0.0045	<0.0018	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018
onsite	HPB03	HPB03-SL-5	02/08/2006 14:10	5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	HPB03	HPB03-SL-10	02/08/2006 14:15	10	mg/kg	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045	0.0024	<0.0045	<0.0045	<0.0018	<0.0045	<0.0045	<0.0045	<0.0018	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "VOCs" volatile organic compounds

Table A-1c
Summary of Soil Matrix Analytical Results, VOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	1,3-Dichloro propane	1,4-Dichloro benzene	2,2-Dichloro propane	2-Chloro toluene	4-Chloro toluene	Benzene	Bromo benzene	Bromo chloro methane	Bromo dichloro methane	Bromoform	Bromo methane	Carbon tetrachloride	Chloro benzene	Chloro ethane	Chloroform	Chloro methane	cis-1,2-Dichloro ethene	cis-1,3-Dichloro propene	Dibromo chloro methane	Dibromo methane
onsite	HPB03	HPB03-2SL-10	02/08/2006 14:16	10	mg/kg	<0.0019	<0.0019	<0.0019	<0.0046	<0.0046	0.0011	<0.0046	<0.0046	<0.0019	<0.0046	<0.0046	<0.0046	<0.0019	<0.0046	<0.0019	<0.0046	<0.0019	<0.0019	<0.0019	<0.0019
onsite	HPB04	HPB04-SL-1.5	02/09/2006 14:25	1.5	mg/kg	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0041	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016
onsite	HPB04	HPB04-SL-5	02/09/2006 14:35	5	mg/kg	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0041	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016
onsite	HPB04	HPB04-SL-10	02/09/2006 14:40	10	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
onsite	HPB04	HPB04-2SL-10	02/09/2006 14:41	10	mg/kg	<0.0019	<0.0019	<0.0019	<0.0048	<0.0048	<0.0019	<0.0048	<0.0048	<0.0019	<0.0048	<0.0048	<0.0048	<0.0019	<0.0048	<0.0019	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019
onsite	HPB05	HPB05-SL-1.5	02/06/2006 11:10	1.5	mg/kg	<0.17	<0.17	<0.17	<0.42	<0.42	<0.17	<0.42	<0.42	<0.17	<0.42	<0.42	<0.42	<0.17	<0.42	<0.17	<0.42	<0.17	<0.17	<0.17	<0.17
onsite	HPB05	HPB05-SL-5	02/06/2006 11:25	5	mg/kg	<0.083	<0.083	<0.083	<0.21	<0.21	<0.083	<0.21	<0.21	<0.083	<0.21	<0.21	<0.21	<0.083	<0.21	<0.083	<0.21	<0.083	<0.083	<0.083	<0.083
onsite	HPB05	HPB05-2SL-5	02/06/2006 11:26	5	mg/kg	<0.11	<0.11	<0.11	<0.29	<0.29	0.053	<0.29	<0.29	<0.11	<0.29	<0.29	<0.29	<0.11	<0.29	<0.11	<0.29	<0.11	<0.11	<0.11	<0.11
onsite	HPB05	HPB05-SL-10	02/06/2006 11:40	10	mg/kg	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041	0.00042	<0.0041	<0.0041	<0.0016	<0.0041	<0.0041	<0.0041	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016
onsite	HPB06	HPB06-SL-1.5	02/06/2006 9:45	1.5	mg/kg	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0047	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019
onsite	HPB06	HPB06-SL-5	02/06/2006 10:00	5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0042	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017
onsite	HPB06	HPB06-SL-10	02/06/2006 10:10	10	mg/kg	<0.0015	<0.0015	<0.0015	<0.0038	<0.0038	<0.0015	<0.0038	<0.0038	<0.0015	<0.0038	<0.0038	<0.0038	<0.0015	<0.0038	<0.0015	<0.0038	<0.0015	<0.0015	<0.0015	<0.0015
onsite	HPB07	HPB07-SL-1.5	02/06/2006 13:40	1.5	mg/kg	<0.002	<0.002	<0.002	<0.005	<0.005	0.00057	<0.005	<0.005	<0.002	<0.005	<0.005	<0.005	<0.002	<0.005	<0.002	<0.005	<0.002	<0.002	<0.002	<0.002
onsite	HPB07	HPB07-SL-5	02/06/2006 13:45	5	mg/kg	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0047	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019
onsite	HPB07	HPB07-2SL-5	02/06/2006 13:46	5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0042	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017
onsite	HPB07	HPB07-SL-10	02/06/2006 13:50	10	mg/kg	<0.14	<0.14	<0.14	<0.35	<0.35	<0.14	<0.35	<0.35	<0.14	<0.35	<0.35	<0.35	<0.14	<0.35	<0.14	<0.35	<0.14	<0.14	<0.14	<0.14
onsite	HPB08	HPB08-SL-1.5	02/08/2006 9:00	1.5	mg/kg	<0.002	<0.002	<0.002	<0.0051	<0.0051	<0.002	<0.0051	<0.0051	<0.002	<0.0051	<0.0051	<0.0051	<0.002	<0.0051	<0.002	<0.0051	<0.002	<0.002	<0.002	<0.002
onsite	HPB08	HPB08-SL-5	02/08/2006 9:05	5	mg/kg	<0.0016	<0.0016	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.004	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016
onsite	HPB08	HPB08-SL-10	02/08/2006 9:10	10	mg/kg	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042	0.0006	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0042	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017
onsite	HPB09	HPB09-SL-1.5	02/09/2006 9:10	1.5	mg/kg	<0.0015	<0.0015	<0.0015	<0.0038	<0.0038	<0.0015	<0.0038	<0.0038	<0.0015	<0.0038	<0.0038	<0.0038	<0.0015	<0.0038	<0.0015	<0.0038	<0.0015	<0.0015	<0.0015	<0.0015
onsite	HPB09	HPB09-2SL-1.5	02/09/2006 9:11	1.5	mg/kg	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0047	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019
onsite	HPB09	HPB09-SL-5	02/09/2006 9:15	5	mg/kg	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0044	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018
onsite	HPB09	HPB09-SL-10	02/09/2006 9:20	10	mg/kg	<0.002	<0.002	<0.002	<0.0049	<0.0049	0.0021	<0.0049	<0.0049	<0.002	<0.0049	<0.0049	<0.0049	<0.002	<0.0049	<0.002	<0.0049	<0.002	<0.002	<0.002	<0.002
onsite	HPB09	HPB09-2SL-10	02/09/2006 9:21	10	mg/kg	<0.0015	<0.0015	<0.0015	<0.0037	<0.0037	0.00046	<0.0037	<0.0037	<0.0015	<0.0037	<0.0037	<0.0037	<0.0015	<0.0037	<0.0015	<0.0037	<0.0015	<0.0015	<0.0015	<0.0015
onsite	HPB11	HPB11-SL-1.5	02/07/2006 13:40	1.5	mg/kg	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045	<0.0018	<0.0045	<0.0045	<0.0018	<0.0045	<0.0045	<0.0045	<0.0018	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018
onsite	HPB11	HPB11-SL-5	02/07/2006 13:45	5	mg/kg	<0.0023	<0.0023	<0.0023	<0.0058	<0.0058	<0.0023	<0.0058	<0.0058	<0.0023	<0.0058	<0.0058	<0.0058	<0.0023	<0.0058	<0.0023	<0.0058	<0.0023	<0.0023	<0.0023	<0.0023
onsite	HPB11	HPB11-SL-10	02/07/2006 13:50	10	mg/kg	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045	<0.0018	<0.0045	<0.0045	<0.0018	<0.0045	<0.0045	<0.0045	<0.0018	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018
onsite	HPB-12	HPB-12-SL-5-7	12/04/2006 13:00	7	mg/kg	<0.0022	<0.0022	<0.0022	<0.0054	<0.0054	<0.0022	<0.0054	<0.0054	<0.0022	<0.0054	<0.0054	<0.0054	<0.0022	<0.0054	<0.0022	<0.0054	<0.0022	<0.0022	<0.0022	<0.0022
onsite	HPB-12	HPB-12-SL-10-12	12/04/2006 13:05	12	mg/kg	<0.0021	<0.0021	<0.0021	<0.0052	<0.0052	<0.0021	<0.0052	<0.0052	<0.0021	<0.0052	<0.0052	<0.0052	<0.0021	<0.0052	<0.0021	<0.0052	<0.0021	<0.0021	<0.0021	<0.0021
offsite residential	RB01	RB01-SL-1.5	02/14/2006 9:40	1.5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0042	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017
offsite residential	RB01	RB01-SL-5	02/14/2006 9:50	5	mg/kg	<0.15	<0.15	<0.15	<0.37	<0.37	<0.15	<0.37	<0.37	<0.15	<0.37	<0.37	<0.37	<0.15	<0.37	<0.15	<0.37	<0.15	<0.15	<0.15	<0.15
offsite residential	RB01	RB01-SL-10	02/14/2006 10:15	10	mg/kg	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0017	<0.0043	<0.0043	<0.0043	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017
offsite residential	RB02	RB02-SL-1.5	02/14/2006 13:40	1.5	mg/kg	<0.0022	<0.0022	<0.0022	<0.0054	<0.0054	<0.0022	<0.0054	<0.0054	<0.0022	<0.0054	<0.0054	<0.0054	<0.0022	<0.0054	<0.0022	<0.0054	<0.0022	<0.0022	<0.0022	<0.0022
offsite residential	RB02	RB02-SL-5	02/14/2006 13:55	5	mg/kg	<0.0025	<0.0025	<0.0025	<0.0061	<0.0061	<0.0025	<0.0061	<0.0061	<0.0025	<0.0061	<0.0061	<0.0061	<0.0025	<0.0061	<0.0025	<0.0061	<0.0025	<0.0025	<0.0025	<0.0025
offsite residential	RB02	RB02-SL-10	02/14/2006 14:05	10	mg/kg	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0047	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019
offsite residential	RB02	RB02-SL-10.5	02/14/2006 15:10	10.5	mg/kg	<0.0024	<0.0024	<0.0024	<0.0061	<0.0061	<0.0024	<0.0061	<0.0061	<0.0024	<0.0061	<0.0061	<0.0061	<0.0024	<0.0061	<0.0024	<0.0061	<0.0024	<0.0024	<0.0024	<0.0024
offsite residential	RB03	RB03-SL-1.5	02/15/2006 9:15	1.5	mg/kg	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0047	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019
offsite residential	RB03	RB03-2SL-1.5	02/15/2006 9:16	1.5	mg/kg	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0047	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019
offsite residential	RB03	RB03-SL-5	02/15/2006 9:45	5	mg/kg	<0.0026	<0.0026	<0.0026	<0.0066	<0.0066	<0.0026	<0.0066	<0.0066	<0.0026	<0.0066	<0.0066	<0.0066	<0.0026	<0.0066	<0.0026	<0.0066	<0.0026	<0.0026	<0.0026	<0.0026
offsite residential	RB03	RB03-SL-10	02/15/2006 9:50	10	mg/kg	<0.15	<0.15	<0.15	<0.38	<0.38	0.49	<0.38	<0.38	<0.15	<0.38	<0.38	<0.38	<0.15	<0.38	<0.15	<0.38	<0.15	<0.15	<0.15	<0.15
onsite	SV02	SV02-SS-5	03/13/2006 13:20	5	mg/kg	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0017	<0.0042	<0.0042	<0.0042	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017
onsite	SV02	SV02-SS-10	03/13/2006 13:40	10	mg/kg	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0019	<0.0047	<0.0047	<0.0047	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019
onsite	SV03	SV03-SS-5	03/07/2006 11:20	5	mg/kg	<0.002	<0.002	<0.002	<0.0049	<0.0049	<0.002	<0.0049	<0.0049	<0.002	<0.0049	<0.0049	<0.0049	<0.002	<0.0049	<0.002	<0.0049	<0.002	<0.002	<0.002	<0.002
onsite	SV03	SV03-2SS-5	03/07/2006 11:21	5	mg/kg	<0.0021	<0.0021	<0.0021	<0.0052	<0.0052	<0.0021	<0.0052	<0.0052	<0.0021	<0.0052	<0.0052	<0.0052	<0.0021	<0.0052	<0.0021	<0.0052	<0.0021	<0.0021	<0.0021	<0.0021
onsite	SV04	SV04-SS-5	03/07/2006 13:40	5	mg/kg	<0.0021	<0.0021	<0.0021	<0.0052	<0.0052	<0.0021	<0.0052	<0.0052	<0.0021	<0.0052	<0.0052	<0.0052	<0.0021	<0.0052	<0.0021	<0.0052	<0.0021	<0.0021	<0.0021	<0.0021
onsite	SV06	SV06-SS-5	03/07/2006 9:25	5	mg/kg	<0.0021	<0.0021	<0.0021	<0.0053	<0.0053	<0.0021	<0.0053	<0.0053	<0.0021	<0.0053	<0.0053	<0.0053	<0.0021	<0.0053	<0.0021	<0.0053	<0.0021	<0.0021	<0.0021	<0.0021
onsite	SV07	SV07-SS-5	03/07/2006 10:10	5	mg/kg	<0.0016	<0.0016	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.004	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016
onsite	SV08	SV08-SS-5	03/07/2006 14:10	5	mg/kg	<0.0023	<0.0023	<0.0023	<0.0058	<0.0058	<0.0023	<0.0058	<0.0058	<0.0023	<0.0058	<0.0058	<0.0058	<0.0023	<0.0058	<0.0023	<0.0058	<0.0023	<0.0023	<0.0023	<0.0023
onsite	SV09	SV09-SS-05	03/08/2006 10:20	5	mg/kg	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0018	<0.0044	<0.0044	<0.0044	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018
onsite	SV10	SV10-SS-5	03/13/2006 14:40	5	mg/kg	<0.16	<0.16	<0.16	<0.39	<0.39	0.25	<0.39	<0.39	<0.16	<0.39	<0.39	<0.39	<0.16	<0.39	<0.16	<0.39	<0.16	<0.16	<0.16	<0.16
onsite	SV10	SV10-SS-10	03/13/2006 14:50	10	mg/kg	<0.0017	<0.0017	<0.0017	<0.0041	<0.0041	0.0017	<0.0041	<0.0041	<0.0017	<0.0041	<0.0041	<0.0041	<0.0017	<0.0041	<0.0017	<0.0041	<0.0017	<0.0017	<0.0017	<0.0017
onsite	SV12	SV12-SS-05	03/08/2006 9:30	5	mg/kg	<0.0022	<0.0022	<0.0022	<0.0056	<0.0056	<0.0022	<0.0056	<0.0056	<0.0022	<0.0056	<0.0056	<0.0056	<0.0022	<0.0056	<0.0022	<0.0056	<0.0022	<0.0022	<0.0022	<0.0022
onsite	SV13	SV13-SS-5	03/07/2006 14:30	5	mg/kg	<0.0026	<0.0026	<0.0026	<0.0064	<0.0064	<0.0026	<0.0064	<0.0064	<0.0026	<0.0064	<0.0064	<0.0064	<0.0026	<0.0064	<0.0026	<0.0064	<0.0026	<0.0026	<0.0026	<0.0026

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "VOCs" volatile organic compounds

Table A-1c
Summary of Soil Matrix Analytical Results, VOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Dichloro difluoro methane	Ethyl benzene	Hexachloro butadiene	Isopropyl benzene	m,p-Xylenes	Methylene chloride	Naphthalene	n-Butyl benzene	n-Propyl benzene	o-Xylene	p-Isopropyl toluene	sec-Butyl benzene	Styrene	tert-Butyl benzene	Tetrachloro ethene	Toluene	trans-1,2-Dichloro ethene	trans-1,3-Dichloro propene	Trichloro ethene	Trichloro fluoro methane	Vinyl chloride
onsite	CPB02	CPB02-SL-1.5	01/17/2006 8:30	1.5	mg/kg	<0.33	0.26	<0.42	0.12	0.62	<1.7	1.9	<0.42	0.19	0.29	0.15	0.085	<0.17	<0.42	<0.17	0.34	<0.17	<0.17	<0.17	<0.42	<0.42
onsite	CPB02	CPB02-SL-5	01/17/2006 8:35	5	mg/kg	<0.0043	0.0055	<0.0043	0.0018	0.0095	<0.017	0.016	<0.0043	0.003	0.0056	0.0013	<0.0043	<0.0017	<0.0043	<0.0017	0.0097	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
onsite	CPB02	CPB02-SL-10	01/17/2006 8:40	10	mg/kg	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.018	<0.0045	<0.0045	<0.0018	<0.0018	<0.0018	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045
onsite	CPB04	CPB04-SL-1.5	01/18/2006 10:20	1.5	mg/kg	<0.0044	<0.0017	<0.0044	<0.0017	<0.0017	<0.017	<0.0044	<0.0044	<0.0017	<0.0017	<0.0017	<0.0044	<0.0017	<0.0044	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0044	<0.0044
onsite	CPB04	CPB04-SL-5	01/18/2006 10:25	5	mg/kg	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.017	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
onsite	CPB04	CPB04-SL-10	01/18/2006 10:30	10	mg/kg	<0.0046	<0.0018	<0.0046	<0.0018	<0.0018	<0.018	<0.0046	<0.0046	<0.0018	<0.0018	<0.0018	<0.0046	<0.0018	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0046	<0.0046
onsite	CPB06	CPB06-SL-1.5	01/17/2006 10:00	1.5	mg/kg	<0.01	0.016	<0.01	0.0036	0.024	<0.041	0.0085	<0.01	0.0051	0.014	0.0016	<0.01	<0.0041	<0.01	<0.0041	0.039	<0.0041	<0.0041	<0.0041	<0.01	<0.01
onsite	CPB06	CPB06-SL-5	01/17/2006 10:05	5	mg/kg	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.018	0.0019	<0.0044	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	0.0013	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044
onsite	CPB06	CPB06-SL-10	01/17/2006 10:10	10	mg/kg	<0.0043	0.00052	<0.0043	<0.0017	0.0015	<0.017	<0.0043	<0.0043	<0.0017	0.0007	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	0.0012	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
onsite	CPB06	CPB06-2SL-10	01/17/2006 10:11	10	mg/kg	<0.0046	0.00048	<0.0046	<0.0018	0.0015	<0.018	<0.0046	<0.0046	<0.0018	0.00068	<0.0018	<0.0046	<0.0018	<0.0046	<0.0018	0.0011	<0.0018	<0.0018	<0.0018	<0.0046	<0.0046
onsite	CPB08	CPB08-SL-1.5	01/17/2006 14:50	1.5	mg/kg	<0.0047	0.013	<0.0047	0.0051	0.034	<0.019	0.014	<0.0047	0.0067	0.015	0.0026	<0.0047	<0.0019	<0.0047	<0.0019	0.026	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047
onsite	CPB08	CPB08-SL-5	01/17/2006 14:55	5	mg/kg	<0.0049	<0.0019	<0.0049	<0.0019	0.0011	<0.019	<0.0049	<0.0049	<0.0019	<0.0019	<0.0019	<0.0049	<0.0019	<0.0049	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0049	<0.0049
onsite	CPB08	CPB08-SL-10	01/17/2006 15:00	10	mg/kg	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.016	<0.004	<0.004	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.004
onsite	CPB1	CPB1-SL-1.5	01/19/2006 8:45	1.5	mg/kg	<0.31	0.14	<0.39	0.059	0.34	<1.6	1.1	<0.39	0.099	0.13	0.079	0.052	<0.16	<0.39	<0.16	0.15	<0.16	<0.16	<0.16	<0.39	<0.39
onsite	CPB1	CPB1-SL-5	01/19/2006 8:50	5	mg/kg	<0.37	0.26	<0.46	0.1	2.3	<1.8	2	<0.46	0.12	0.59	0.22	0.059	<0.18	<0.46	<0.18	0.75	<0.18	<0.18	<0.18	<0.46	<0.46
onsite	CPB1	CPB1-SL-10	01/19/2006 8:55	10	mg/kg	<0.3	0.15	<0.38	0.068	1.3	<1.5	1.8	<0.38	0.092	0.21	0.12	0.048	<0.15	<0.38	<0.15	0.32	<0.15	<0.15	<0.15	<0.38	<0.38
onsite	CPB10	CPB10-SL-1.5	01/10/2006 11:20	1.5	mg/kg	<0.46	0.27	<0.57	<0.23	1.2	<2.3	0.87	<0.57	0.095	0.49	<0.23	<0.57	<0.23	<0.57	<0.23	0.4	<0.23	<0.23	<0.23	<0.57	<0.57
onsite	CPB10	CPB10-SL-5	01/10/2006 11:25	5	mg/kg	<0.31	0.24	<0.39	0.099	1.6	<1.6	1.4	<0.39	0.089	0.48	0.1	0.051	<0.16	<0.39	<0.16	0.71	<0.16	<0.16	<0.16	<0.39	<0.39
onsite	CPB10	CPB10-SL-10	01/10/2006 11:35	10	mg/kg	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.016	<0.004	<0.004	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.004
onsite	CPB11	CPB11-SL-1.5	12/22/2005 12:50	1.5	mg/kg	<0.35	0.54	<0.44	0.19	1.4	<1.8	1.9	0.25	0.29	0.63	0.21	0.15	<0.18	<0.44	<0.18	0.94	<0.18	<0.18	<0.18	<0.44	<0.44
onsite	CPB11	CPB11-SL-5	12/22/2005 12:55	5	mg/kg	<0.39	1.2	<0.49	0.37	6.4	<2	1.7	<0.49	0.48	2.1	0.33	0.19	0.063	0.072	<0.2	4.2	<0.2	<0.2	<0.2	<0.49	<0.49
onsite	CPB11	CPB11-SL-10	12/22/2005 13:00	10	mg/kg	<0.0059	<0.0024	<0.0059	<0.0024	<0.0024	<0.024	<0.0059	<0.0059	<0.0024	<0.0024	<0.0024	<0.0059	<0.0024	<0.0059	<0.0024	<0.0024	<0.0024	<0.0024	<0.0024	<0.0059	<0.0059
onsite	CPB11R	CPB11R-SL-1.5	01/10/2006 14:15	1.5	mg/kg	<0.35	0.37	<0.44	0.16	1.1	<1.7	1.5	0.18	0.19	0.44	0.15	0.097	<0.17	<0.44	<0.17	0.72	<0.17	<0.17	<0.17	<0.44	<0.44
onsite	CPB11R	CPB11R-SL-5	01/10/2006 14:25	5	mg/kg	<0.4	1	<0.5	0.28	5.6	<2	2.9	<0.5	0.34	1.9	0.25	0.13	<0.2	<0.5	<0.2	3.6	<0.2	<0.2	<0.2	<0.5	<0.5
onsite	CPB11R	CPB11R-SL-10	01/10/2006 14:45	10	mg/kg	<0.0064	<0.0025	<0.0064	<0.0025	0.0026	<0.025	<0.0064	<0.0064	<0.0025	0.00092	<0.0025	<0.0064	<0.0025	<0.0064	<0.0025	0.002	<0.0025	<0.0025	<0.0025	<0.0064	<0.0064
onsite	CPB12	CPB12-SL-1.5	01/17/2006 14:00	1.5	mg/kg	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.016	<0.0041	<0.0041	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041
onsite	CPB12	CPB12-SL-5	01/17/2006 14:05	5	mg/kg	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.019	<0.0047	<0.0047	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047
onsite	CPB12	CPB12-SL-10	01/17/2006 14:10	10	mg/kg	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.017	<0.0042	<0.0042	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042
onsite	CPB13	CPB13-SL-1.5	01/16/2006 10:05	1.5	mg/kg	<0.0069	0.0099	<0.0069	0.0047	0.047	<0.028	0.034	<0.0069	0.0073	0.018	0.0035	<0.0069	<0.0028	<0.0069	<0.0028	0.025	<0.0028	<0.0028	<0.0028	<0.0069	<0.0069
onsite	CPB13	CPB13-SL-5	01/16/2006 10:10	5	mg/kg	<0.0043	0.0011	<0.0043	<0.0017	0.003	<0.017	<0.0043	<0.0043	<0.0017	0.0033	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	0.00056	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
onsite	CPB13	CPB13-SL-10	01/16/2006 10:15	10	mg/kg	<0.004	0.022	<0.004	0.026	0.016	<0.016	<0.004	<0.004	0.042	0.028	0.044	0.011	<0.0016	<0.004	<0.0016	0.00083	<0.0016	<0.0016	<0.0016	<0.004	<0.004
onsite	CPB14	CPB14-SL-1.5	01/10/2006 9:50	1.5	mg/kg	<0.4	0.76	<0.51	0.26	2	<2	2.2	0.3	0.39	0.86	0.22	0.17	<0.2	<0.51	<0.2	1.5	<0.2	<0.2	<0.2	<0.51	<0.51
onsite	CPB14	CPB14-SL-5	01/10/2006 10:00	5	mg/kg	<0.005	0.00062	<0.005	<0.002	0.0031	<0.02	0.0018	<0.005	<0.002	0.0012	<0.002	<0.005	<0.002	<0.005	<0.002	0.0019	<0.002	<0.002	<0.002	<0.005	<0.005
onsite	CPB14	CPB14-SL-10	01/10/2006 10:20	10	mg/kg	<0.0042	0.002	<0.0042	<0.0017	0.011	<0.017	0.0052	<0.0042	0.00067	0.0037	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	0.0073	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042
onsite	CPB15	CPB15-SL-1.5'	12/20/2005 13:40	1.5	mg/kg	<0.41	1	<0.51	0.26	4.4	<2	1.8	<0.51	0.41	1.5	0.28	0.14	<0.2	<0.51	<0.2	3	<0.2	<0.2	<0.2	<0.51	<0.51
onsite	CPB15	CPB15-SL-5'	12/20/2005 13:45	5	mg/kg	<0.0049	0.0016	<0.0049	<0.002	0.0092	<0.02	0.0041	<0.0049	<0.002	0.0031	<0.002	<0.0049	<0.002	<0.0049	<0.002	0.0077	<0.002	<0.002	<0.002	<0.0049	<0.0049
onsite	CPB15	CPB15-SL-10'	12/20/2005 14:50	10	mg/kg	<0.0051	<0.002	<0.0051	<0.002	<0.002	<0.02	<0.0051	<0.0051	<0.002	<0.002	<0.002	<0.0051	<0.002	<0.0051	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0051	<0.0051
onsite	CPB15	CPB15-SL-11'	12/20/2005 14:55	11	mg/kg	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.018	<0.0044	<0.0044	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044
onsite	CPB15R	CPB15R-SL-1.5	01/20/2006 10:00	1.5	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
onsite	CPB16	CPB16-SL-1.5	01/17/2006 13:00	1.5	mg/kg	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.017	<0.0042	<0.0042	<0.0017	<0.0017	<0.0017	0.00086	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042
onsite	CPB16	CPB16-2SL-1.5	01/17/2006 13:01	1.5	mg/kg	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.016	<0.0041	<0.0041	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041
onsite	CPB16	CPB16-SL-5	01/17/2006 13:05	5	mg/kg	<0.0048	<0.0019	<0.0048	<0.0019	<0.0019	<0.019	<0.0048	<0.0048	<0.0019	<0.0019	<0.0019	<0.0048	<0.0019	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0048	<0.0048
onsite	CPB16	CPB16-SL-10	01/17/2006 13:10	10	mg/kg	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.016	<0.004	<0.004	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.004
onsite	CPB17	CPB17-SL-1.5	01/09/2006 15:19	1.5	mg/kg	<0.35	0.43	<0.44	0.13	2.1	<1.8	0.89	<0.44	0.2	0.69	0.16	0.059	<0.18	<0.44	<0.18	1.4	<0.18	<0.18	<0.18	<0.44	<0.44
onsite	CPB17	CPB17-2SL-1.5	01/09/2006 15:20	1.5	mg/kg	<0.37	2.1	<0.46	0.5	9.8	<1.9	2.9	<0.46	0.75	3.5	0.48	0.17	<0.19	<0.46	<0.19	7.3	<0.19	<0.19	<0.19	<0.46	<0.46
onsite	CPB17	CPB17-SL-5	01/09/2006 15:35	5	mg/kg	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.016	<0.0039	<0.0039	<0.0016	<0.0016	<0.0016	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0039
onsite	CPB17	CPB17-SL-10	01/09/2006 15:45	10	mg/kg	<0.0041	0.0074	<0.0041	0.0018	0.031	<0.017	0.0078	<0.0041	0.0025	0.012	0.0013	<0.0041	<0.0017	<0.0041	<0.0017	0.026	<0.0017	<0.0017	<0.0017	<0.0041	<0.0041
onsite	CPB18	CPB18-SL-1.5'	12/20/2005 9:28	1.5	mg/kg	<2	0.45	<2.6	<1	2	<10	<2.6	<2.6	<1	0.68	<1	<2.6	<1	<2.6	<1	1.7	<1	<1	<1	<2.6	<2.6
onsite	CPB18	CPB18-SL-5'	12/20/2005 9:40	5	mg/kg	<0.0043	0.00061	<0.0043	<0.0017	0.0026	<0.017	0.0021	<0.0043	<0.0017	0.00082	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	0.002	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
onsite	CPB18	CPB18-SL-10'	12/20/2005 9:49	10	mg/kg	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.017	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
onsite	CPB19	CPB19-SL-1.5	01/16/2006 9:00	1.5	mg/kg	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.017	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
onsite	CPB19	CPB19-SL-5	01/16/2006 9:10	5	mg/kg	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.016	<0.004	<0.004	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0016	0.00053	<0.0016	<0.0016	<0.0016	<0.004	<0.004
onsite	CPB19	CPB19-2SL-5	01/16/2006 9:11	5	mg/kg	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.017	<0.0042	<0.0042	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "VOCs" volatile organic compounds

Table A-1c
Summary of Soil Matrix Analytical Results, VOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Dichloro difluoro methane	Ethyl benzene	Hexachloro butadiene	Isopropyl benzene	m,p-Xylenes	Methylene chloride	Naphthalene	n-Butyl benzene	n-Propyl benzene	o-Xylene	p-Isopropyl toluene	sec-Butyl benzene	Styrene	tert-Butyl benzene	Tetrachloro ethene	Toluene	trans-1,2-Dichloro ethene	trans-1,3-Dichloro propene	Trichloro ethene	Trichloro fluoro methane	Vinyl chloride
onsite	CPB19	CPB19-SL-10	01/16/2006 9:20	10	mg/kg	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.017	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
onsite	CPB20	CPB20-SL-1.5	01/17/2006 11:15	1.5	mg/kg	<0.0059	<0.0023	<0.0059	<0.0023	<0.0023	<0.023	<0.0059	<0.0059	<0.0023	<0.0023	<0.0023	<0.0059	<0.0023	<0.0059	<0.0023	<0.0023	<0.0023	<0.0023	<0.0023	<0.0023	<0.0059	<0.0059
onsite	CPB20	CPB20-SL-5	01/17/2006 11:20	5	mg/kg	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.017	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
onsite	CPB20	CPB20-SL-10	01/17/2006 11:25	10	mg/kg	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.017	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
onsite	CPB21	CPB21-SL-1.5	01/13/2006 8:40	1.5	mg/kg	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.018	<0.0044	<0.0044	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044
onsite	CPB21	CPB21-SL-5	01/13/2006 8:50	5	mg/kg	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.016	<0.0041	<0.0041	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041
onsite	CPB21	CPB21-SL-10	01/13/2006 9:00	10	mg/kg	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.017	<0.0042	<0.0042	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042
onsite	CPB22	CPB22-SL-1.5	01/12/2006 15:10	1.5	mg/kg	<0.0049	<0.002	<0.0049	<0.002	<0.002	<0.02	<0.0049	<0.0049	<0.002	<0.002	<0.002	<0.0049	<0.002	<0.0049	<0.002	0.00092	<0.002	<0.002	<0.002	<0.0049	<0.0049	<0.0049
onsite	CPB22	CPB22-SL-5	01/12/2006 15:15	5	mg/kg	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.019	<0.0047	<0.0047	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047
onsite	CPB22	CPB22-SL-10	01/12/2006 15:20	10	mg/kg	<0.0048	<0.0019	<0.0048	<0.0019	<0.0019	<0.019	<0.0048	<0.0048	<0.0019	<0.0019	<0.0019	<0.0048	<0.0019	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0048	<0.0048
onsite	CPB23	CPB23-SL-1.5	01/18/2006 14:30	1.5	mg/kg	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.019	<0.0047	<0.0047	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047
onsite	CPB23	CPB23-SL-5	01/18/2006 14:35	5	mg/kg	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.018	<0.0045	<0.0045	<0.0018	<0.0018	<0.0018	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045
onsite	CPB23	CPB23-SL-10	01/18/2006 14:40	10	mg/kg	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.018	<0.0044	<0.0044	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044
onsite	CPB24	CPB24-SL-1.5	01/20/2006 9:20	1.5	mg/kg	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.016	<0.004	<0.004	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.004
onsite	CPB24	CPB24-SL-5.0	01/20/2006 9:25	5	mg/kg	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.016	<0.0041	<0.0041	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041
onsite	CPB24	CPB24-SL-10.0	01/20/2006 9:30	10	mg/kg	<0.0059	<0.0024	<0.0059	<0.0024	0.0013	<0.024	<0.0059	<0.0059	<0.0024	0.00095	<0.0024	<0.0059	<0.0024	<0.0059	<0.0024	<0.0024	<0.0024	<0.0024	<0.0024	<0.0024	<0.0059	<0.0059
onsite	CPB-28	CPB-28-SL-5-7	12/05/2006 14:50	7	mg/kg	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.016	<0.0039	<0.0039	<0.0016	<0.0016	<0.0016	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0039
onsite	CPB-28	CPB-28-SL-9-11	12/05/2006 15:00	11	mg/kg	<0.0038	<0.0015	<0.0038	<0.0015	<0.0015	<0.015	<0.0038	<0.0038	<0.0015	<0.0015	<0.0015	<0.0038	<0.0015	<0.0038	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0038	<0.0038
onsite	CPB3	CPB3-SL-1.5	01/12/2006 14:00	1.5	mg/kg	<0.86	0.58	<1.1	0.2	2	<4.3	2.9	<1.1	0.3	0.69	0.25	0.16	<0.43	<1.1	<0.43	1.1	<0.43	<0.43	<0.43	<1.1	<1.1	<1.1
onsite	CPB3	CPB3-SL-5	01/12/2006 14:10	5	mg/kg	<0.0049	0.00097	<0.0049	<0.002	0.0015	<0.02	<0.0049	<0.0049	0.00063	0.00099	<0.002	<0.0049	<0.002	<0.0049	<0.002	0.0012	<0.002	0.0021	<0.002	<0.0049	<0.0049	<0.0049
onsite	CPB3	CPB3-SL-10	01/12/2006 14:15	10	mg/kg	<0.0046	<0.0018	<0.0046	<0.0018	<0.0018	<0.018	<0.0046	<0.0046	<0.0018	<0.0018	<0.0018	<0.0046	<0.0018	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0046	<0.0046
onsite	CPB-30	CPB-30-SL-8-10	12/06/2006 10:10	10	mg/kg	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.016	<0.004	<0.004	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.004
onsite	CPB5	CPB5-SL-1.5	01/19/2006 14:25	1.5	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
onsite	CPB5	CPB5-SL-5	01/19/2006 14:30	5	mg/kg	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.017	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
onsite	CPB5	CPB5-SL-10	01/19/2006 14:35	10	mg/kg	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.016	<0.004	<0.004	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.004
onsite	CPB7	CPB7-SL-1.5	01/12/2006 10:45	1.5	mg/kg	<0.28	0.092	<0.35	<0.14	0.22	<1.4	0.2	<0.35	0.053	0.089	<0.14	<0.35	<0.14	<0.35	<0.14	0.18	<0.14	<0.14	<0.14	<0.35	<0.35	<0.35
onsite	CPB7	CPB7-2SL-1.5	01/12/2006 10:46	1.5	mg/kg	<0.36	0.23	<0.45	0.092	0.47	<1.8	0.67	<0.45	0.15	0.23	0.1	0.072	<0.18	<0.45	<0.18	0.34	<0.18	<0.18	<0.18	<0.45	<0.45	<0.45
onsite	CPB7	CPB7-SL-5	01/12/2006 11:00	5	mg/kg	<0.3	0.063	<0.38	<0.15	0.29	<1.5	<0.38	<0.38	<0.15	0.091	<0.15	<0.38	<0.15	<0.38	<0.15	0.14	<0.15	<0.15	<0.15	<0.38	<0.38	<0.38
onsite	CPB7	CPB7-SL-10	01/12/2006 11:10	10	mg/kg	<0.0039	<0.0016	<0.0039	<0.0016	0.00068	<0.016	<0.0039	<0.0039	<0.0016	<0.0016	<0.0016	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0039
onsite	CPB9	CPB9-SL-1.5	01/13/2006 9:40	1.5	mg/kg	<0.0051	<0.002	<0.0051	<0.002	<0.002	<0.02	<0.0051	<0.0051	<0.002	<0.002	<0.002	<0.0051	<0.002	<0.0051	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0051	<0.0051
onsite	CPB9	CPB9-SL-5	01/13/2006 9:45	5	mg/kg	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.016	<0.0041	<0.0041	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041
onsite	CPB9	CPB9-SL-10	01/13/2006 9:50	10	mg/kg	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.016	<0.0039	<0.0039	<0.0016	<0.0016	<0.0016	<0.0039	<0.0016	<0.0039	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0039	<0.0039
onsite	DPW01	DPW01-SS-1.5	01/18/2006 13:10	1.5	mg/kg	<0.0088	<0.0035	<0.0088	<0.0035	<0.0035	<0.035	<0.0088	<0.0088	<0.0035	<0.0035	<0.0035	<0.0088	<0.0035	<0.0088	<0.0035	<0.0035	<0.0035	<0.0035	<0.0035	<0.0035	<0.0088	<0.0088
onsite	DPW01	DPW01-SS-5	01/18/2006 13:15	5	mg/kg	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.018	<0.0044	<0.0044	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044
onsite	DPW01	DPW01-SS-10	01/18/2006 13:20	10	mg/kg	<0.0037	<0.0015	<0.0037	<0.0015	<0.0015	<0.015	<0.0037	<0.0037	<0.0015	<0.0015	<0.0015	<0.0037	<0.0015	<0.0037	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0037	<0.0037
onsite	DPW02	DPW02-SS-2	01/13/2006 10:25	2	mg/kg	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.018	<0.0045	<0.0045	<0.0018	<0.0018	<0.0018	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045
onsite	DPW02	DPW02-SS-5	01/13/2006 10:30	5	mg/kg	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.017	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
onsite	DPW03	DPW03-SS-2	01/13/2006 10:50	2	mg/kg	<0.0049	0.0014	<0.0049	<0.002	0.0039	<0.02	0.0046	<0.0049	0.00073	0.0018	<0.002	<0.0049	<0.002	<0.0049	<0.002	0.0028	<0.002	<0.002	<0.002	<0.0049	<0.0049	<0.0049
onsite	DPW03	DPW03-SS-5	01/13/2006 11:00	5	mg/kg	<0.0046	<0.0018	<0.0046	<0.0018	<0.0018	<0.018	<0.0046	<0.0046	<0.0018	<0.0018	<0.0018	<0.0046	<0.0018	<0.0046	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0046	<0.0046
onsite	DPW04	DPW04-SS-2	01/13/2006 11:15	2	mg/kg	<0.33	0.41	<0.42	0.16	1.1	<1.7	1.9	<0.42	0.24	0.49	0.19	0.12	<0.17	<0.42	<0.17	0.85	<0.17	<0.17	<0.17	<0.42	<0.42	<0.42
onsite	DPW04	DPW04-SS-5	01/13/2006 11:20	5	mg/kg	<0.0039	0.0012	<0.0039	<0.0016	0.003	<0.016	<0.0039	<0.0039	0.00048	0.0014	<0.0016	<0.0039	<0.0016	<0.0039	<0.0016	0.0031	<0.0016	<0.0016	<0.0016	<0.0039	<0.0039	<0.0039
onsite	DPW05	DPW05-SS-5	01/13/2006 11:35	5	mg/kg	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.018	0.039	0.0017	0.0011	<0.0018	<0.0018	0.00075	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045
bkgd; offsite LADPW	DPW10	DPW10-SS-2'	01/11/2006 10:20	2	mg/kg	<0.0062	<0.0025	<0.0062	<0.0025	<0.0025	<0.025	<0.0062	<0.0062	<0.0025	<0.0025	<0.0025	<0.0062	<0.0025	<0.0062	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0062	<0.0062
onsite	HPB01	HPB01-SL-1.5	02/08/2006 11:00	1.5	mg/kg	<0.0055	<0.0022	<0.0055	<0.0022	<0.0022	<0.022	<0.0055	<0.0055	<0.0022	<0.0022	<0.0022	<0.0055	<0.0022	<0.0055	<0.0022	<0.0022	<0.0022	<0.0022	<0.0022	<0.0022	<0.0055	<0.0055
onsite	HPB01	HPB01-SL-5	02/08/2006 11:05	5	mg/kg	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.017	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	0.00047	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
onsite	HPB01	HPB01-SL-10	02/08/2006 11:15	10	mg/kg	<0.0047	0.00099	<0.0047	<0.0019	0.0066	<0.019	0.01	<0.0047	<0.0019	0.00055	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047
onsite	HPB02	HPB02-SL-1.5	02/09/2006 10:00	1.5	mg/kg	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.016	<0.004	<0.004	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.004
onsite	HPB02	HPB02-SL-5	02/09/2006 10:20	5	mg/kg	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.018	<0.0044	<0.0044	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044
onsite	HPB02	HPB02-2SL-5	02/09/2006 10:21	5	mg/kg	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.019	<0.0047	<0.0047	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047
onsite	HPB02	HPB02-SL-10	02/09/2006 10:30	10	mg/kg	<0.0048	<0.0019	<0.0048	<0.0019	0.0042	<0.019	0.002	<0.0048	<0.0019	0.0005	<0.0019	<0.0048	<0.0019	<0.0048	<0.0019	0.0011	<0.0019	<0.0019	<0.0019	<0.0048	<0.0048	<0.0048
onsite	HPB03	HPB03-SL-1.5	02/08/2006 14:00	1.5	mg/kg	<0.0045	<0.0018	<0.0045	<0.0018	0.00096	<0.018	<0.0045	<0.0045	<0.0018	<0.0018	<0.0018	<0.0045	<0.0018	<0.0045	<0.0018	0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045
onsite	HPB03	HPB03-SL-5	02/08/2006 14:10	5	mg/kg	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	0.0076	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	0.002	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043	<0.0043
onsite	HPB03	HPB03-SL-10	02/08/2006 14:15	10	mg/kg	<0.0045	0.011	<0.0045	0.017	0.021	0.015	<0.0045	<0.0045	0.026	0.016	0.022	0.016	<0.0018	<0.0045	<0.0018	0.0016	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045	<0.0045

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "VOCs" volatile organic compounds

Table A-1c
Summary of Soil Matrix Analytical Results, VOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Dichloro difluoro methane	Ethyl benzene	Hexachloro butadiene	Isopropyl benzene	m,p-Xylenes	Methylene chloride	Naphthalene	n-Butyl benzene	n-Propyl benzene	o-Xylene	p-Isopropyl toluene	sec-Butyl benzene	Styrene	tert-Butyl benzene	Tetrachloro ethene	Toluene	trans-1,2-Dichloro ethene	trans-1,3-Dichloro propene	Trichloro ethene	Trichloro fluoro methane	Vinyl chloride
onsite	HPB03	HPB03-2SL-10	02/08/2006 14:16	10	mg/kg	<0.0046	0.0044	<0.0046	0.005	0.0091	0.0087	<0.0046	<0.0046	0.0076	0.0075	0.0064	0.0042	<0.0019	<0.0046	<0.0019	0.00093	<0.0019	<0.0019	<0.0019	<0.0046	<0.0046
onsite	HPB04	HPB04-SL-1.5	02/09/2006 14:25	1.5	mg/kg	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.016	<0.0041	<0.0041	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	0.00071	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041
onsite	HPB04	HPB04-SL-5	02/09/2006 14:35	5	mg/kg	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.016	<0.0041	<0.0041	<0.0016	<0.0016	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041
onsite	HPB04	HPB04-SL-10	02/09/2006 14:40	10	mg/kg	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.017	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
onsite	HPB04	HPB04-2SL-10	02/09/2006 14:41	10	mg/kg	<0.0048	<0.0019	<0.0048	<0.0019	<0.0019	<0.019	<0.0048	<0.0048	<0.0019	<0.0019	<0.0019	<0.0048	<0.0019	<0.0048	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0048	<0.0048
onsite	HPB05	HPB05-SL-1.5	02/06/2006 11:10	1.5	mg/kg	<0.34	0.18	<0.42	0.067	0.98	<1.7	0.81	<0.42	<0.17	0.35	<0.17	<0.42	<0.17	<0.42	<0.17	0.52	<0.17	<0.17	<0.17	<0.42	<0.42
onsite	HPB05	HPB05-SL-5	02/06/2006 11:25	5	mg/kg	<0.17	0.053	<0.21	<0.083	0.35	<0.83	0.36	<0.21	<0.083	0.12	<0.083	<0.21	<0.083	<0.21	<0.083	0.11	<0.083	<0.083	<0.083	<0.21	<0.21
onsite	HPB05	HPB05-2SL-5	02/06/2006 11:26	5	mg/kg	<0.23	0.71	<0.29	0.26	4.6	<1.1	2.8	<0.29	0.42	1.7	0.18	0.099	<0.11	<0.29	<0.11	1.1	<0.11	<0.11	<0.11	<0.29	<0.29
onsite	HPB05	HPB05-SL-10	02/06/2006 11:40	10	mg/kg	<0.0041	0.0012	<0.0041	<0.0016	0.0066	<0.016	0.0019	<0.0041	0.00054	0.0021	<0.0016	<0.0041	<0.0016	<0.0041	<0.0016	0.0046	<0.0016	<0.0016	<0.0016	<0.0041	<0.0041
onsite	HPB06	HPB06-SL-1.5	02/06/2006 9:45	1.5	mg/kg	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.019	0.0014	<0.0047	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047
onsite	HPB06	HPB06-SL-5	02/06/2006 10:00	5	mg/kg	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.017	<0.0042	<0.0042	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042
onsite	HPB06	HPB06-SL-10	02/06/2006 10:10	10	mg/kg	<0.0038	<0.0015	<0.0038	<0.0015	<0.0015	<0.015	<0.0038	<0.0038	<0.0015	<0.0015	<0.0015	<0.0038	<0.0015	<0.0038	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0038	<0.0038
onsite	HPB07	HPB07-SL-1.5	02/06/2006 13:40	1.5	mg/kg	<0.005	<0.002	<0.005	<0.002	0.00094	<0.02	<0.005	<0.005	<0.002	<0.002	<0.002	<0.005	<0.002	<0.005	<0.002	0.00061	<0.002	<0.002	<0.002	<0.005	<0.005
onsite	HPB07	HPB07-SL-5	02/06/2006 13:45	5	mg/kg	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.019	<0.0047	<0.0047	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047
onsite	HPB07	HPB07-2SL-5	02/06/2006 13:46	5	mg/kg	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.017	<0.0042	<0.0042	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042
onsite	HPB07	HPB07-SL-10	02/06/2006 13:50	10	mg/kg	<0.28	0.037	<0.35	<0.14	0.18	<1.4	0.43	<0.35	<0.14	0.075	0.069	<0.35	<0.14	<0.35	<0.14	0.058	<0.14	<0.14	<0.14	<0.35	<0.35
onsite	HPB08	HPB08-SL-1.5	02/08/2006 9:00	1.5	mg/kg	<0.0051	<0.002	<0.0051	<0.002	<0.002	<0.02	<0.0051	<0.0051	<0.002	<0.002	<0.002	<0.0051	<0.002	<0.0051	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0051	<0.0051
onsite	HPB08	HPB08-SL-5	02/08/2006 9:05	5	mg/kg	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.016	<0.004	<0.004	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.004
onsite	HPB08	HPB08-SL-10	02/08/2006 9:10	10	mg/kg	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.017	<0.0042	<0.0042	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042
onsite	HPB09	HPB09-SL-1.5	02/09/2006 9:10	1.5	mg/kg	<0.0038	<0.0015	<0.0038	<0.0015	<0.0015	<0.015	<0.0038	<0.0038	<0.0015	<0.0015	<0.0015	<0.0038	<0.0015	<0.0038	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0038	<0.0038
onsite	HPB09	HPB09-2SL-1.5	02/09/2006 9:11	1.5	mg/kg	<0.0047	0.00059	<0.0047	<0.0019	0.003	<0.019	<0.0047	<0.0047	<0.0019	0.00068	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	0.004	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047
onsite	HPB09	HPB09-SL-5	02/09/2006 9:15	5	mg/kg	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.018	<0.0044	<0.0044	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044
onsite	HPB09	HPB09-SL-10	02/09/2006 9:20	10	mg/kg	<0.0049	<0.002	<0.0049	<0.002	0.006	<0.02	0.0071	<0.0049	<0.002	<0.002	<0.002	<0.0049	<0.002	<0.0049	<0.002	0.00061	<0.002	<0.002	<0.002	<0.0049	<0.0049
onsite	HPB09	HPB09-2SL-10	02/09/2006 9:21	10	mg/kg	<0.0037	<0.0015	<0.0037	<0.0015	0.0013	<0.015	0.002	<0.0037	<0.0015	<0.0015	<0.0015	<0.0037	<0.0015	<0.0037	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0037	<0.0037
onsite	HPB11	HPB11-SL-1.5	02/07/2006 13:40	1.5	mg/kg	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.018	<0.0045	<0.0045	<0.0018	<0.0018	<0.0018	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045
onsite	HPB11	HPB11-SL-5	02/07/2006 13:45	5	mg/kg	<0.0058	<0.0023	<0.0058	<0.0023	0.0018	<0.023	0.0021	<0.0058	<0.0023	0.00078	<0.0023	<0.0058	<0.0023	<0.0058	<0.0023	0.0013	<0.0023	<0.0023	<0.0023	<0.0058	<0.0058
onsite	HPB11	HPB11-SL-10	02/07/2006 13:50	10	mg/kg	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.018	<0.0045	<0.0045	<0.0018	<0.0018	<0.0018	<0.0045	<0.0018	<0.0045	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0045	<0.0045
onsite	HPB-12	HPB-12-SL-5-7	12/04/2006 13:00	7	mg/kg	<0.0054	<0.0022	<0.0054	<0.0022	<0.0022	<0.022	<0.0054	<0.0054	<0.0022	<0.0022	<0.0022	<0.0054	<0.0022	<0.0054	<0.0022	<0.0022	<0.0022	<0.0022	<0.0022	<0.0054	<0.0054
onsite	HPB-12	HPB-12-SL-10-12	12/04/2006 13:05	12	mg/kg	<0.0052	<0.0021	<0.0052	<0.0021	<0.0021	<0.021	<0.0052	<0.0052	<0.0021	<0.0021	<0.0021	<0.0052	<0.0021	<0.0052	<0.0021	<0.0021	<0.0021	<0.0021	<0.0021	<0.0052	<0.0052
offsite residential	RB01	RB01-SL-1.5	02/14/2006 9:40	1.5	mg/kg	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.017	<0.0042	<0.0042	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042
offsite residential	RB01	RB01-SL-5	02/14/2006 9:50	5	mg/kg	<0.3	0.067	<0.37	<0.15	0.24	<1.5	0.58	<0.37	<0.15	0.083	<0.15	<0.37	<0.15	<0.37	<0.15	0.12	<0.15	<0.15	<0.15	<0.37	<0.37
offsite residential	RB01	RB01-SL-10	02/14/2006 10:15	10	mg/kg	<0.0043	<0.0017	<0.0043	<0.0017	<0.0017	<0.017	<0.0043	<0.0043	<0.0017	<0.0017	<0.0017	<0.0043	<0.0017	<0.0043	<0.0017	0.0017	<0.0017	<0.0017	<0.0017	<0.0043	<0.0043
offsite residential	RB02	RB02-SL-1.5	02/14/2006 13:40	1.5	mg/kg	<0.0054	<0.0022	<0.0054	<0.0022	<0.0022	<0.022	<0.0054	<0.0054	<0.0022	<0.0022	<0.0022	<0.0054	<0.0022	<0.0054	<0.0022	<0.0022	<0.0022	<0.0022	<0.0022	<0.0054	<0.0054
offsite residential	RB02	RB02-SL-5	02/14/2006 13:55	5	mg/kg	<0.0061	<0.0025	<0.0061	<0.0025	<0.0025	<0.025	<0.0061	<0.0061	<0.0025	<0.0025	<0.0025	<0.0061	<0.0025	<0.0061	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0061	<0.0061
offsite residential	RB02	RB02-SL-10	02/14/2006 14:05	10	mg/kg	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.019	<0.0047	<0.0047	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047
offsite residential	RB02	RB02-SL-10.5	02/14/2006 15:10	10.5	mg/kg	<0.0061	<0.0024	<0.0061	<0.0024	<0.0024	<0.024	<0.0061	<0.0061	<0.0024	<0.0024	<0.0024	<0.0061	<0.0024	<0.0061	<0.0024	<0.0024	<0.0024	<0.0024	<0.0024	<0.0061	<0.0061
offsite residential	RB03	RB03-SL-1.5	02/15/2006 9:15	1.5	mg/kg	<0.0047	0.0055	<0.0047	<0.0019	0.028	<0.019	<0.0047	<0.0047	<0.0019	0.0095	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047
offsite residential	RB03	RB03-2SL-1.5	02/15/2006 9:16	1.5	mg/kg	<0.0047	0.011	<0.0047	<0.0019	0.059	<0.019	<0.0047	<0.0047	<0.0019	0.022	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	0.00054	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047
offsite residential	RB03	RB03-SL-5	02/15/2006 9:45	5	mg/kg	<0.0066	<0.0026	<0.0066	<0.0026	<0.0026	<0.026	<0.0066	<0.0066	<0.0026	<0.0026	<0.0026	<0.0066	<0.0026	<0.0066	<0.0026	<0.0026	<0.0026	<0.0026	<0.0026	<0.0066	<0.0066
offsite residential	RB03	RB03-SL-10	02/15/2006 9:50	10	mg/kg	<0.31	2.8	<0.38	0.53	12	<1.5	3.6	<0.38	0.75	4.9	0.52	0.12	<0.15	<0.38	<0.15	9.9	<0.15	<0.15	<0.15	<0.38	<0.38
onsite	SV02	SV02-SS-5	03/13/2006 13:20	5	mg/kg	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.017	<0.0042	<0.0042	<0.0017	<0.0017	<0.0017	<0.0042	<0.0017	<0.0042	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0042	<0.0042
onsite	SV02	SV02-SS-10	03/13/2006 13:40	10	mg/kg	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.019	<0.0047	<0.0047	<0.0019	<0.0019	<0.0019	<0.0047	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	<0.0047	<0.0047
onsite	SV03	SV03-SS-5	03/07/2006 11:20	5	mg/kg	<0.0049	<0.002	<0.0049	<0.002	<0.002	<0.02	<0.0049	<0.0049	<0.002	<0.002	<0.002	<0.0049	<0.002	<0.0049	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0049	<0.0049
onsite	SV03	SV03-2SS-5	03/07/2006 11:21	5	mg/kg	<0.0052	<0.0021	<0.0052	<0.0021	<0.0021	<0.021	<0.0052	<0.0052	<0.0021	<0.0021	<0.0021	<0.0052	<0.0021	<0.0052	<0.0021	0.00063	<0.0021	<0.0021	<0.0021	<0.0052	<0.0052
onsite	SV04	SV04-SS-5	03/07/2006 13:40	5	mg/kg	<0.0052	<0.0021	<0.0052	<0.0021	<0.0021	<0.021	<0.0052	<0.0052	<0.0021	<0.0021	<0.0021	<0.0052	<0.0021	<0.0052	<0.0021	<0.0021	<0.0021	<0.0021	<0.0021	<0.0052	<0.0052
onsite	SV06	SV06-SS-5	03/07/2006 9:25	5	mg/kg	<0.0053	<0.0021	<0.0053	<0.0021	<0.0021	<0.021	<0.0053	<0.0053	<0.0021	<0.0021	<0.0021	<0.0053	<0.0021	<0.0053	<0.0021	<0.0021	<0.0021	<0.0021	<0.0021	<0.0053	<0.0053
onsite	SV07	SV07-SS-5	03/07/2006 10:10	5	mg/kg	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.016	<0.004	<0.004	<0.0016	<0.0016	<0.0016	<0.004	<0.0016	<0.004	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.004	<0.004
onsite	SV08	SV08-SS-5	03/07/2006 14:10	5	mg/kg	<0.0058	<0.0023	<0.0058	<0.0023	<0.0023	<0.023	<0.0058	<0.0058	<0.0023	<0.0023	<0.0023	<0.0058	<0.0023	<0.0058	<0.0023	<0.0023	<0.0023	<0.0023	<0.0023	<0.0058	<0.0058
onsite	SV09	SV09-SS-05	03/08/2006 10:20	5	mg/kg	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.018	<0.0044	<0.0044	<0.0018	<0.0018	<0.0018	<0.0044	<0.0018	<0.0044	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0044	<0.0044
onsite	SV10	SV10-SS-5	03/13/2006 14:40	5	mg/kg	<0.31	0.094	<0.39	<0.16	1.3	<1.6	1.7	<0.39	<0.16	0.12	0.076	<0.39	<0.16	<0.39	<0.16	0.16	<0.16	<0.16	<0.16	<0.39	<0.39
onsite	SV10	SV10-SS-10	03/13/2006 14:50	10	mg/kg	<0.0041	<0.0017	<0.0041	<0.0017	0.0054	<0.017	0.0026	<0.0041	<0.0017	0.00045	<0.0017	<0.0041	<0.0017	<0.0041	<0.0017	0.00096	<0.0017	<0.0017	<0.0017	<0.0041	<0.0041
onsite	SV12	SV12-SS-05	03/08/2006 9:30	5	mg/kg	<0.0056	<0.0022	<0.0056	<0.0022	<0.0022	<0.022	<0.0056	<0.0056	<0.0022	<0.0022	<0.0022	<0.0056	<0.0022	<0.0056	<0.0022	<0.0022	<0.0022	<0.0022	<0.0022	<0.0056	<0.0056
onsite	SV13	SV13-SS-5	03/07/2006 14:30	5	mg/kg	<0.0064	<0.0026	<0.0064	<0.0026	<0.0026	<0.026	<0.0064	<0.0064	<0.0026	<0.0026	<0.0026	<0.0064	<0.0026	<0.0064	<0.0026	<0.0026	<0.0026	<0.0026	<0.0026	<0.0064	<0.0064

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "VOCs" volatile organic compounds

Table A-1d
Summary of Soil Matrix Analytical Results, SVOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	1,2,4-Trichloro benzene	1,2-Dichloro benzene	1,2-Diphenylhydrazine/ Azobenzene	1,3-Dichloro benzene	1,4-Dichloro benzene	2,4,5-Trichloro phenol	2,4,6-Trichloro phenol	2,4-Dichloro phenol	2,4-Dimethyl phenol	2,4-Dinitro phenol	2,4-Dinitro toluene	2,6-Dinitro toluene	2-Chloro naphthalene	2-Chlorophenol	2-Methyl naphthalene	2-Methylphenol	2-Nitroaniline
onsite	CPB02	CPB02-SL-1.5	01/17/2006 8:30	1.5	mg/kg	<170	<170	<170	<170	<170	<170	<170	<170	<170	<330	<170	<170	<170	<170	<170	<170	<170
onsite	CPB02	CPB02-SL-5	01/17/2006 8:35	5	mg/kg	<6.6	<6.6	<6.6	<6.6	<6.6	<6.6	<6.6	<6.6	<6.6	<13	<6.6	<6.6	<6.6	<6.6	<6.6	<6.6	<6.6
onsite	CPB02	CPB02-SL-10	01/17/2006 8:40	10	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<1.3	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67
onsite	CPB04	CPB04-SL-1.5	01/18/2006 10:20	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB04	CPB04-SL-5	01/18/2006 10:25	5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<1.3	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67
onsite	CPB04	CPB04-SL-10	01/18/2006 10:30	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB06	CPB06-SL-1.5	01/17/2006 10:00	1.5	mg/kg	<160	<160	<160	<160	<160	<160	<160	<160	<160	<330	<160	<160	<160	<160	<160	<160	<160
onsite	CPB06	CPB06-SL-5	01/17/2006 10:05	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<2.6	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
onsite	CPB06	CPB06-SL-10	01/17/2006 10:10	10	mg/kg	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<1.3	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66
onsite	CPB06	CPB06-2SL-10	01/17/2006 10:11	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB08	CPB08-SL-1.5	01/17/2006 14:50	1.5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<1.3	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67
onsite	CPB08	CPB08-SL-5	01/17/2006 14:55	5	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<20	<10	<10	<10	<10	<10	<10	<10
onsite	CPB08	CPB08-SL-10	01/17/2006 15:00	10	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<2.6	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
onsite	CPB1	CPB1-SL-1.5	01/19/2006 8:45	1.5	mg/kg	<500	<500	<500	<500	<500	<500	<500	<500	<500	<990	<500	<500	<500	<500	<500	<500	<500
onsite	CPB1	CPB1-SL-5	01/19/2006 8:50	5	mg/kg	<120	<120	<120	<120	<120	<120	<120	<120	<120	<250	<120	<120	<120	<120	<120	<120	<120
onsite	CPB1	CPB1-SL-10	01/19/2006 8:55	10	mg/kg	<83	<83	<83	<83	<83	<83	<83	<83	<83	<160	<83	<83	<83	<83	<83	<83	<83
onsite	CPB10	CPB10-SL-1.5	01/10/2006 11:20	1.5	mg/kg	<250	<250	<250	<250	<250	<250	<250	<250	<250	<490	<250	<250	<250	<250	<250	<250	<250
onsite	CPB10	CPB10-SL-5	01/10/2006 11:25	5	mg/kg	<250	<250	<250	<250	<250	<250	<250	<250	<250	<490	<250	<250	<250	<250	<250	<250	<250
onsite	CPB10	CPB10-SL-10	01/10/2006 11:35	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB11	CPB11-SL-1.5	12/22/2005 12:50	1.5	mg/kg	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<2000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
onsite	CPB11	CPB11-SL-5	12/22/2005 12:55	5	mg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<16	<8	<8	<8	<8	<8	<8	<8
onsite	CPB11	CPB11-SL-10	12/22/2005 13:00	10	mg/kg	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<2000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
onsite	CPB11R	CPB11R-SL-1.5	01/10/2006 14:15	1.5	mg/kg	<250	<250	<250	<250	<250	<250	<250	<250	<250	<500	<250	<250	<250	<250	<250	<250	<250
onsite	CPB11R	CPB11R-SL-5	01/10/2006 14:25	5	mg/kg	<250	<250	<250	<250	<250	<250	<250	<250	<250	<490	<250	<250	<250	<250	<250	<250	<250
onsite	CPB11R	CPB11R-SL-10	01/10/2006 14:45	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB12	CPB12-SL-1.5	01/17/2006 14:00	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<6.6	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
onsite	CPB12	CPB12-SL-5	01/17/2006 14:05	5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<6.6	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
onsite	CPB12	CPB12-SL-10	01/17/2006 14:10	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB13	CPB13-SL-1.5	01/16/2006 10:05	1.5	mg/kg	<62	<62	<62	<62	<62	<62	<62	<62	<62	<120	<62	<62	<62	<62	<62	<62	<62
onsite	CPB13	CPB13-SL-5	01/16/2006 10:10	5	mg/kg	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<12	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2
onsite	CPB13	CPB13-SL-10	01/16/2006 10:15	10	mg/kg	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<13	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7
onsite	CPB14	CPB14-SL-1.5	01/10/2006 9:50	1.5	mg/kg	<25	<25	<25	<25	<25	<25	<25	<25	<25	<49	<25	<25	<25	<25	<25	<25	<25
onsite	CPB14	CPB14-SL-5	01/10/2006 10:00	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB14	CPB14-SL-10	01/10/2006 10:20	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB15	CPB15-SL-1.5'	12/20/2005 13:40	1.5	mg/kg	<480	<480	<480	<480	<480	<480	<480	<480	<480	<950	<480	<480	<480	<480	<480	<480	<480
onsite	CPB15	CPB15-SL-5'	12/20/2005 13:45	5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<6.6	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
onsite	CPB15	CPB15-SL-10'	12/20/2005 14:50	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB15	CPB15-SL-11'	12/20/2005 14:55	11	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB15R	CPB15R-SL-1.5	01/20/2006 10:00	1.5	mg/kg	<250	<250	<250	<250	<250	<250	<250	<250	<250	<490	<250	<250	<250	<250	<250	<250	<250
onsite	CPB16	CPB16-SL-1.5	01/17/2006 13:00	1.5	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<2.6	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
onsite	CPB16	CPB16-2SL-1.5	01/17/2006 13:01	1.5	mg/kg	<100	<100	<100	<100	<100	<100	<100	<100	<100	<200	<100	<100	<100	<100	<100	<100	<100
onsite	CPB16	CPB16-SL-5	01/17/2006 13:05	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB16	CPB16-SL-10	01/17/2006 13:10	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB17	CPB17-SL-1.5	01/09/2006 15:19	1.5	mg/kg	<41	<41	<41	<41	<41	<41	<41	<41	<41	<82	<41	<41	<41	<41	<41	<41	<41
onsite	CPB17	CPB17-2SL-1.5	01/09/2006 15:20	1.5	mg/kg	<49	<49	<49	<49	<49	<49	<49	<49	<49	<98	<49	<49	<49	<49	<49	<49	<49
onsite	CPB17	CPB17-SL-5	01/09/2006 15:35	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB17	CPB17-SL-10	01/09/2006 15:45	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB18	CPB18-SL-1.5'	12/20/2005 9:28	1.5	mg/kg	<990	<990	<990	<990	<990	<990	<990	<990	<990	<2000	<990	<990	<990	<990	<990	<990	<990
onsite	CPB18	CPB18-SL-5'	12/20/2005 9:40	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<2.6	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
onsite	CPB18	CPB18-SL-10'	12/20/2005 9:49	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB19	CPB19-SL-1.5	01/16/2006 9:00	1.5	mg/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<16	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
onsite	CPB19	CPB19-SL-5	01/16/2006 9:10	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB19	CPB19-2SL-5	01/16/2006 9:11	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "SVOCs" semi-volatile organic compounds

Table A-1d
Summary of Soil Matrix Analytical Results, SVOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	1,2,4-Trichloro benzene	1,2-Dichloro benzene	1,2-Diphenylhydrazine/ Azobenzene	1,3-Dichloro benzene	1,4-Dichloro benzene	2,4,5-Trichloro phenol	2,4,6-Trichloro phenol	2,4-Dichloro phenol	2,4-Dimethyl phenol	2,4-Dinitro phenol	2,4-Dinitro toluene	2,6-Dinitro toluene	2-Chloro naphthalene	2-Chlorophenol	2-Methyl naphthalene	2-Methylphenol	2-Nitroaniline
onsite	CPB19	CPB19-SL-10	01/16/2006 9:20	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB20	CPB20-SL-1.5	01/17/2006 11:15	1.5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<1.3	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67
onsite	CPB20	CPB20-SL-5	01/17/2006 11:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB20	CPB20-SL-10	01/17/2006 11:25	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB21	CPB21-SL-1.5	01/13/2006 8:40	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB21	CPB21-SL-5	01/13/2006 8:50	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB21	CPB21-SL-10	01/13/2006 9:00	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB22	CPB22-SL-1.5	01/12/2006 15:10	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB22	CPB22-SL-5	01/12/2006 15:15	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB22	CPB22-SL-10	01/12/2006 15:20	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB23	CPB23-SL-1.5	01/18/2006 14:30	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<6.6	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
onsite	CPB23	CPB23-SL-5	01/18/2006 14:35	5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<1.3	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67
onsite	CPB23	CPB23-SL-10	01/18/2006 14:40	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB24	CPB24-SL-1.5	01/20/2006 9:20	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB24	CPB24-SL-5.0	01/20/2006 9:25	5	mg/kg	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<13	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7
onsite	CPB24	CPB24-SL-10.0	01/20/2006 9:30	10	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<6.6	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
onsite	CPB-28	CPB-28-SL-5-7	12/05/2006 14:50	7	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB-28	CPB-28-SL-9-11	12/05/2006 15:00	11	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB3	CPB3-SL-1.5	01/12/2006 14:00	1.5	mg/kg	<500	<500	<500	<500	<500	<500	<500	<500	<500	<990	<500	<500	<500	<500	<500	<500	<500
onsite	CPB3	CPB3-SL-5	01/12/2006 14:10	5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<6.6	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
onsite	CPB3	CPB3-SL-10	01/12/2006 14:15	10	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<1.3	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67
onsite	CPB-30	CPB-30-SL-8-10	12/06/2006 10:10	10	mg/kg	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<5.3	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7
onsite	CPB5	CPB5-SL-1.5	01/19/2006 14:25	1.5	mg/kg	<250	<250	<250	<250	<250	<250	<250	<250	<250	<500	<250	<250	<250	<250	<250	<250	<250
onsite	CPB5	CPB5-SL-5	01/19/2006 14:30	5	mg/kg	<17	<17	<17	<17	<17	<17	<17	<17	<17	<33	<17	<17	<17	<17	<17	<17	<17
onsite	CPB5	CPB5-SL-10	01/19/2006 14:35	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB7	CPB7-SL-1.5	01/12/2006 10:45	1.5	mg/kg	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<2000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
onsite	CPB7	CPB7-2SL-1.5	01/12/2006 10:46	1.5	mg/kg	<500	<500	<500	<500	<500	<500	<500	<500	<500	<990	<500	<500	<500	<500	<500	<500	<500
onsite	CPB7	CPB7-SL-5	01/12/2006 11:00	5	mg/kg	<500	<500	<500	<500	<500	<500	<500	<500	<500	<990	<500	<500	<500	<500	<500	<500	<500
onsite	CPB7	CPB7-SL-10	01/12/2006 11:10	10	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<2.6	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
onsite	CPB9	CPB9-SL-1.5	01/13/2006 9:40	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB9	CPB9-SL-5	01/13/2006 9:45	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	CPB9	CPB9-SL-10	01/13/2006 9:50	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	DPW01	DPW01-SS-1.5	01/18/2006 13:10	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<6.6	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
onsite	DPW01	DPW01-SS-5	01/18/2006 13:15	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	DPW01	DPW01-SS-10	01/18/2006 13:20	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	DPW02	DPW02-SS-2	01/13/2006 10:25	2	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<1.3	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67
onsite	DPW02	DPW02-SS-5	01/13/2006 10:30	5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<6.6	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
onsite	DPW03	DPW03-SS-2	01/13/2006 10:50	2	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<2.6	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
onsite	DPW03	DPW03-SS-5	01/13/2006 11:00	5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<1.3	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67
onsite	DPW04	DPW04-SS-2	01/13/2006 11:15	2	mg/kg	<100	<100	<100	<100	<100	<100	<100	<100	<100	<200	<100	<100	<100	<100	<100	<100	<100
onsite	DPW04	DPW04-SS-5	01/13/2006 11:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	DPW05	DPW05-SS-5	01/13/2006 11:35	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bkgd; offsite LADPW	DPW10	DPW10-SS-2'	01/11/2006 10:20	2	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB01	HPB01-SL-1.5	02/08/2006 11:00	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB01	HPB01-SL-5	02/08/2006 11:05	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB01	HPB01-SL-10	02/08/2006 11:15	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB02	HPB02-SL-1.5	02/09/2006 10:00	1.5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<1.3	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67
onsite	HPB02	HPB02-SL-5	02/09/2006 10:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB02	HPB02-2SL-5	02/09/2006 10:21	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<2.6	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
onsite	HPB02	HPB02-SL-10	02/09/2006 10:30	10	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<1.3	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67
onsite	HPB03	HPB03-SL-1.5	02/08/2006 14:00	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB03	HPB03-SL-5	02/08/2006 14:10	5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<1.3	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67
onsite	HPB03	HPB03-SL-10	02/08/2006 14:15	10	mg/kg	<20	<20	<20	<20	<20	<20	<20	<20	<20	<39	<20	<20	<20	<20	<20	<20	<20

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "SVOCs" semi-volatile organic compounds

Table A-1d
Summary of Soil Matrix Analytical Results, SVOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	1,2,4-Trichloro benzene	1,2-Dichloro benzene	1,2-Diphenylhydrazine/ Azobenzene	1,3-Dichloro benzene	1,4-Dichloro benzene	2,4,5-Trichloro phenol	2,4,6-Trichloro phenol	2,4-Dichloro phenol	2,4-Dimethyl phenol	2,4-Dinitro phenol	2,4-Dinitro toluene	2,6-Dinitro toluene	2-Chloro naphthalene	2-Chlorophenol	2-Methyl naphthalene	2-Methylphenol	2-Nitroaniline
onsite	HPB03	HPB03-2SL-10	02/08/2006 14:16	10	mg/kg	<6.6	<6.6	<6.6	<6.6	<6.6	<6.6	<6.6	<6.6	<6.6	<13	<6.6	<6.6	<6.6	<6.6	<6.6	<6.6	<6.6
onsite	HPB04	HPB04-SL-1.5	02/09/2006 14:25	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB04	HPB04-SL-5	02/09/2006 14:35	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB04	HPB04-SL-10	02/09/2006 14:40	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB04	HPB04-2SL-10	02/09/2006 14:41	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB05	HPB05-SL-1.5	02/06/2006 11:10	1.5	mg/kg	<49	<49	<49	<49	<49	<49	<49	<49	<49	<97	<49	<49	<49	<49	<49	<49	<49
onsite	HPB05	HPB05-SL-5	02/06/2006 11:25	5	mg/kg	<5	<5	<5	<5	<5	<5	<5	<5	<5	<9.9	<5	<5	<5	<5	<5	<5	<5
onsite	HPB05	HPB05-2SL-5	02/06/2006 11:26	5	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<20	<10	<10	<10	<10	<10	<10	<10
onsite	HPB05	HPB05-SL-10	02/06/2006 11:40	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB06	HPB06-SL-1.5	02/06/2006 9:45	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<6.6	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
onsite	HPB06	HPB06-SL-5	02/06/2006 10:00	5	mg/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<16	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
onsite	HPB06	HPB06-SL-10	02/06/2006 10:10	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB07	HPB07-SL-1.5	02/06/2006 13:40	1.5	mg/kg	<17	<17	<17	<17	<17	<17	<17	<17	<17	<33	<17	<17	<17	<17	<17	<17	<17
onsite	HPB07	HPB07-SL-5	02/06/2006 13:45	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB07	HPB07-2SL-5	02/06/2006 13:46	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<2.6	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
onsite	HPB07	HPB07-SL-10	02/06/2006 13:50	10	mg/kg	<41	<41	<41	<41	<41	<41	<41	<41	<41	<82	<41	<41	<41	<41	<41	<41	<41
onsite	HPB08	HPB08-SL-1.5	02/08/2006 9:00	1.5	mg/kg	<17	<17	<17	<17	<17	<17	<17	<17	<17	<33	<17	<17	<17	<17	<17	<17	<17
onsite	HPB08	HPB08-SL-5	02/08/2006 9:05	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB08	HPB08-SL-10	02/08/2006 9:10	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB09	HPB09-SL-1.5	02/09/2006 9:10	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<6.6	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
onsite	HPB09	HPB09-2SL-1.5	02/09/2006 9:11	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<6.6	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
onsite	HPB09	HPB09-SL-5	02/09/2006 9:15	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB09	HPB09-SL-10	02/09/2006 9:20	10	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<1.3	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67
onsite	HPB09	HPB09-2SL-10	02/09/2006 9:21	10	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<6.6	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
onsite	HPB11	HPB11-SL-1.5	02/07/2006 13:40	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<6.6	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
onsite	HPB11	HPB11-SL-5	02/07/2006 13:45	5	mg/kg	<12	<12	<12	<12	<12	<12	<12	<12	<12	<25	<12	<12	<12	<12	<12	<12	<12
onsite	HPB11	HPB11-SL-10	02/07/2006 13:50	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB-12	HPB-12-SL-5-7	12/04/2006 13:00	7	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	HPB-12	HPB-12-SL-10-12	12/04/2006 13:05	12	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
offsite residential	RB01	RB01-SL-1.5	02/14/2006 9:40	1.5	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<2.6	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
offsite residential	RB01	RB01-SL-5	02/14/2006 9:50	5	mg/kg	<120	<120	<120	<120	<120	<120	<120	<120	<120	<240	<120	<120	<120	<120	<120	<120	<120
offsite residential	RB01	RB01-SL-10	02/14/2006 10:15	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
offsite residential	RB02	RB02-SL-1.5	02/14/2006 13:40	1.5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<1.3	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67	<0.67
offsite residential	RB02	RB02-SL-5	02/14/2006 13:55	5	mg/kg	<25	<25	<25	<25	<25	<25	<25	<25	<25	<50	<25	<25	<25	<25	<25	<25	<25
offsite residential	RB02	RB02-SL-10	02/14/2006 14:05	10	mg/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<16	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
offsite residential	RB02	RB02-SL-10.5	02/14/2006 15:10	10.5	mg/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<16	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
offsite residential	RB03	RB03-SL-1.5	02/15/2006 9:15	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
offsite residential	RB03	RB03-2SL-1.5	02/15/2006 9:16	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
offsite residential	RB03	RB03-SL-5	02/15/2006 9:45	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<2.6	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
offsite residential	RB03	RB03-SL-10	02/15/2006 9:50	10	mg/kg	<82	<82	<82	<82	<82	<82	<82	<82	<82	<160	<82	<82	<82	<82	<82	<82	<82
onsite	SV02	SV02-SS-5	03/13/2006 13:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	SV02	SV02-SS-10	03/13/2006 13:40	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	SV03	SV03-SS-5	03/07/2006 11:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	SV03	SV03-2SS-5	03/07/2006 11:21	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	SV04	SV04-SS-5	03/07/2006 13:40	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	SV06	SV06-SS-5	03/07/2006 9:25	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	SV07	SV07-SS-5	03/07/2006 10:10	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	SV08	SV08-SS-5	03/07/2006 14:10	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	SV09	SV09-SS-05	03/08/2006 10:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	SV10	SV10-SS-5	03/13/2006 14:40	5	mg/kg	<170	<170	<170	<170	<170	<170	<170	<170	<170	<330	<170	<170	<170	<170	<170	<170	<170
onsite	SV10	SV10-SS-10	03/13/2006 14:50	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	SV12	SV12-SS-05	03/08/2006 9:30	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
onsite	SV13	SV13-SS-5	03/07/2006 14:30	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.66	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "SVOCs" semi-volatile organic compounds

Table A-1d
Summary of Soil Matrix Analytical Results, SVOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	2-Nitrophenol	3,3'-Dichloro benzidine	3-Nitroaniline	4,6-Dinitro-2-methylphenol	4-Bromophenyl phenyl ether	4-Chloro-3-methylphenol	4-Chloroaniline	4-Chlorophenyl phenyl ether	4-Methylphenol	4-Nitroaniline	4-Nitrophenol	Acenaphthene	Acenaphthylene	Aniline	Anthracene	Benzidine	Benzo(a) anthracene
onsite	CPB02	CPB02-SL-1.5	01/17/2006 8:30	1.5	mg/kg	<170	<420	<170	<210	<170	<170	<170	<170	<170	<420	<420	<170	<170	<210	<170	<330	<170
onsite	CPB02	CPB02-SL-5	01/17/2006 8:35	5	mg/kg	<6.6	<17	<6.6	<8.3	<6.6	<6.6	<6.6	<6.6	<6.6	<17	<17	<6.6	<6.6	<8.3	<6.6	<13	<6.6
onsite	CPB02	CPB02-SL-10	01/17/2006 8:40	10	mg/kg	<0.67	<1.7	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<1.7	<0.67	<0.67	<0.83	<0.67	<1.3	<0.67
onsite	CPB04	CPB04-SL-1.5	01/18/2006 10:20	1.5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB04	CPB04-SL-5	01/18/2006 10:25	5	mg/kg	<0.67	<1.7	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<1.7	<0.67	<0.67	<0.83	<0.67	<1.3	<0.67
onsite	CPB04	CPB04-SL-10	01/18/2006 10:30	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB06	CPB06-SL-1.5	01/17/2006 10:00	1.5	mg/kg	<160	<410	<160	<210	<160	<160	<160	<160	<160	<410	<410	<160	<160	<210	<160	<330	<160
onsite	CPB06	CPB06-SL-5	01/17/2006 10:05	5	mg/kg	<1.3	<3.3	<1.3	<1.7	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<3.3	<1.3	<1.3	<1.7	<1.3	<2.6	<1.3
onsite	CPB06	CPB06-SL-10	01/17/2006 10:10	10	mg/kg	<0.66	<1.7	<0.66	<0.83	<0.66	<0.66	<0.66	<0.66	<0.66	<1.7	<1.7	<0.66	<0.66	<0.83	<0.66	<1.3	<0.66
onsite	CPB06	CPB06-2SL-10	01/17/2006 10:11	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB08	CPB08-SL-1.5	01/17/2006 14:50	1.5	mg/kg	<0.67	<1.7	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<1.7	<0.67	<0.67	<0.83	<0.67	<1.3	<0.67
onsite	CPB08	CPB08-SL-5	01/17/2006 14:55	5	mg/kg	<10	<25	<10	<13	<10	<10	<10	<10	<10	<25	<25	<10	<10	<13	<10	<20	<10
onsite	CPB08	CPB08-SL-10	01/17/2006 15:00	10	mg/kg	<1.3	<3.3	<1.3	<1.7	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<3.3	<1.3	<1.3	<1.7	<1.3	<2.6	<1.3
onsite	CPB1	CPB1-SL-1.5	01/19/2006 8:45	1.5	mg/kg	<500	<1200	<500	<630	<500	<500	<500	<500	<500	<1200	<1200	<500	<500	<630	<500	<990	<500
onsite	CPB1	CPB1-SL-5	01/19/2006 8:50	5	mg/kg	<120	<310	<120	<160	<120	<120	<120	<120	<120	<310	<310	<120	<120	<160	<120	<250	<120
onsite	CPB1	CPB1-SL-10	01/19/2006 8:55	10	mg/kg	<83	<210	<83	<100	<83	<83	<83	<83	<83	<210	<210	<83	<83	<100	<83	<160	<83
onsite	CPB10	CPB10-SL-1.5	01/10/2006 11:20	1.5	mg/kg	<250	<620	<250	<310	<250	<250	<250	<250	<250	<620	<620	<250	<250	<310	<250	<490	<250
onsite	CPB10	CPB10-SL-5	01/10/2006 11:25	5	mg/kg	<250	<620	<250	<310	<250	<250	<250	<250	<250	<620	<620	<250	<250	<310	<250	<490	<250
onsite	CPB10	CPB10-SL-10	01/10/2006 11:35	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB11	CPB11-SL-1.5	12/22/2005 12:50	1.5	mg/kg	<1000	<2500	<1000	<1300	<1000	<1000	<1000	<1000	<1000	<2500	<2500	<1000	<1000	<1300	<1000	<2000	<1000
onsite	CPB11	CPB11-SL-5	12/22/2005 12:55	5	mg/kg	<8	<20	<8	<10	<8	<8	<8	<8	<8	<20	<20	<8	<8	<10	<8	<16	<8
onsite	CPB11	CPB11-SL-10	12/22/2005 13:00	10	mg/kg	<1000	<2500	<1000	<1300	<1000	<1000	<1000	<1000	<1000	<2500	<2500	<1000	<1000	<1300	<1000	<2000	<1000
onsite	CPB11R	CPB11R-SL-1.5	01/10/2006 14:15	1.5	mg/kg	<250	<620	<250	<310	<250	<250	<250	<250	<250	<620	<620	<250	<250	<310	<250	<500	<250
onsite	CPB11R	CPB11R-SL-5	01/10/2006 14:25	5	mg/kg	<250	<620	<250	<310	<250	<250	<250	<250	<250	<620	<620	<250	<250	<310	<250	<490	<250
onsite	CPB11R	CPB11R-SL-10	01/10/2006 14:45	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB12	CPB12-SL-1.5	01/17/2006 14:00	1.5	mg/kg	<3.3	<8.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<8.3	<3.3	<3.3	<4.2	<3.3	<6.6	<3.3
onsite	CPB12	CPB12-SL-5	01/17/2006 14:05	5	mg/kg	<3.3	<8.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<8.3	<3.3	<3.3	<4.2	<3.3	<6.6	<3.3
onsite	CPB12	CPB12-SL-10	01/17/2006 14:10	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB13	CPB13-SL-1.5	01/16/2006 10:05	1.5	mg/kg	<62	<160	<62	<78	<62	<62	<62	<62	<62	<160	<160	<62	<62	<78	<62	<120	<62
onsite	CPB13	CPB13-SL-5	01/16/2006 10:10	5	mg/kg	<6.2	<15	<6.2	<7.8	<6.2	<6.2	<6.2	<6.2	<6.2	<15	<15	<6.2	<6.2	<7.8	<6.2	<12	<6.2
onsite	CPB13	CPB13-SL-10	01/16/2006 10:15	10	mg/kg	<6.7	<17	<6.7	<8.3	<6.7	<6.7	<6.7	<6.7	<6.7	<17	<17	<6.7	<6.7	<8.3	<6.7	<13	<6.7
onsite	CPB14	CPB14-SL-1.5	01/10/2006 9:50	1.5	mg/kg	<25	<62	<25	<31	<25	<25	<25	<25	<25	<62	<62	<25	<25	<31	<25	<49	<25
onsite	CPB14	CPB14-SL-5	01/10/2006 10:00	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB14	CPB14-SL-10	01/10/2006 10:20	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB15	CPB15-SL-1.5'	12/20/2005 13:40	1.5	mg/kg	<480	<1200	<480	<600	<480	<480	<480	<480	<480	<1200	<1200	<480	<480	<600	<480	<950	<480
onsite	CPB15	CPB15-SL-5'	12/20/2005 13:45	5	mg/kg	<3.3	<8.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<8.3	<3.3	<3.3	<4.2	<3.3	<6.6	<3.3
onsite	CPB15	CPB15-SL-10'	12/20/2005 14:50	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB15	CPB15-SL-11'	12/20/2005 14:55	11	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB15R	CPB15R-SL-1.5	01/20/2006 10:00	1.5	mg/kg	<250	<620	<250	<310	<250	<250	<250	<250	<250	<620	<620	<250	<250	<310	<250	<490	<250
onsite	CPB16	CPB16-SL-1.5	01/17/2006 13:00	1.5	mg/kg	<1.3	<3.3	<1.3	<1.7	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<3.3	<1.3	<1.3	<1.7	<1.3	<2.6	<1.3
onsite	CPB16	CPB16-2SL-1.5	01/17/2006 13:01	1.5	mg/kg	<100	<250	<100	<120	<100	<100	<100	<100	<100	<250	<250	<100	<100	<120	<100	<200	<100
onsite	CPB16	CPB16-SL-5	01/17/2006 13:05	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB16	CPB16-SL-10	01/17/2006 13:10	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB17	CPB17-SL-1.5	01/09/2006 15:19	1.5	mg/kg	<41	<100	<41	<52	<41	<41	<41	<41	<41	<100	<100	<41	<41	<52	<41	<82	<41
onsite	CPB17	CPB17-2SL-1.5	01/09/2006 15:20	1.5	mg/kg	<49	<120	<49	<62	<49	<49	<49	<49	<49	<120	<120	<49	<49	<62	<49	<98	<49
onsite	CPB17	CPB17-SL-5	01/09/2006 15:35	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB17	CPB17-SL-10	01/09/2006 15:45	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB18	CPB18-SL-1.5'	12/20/2005 9:28	1.5	mg/kg	<990	<2500	<990	<1200	<990	<990	<990	<990	<990	<2500	<2500	<990	<990	<1200	<990	<2000	<990
onsite	CPB18	CPB18-SL-5'	12/20/2005 9:40	5	mg/kg	<1.3	<3.3	<1.3	<1.7	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<3.3	<1.3	<1.3	<1.7	<1.3	<2.6	<1.3
onsite	CPB18	CPB18-SL-10'	12/20/2005 9:49	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB19	CPB19-SL-1.5	01/16/2006 9:00	1.5	mg/kg	<8.3	<21	<8.3	<10	<8.3	<8.3	<8.3	<8.3	<8.3	<21	<21	<8.3	<8.3	<10	<8.3	<16	<8.3
onsite	CPB19	CPB19-SL-5	01/16/2006 9:10	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB19	CPB19-2SL-5	01/16/2006 9:11	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "SVOCs" semi-volatile organic compounds

Table A-1d
Summary of Soil Matrix Analytical Results, SVOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	2-Nitrophenol	3,3'-Dichloro benzidine	3-Nitroaniline	4,6-Dinitro-2-methylphenol	4-Bromophenyl phenyl ether	4-Chloro-3-methylphenol	4-Chloroaniline	4-Chlorophenyl phenyl ether	4-Methylphenol	4-Nitroaniline	4-Nitrophenol	Acenaphthene	Acenaphthylene	Aniline	Anthracene	Benzidine	Benzo(a) anthracene
onsite	CPB19	CPB19-SL-10	01/16/2006 9:20	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB20	CPB20-SL-1.5	01/17/2006 11:15	1.5	mg/kg	<0.67	<1.7	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<1.7	<0.67	<0.67	<0.83	<0.67	<1.3	<0.67
onsite	CPB20	CPB20-SL-5	01/17/2006 11:20	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB20	CPB20-SL-10	01/17/2006 11:25	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB21	CPB21-SL-1.5	01/13/2006 8:40	1.5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB21	CPB21-SL-5	01/13/2006 8:50	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB21	CPB21-SL-10	01/13/2006 9:00	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB22	CPB22-SL-1.5	01/12/2006 15:10	1.5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB22	CPB22-SL-5	01/12/2006 15:15	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB22	CPB22-SL-10	01/12/2006 15:20	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB23	CPB23-SL-1.5	01/18/2006 14:30	1.5	mg/kg	<3.3	<8.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<8.3	<3.3	<3.3	<4.2	<3.3	<6.6	<3.3
onsite	CPB23	CPB23-SL-5	01/18/2006 14:35	5	mg/kg	<0.67	<1.7	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<1.7	<0.67	<0.67	<0.83	<0.67	<1.3	<0.67
onsite	CPB23	CPB23-SL-10	01/18/2006 14:40	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB24	CPB24-SL-1.5	01/20/2006 9:20	1.5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB24	CPB24-SL-5.0	01/20/2006 9:25	5	mg/kg	<6.7	<17	<6.7	<8.3	<6.7	<6.7	<6.7	<6.7	<6.7	<17	<17	<6.7	<6.7	<8.3	<6.7	<13	<6.7
onsite	CPB24	CPB24-SL-10.0	01/20/2006 9:30	10	mg/kg	<3.3	<8.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<8.3	<3.3	<3.3	<4.2	<3.3	<6.6	<3.3
onsite	CPB-28	CPB-28-SL-5-7	12/05/2006 14:50	7	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB-28	CPB-28-SL-9-11	12/05/2006 15:00	11	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB3	CPB3-SL-1.5	01/12/2006 14:00	1.5	mg/kg	<500	<1200	<500	<630	<500	<500	<500	<500	<500	<1200	<1200	<500	<500	<630	<500	<990	<500
onsite	CPB3	CPB3-SL-5	01/12/2006 14:10	5	mg/kg	<3.3	<8.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<8.3	<3.3	<3.3	<4.2	<3.3	<6.6	<3.3
onsite	CPB3	CPB3-SL-10	01/12/2006 14:15	10	mg/kg	<0.67	<1.7	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<1.7	<0.67	<0.67	<0.83	<0.67	<1.3	<0.67
onsite	CPB-30	CPB-30-SL-8-10	12/06/2006 10:10	10	mg/kg	<2.7	<6.7	<2.7	<3.3	<2.7	<2.7	<2.7	<2.7	<2.7	<6.7	<6.7	<2.7	<2.7	<3.3	<2.7	<5.3	0.59
onsite	CPB5	CPB5-SL-1.5	01/19/2006 14:25	1.5	mg/kg	<250	<620	<250	<310	<250	<250	<250	<250	<250	<620	<620	<250	<250	<310	<250	<500	<250
onsite	CPB5	CPB5-SL-5	01/19/2006 14:30	5	mg/kg	<17	<42	<17	<21	<17	<17	<17	<17	<17	<42	<42	<17	<17	<21	<17	<33	<17
onsite	CPB5	CPB5-SL-10	01/19/2006 14:35	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB7	CPB7-SL-1.5	01/12/2006 10:45	1.5	mg/kg	<1000	<2500	<1000	<1300	<1000	<1000	<1000	<1000	<1000	<2500	<2500	<1000	<1000	<1300	<1000	<2000	<1000
onsite	CPB7	CPB7-2SL-1.5	01/12/2006 10:46	1.5	mg/kg	<500	<1200	<500	<630	<500	<500	<500	<500	<500	<1200	<1200	<500	<500	<630	<500	<990	<500
onsite	CPB7	CPB7-SL-5	01/12/2006 11:00	5	mg/kg	<500	<1200	<500	<630	<500	<500	<500	<500	<500	<1200	<1200	<500	<500	<630	<500	<990	<500
onsite	CPB7	CPB7-SL-10	01/12/2006 11:10	10	mg/kg	<1.3	<3.3	<1.3	<1.7	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<3.3	<1.3	<1.3	<1.7	<1.3	<2.6	<1.3
onsite	CPB9	CPB9-SL-1.5	01/13/2006 9:40	1.5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB9	CPB9-SL-5	01/13/2006 9:45	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	CPB9	CPB9-SL-10	01/13/2006 9:50	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	DPW01	DPW01-SS-1.5	01/18/2006 13:10	1.5	mg/kg	<3.3	<8.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<8.3	<3.3	<3.3	<4.2	<3.3	<6.6	<3.3
onsite	DPW01	DPW01-SS-5	01/18/2006 13:15	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	DPW01	DPW01-SS-10	01/18/2006 13:20	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	DPW02	DPW02-SS-2	01/13/2006 10:25	2	mg/kg	<0.67	<1.7	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<1.7	<0.67	<0.67	<0.83	<0.67	<1.3	0.59
onsite	DPW02	DPW02-SS-5	01/13/2006 10:30	5	mg/kg	<3.3	<8.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<8.3	<3.3	<3.3	<4.2	<3.3	<6.6	<3.3
onsite	DPW03	DPW03-SS-2	01/13/2006 10:50	2	mg/kg	<1.3	<3.3	<1.3	<1.7	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<3.3	<1.3	<1.3	<1.7	<1.3	<2.6	<1.3
onsite	DPW03	DPW03-SS-5	01/13/2006 11:00	5	mg/kg	<0.67	<1.7	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<1.7	<0.67	<0.67	<0.83	<0.67	<1.3	<0.67
onsite	DPW04	DPW04-SS-2	01/13/2006 11:15	2	mg/kg	<100	<250	<100	<120	<100	<100	<100	<100	<100	<250	<250	<100	<100	<120	<100	<200	<100
onsite	DPW04	DPW04-SS-5	01/13/2006 11:20	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	DPW05	DPW05-SS-5	01/13/2006 11:35	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
bkgd; offsite LADPW	DPW10	DPW10-SS-2'	01/11/2006 10:20	2	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB01	HPB01-SL-1.5	02/08/2006 11:00	1.5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB01	HPB01-SL-5	02/08/2006 11:05	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB01	HPB01-SL-10	02/08/2006 11:15	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB02	HPB02-SL-1.5	02/09/2006 10:00	1.5	mg/kg	<0.67	<1.7	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<1.7	<0.67	<0.67	<0.83	<0.67	<1.3	<0.67
onsite	HPB02	HPB02-SL-5	02/09/2006 10:20	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB02	HPB02-2SL-5	02/09/2006 10:21	5	mg/kg	<1.3	<3.3	<1.3	<1.7	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<3.3	<1.3	<1.3	<1.7	<1.3	<2.6	<1.3
onsite	HPB02	HPB02-SL-10	02/09/2006 10:30	10	mg/kg	<0.67	<1.7	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<1.7	<0.67	<0.67	<0.83	<0.67	<1.3	<0.67
onsite	HPB03	HPB03-SL-1.5	02/08/2006 14:00	1.5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB03	HPB03-SL-5	02/08/2006 14:10	5	mg/kg	<0.67	<1.7	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<1.7	<0.67	<0.67	<0.83	<0.67	<1.3	<0.67
onsite	HPB03	HPB03-SL-10	02/08/2006 14:15	10	mg/kg	<20	<50	<20	<25	<20	<20	<20	<20	<20	<50	<50	<20	<20	<25	<20	<39	<20

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "SVOCs" semi-volatile organic compounds

Table A-1d
Summary of Soil Matrix Analytical Results, SVOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	2-Nitrophenol	3,3'-Dichloro benzidine	3-Nitroaniline	4,6-Dinitro-2-methylphenol	4-Bromophenyl phenyl ether	4-Chloro-3-methylphenol	4-Chloroaniline	4-Chlorophenyl phenyl ether	4-Methylphenol	4-Nitroaniline	4-Nitrophenol	Acenaphthene	Acenaphthylene	Aniline	Anthracene	Benzidine	Benzo(a) anthracene
onsite	HPB03	HPB03-2SL-10	02/08/2006 14:16	10	mg/kg	<6.6	<17	<6.6	<8.3	<6.6	<6.6	<6.6	<6.6	<6.6	<17	<17	<6.6	<6.6	<8.3	<6.6	<13	<6.6
onsite	HPB04	HPB04-SL-1.5	02/09/2006 14:25	1.5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB04	HPB04-SL-5	02/09/2006 14:35	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB04	HPB04-SL-10	02/09/2006 14:40	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB04	HPB04-2SL-10	02/09/2006 14:41	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB05	HPB05-SL-1.5	02/06/2006 11:10	1.5	mg/kg	<49	<120	<49	<61	<49	<49	<49	<49	<49	<120	<120	<49	<49	<61	<49	<97	<49
onsite	HPB05	HPB05-SL-5	02/06/2006 11:25	5	mg/kg	<5	<12	<5	<6.3	<5	<5	<5	<5	<5	<12	<12	<5	<5	<6.3	<5	<9.9	<5
onsite	HPB05	HPB05-2SL-5	02/06/2006 11:26	5	mg/kg	<10	<25	<10	<12	<10	<10	<10	<10	<10	<25	<25	<10	<10	<12	<10	<20	<10
onsite	HPB05	HPB05-SL-10	02/06/2006 11:40	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB06	HPB06-SL-1.5	02/06/2006 9:45	1.5	mg/kg	<3.3	<8.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<8.3	2	<3.3	<4.2	4	<6.6	6.4
onsite	HPB06	HPB06-SL-5	02/06/2006 10:00	5	mg/kg	<8.3	<21	<8.3	<10	<8.3	<8.3	<8.3	<8.3	<8.3	<21	<21	<8.3	<8.3	<10	<8.3	<16	<8.3
onsite	HPB06	HPB06-SL-10	02/06/2006 10:10	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB07	HPB07-SL-1.5	02/06/2006 13:40	1.5	mg/kg	<17	<41	<17	<21	<17	<17	<17	<17	<17	<41	<41	<17	<17	<21	<17	<33	<17
onsite	HPB07	HPB07-SL-5	02/06/2006 13:45	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB07	HPB07-2SL-5	02/06/2006 13:46	5	mg/kg	<1.3	<3.3	<1.3	<1.7	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<3.3	<1.3	<1.3	<1.7	<1.3	<2.6	<1.3
onsite	HPB07	HPB07-SL-10	02/06/2006 13:50	10	mg/kg	<41	<100	<41	<52	<41	<41	<41	<41	<41	<100	<100	<41	<41	<52	<41	<82	<41
onsite	HPB08	HPB08-SL-1.5	02/08/2006 9:00	1.5	mg/kg	<17	<41	<17	<21	<17	<17	<17	<17	<17	<41	<41	<17	<17	<21	<17	<33	<17
onsite	HPB08	HPB08-SL-5	02/08/2006 9:05	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB08	HPB08-SL-10	02/08/2006 9:10	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB09	HPB09-SL-1.5	02/09/2006 9:10	1.5	mg/kg	<3.3	<8.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<8.3	<3.3	<3.3	<4.2	<3.3	<6.6	<3.3
onsite	HPB09	HPB09-2SL-1.5	02/09/2006 9:11	1.5	mg/kg	<3.3	<8.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<8.3	<3.3	<3.3	<4.2	<3.3	<6.6	<3.3
onsite	HPB09	HPB09-SL-5	02/09/2006 9:15	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB09	HPB09-SL-10	02/09/2006 9:20	10	mg/kg	<0.67	<1.7	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<1.7	<0.67	<0.67	<0.83	<0.67	<1.3	<0.67
onsite	HPB09	HPB09-2SL-10	02/09/2006 9:21	10	mg/kg	<3.3	<8.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<8.3	<3.3	<3.3	<4.2	<3.3	<6.6	<3.3
onsite	HPB11	HPB11-SL-1.5	02/07/2006 13:40	1.5	mg/kg	<3.3	<8.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<8.3	<3.3	<3.3	<4.2	<3.3	<6.6	<3.3
onsite	HPB11	HPB11-SL-5	02/07/2006 13:45	5	mg/kg	<12	<31	<12	<16	<12	<12	<12	<12	<12	<31	<31	<12	<12	<16	<12	<25	<12
onsite	HPB11	HPB11-SL-10	02/07/2006 13:50	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB-12	HPB-12-SL-5-7	12/04/2006 13:00	7	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	HPB-12	HPB-12-SL-10-12	12/04/2006 13:05	12	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
offsite residential	RB01	RB01-SL-1.5	02/14/2006 9:40	1.5	mg/kg	<1.3	<3.3	<1.3	<1.7	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<3.3	<1.3	<1.3	<1.7	<1.3	<2.6	<1.3
offsite residential	RB01	RB01-SL-5	02/14/2006 9:50	5	mg/kg	<120	<300	<120	<150	<120	<120	<120	<120	<120	<300	<300	<120	<120	<150	<120	<240	<120
offsite residential	RB01	RB01-SL-10	02/14/2006 10:15	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
offsite residential	RB02	RB02-SL-1.5	02/14/2006 13:40	1.5	mg/kg	<0.67	<1.7	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<1.7	<0.67	<0.67	<0.83	<0.67	<1.3	<0.67
offsite residential	RB02	RB02-SL-5	02/14/2006 13:55	5	mg/kg	<25	<62	<25	<31	<25	<25	<25	<25	<25	<62	<62	<25	<25	<31	<25	<50	<25
offsite residential	RB02	RB02-SL-10	02/14/2006 14:05	10	mg/kg	<8.3	<21	<8.3	<10	<8.3	<8.3	<8.3	<8.3	<8.3	<21	<21	<8.3	<8.3	<10	<8.3	<16	<8.3
offsite residential	RB02	RB02-SL-10.5	02/14/2006 15:10	10.5	mg/kg	<8.3	<21	<8.3	<10	<8.3	<8.3	<8.3	<8.3	<8.3	<21	<21	<8.3	<8.3	<10	<8.3	<16	<8.3
offsite residential	RB03	RB03-SL-1.5	02/15/2006 9:15	1.5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
offsite residential	RB03	RB03-2SL-1.5	02/15/2006 9:16	1.5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
offsite residential	RB03	RB03-SL-5	02/15/2006 9:45	5	mg/kg	<1.3	<3.3	<1.3	<1.7	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<3.3	<1.3	<1.3	<1.7	<1.3	<2.6	<1.3
offsite residential	RB03	RB03-SL-10	02/15/2006 9:50	10	mg/kg	<82	<200	<82	<100	<82	<82	<82	<82	<82	<200	<200	<82	<82	<100	<82	<160	<82
onsite	SV02	SV02-SS-5	03/13/2006 13:20	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	SV02	SV02-SS-10	03/13/2006 13:40	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	SV03	SV03-SS-5	03/07/2006 11:20	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	SV03	SV03-2SS-5	03/07/2006 11:21	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	SV04	SV04-SS-5	03/07/2006 13:40	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	SV06	SV06-SS-5	03/07/2006 9:25	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	SV07	SV07-SS-5	03/07/2006 10:10	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	SV08	SV08-SS-5	03/07/2006 14:10	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	SV09	SV09-SS-05	03/08/2006 10:20	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	SV10	SV10-SS-5	03/13/2006 14:40	5	mg/kg	<170	<420	<170	<210	<170	<170	<170	<170	<170	<420	<420	<170	<170	<210	<170	<330	<170
onsite	SV10	SV10-SS-10	03/13/2006 14:50	10	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	SV12	SV12-SS-05	03/08/2006 9:30	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33
onsite	SV13	SV13-SS-5	03/07/2006 14:30	5	mg/kg	<0.33	<0.83	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.83	<0.33	<0.33	<0.42	<0.33	<0.66	<0.33

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "SVOCs" semi-volatile organic compounds

Table A-1d
Summary of Soil Matrix Analytical Results, SVOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Benzoic acid	Benzyl alcohol	Bis(2-chloroethoxy) methane	Bis(2-chloroethyl) ether	Bis(2-chloro isopropyl) ether	Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Chrysene	Dibenz(a,h) anthracene	Dibenzofuran	Diethyl phthalate	Dimethyl phthalate	Di-n-butyl phthalate
onsite	CPB02	CPB02-SL-1.5	01/17/2006 8:30	1.5	mg/kg	<170	<170	<170	<170	<420	<170	<170	<83	<170	<170	<170	180	<210	<170	<170	<170	<170
onsite	CPB02	CPB02-SL-5	01/17/2006 8:35	5	mg/kg	<6.6	<6.6	<6.6	<6.6	<17	<6.6	<6.6	<3.3	<6.6	<6.6	<6.6	<6.6	<8.3	<6.6	<6.6	<6.6	<6.6
onsite	CPB02	CPB02-SL-10	01/17/2006 8:40	10	mg/kg	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.33	<0.67	<0.67	<0.67	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67
onsite	CPB04	CPB04-SL-1.5	01/18/2006 10:20	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	0.3	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB04	CPB04-SL-5	01/18/2006 10:25	5	mg/kg	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.33	<0.67	<0.67	<0.67	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67
onsite	CPB04	CPB04-SL-10	01/18/2006 10:30	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB06	CPB06-SL-1.5	01/17/2006 10:00	1.5	mg/kg	<160	<160	<160	<160	<410	<160	<160	<83	<160	<160	<160	180	<210	<160	<160	<160	<160
onsite	CPB06	CPB06-SL-5	01/17/2006 10:05	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<0.67	<1.3	<1.3	<1.3	1.3	<1.7	<1.3	<1.3	<1.3	<1.3
onsite	CPB06	CPB06-SL-10	01/17/2006 10:10	10	mg/kg	<0.66	<0.66	<0.66	<0.66	<1.7	<0.66	<0.66	<0.33	<0.66	<0.66	<0.66	0.61	<0.83	<0.66	<0.66	<0.66	<0.66
onsite	CPB06	CPB06-2SL-10	01/17/2006 10:11	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	0.45	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB08	CPB08-SL-1.5	01/17/2006 14:50	1.5	mg/kg	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.33	<0.67	<0.67	<0.67	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67
onsite	CPB08	CPB08-SL-5	01/17/2006 14:55	5	mg/kg	<10	<10	<10	<10	<25	<10	<10	<5	<10	<10	<10	<10	<13	<10	<10	<10	<10
onsite	CPB08	CPB08-SL-10	01/17/2006 15:00	10	mg/kg	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<0.67	<1.3	<1.3	<1.3	0.85	<1.7	<1.3	<1.3	<1.3	<1.3
onsite	CPB1	CPB1-SL-1.5	01/19/2006 8:45	1.5	mg/kg	<500	<500	<500	<500	<1200	<500	<500	<250	<500	<500	<500	<500	<630	<500	<500	<500	<500
onsite	CPB1	CPB1-SL-5	01/19/2006 8:50	5	mg/kg	<120	<120	<120	<120	<310	<120	<120	<63	<120	<120	<120	64	<160	<120	<120	<120	<120
onsite	CPB1	CPB1-SL-10	01/19/2006 8:55	10	mg/kg	<83	<83	<83	<83	<210	<83	<83	<42	<83	<83	<83	65	<100	<83	<83	<83	<83
onsite	CPB10	CPB10-SL-1.5	01/10/2006 11:20	1.5	mg/kg	<250	<250	<250	<250	<620	<250	<250	<120	<250	<250	<250	180	<310	<250	<250	<250	<250
onsite	CPB10	CPB10-SL-5	01/10/2006 11:25	5	mg/kg	<250	<250	<250	<250	<620	<250	<250	<120	<250	<250	<250	180	<310	<250	<250	<250	<250
onsite	CPB10	CPB10-SL-10	01/10/2006 11:35	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB11	CPB11-SL-1.5	12/22/2005 12:50	1.5	mg/kg	<1000	<1000	<1000	<1000	<2500	<1000	<1000	<500	<1000	<1000	<1000	<1000	<1300	<1000	<1000	<1000	<1000
onsite	CPB11	CPB11-SL-5	12/22/2005 12:55	5	mg/kg	<8	<8	<8	<8	<20	<8	<8	<4	<8	<8	<8	<8	<10	<8	<8	<8	<8
onsite	CPB11	CPB11-SL-10	12/22/2005 13:00	10	mg/kg	<1000	<1000	<1000	<1000	<2500	<1000	<1000	<500	<1000	<1000	<1000	<1000	<1300	<1000	<1000	<1000	<1000
onsite	CPB11R	CPB11R-SL-1.5	01/10/2006 14:15	1.5	mg/kg	<250	<250	<250	<250	<620	<250	<250	<130	<250	<250	<250	150	<310	<250	<250	<250	<250
onsite	CPB11R	CPB11R-SL-5	01/10/2006 14:25	5	mg/kg	<250	<250	<250	<250	<620	<250	<250	<120	<250	<250	<250	180	<310	<250	<250	<250	<250
onsite	CPB11R	CPB11R-SL-10	01/10/2006 14:45	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB12	CPB12-SL-1.5	01/17/2006 14:00	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<1.7	<3.3	<3.3	<3.3	1.9	<4.2	<3.3	<3.3	<3.3	<3.3
onsite	CPB12	CPB12-SL-5	01/17/2006 14:05	5	mg/kg	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<1.7	<3.3	<3.3	<3.3	2.3	<4.2	<3.3	<3.3	<3.3	<3.3
onsite	CPB12	CPB12-SL-10	01/17/2006 14:10	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB13	CPB13-SL-1.5	01/16/2006 10:05	1.5	mg/kg	<62	<62	<62	<62	<160	<62	<62	<31	<62	<62	<62	57	<78	<62	<62	<62	<62
onsite	CPB13	CPB13-SL-5	01/16/2006 10:10	5	mg/kg	<6.2	<6.2	<6.2	<6.2	<15	<6.2	<6.2	<3.1	<6.2	<6.2	<6.2	<6.2	<7.8	<6.2	<6.2	<6.2	<6.2
onsite	CPB13	CPB13-SL-10	01/16/2006 10:15	10	mg/kg	<6.7	<6.7	<6.7	<6.7	<17	<6.7	<6.7	<3.3	<6.7	<6.7	<6.7	4.3	<8.3	<6.7	<6.7	<6.7	<6.7
onsite	CPB14	CPB14-SL-1.5	01/10/2006 9:50	1.5	mg/kg	<25	<25	<25	<25	<62	<25	<25	<12	<25	<25	<25	21	<31	<25	<25	<25	<25
onsite	CPB14	CPB14-SL-5	01/10/2006 10:00	5	mg/kg	<0.33	<0.33	<0.33	<0.33	0.24	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB14	CPB14-SL-10	01/10/2006 10:20	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	0.35	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB15	CPB15-SL-1.5'	12/20/2005 13:40	1.5	mg/kg	<480	<480	<480	<480	<1200	<480	<480	<240	<480	<480	<480	<480	<600	<480	<480	<480	<480
onsite	CPB15	CPB15-SL-5'	12/20/2005 13:45	5	mg/kg	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<1.7	<3.3	<3.3	<3.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3
onsite	CPB15	CPB15-SL-10'	12/20/2005 14:50	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB15	CPB15-SL-11'	12/20/2005 14:55	11	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB15R	CPB15R-SL-1.5	01/20/2006 10:00	1.5	mg/kg	<250	<250	<250	<250	<620	<250	<250	<120	<250	<250	<250	160	<310	<250	<250	<250	<250
onsite	CPB16	CPB16-SL-1.5	01/17/2006 13:00	1.5	mg/kg	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<0.67	<1.3	<1.3	<1.3	<1.3	<1.7	<1.3	<1.3	<1.3	<1.3
onsite	CPB16	CPB16-2SL-1.5	01/17/2006 13:01	1.5	mg/kg	<100	<100	<100	<100	<250	<100	<100	<50	<100	<100	<100	96	<120	<100	<100	<100	<100
onsite	CPB16	CPB16-SL-5	01/17/2006 13:05	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB16	CPB16-SL-10	01/17/2006 13:10	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB17	CPB17-SL-1.5	01/09/2006 15:19	1.5	mg/kg	<41	<41	<41	<41	<100	<41	<41	<21	<41	<41	<41	<41	<52	<41	<41	<41	<41
onsite	CPB17	CPB17-2SL-1.5	01/09/2006 15:20	1.5	mg/kg	<49	<49	<49	<49	<120	<49	<49	<25	<49	<49	<49	<49	<62	<49	<49	<49	<49
onsite	CPB17	CPB17-SL-5	01/09/2006 15:35	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB17	CPB17-SL-10	01/09/2006 15:45	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	0.26	0.34	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB18	CPB18-SL-1.5'	12/20/2005 9:28	1.5	mg/kg	<990	<990	<990	<990	<2500	<990	<990	<500	<990	<990	<990	<990	<1200	<990	<990	<990	<990
onsite	CPB18	CPB18-SL-5'	12/20/2005 9:40	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<0.67	<1.3	<1.3	<1.3	1.3	<1.7	<1.3	<1.3	<1.3	<1.3
onsite	CPB18	CPB18-SL-10'	12/20/2005 9:49	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB19	CPB19-SL-1.5	01/16/2006 9:00	1.5	mg/kg	<8.3	<8.3	<8.3	<8.3	<21	<8.3	<8.3	<4.2	<8.3	<8.3	<8.3	<8.3	<10	<8.3	<8.3	<8.3	<8.3
onsite	CPB19	CPB19-SL-5	01/16/2006 9:10	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB19	CPB19-2SL-5	01/16/2006 9:11	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "SVOCs" semi-volatile organic compounds

Table A-1d
Summary of Soil Matrix Analytical Results, SVOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Benzoic acid	Benzyl alcohol	Bis(2-chloroethoxy) methane	Bis(2-chloroethyl) ether	Bis(2-chloro isopropyl) ether	Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Chrysene	Dibenz(a,h) anthracene	Dibenzofuran	Diethyl phthalate	Dimethyl phthalate	Di-n-butyl phthalate
onsite	CPB19	CPB19-SL-10	01/16/2006 9:20	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB20	CPB20-SL-1.5	01/17/2006 11:15	1.5	mg/kg	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.33	<0.67	<0.67	<0.67	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67
onsite	CPB20	CPB20-SL-5	01/17/2006 11:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB20	CPB20-SL-10	01/17/2006 11:25	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB21	CPB21-SL-1.5	01/13/2006 8:40	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB21	CPB21-SL-5	01/13/2006 8:50	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB21	CPB21-SL-10	01/13/2006 9:00	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB22	CPB22-SL-1.5	01/12/2006 15:10	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB22	CPB22-SL-5	01/12/2006 15:15	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB22	CPB22-SL-10	01/12/2006 15:20	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB23	CPB23-SL-1.5	01/18/2006 14:30	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<1.7	<3.3	<3.3	<3.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3
onsite	CPB23	CPB23-SL-5	01/18/2006 14:35	5	mg/kg	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.33	<0.67	<0.67	<0.67	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67
onsite	CPB23	CPB23-SL-10	01/18/2006 14:40	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	0.26	<0.33	<0.33
onsite	CPB24	CPB24-SL-1.5	01/20/2006 9:20	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB24	CPB24-SL-5.0	01/20/2006 9:25	5	mg/kg	<6.7	<6.7	<6.7	<6.7	<17	<6.7	<6.7	<3.3	<6.7	<6.7	<6.7	<6.7	<8.3	<6.7	<6.7	<6.7	<6.7
onsite	CPB24	CPB24-SL-10.0	01/20/2006 9:30	10	mg/kg	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<1.7	<3.3	<3.3	<3.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3
onsite	CPB-28	CPB-28-SL-5-7	12/05/2006 14:50	7	mg/kg	<0.33	<0.33	<0.33	<0.33	0.29	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB-28	CPB-28-SL-9-11	12/05/2006 15:00	11	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB3	CPB3-SL-1.5	01/12/2006 14:00	1.5	mg/kg	<500	<500	<500	<500	<1200	<500	<500	<250	<500	<500	<500	<500	<630	<500	<500	<500	<500
onsite	CPB3	CPB3-SL-5	01/12/2006 14:10	5	mg/kg	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<1.7	<3.3	<3.3	<3.3	5.9	<4.2	<3.3	<3.3	<3.3	<3.3
onsite	CPB3	CPB3-SL-10	01/12/2006 14:15	10	mg/kg	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.33	<0.67	<0.67	<0.67	0.4	<0.83	<0.67	<0.67	<0.67	<0.67
onsite	CPB-30	CPB-30-SL-8-10	12/06/2006 10:10	10	mg/kg	<2.7	<2.7	<2.7	<2.7	<6.7	<2.7	<2.7	<1.3	<2.7	<2.7	<2.7	1.6	<3.3	<2.7	<2.7	<2.7	<2.7
onsite	CPB5	CPB5-SL-1.5	01/19/2006 14:25	1.5	mg/kg	<250	<250	<250	<250	<620	<250	<250	<130	<250	<250	<250	190	<310	<250	<250	<250	<250
onsite	CPB5	CPB5-SL-5	01/19/2006 14:30	5	mg/kg	<17	<17	<17	<17	<42	<17	<17	<8.4	<17	<17	<17	<17	<21	<17	<17	<17	<17
onsite	CPB5	CPB5-SL-10	01/19/2006 14:35	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB7	CPB7-SL-1.5	01/12/2006 10:45	1.5	mg/kg	<1000	<1000	<1000	<1000	<2500	<1000	<1000	<500	<1000	<1000	<1000	<1000	<1300	<1000	<1000	<1000	<1000
onsite	CPB7	CPB7-2SL-1.5	01/12/2006 10:46	1.5	mg/kg	<500	<500	<500	<500	<1200	<500	<500	<250	<500	<500	<500	<500	<630	<500	<500	<500	<500
onsite	CPB7	CPB7-SL-5	01/12/2006 11:00	5	mg/kg	<500	<500	<500	<500	<1200	<500	<500	<250	<500	<500	<500	<500	<630	<500	<500	<500	<500
onsite	CPB7	CPB7-SL-10	01/12/2006 11:10	10	mg/kg	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<0.67	<1.3	<1.3	<1.3	1.9	<1.7	<1.3	<1.3	<1.3	<1.3
onsite	CPB9	CPB9-SL-1.5	01/13/2006 9:40	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB9	CPB9-SL-5	01/13/2006 9:45	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	CPB9	CPB9-SL-10	01/13/2006 9:50	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	DPW01	DPW01-SS-1.5	01/18/2006 13:10	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<1.7	<3.3	<3.3	<3.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3
onsite	DPW01	DPW01-SS-5	01/18/2006 13:15	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	DPW01	DPW01-SS-10	01/18/2006 13:20	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	0.23	<0.33	<0.33
onsite	DPW02	DPW02-SS-2	01/13/2006 10:25	2	mg/kg	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.33	<0.67	<0.67	<0.67	0.66	<0.83	<0.67	<0.67	<0.67	<0.67
onsite	DPW02	DPW02-SS-5	01/13/2006 10:30	5	mg/kg	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<1.7	<3.3	<3.3	<3.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3
onsite	DPW03	DPW03-SS-2	01/13/2006 10:50	2	mg/kg	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<0.67	<1.3	<1.3	<1.3	1.1	<1.7	<1.3	<1.3	<1.3	<1.3
onsite	DPW03	DPW03-SS-5	01/13/2006 11:00	5	mg/kg	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.33	<0.67	<0.67	<0.67	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67
onsite	DPW04	DPW04-SS-2	01/13/2006 11:15	2	mg/kg	<100	<100	<100	<100	<250	<100	<100	<50	<100	<100	<100	82	<120	<100	<100	<100	<100
onsite	DPW04	DPW04-SS-5	01/13/2006 11:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	DPW05	DPW05-SS-5	01/13/2006 11:35	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
bkgd; offsite LADPW	DPW10	DPW10-SS-2'	01/11/2006 10:20	2	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB01	HPB01-SL-1.5	02/08/2006 11:00	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB01	HPB01-SL-5	02/08/2006 11:05	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB01	HPB01-SL-10	02/08/2006 11:15	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB02	HPB02-SL-1.5	02/09/2006 10:00	1.5	mg/kg	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.33	<0.67	<0.67	<0.67	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67
onsite	HPB02	HPB02-SL-5	02/09/2006 10:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	0.22	<0.33	<0.33
onsite	HPB02	HPB02-2SL-5	02/09/2006 10:21	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<0.67	<1.3	<1.3	<1.3	0.71	<1.7	<1.3	<1.3	<1.3	<1.3
onsite	HPB02	HPB02-SL-10	02/09/2006 10:30	10	mg/kg	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.33	<0.67	<0.67	<0.67	0.66	<0.83	<0.67	<0.67	<0.67	<0.67
onsite	HPB03	HPB03-SL-1.5	02/08/2006 14:00	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB03	HPB03-SL-5	02/08/2006 14:10	5	mg/kg	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.33	<0.67	<0.67	<0.67	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67
onsite	HPB03	HPB03-SL-10	02/08/2006 14:15	10	mg/kg	<20	<20	<20	<20	<50	<20	<20	<10	<20	<20	<20	<20	<25	<20	<20	<20	<20

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "SVOCs" semi-volatile organic compounds

Table A-1d
Summary of Soil Matrix Analytical Results, SVOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Benzoic acid	Benzyl alcohol	Bis(2-chloroethoxy) methane	Bis(2-chloroethyl) ether	Bis(2-chloro isopropyl) ether	Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Chrysene	Dibenz(a,h) anthracene	Dibenzofuran	Diethyl phthalate	Dimethyl phthalate	Di-n-butyl phthalate
onsite	HPB03	HPB03-2SL-10	02/08/2006 14:16	10	mg/kg	<6.6	<6.6	<6.6	<6.6	<17	<6.6	<6.6	<3.3	<6.6	<6.6	<6.6	<6.6	<8.3	<6.6	<6.6	<6.6	<6.6
onsite	HPB04	HPB04-SL-1.5	02/09/2006 14:25	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB04	HPB04-SL-5	02/09/2006 14:35	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB04	HPB04-SL-10	02/09/2006 14:40	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	0.22	<0.33	<0.33
onsite	HPB04	HPB04-2SL-10	02/09/2006 14:41	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB05	HPB05-SL-1.5	02/06/2006 11:10	1.5	mg/kg	<49	<49	<49	<49	<120	<49	<49	<25	<49	<49	<49	52	<61	<49	<49	<49	<49
onsite	HPB05	HPB05-SL-5	02/06/2006 11:25	5	mg/kg	<5	<5	<5	<5	<12	<5	<5	<2.5	<5	<5	<5	<5	<6.3	<5	<5	<5	<5
onsite	HPB05	HPB05-2SL-5	02/06/2006 11:26	5	mg/kg	<10	<10	<10	<10	<25	<10	<10	<5	<10	<10	<10	<10	<12	<10	<10	<10	<10
onsite	HPB05	HPB05-SL-10	02/06/2006 11:40	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB06	HPB06-SL-1.5	02/06/2006 9:45	1.5	mg/kg	5.7	4.5	<3.3	5.2	<8.3	<3.3	<3.3	<1.7	<3.3	<3.3	<3.3	7.2	<4.2	<3.3	<3.3	<3.3	<3.3
onsite	HPB06	HPB06-SL-5	02/06/2006 10:00	5	mg/kg	<8.3	<8.3	<8.3	<8.3	<21	<8.3	<8.3	<4.2	<8.3	<8.3	<8.3	<8.3	<10	<8.3	<8.3	<8.3	<8.3
onsite	HPB06	HPB06-SL-10	02/06/2006 10:10	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB07	HPB07-SL-1.5	02/06/2006 13:40	1.5	mg/kg	<17	<17	<17	<17	<41	<17	<17	<8.3	<17	<17	<17	<17	<21	<17	<17	<17	<17
onsite	HPB07	HPB07-SL-5	02/06/2006 13:45	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB07	HPB07-2SL-5	02/06/2006 13:46	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<0.67	<1.3	<1.3	<1.3	<1.3	<1.7	<1.3	<1.3	<1.3	<1.3
onsite	HPB07	HPB07-SL-10	02/06/2006 13:50	10	mg/kg	<41	<41	<41	<41	<100	<41	<41	<21	<41	<41	<41	<41	<52	<41	<41	<41	<41
onsite	HPB08	HPB08-SL-1.5	02/08/2006 9:00	1.5	mg/kg	<17	<17	<17	<17	<41	<17	<17	<8.3	<17	<17	<17	8.1	<21	<17	<17	<17	<17
onsite	HPB08	HPB08-SL-5	02/08/2006 9:05	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB08	HPB08-SL-10	02/08/2006 9:10	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB09	HPB09-SL-1.5	02/09/2006 9:10	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<1.7	<3.3	<3.3	<3.3	1.8	<4.2	<3.3	<3.3	<3.3	<3.3
onsite	HPB09	HPB09-2SL-1.5	02/09/2006 9:11	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<1.7	<3.3	<3.3	<3.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3
onsite	HPB09	HPB09-SL-5	02/09/2006 9:15	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB09	HPB09-SL-10	02/09/2006 9:20	10	mg/kg	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.33	<0.67	<0.67	<0.67	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67
onsite	HPB09	HPB09-2SL-10	02/09/2006 9:21	10	mg/kg	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<1.7	<3.3	<3.3	<3.3	2.6	<4.2	<3.3	<3.3	<3.3	<3.3
onsite	HPB11	HPB11-SL-1.5	02/07/2006 13:40	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<1.7	<3.3	<3.3	<3.3	<3.3	<4.2	<3.3	<3.3	<3.3	<3.3
onsite	HPB11	HPB11-SL-5	02/07/2006 13:45	5	mg/kg	<12	<12	<12	<12	<31	<12	<12	<6.2	<12	<12	<12	11	<16	<12	<12	<12	<12
onsite	HPB11	HPB11-SL-10	02/07/2006 13:50	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB-12	HPB-12-SL-5-7	12/04/2006 13:00	7	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	HPB-12	HPB-12-SL-10-12	12/04/2006 13:05	12	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
offsite residential	RB01	RB01-SL-1.5	02/14/2006 9:40	1.5	mg/kg	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<0.67	<1.3	<1.3	<1.3	<1.3	<1.7	<1.3	<1.3	<1.3	<1.3
offsite residential	RB01	RB01-SL-5	02/14/2006 9:50	5	mg/kg	<120	<120	<120	<120	<300	<120	<120	<61	<120	<120	<120	170	<150	<120	<120	<120	<120
offsite residential	RB01	RB01-SL-10	02/14/2006 10:15	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
offsite residential	RB02	RB02-SL-1.5	02/14/2006 13:40	1.5	mg/kg	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.33	<0.67	<0.67	<0.67	<0.67	<0.83	<0.67	<0.67	<0.67	<0.67
offsite residential	RB02	RB02-SL-5	02/14/2006 13:55	5	mg/kg	<25	<25	<25	<25	<62	<25	<25	<13	<25	<25	<25	<25	<31	<25	<25	<25	<25
offsite residential	RB02	RB02-SL-10	02/14/2006 14:05	10	mg/kg	<8.3	<8.3	<8.3	<8.3	<21	<8.3	<8.3	<4.2	<8.3	<8.3	<8.3	<8.3	<10	<8.3	<8.3	<8.3	<8.3
offsite residential	RB02	RB02-SL-10.5	02/14/2006 15:10	10.5	mg/kg	<8.3	<8.3	<8.3	<8.3	<21	<8.3	<8.3	<4.2	<8.3	<8.3	<8.3	7	<10	<8.3	<8.3	<8.3	<8.3
offsite residential	RB03	RB03-SL-1.5	02/15/2006 9:15	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	0.27	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
offsite residential	RB03	RB03-2SL-1.5	02/15/2006 9:16	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
offsite residential	RB03	RB03-SL-5	02/15/2006 9:45	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<0.67	<1.3	<1.3	<1.3	<1.3	<1.7	<1.3	<1.3	<1.3	<1.3
offsite residential	RB03	RB03-SL-10	02/15/2006 9:50	10	mg/kg	<82	<82	<82	<82	<200	<82	<82	<41	<82	<82	<82	130	<100	<82	<82	<82	<82
onsite	SV02	SV02-SS-5	03/13/2006 13:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	SV02	SV02-SS-10	03/13/2006 13:40	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	SV03	SV03-SS-5	03/07/2006 11:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	SV03	SV03-2SS-5	03/07/2006 11:21	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	SV04	SV04-SS-5	03/07/2006 13:40	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	0.21	<0.33	<0.33
onsite	SV06	SV06-SS-5	03/07/2006 9:25	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	SV07	SV07-SS-5	03/07/2006 10:10	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	SV08	SV08-SS-5	03/07/2006 14:10	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	SV09	SV09-SS-05	03/08/2006 10:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	0.33	<0.33	<0.33
onsite	SV10	SV10-SS-5	03/13/2006 14:40	5	mg/kg	<170	<170	<170	<170	<420	<170	<170	<84	<170	<170	<170	230	<210	<170	<170	<170	<170
onsite	SV10	SV10-SS-10	03/13/2006 14:50	10	mg/kg	<0.33	<0.33	<0.33	<0.33	0.25	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	SV12	SV12-SS-05	03/08/2006 9:30	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33
onsite	SV13	SV13-SS-5	03/07/2006 14:30	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.17	<0.33	<0.33	<0.33	<0.33	<0.42	<0.33	<0.33	<0.33	<0.33

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "SVOCs" semi-volatile organic compounds

Table A-1d
Summary of Soil Matrix Analytical Results, SVOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Di-n-octyl phthalate	Fluoranthene	Fluorene	Hexachloro benzene	Hexachloro butadiene	Hexachloro cyclopentadiene	Hexachloro ethane	Indeno(1,2,3-cd)pyrene	Isophorone	Naphthalene	Nitrobenzene	N-Nitroso-di-n-propylamine	N-Nitrosodi phenylamine	Pentachloro phenol	Phenanthrene	Phenol	Pyrene
onsite	CPB02	CPB02-SL-1.5	01/17/2006 8:30	1.5	mg/kg	<170	<170	<170	<170	<170	<420	<170	<170	<170	<170	<170	<120	<170	<420	230	<170	<170
onsite	CPB02	CPB02-SL-5	01/17/2006 8:35	5	mg/kg	<6.6	<6.6	<6.6	<6.6	<6.6	<17	<6.6	<6.6	<6.6	<6.6	<6.6	<5	<6.6	<17	3.6	<6.6	<6.6
onsite	CPB02	CPB02-SL-10	01/17/2006 8:40	10	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.67	<0.67	<0.67	<0.5	<0.67	<1.7	<0.67	<0.67	<0.67
onsite	CPB04	CPB04-SL-1.5	01/18/2006 10:20	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB04	CPB04-SL-5	01/18/2006 10:25	5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.67	<0.67	<0.67	<0.5	<0.67	<1.7	<0.67	<0.67	<0.67
onsite	CPB04	CPB04-SL-10	01/18/2006 10:30	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB06	CPB06-SL-1.5	01/17/2006 10:00	1.5	mg/kg	<160	<160	<160	<160	<160	<410	<160	<160	<160	<160	<160	<120	<160	<410	240	<160	<160
onsite	CPB06	CPB06-SL-5	01/17/2006 10:05	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1	<1.3	<3.3	1.5	<1.3	<1.3
onsite	CPB06	CPB06-SL-10	01/17/2006 10:10	10	mg/kg	<0.66	<0.66	<0.66	<0.66	<0.66	<1.7	<0.66	<0.66	<0.66	<0.66	<0.66	<0.5	<0.66	<1.7	0.51	<0.66	<0.66
onsite	CPB06	CPB06-2SL-10	01/17/2006 10:11	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	0.36	<0.33	0.16
onsite	CPB08	CPB08-SL-1.5	01/17/2006 14:50	1.5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.67	<0.67	<0.67	<0.5	<0.67	<1.7	<0.67	<0.67	<0.67
onsite	CPB08	CPB08-SL-5	01/17/2006 14:55	5	mg/kg	<10	<10	<10	<10	<10	<25	<10	<10	<10	<10	<10	<7.5	<10	<25	<10	<10	<10
onsite	CPB08	CPB08-SL-10	01/17/2006 15:00	10	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1	<1.3	<3.3	<1.3	<1.3	<1.3
onsite	CPB1	CPB1-SL-1.5	01/19/2006 8:45	1.5	mg/kg	<500	<500	<500	<500	<500	<1200	<500	<500	<500	<500	<500	<380	<500	<1200	270	<500	<500
onsite	CPB1	CPB1-SL-5	01/19/2006 8:50	5	mg/kg	<120	<120	<120	<120	<120	<310	<120	<120	<120	<120	<120	<94	<120	<310	110	<120	<120
onsite	CPB1	CPB1-SL-10	01/19/2006 8:55	10	mg/kg	<83	<83	<83	<83	<83	<210	<83	<83	<83	<83	<83	<62	<83	<210	89	<83	<83
onsite	CPB10	CPB10-SL-1.5	01/10/2006 11:20	1.5	mg/kg	<250	<250	<250	<250	<250	<620	<250	<250	<250	<250	<250	<190	<250	<620	150	<250	<250
onsite	CPB10	CPB10-SL-5	01/10/2006 11:25	5	mg/kg	<250	<250	<250	<250	<250	<620	<250	<250	<250	<250	<250	<190	<250	<620	200	<250	<250
onsite	CPB10	CPB10-SL-10	01/10/2006 11:35	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB11	CPB11-SL-1.5	12/22/2005 12:50	1.5	mg/kg	<1000	<1000	<1000	<1000	<1000	<2500	<1000	<1000	<1000	<1000	<1000	<750	<1000	<2500	<1000	<1000	<1000
onsite	CPB11	CPB11-SL-5	12/22/2005 12:55	5	mg/kg	<8	<8	<8	<8	<8	<20	<8	<8	<8	<8	<8	<6	<8	<20	4.8	<8	<8
onsite	CPB11	CPB11-SL-10	12/22/2005 13:00	10	mg/kg	<1000	<1000	<1000	<1000	<1000	<2500	<1000	<1000	<1000	<1000	<1000	<750	<1000	<2500	<1000	<1000	<1000
onsite	CPB11R	CPB11R-SL-1.5	01/10/2006 14:15	1.5	mg/kg	<250	<250	<250	<250	<250	<620	<250	<250	<250	<250	<250	<190	<250	<620	180	<250	<250
onsite	CPB11R	CPB11R-SL-5	01/10/2006 14:25	5	mg/kg	<250	<250	<250	<250	<250	<620	<250	<250	<250	<250	<250	<190	<250	<620	240	<250	<250
onsite	CPB11R	CPB11R-SL-10	01/10/2006 14:45	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB12	CPB12-SL-1.5	01/17/2006 14:00	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<3.3	<3.3	<3.3	<2.5	<3.3	<8.3	<3.3	<3.3	<3.3
onsite	CPB12	CPB12-SL-5	01/17/2006 14:05	5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<3.3	<3.3	<3.3	<2.5	<3.3	<8.3	<3.3	<3.3	<3.3
onsite	CPB12	CPB12-SL-10	01/17/2006 14:10	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB13	CPB13-SL-1.5	01/16/2006 10:05	1.5	mg/kg	<62	<62	<62	<62	<62	<160	<62	<62	<62	<62	<62	<47	<62	<160	52	<62	<62
onsite	CPB13	CPB13-SL-5	01/16/2006 10:10	5	mg/kg	<6.2	<6.2	<6.2	<6.2	<6.2	<15	<6.2	<6.2	<6.2	<6.2	<6.2	<4.6	<6.2	<15	<6.2	<6.2	<6.2
onsite	CPB13	CPB13-SL-10	01/16/2006 10:15	10	mg/kg	<6.7	<6.7	<6.7	<6.7	<6.7	<17	<6.7	<6.7	<6.7	<6.7	<6.7	<5	<6.7	<17	<6.7	<6.7	<6.7
onsite	CPB14	CPB14-SL-1.5	01/10/2006 9:50	1.5	mg/kg	<25	<25	<25	<25	<25	<62	<25	<25	<25	<25	<25	<18	<25	<62	17	<25	<25
onsite	CPB14	CPB14-SL-5	01/10/2006 10:00	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	0.19	<0.33	<0.33
onsite	CPB14	CPB14-SL-10	01/10/2006 10:20	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	0.57	<0.33	<0.33
onsite	CPB15	CPB15-SL-1.5'	12/20/2005 13:40	1.5	mg/kg	<480	<480	<480	<480	<480	<1200	<480	<480	<480	<480	<480	<360	<480	<1200	300	<480	<480
onsite	CPB15	CPB15-SL-5'	12/20/2005 13:45	5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<3.3	<3.3	<3.3	<2.5	<3.3	<8.3	<3.3	<3.3	<3.3
onsite	CPB15	CPB15-SL-10'	12/20/2005 14:50	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB15	CPB15-SL-11'	12/20/2005 14:55	11	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB15R	CPB15R-SL-1.5	01/20/2006 10:00	1.5	mg/kg	<250	<250	<250	<250	<250	<620	<250	<250	<250	<250	<250	<190	<250	<620	300	<250	<250
onsite	CPB16	CPB16-SL-1.5	01/17/2006 13:00	1.5	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1	<1.3	<3.3	<1.3	<1.3	<1.3
onsite	CPB16	CPB16-2SL-1.5	01/17/2006 13:01	1.5	mg/kg	<100	<100	<100	<100	<100	<250	<100	<100	<100	<100	<100	<75	<100	<250	110	<100	<100
onsite	CPB16	CPB16-SL-5	01/17/2006 13:05	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB16	CPB16-SL-10	01/17/2006 13:10	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB17	CPB17-SL-1.5	01/09/2006 15:19	1.5	mg/kg	<41	<41	<41	<41	<41	<100	<41	<41	<41	<41	<41	<31	<41	<100	30	<41	<41
onsite	CPB17	CPB17-2SL-1.5	01/09/2006 15:20	1.5	mg/kg	<49	<49	<49	<49	<49	<120	<49	<49	<49	<49	<49	<37	<49	<120	35	<49	<49
onsite	CPB17	CPB17-SL-5	01/09/2006 15:35	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB17	CPB17-SL-10	01/09/2006 15:45	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	0.56	<0.33	<0.33
onsite	CPB18	CPB18-SL-1.5'	12/20/2005 9:28	1.5	mg/kg	<990	<990	<990	<990	<990	<2500	<990	<990	<990	<990	<990	<740	<990	<2500	<990	<990	<990
onsite	CPB18	CPB18-SL-5'	12/20/2005 9:40	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1	<1.3	<3.3	1.6	<1.3	<1.3
onsite	CPB18	CPB18-SL-10'	12/20/2005 9:49	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB19	CPB19-SL-1.5	01/16/2006 9:00	1.5	mg/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<21	<8.3	<8.3	<8.3	<8.3	<8.3	<6.2	<8.3	<21	<8.3	<8.3	<8.3
onsite	CPB19	CPB19-SL-5	01/16/2006 9:10	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB19	CPB19-2SL-5	01/16/2006 9:11	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "SVOCs" semi-volatile organic compounds

Table A-1d
Summary of Soil Matrix Analytical Results, SVOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Di-n-octyl phthalate	Fluoranthene	Fluorene	Hexachloro benzene	Hexachloro butadiene	Hexachloro cyclopentadiene	Hexachloro ethane	Indeno(1,2,3-cd)pyrene	Isophorone	Naphthalene	Nitrobenzene	N-Nitroso-di-n-propylamine	N-Nitrosodi phenylamine	Pentachloro phenol	Phenanthrene	Phenol	Pyrene
onsite	CPB19	CPB19-SL-10	01/16/2006 9:20	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB20	CPB20-SL-1.5	01/17/2006 11:15	1.5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.67	<0.67	<0.67	<0.5	<0.67	<1.7	<0.67	<0.67	<0.67
onsite	CPB20	CPB20-SL-5	01/17/2006 11:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB20	CPB20-SL-10	01/17/2006 11:25	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB21	CPB21-SL-1.5	01/13/2006 8:40	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB21	CPB21-SL-5	01/13/2006 8:50	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB21	CPB21-SL-10	01/13/2006 9:00	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB22	CPB22-SL-1.5	01/12/2006 15:10	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB22	CPB22-SL-5	01/12/2006 15:15	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB22	CPB22-SL-10	01/12/2006 15:20	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB23	CPB23-SL-1.5	01/18/2006 14:30	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<3.3	<3.3	<3.3	<2.5	<3.3	<8.3	<3.3	<3.3	<3.3
onsite	CPB23	CPB23-SL-5	01/18/2006 14:35	5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.67	<0.67	<0.67	<0.5	<0.67	<1.7	<0.67	<0.67	<0.67
onsite	CPB23	CPB23-SL-10	01/18/2006 14:40	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB24	CPB24-SL-1.5	01/20/2006 9:20	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB24	CPB24-SL-5.0	01/20/2006 9:25	5	mg/kg	<6.7	<6.7	<6.7	<6.7	<6.7	<17	<6.7	<6.7	<6.7	<6.7	<6.7	<5	<6.7	<17	<6.7	<6.7	<6.7
onsite	CPB24	CPB24-SL-10.0	01/20/2006 9:30	10	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<3.3	<3.3	<3.3	<2.5	<3.3	<8.3	<3.3	<3.3	<3.3
onsite	CPB-28	CPB-28-SL-5-7	12/05/2006 14:50	7	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB-28	CPB-28-SL-9-11	12/05/2006 15:00	11	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB3	CPB3-SL-1.5	01/12/2006 14:00	1.5	mg/kg	<500	<500	<500	<500	<500	<1200	<500	<500	<500	<500	<500	<380	<500	<1200	280	<500	<500
onsite	CPB3	CPB3-SL-5	01/12/2006 14:10	5	mg/kg	<3.3	<3.3	3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<3.3	<3.3	<3.3	<2.5	<3.3	<8.3	5.4	<3.3	2.8
onsite	CPB3	CPB3-SL-10	01/12/2006 14:15	10	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.67	<0.67	<0.67	<0.5	<0.67	<1.7	0.52	<0.67	<0.67
onsite	CPB-30	CPB-30-SL-8-10	12/06/2006 10:10	10	mg/kg	<2.7	<2.7	1.3	<2.7	<2.7	<6.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2	<2.7	<6.7	<2.7	<2.7	<2.7
onsite	CPB5	CPB5-SL-1.5	01/19/2006 14:25	1.5	mg/kg	<250	<250	<250	<250	<250	<620	<250	<250	<250	<250	<250	<190	<250	<620	190	<250	<250
onsite	CPB5	CPB5-SL-5	01/19/2006 14:30	5	mg/kg	<17	<17	<17	<17	<17	<42	<17	<17	<17	<17	<17	<12	<17	<42	16	<17	<17
onsite	CPB5	CPB5-SL-10	01/19/2006 14:35	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB7	CPB7-SL-1.5	01/12/2006 10:45	1.5	mg/kg	<1000	<1000	<1000	<1000	<1000	<2500	<1000	<1000	<1000	<1000	<1000	<750	<1000	<2500	<1000	<1000	<1000
onsite	CPB7	CPB7-2SL-1.5	01/12/2006 10:46	1.5	mg/kg	<500	<500	<500	<500	<500	<1200	<500	<500	<500	<500	<500	<380	<500	<1200	280	<500	<500
onsite	CPB7	CPB7-SL-5	01/12/2006 11:00	5	mg/kg	<500	<500	<500	<500	<500	<1200	<500	<500	<500	<500	<500	<380	<500	<1200	<500	<500	<500
onsite	CPB7	CPB7-SL-10	01/12/2006 11:10	10	mg/kg	<1.3	<1.3	0.74	<1.3	<1.3	<3.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1	<1.3	<3.3	0.9	<1.3	0.71
onsite	CPB9	CPB9-SL-1.5	01/13/2006 9:40	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB9	CPB9-SL-5	01/13/2006 9:45	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	CPB9	CPB9-SL-10	01/13/2006 9:50	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	DPW01	DPW01-SS-1.5	01/18/2006 13:10	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<3.3	<3.3	<3.3	<2.5	<3.3	<8.3	<3.3	<3.3	<3.3
onsite	DPW01	DPW01-SS-5	01/18/2006 13:15	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	DPW01	DPW01-SS-10	01/18/2006 13:20	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	DPW02	DPW02-SS-2	01/13/2006 10:25	2	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.67	<0.67	<0.67	<0.5	<0.67	<1.7	<0.67	<0.67	0.36
onsite	DPW02	DPW02-SS-5	01/13/2006 10:30	5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<3.3	<3.3	<3.3	<2.5	<3.3	<8.3	<3.3	<3.3	<3.3
onsite	DPW03	DPW03-SS-2	01/13/2006 10:50	2	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1	<1.3	<3.3	1.3	<1.3	<1.3
onsite	DPW03	DPW03-SS-5	01/13/2006 11:00	5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.67	<0.67	<0.67	<0.5	<0.67	<1.7	0.44	<0.67	<0.67
onsite	DPW04	DPW04-SS-2	01/13/2006 11:15	2	mg/kg	<100	<100	<100	<100	<100	<250	<100	<100	<100	<100	<100	<75	<100	<250	94	<100	<100
onsite	DPW04	DPW04-SS-5	01/13/2006 11:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	DPW05	DPW05-SS-5	01/13/2006 11:35	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
bkgd; offsite LADPW	DPW10	DPW10-SS-2'	01/11/2006 10:20	2	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB01	HPB01-SL-1.5	02/08/2006 11:00	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB01	HPB01-SL-5	02/08/2006 11:05	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB01	HPB01-SL-10	02/08/2006 11:15	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB02	HPB02-SL-1.5	02/09/2006 10:00	1.5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.67	<0.67	<0.67	<0.5	<0.67	<1.7	<0.67	<0.67	<0.67
onsite	HPB02	HPB02-SL-5	02/09/2006 10:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB02	HPB02-2SL-5	02/09/2006 10:21	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1	<1.3	<3.3	<1.3	<1.3	<1.3
onsite	HPB02	HPB02-SL-10	02/09/2006 10:30	10	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.67	<0.67	<0.67	<0.5	<0.67	<1.7	0.99	<0.67	<0.67
onsite	HPB03	HPB03-SL-1.5	02/08/2006 14:00	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB03	HPB03-SL-5	02/08/2006 14:10	5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.67	<0.67	<0.67	<0.5	<0.67	<1.7	<0.67	<0.67	<0.67
onsite	HPB03	HPB03-SL-10	02/08/2006 14:15	10	mg/kg	<20	<20	<20	<20	<20	<50	<20	<20	<20	<20	<20	<15	<20	<50	16	<20	<20

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "SVOCs" semi-volatile organic compounds

Table A-1d
Summary of Soil Matrix Analytical Results, SVOCs
Gardena Sumps

Study Area	Location	Sample Name	Sample Date	Sample Depth (ft bgs)	Units	Di-n-octyl phthalate	Fluoranthene	Fluorene	Hexachloro benzene	Hexachloro butadiene	Hexachloro cyclopentadiene	Hexachloro ethane	Indeno(1,2,3-cd)pyrene	Isophorone	Naphthalene	Nitrobenzene	N-Nitroso-di-n-propylamine	N-Nitrosodi phenylamine	Pentachloro phenol	Phenanthrene	Phenol	Pyrene
onsite	HPB03	HPB03-2SL-10	02/08/2006 14:16	10	mg/kg	<6.6	<6.6	<6.6	<6.6	<6.6	<17	<6.6	<6.6	<6.6	<6.6	<6.6	<5	<6.6	<17	5.1	<6.6	<6.6
onsite	HPB04	HPB04-SL-1.5	02/09/2006 14:25	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB04	HPB04-SL-5	02/09/2006 14:35	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB04	HPB04-SL-10	02/09/2006 14:40	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB04	HPB04-2SL-10	02/09/2006 14:41	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB05	HPB05-SL-1.5	02/06/2006 11:10	1.5	mg/kg	<49	<49	<49	<49	<49	<120	<49	<49	<49	<49	<49	<37	<49	<120	100	<49	<49
onsite	HPB05	HPB05-SL-5	02/06/2006 11:25	5	mg/kg	<5	<5	<5	<5	<5	<12	<5	<5	<5	<5	<5	<3.7	<5	<12	3.4	<5	<5
onsite	HPB05	HPB05-2SL-5	02/06/2006 11:26	5	mg/kg	<10	<10	<10	<10	<10	<25	<10	<10	<10	<10	<10	<7.5	<10	<25	13	<10	<10
onsite	HPB05	HPB05-SL-10	02/06/2006 11:40	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB06	HPB06-SL-1.5	02/06/2006 9:45	1.5	mg/kg	<3.3	16	<3.3	<3.3	<3.3	<8.3	<3.3	2.8	<3.3	<3.3	<3.3	<2.5	<3.3	<8.3	19	<3.3	20
onsite	HPB06	HPB06-SL-5	02/06/2006 10:00	5	mg/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<21	<8.3	<8.3	<8.3	<8.3	<8.3	<6.2	<8.3	<21	<8.3	<8.3	<8.3
onsite	HPB06	HPB06-SL-10	02/06/2006 10:10	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB07	HPB07-SL-1.5	02/06/2006 13:40	1.5	mg/kg	<17	<17	<17	<17	<17	<41	<17	<17	<17	<17	<17	<12	<17	<41	<17	<17	<17
onsite	HPB07	HPB07-SL-5	02/06/2006 13:45	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB07	HPB07-2SL-5	02/06/2006 13:46	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1	<1.3	<3.3	<1.3	<1.3	<1.3
onsite	HPB07	HPB07-SL-10	02/06/2006 13:50	10	mg/kg	<41	<41	<41	<41	<41	<100	<41	<41	<41	<41	<41	<31	<41	<100	<41	<41	<41
onsite	HPB08	HPB08-SL-1.5	02/08/2006 9:00	1.5	mg/kg	<17	<17	<17	<17	<17	<41	<17	<17	<17	<17	<17	<12	<17	<41	<17	<17	<17
onsite	HPB08	HPB08-SL-5	02/08/2006 9:05	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB08	HPB08-SL-10	02/08/2006 9:10	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB09	HPB09-SL-1.5	02/09/2006 9:10	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<3.3	<3.3	<3.3	<2.5	<3.3	<8.3	<3.3	<3.3	<3.3
onsite	HPB09	HPB09-2SL-1.5	02/09/2006 9:11	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<3.3	<3.3	<3.3	<2.5	<3.3	<8.3	<3.3	<3.3	<3.3
onsite	HPB09	HPB09-SL-5	02/09/2006 9:15	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB09	HPB09-SL-10	02/09/2006 9:20	10	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.67	<0.67	<0.67	<0.5	<0.67	<1.7	<0.67	<0.67	<0.67
onsite	HPB09	HPB09-2SL-10	02/09/2006 9:21	10	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<3.3	<3.3	<3.3	<2.5	<3.3	<8.3	2.6	<3.3	<3.3
onsite	HPB11	HPB11-SL-1.5	02/07/2006 13:40	1.5	mg/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<8.3	<3.3	<3.3	<3.3	<3.3	<3.3	<2.5	<3.3	<8.3	<3.3	<3.3	<3.3
onsite	HPB11	HPB11-SL-5	02/07/2006 13:45	5	mg/kg	<12	<12	<12	<12	<12	<31	<12	<12	<12	<12	<12	<9.3	<12	<31	17	<12	<12
onsite	HPB11	HPB11-SL-10	02/07/2006 13:50	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB-12	HPB-12-SL-5-7	12/04/2006 13:00	7	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	HPB-12	HPB-12-SL-10-12	12/04/2006 13:05	12	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
offsite residential	RB01	RB01-SL-1.5	02/14/2006 9:40	1.5	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1	<1.3	<3.3	<1.3	<1.3	<1.3
offsite residential	RB01	RB01-SL-5	02/14/2006 9:50	5	mg/kg	<120	<120	<120	<120	<120	<300	<120	<120	<120	<120	<120	<91	<120	<300	280	<120	<120
offsite residential	RB01	RB01-SL-10	02/14/2006 10:15	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
offsite residential	RB02	RB02-SL-1.5	02/14/2006 13:40	1.5	mg/kg	<0.67	<0.67	<0.67	<0.67	<0.67	<1.7	<0.67	<0.67	<0.67	<0.67	<0.67	<0.5	<0.67	<1.7	<0.67	<0.67	<0.67
offsite residential	RB02	RB02-SL-5	02/14/2006 13:55	5	mg/kg	<25	<25	<25	<25	<25	<62	<25	<25	<25	<25	<25	<19	<25	<62	<25	<25	<25
offsite residential	RB02	RB02-SL-10	02/14/2006 14:05	10	mg/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<21	<8.3	<8.3	<8.3	<8.3	<8.3	<6.2	<8.3	<21	6.2	<8.3	<8.3
offsite residential	RB02	RB02-SL-10.5	02/14/2006 15:10	10.5	mg/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<21	<8.3	<8.3	<8.3	<8.3	<8.3	<6.2	<8.3	<21	6.9	<8.3	<8.3
offsite residential	RB03	RB03-SL-1.5	02/15/2006 9:15	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
offsite residential	RB03	RB03-2SL-1.5	02/15/2006 9:16	1.5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
offsite residential	RB03	RB03-SL-5	02/15/2006 9:45	5	mg/kg	<1.3	<1.3	<1.3	<1.3	<1.3	<3.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1	<1.3	<3.3	<1.3	<1.3	<1.3
offsite residential	RB03	RB03-SL-10	02/15/2006 9:50	10	mg/kg	<82	<82	<82	<82	<82	<200	<82	<82	<82	<82	<82	<61	<82	<200	260	<82	<82
onsite	SV02	SV02-SS-5	03/13/2006 13:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	SV02	SV02-SS-10	03/13/2006 13:40	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	SV03	SV03-SS-5	03/07/2006 11:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	SV03	SV03-2SS-5	03/07/2006 11:21	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	SV04	SV04-SS-5	03/07/2006 13:40	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	SV06	SV06-SS-5	03/07/2006 9:25	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	SV07	SV07-SS-5	03/07/2006 10:10	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	SV08	SV08-SS-5	03/07/2006 14:10	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	SV09	SV09-SS-05	03/08/2006 10:20	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	SV10	SV10-SS-5	03/13/2006 14:40	5	mg/kg	<170	<170	<170	<170	<170	<420	<170	<170	<170	<170	<170	<120	<170	<420	240	<170	<170
onsite	SV10	SV10-SS-10	03/13/2006 14:50	10	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	0.24	<0.33	<0.33
onsite	SV12	SV12-SS-05	03/08/2006 9:30	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33
onsite	SV13	SV13-SS-5	03/07/2006 14:30	5	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.83	<0.33	<0.33	<0.33	<0.33	<0.33	<0.25	<0.33	<0.83	<0.33	<0.33	<0.33

Notes: "NA" not analyzed; "ft bgs" feet below ground surface; "SVOCs" semi-volatile organic compounds

Table A-1e
Derivation of BaP-Equivalent Concentrations
Gardena Sumps

Location	Sample Name	Sample Depth (ft bgs)	Sample Date	CAS Number	cPAH	Detected Value (mgkg)	Toxicity Equivalency Factor (TEF)	Converted Result (mg/kg)
CPB02	CPB02-SL-1.5	1.5	01/17/2006 8:30	56-55-3	Benzo(a)anthracene	26	0.1	2.6
CPB02	CPB02-SL-1.5	1.5	01/17/2006 8:30	205-99-2	Benzo(b)fluoranthene	31	0.1	3.1
CPB02	CPB02-SL-1.5	1.5	01/17/2006 8:30	207-08-9	Benzo(k)fluoranthene	6.1	0.1	0.6100
CPB02	CPB02-SL-1.5	1.5	01/17/2006 8:30	218-01-9	Chrysene	180	0.01	1.8
CPB02		1.5			**BaP-equivalent**			**8.1**
CPB02	CPB02-SL-5	5	01/17/2006 8:35	56-55-3	Benzo(a)anthracene	3.9	0.1	0.3900
CPB02	CPB02-SL-5	5	01/17/2006 8:35	205-99-2	Benzo(b)fluoranthene	4.2	0.1	0.4200
CPB02	CPB02-SL-5	5	01/17/2006 8:35	218-01-9	Chrysene	17	0.01	0.1700
CPB02		5			**BaP-equivalent**			**0.98**
CPB02	CPB02-SL-10	10	01/17/2006 8:40	56-55-3	Benzo(a)anthracene	0.3900	0.1	0.0390
CPB02	CPB02-SL-10	10	01/17/2006 8:40	50-32-8	Benzo(a)pyrene	0.8100	1	0.8100
CPB02	CPB02-SL-10	10	01/17/2006 8:40	205-99-2	Benzo(b)fluoranthene	0.4800	0.1	0.0480
CPB02	CPB02-SL-10	10	01/17/2006 8:40	207-08-9	Benzo(k)fluoranthene	0.0930	0.1	0.0093
CPB02	CPB02-SL-10	10	01/17/2006 8:40	218-01-9	Chrysene	2.2	0.01	0.0220
CPB02	CPB02-SL-10	10	01/17/2006 8:40	53-70-3	Dibenz(a,h)anthracene	0.0340	0.34	0.0116
CPB02		10			**BaP-equivalent**			**0.94**
CPB04	CPB04-SL-1.5	1.5	01/18/2006 10:20	205-99-2	Benzo(b)fluoranthene	0.0036	0.1	0.0004
CPB04	CPB04-SL-1.5	1.5	01/18/2006 10:20	218-01-9	Chrysene	0.0091	0.01	0.00009
CPB04		1.5			**BaP-equivalent**			**0.0005**
CPB04	CPB04-SL-5	5	01/18/2006 10:25	53-70-3	Dibenz(a,h)anthracene	0.0210	0.34	0.0071
CPB04		5			**BaP-equivalent**			**0.007**
CPB06	CPB06-SL-1.5	1.5	01/17/2006 10:00	56-55-3	Benzo(a)anthracene	74	0.1	7.4
CPB06	CPB06-SL-1.5	1.5	01/17/2006 10:00	50-32-8	Benzo(a)pyrene	130	1	130
CPB06	CPB06-SL-1.5	1.5	01/17/2006 10:00	205-99-2	Benzo(b)fluoranthene	81	0.1	8.1
CPB06	CPB06-SL-1.5	1.5	01/17/2006 10:00	207-08-9	Benzo(k)fluoranthene	13	0.1	1.3
CPB06	CPB06-SL-1.5	1.5	01/17/2006 10:00	218-01-9	Chrysene	430	0.01	4.3
CPB06	CPB06-SL-1.5	1.5	01/17/2006 10:00	53-70-3	Dibenz(a,h)anthracene	46	0.34	15.64
CPB06		1.5			**BaP-equivalent**			**167**
CPB06	CPB06-SL-5	5	01/17/2006 10:05	56-55-3	Benzo(a)anthracene	18	0.1	1.8
CPB06	CPB06-SL-5	5	01/17/2006 10:05	205-99-2	Benzo(b)fluoranthene	22	0.1	2.2
CPB06	CPB06-SL-5	5	01/17/2006 10:05	207-08-9	Benzo(k)fluoranthene	5	0.1	0.5000
CPB06	CPB06-SL-5	5	01/17/2006 10:05	218-01-9	Chrysene	100	0.01	1
CPB06	CPB06-SL-5	5	01/17/2006 10:05	53-70-3	Dibenz(a,h)anthracene	2.1	0.34	0.7140
CPB06		5			**BaP-equivalent**			**6.2**
CPB06	CPB06-2SL-10	10	01/17/2006 10:11	56-55-3	Benzo(a)anthracene	0.2400	0.1	0.0240
CPB06	CPB06-2SL-10	10	01/17/2006 10:11	50-32-8	Benzo(a)pyrene	0.0780	1	0.0780
CPB06	CPB06-2SL-10	10	01/17/2006 10:11	205-99-2	Benzo(b)fluoranthene	0.6800	0.1	0.0680
CPB06	CPB06-2SL-10	10	01/17/2006 10:11	207-08-9	Benzo(k)fluoranthene	0.0580	0.1	0.0058
CPB06	CPB06-2SL-10	10	01/17/2006 10:11	218-01-9	Chrysene	1.6	0.01	0.0160
CPB06	CPB06-SL-10	10	01/17/2006 10:10	53-70-3	Dibenz(a,h)anthracene	0.3100	0.34	0.1054
CPB06		10			**BaP-equivalent**			**0.3**
CPB08	CPB08-SL-1.5	1.5	01/17/2006 14:50	56-55-3	Benzo(a)anthracene	1.9	0.1	0.1900
CPB08	CPB08-SL-1.5	1.5	01/17/2006 14:50	50-32-8	Benzo(a)pyrene	0.4700	1	0.4700
CPB08	CPB08-SL-1.5	1.5	01/17/2006 14:50	205-99-2	Benzo(b)fluoranthene	3.8	0.1	0.3800
CPB08	CPB08-SL-1.5	1.5	01/17/2006 14:50	207-08-9	Benzo(k)fluoranthene	0.2700	0.1	0.0270
CPB08	CPB08-SL-1.5	1.5	01/17/2006 14:50	218-01-9	Chrysene	9.4	0.01	0.0940
CPB08	CPB08-SL-1.5	1.5	01/17/2006 14:50	53-70-3	Dibenz(a,h)anthracene	0.1900	0.34	0.0646
CPB08		1.5			**BaP-equivalent**			**1.2**
CPB08	CPB08-SL-5	5	01/17/2006 14:55	56-55-3	Benzo(a)anthracene	0.0360	0.1	0.0036
CPB08	CPB08-SL-5	5	01/17/2006 14:55	50-32-8	Benzo(a)pyrene	0.0860	1	0.0860
CPB08	CPB08-SL-5	5	01/17/2006 14:55	205-99-2	Benzo(b)fluoranthene	0.0760	0.1	0.0076

Notes: "ft bgs" feet below ground surface; "cPAH" carcinogenic polynuclear aromatic hydrocarbon; "BaP" benzo(a)pyrene; Converted Result = [cPAH] x TEF

Table A-1e
Derivation of BaP-Equivalent Concentrations
Gardena Sumps

Location	Sample Name	Sample Depth (ft bgs)	Sample Date	CAS Number	cPAH	Detected Value (mgkg)	Toxicity Equivalency Factor (TEF)	Converted Result (mg/kg)
CPB08	CPB08-SL-5	5	01/17/2006 14:55	207-08-9	Benzo(k)fluoranthene	0.0059	0.1	0.0006
CPB08	CPB08-SL-5	5	01/17/2006 14:55	218-01-9	Chrysene	0.1600	0.01	0.0016
CPB08	CPB08-SL-5	5	01/17/2006 14:55	53-70-3	Dibenz(a,h)anthracene	0.0039	0.34	0.0013
CPB08		5			**BaP-equivalent**			**0.1**
CPB08	CPB08-SL-10	10	01/17/2006 15:00	56-55-3	Benzo(a)anthracene	0.5900	0.1	0.0590
CPB08	CPB08-SL-10	10	01/17/2006 15:00	205-99-2	Benzo(b)fluoranthene	2.5	0.1	0.2500
CPB08	CPB08-SL-10	10	01/17/2006 15:00	218-01-9	Chrysene	6	0.01	0.0600
CPB08		10			**BaP-equivalent**			**0.37**
CPB1	CPB1-SL-1.5	1.5	01/19/2006 8:45	56-55-3	Benzo(a)anthracene	30	0.1	3
CPB1	CPB1-SL-1.5	1.5	01/19/2006 8:45	50-32-8	Benzo(a)pyrene	56	1	56
CPB1	CPB1-SL-1.5	1.5	01/19/2006 8:45	205-99-2	Benzo(b)fluoranthene	49	0.1	4.9
CPB1	CPB1-SL-1.5	1.5	01/19/2006 8:45	207-08-9	Benzo(k)fluoranthene	6.4	0.1	0.6400
CPB1	CPB1-SL-1.5	1.5	01/19/2006 8:45	218-01-9	Chrysene	170	0.01	1.7
CPB1	CPB1-SL-1.5	1.5	01/19/2006 8:45	53-70-3	Dibenz(a,h)anthracene	1.9	0.34	0.6460
CPB1		1.5			**BaP-equivalent**			**67**
CPB1	CPB1-SL-5	5	01/19/2006 8:50	56-55-3	Benzo(a)anthracene	23	0.1	2.3
CPB1	CPB1-SL-5	5	01/19/2006 8:50	50-32-8	Benzo(a)pyrene	18	1	18
CPB1	CPB1-SL-5	5	01/19/2006 8:50	205-99-2	Benzo(b)fluoranthene	11	0.1	1.1
CPB1	CPB1-SL-5	5	01/19/2006 8:50	207-08-9	Benzo(k)fluoranthene	1.6	0.1	0.1600
CPB1	CPB1-SL-5	5	01/19/2006 8:50	218-01-9	Chrysene	64	0.01	0.6400
CPB1		5			**BaP-equivalent**			**22**
CPB1	CPB1-SL-10	10	01/19/2006 8:55	56-55-3	Benzo(a)anthracene	20	0.1	2
CPB1	CPB1-SL-10	10	01/19/2006 8:55	50-32-8	Benzo(a)pyrene	34	1	34
CPB1	CPB1-SL-10	10	01/19/2006 8:55	205-99-2	Benzo(b)fluoranthene	20	0.1	2
CPB1	CPB1-SL-10	10	01/19/2006 8:55	207-08-9	Benzo(k)fluoranthene	4	0.1	0.4000
CPB1	CPB1-SL-10	10	01/19/2006 8:55	218-01-9	Chrysene	110	0.01	1.1
CPB1		10			**BaP-equivalent**			**40**
CPB10	CPB10-SL-1.5	1.5	01/10/2006 11:20	56-55-3	Benzo(a)anthracene	17	0.1	1.7
CPB10	CPB10-SL-1.5	1.5	01/10/2006 11:20	50-32-8	Benzo(a)pyrene	8.7	1	8.7
CPB10	CPB10-SL-1.5	1.5	01/10/2006 11:20	205-99-2	Benzo(b)fluoranthene	27	0.1	2.7
CPB10	CPB10-SL-1.5	1.5	01/10/2006 11:20	207-08-9	Benzo(k)fluoranthene	3.2	0.1	0.3200
CPB10	CPB10-SL-1.5	1.5	01/10/2006 11:20	218-01-9	Chrysene	180	0.01	1.8
CPB10		1.5			**BaP-equivalent**			**15**
CPB10	CPB10-SL-5	5	01/10/2006 11:25	56-55-3	Benzo(a)anthracene	51	0.1	5.1
CPB10	CPB10-SL-5	5	01/10/2006 11:25	50-32-8	Benzo(a)pyrene	7.2	1	7.2
CPB10	CPB10-SL-5	5	01/10/2006 11:25	205-99-2	Benzo(b)fluoranthene	59	0.1	5.9
CPB10	CPB10-SL-5	5	01/10/2006 11:25	218-01-9	Chrysene	180	0.01	1.8
CPB10		5			**BaP-equivalent**			**20**
CPB10	CPB10-SL-10	10	01/10/2006 11:35	56-55-3	Benzo(a)anthracene	0.0530	0.1	0.0053
CPB10	CPB10-SL-10	10	01/10/2006 11:35	50-32-8	Benzo(a)pyrene	0.0012	1	0.0012
CPB10	CPB10-SL-10	10	01/10/2006 11:35	205-99-2	Benzo(b)fluoranthene	0.1000	0.1	0.0100
CPB10	CPB10-SL-10	10	01/10/2006 11:35	218-01-9	Chrysene	0.2100	0.01	0.0021
CPB10		10			**BaP-equivalent**			**0.02**
CPB11R	CPB11R-SL-1.5	1.5	01/10/2006 14:15	56-55-3	Benzo(a)anthracene	27	0.1	2.7
CPB11R	CPB11R-SL-1.5	1.5	01/10/2006 14:15	50-32-8	Benzo(a)pyrene	7.1	1	7.1
CPB11R	CPB11R-SL-1.5	1.5	01/10/2006 14:15	205-99-2	Benzo(b)fluoranthene	40	0.1	4
CPB11R	CPB11R-SL-1.5	1.5	01/10/2006 14:15	207-08-9	Benzo(k)fluoranthene	4.3	0.1	0.4300
CPB11R	CPB11R-SL-1.5	1.5	01/10/2006 14:15	218-01-9	Chrysene	150	0.01	1.5
CPB11R		1.5			**BaP-equivalent**			**16**
CPB11R	CPB11R-SL-5	5	01/10/2006 14:25	56-55-3	Benzo(a)anthracene	22	0.1	2.2
CPB11R	CPB11R-SL-5	5	01/10/2006 14:25	205-99-2	Benzo(b)fluoranthene	21	0.1	2.1

Notes: "ft bgs" feet below ground surface; "cPAH" carcinogenic polynuclear aromatic hydrocarbon; "BaP" benzo(a)pyrene; Converted Result = [cPAH] x TEF

Table A-1e
Derivation of BaP-Equivalent Concentrations
Gardena Sumps

Location	Sample Name	Sample Depth (ft bgs)	Sample Date	CAS Number	cPAH	Detected Value (mgkg)	Toxicity Equivalency Factor (TEF)	Converted Result (mg/kg)
CPB11R	CPB11R-SL-5	5	01/10/2006 14:25	207-08-9	Benzo(k)fluoranthene	2.6	0.1	0.2600
CPB11R	CPB11R-SL-5	5	01/10/2006 14:25	218-01-9	Chrysene	180	0.01	1.8
CPB11R		5			**BaP-equivalent**			**6.4**
CPB11R	CPB11R-SL-10	10	01/10/2006 14:45	56-55-3	Benzo(a)anthracene	0.0011	0.1	0.0001
CPB11R	CPB11R-SL-10	10	01/10/2006 14:45	50-32-8	Benzo(a)pyrene	0.0035	1	0.0035
CPB11R	CPB11R-SL-10	10	01/10/2006 14:45	205-99-2	Benzo(b)fluoranthene	0.0022	0.1	0.0002
CPB11R		10			**BaP-equivalent**			**0.004**
CPB12	CPB12-SL-1.5	1.5	01/17/2006 14:00	56-55-3	Benzo(a)anthracene	0.0005	0.1	0.00005
CPB12	CPB12-SL-1.5	1.5	01/17/2006 14:00	205-99-2	Benzo(b)fluoranthene	0.0009	0.1	0.0001
CPB12	CPB12-SL-1.5	1.5	01/17/2006 14:00	218-01-9	Chrysene	1.9	0.01	0.0190
CPB12		1.5			**BaP-equivalent**			**0.02**
CPB12	CPB12-SL-5	5	01/17/2006 14:05	56-55-3	Benzo(a)anthracene	0.1600	0.1	0.0160
CPB12	CPB12-SL-5	5	01/17/2006 14:05	50-32-8	Benzo(a)pyrene	0.0480	1	0.0480
CPB12	CPB12-SL-5	5	01/17/2006 14:05	205-99-2	Benzo(b)fluoranthene	0.3100	0.1	0.0310
CPB12	CPB12-SL-5	5	01/17/2006 14:05	207-08-9	Benzo(k)fluoranthene	0.0230	0.1	0.0023
CPB12	CPB12-SL-5	5	01/17/2006 14:05	218-01-9	Chrysene	2.3	0.01	0.0230
CPB12	CPB12-SL-5	5	01/17/2006 14:05	53-70-3	Dibenz(a,h)anthracene	0.1800	0.34	0.0612
CPB12		5			**BaP-equivalent**			**0.18**
CPB12	CPB12-SL-10	10	01/17/2006 14:10	56-55-3	Benzo(a)anthracene	4.9	0.1	0.4900
CPB12	CPB12-SL-10	10	01/17/2006 14:10	205-99-2	Benzo(b)fluoranthene	4.7	0.1	0.4700
CPB12	CPB12-SL-10	10	01/17/2006 14:10	218-01-9	Chrysene	16	0.01	0.1600
CPB12		10			**BaP-equivalent**			**1.1**
CPB13	CPB13-SL-1.5	1.5	01/16/2006 10:05	56-55-3	Benzo(a)anthracene	5.1	0.1	0.5100
CPB13	CPB13-SL-1.5	1.5	01/16/2006 10:05	50-32-8	Benzo(a)pyrene	0.8300	1	0.8300
CPB13	CPB13-SL-1.5	1.5	01/16/2006 10:05	205-99-2	Benzo(b)fluoranthene	8.1	0.1	0.8100
CPB13	CPB13-SL-1.5	1.5	01/16/2006 10:05	207-08-9	Benzo(k)fluoranthene	0.5500	0.1	0.0550
CPB13	CPB13-SL-1.5	1.5	01/16/2006 10:05	218-01-9	Chrysene	57	0.01	0.5700
CPB13	CPB13-SL-1.5	1.5	01/16/2006 10:05	53-70-3	Dibenz(a,h)anthracene	2.8	0.34	0.9520
CPB13		1.5			**BaP-equivalent**			**3.7**
CPB13	CPB13-SL-5	5	01/16/2006 10:10	50-32-8	Benzo(a)pyrene	0.1700	1	0.1700
CPB13	CPB13-SL-5	5	01/16/2006 10:10	205-99-2	Benzo(b)fluoranthene	0.3400	0.1	0.0340
CPB13	CPB13-SL-5	5	01/16/2006 10:10	218-01-9	Chrysene	0.8600	0.01	0.0086
CPB13	CPB13-SL-5	5	01/16/2006 10:10	53-70-3	Dibenz(a,h)anthracene	0.1900	0.34	0.0646
CPB13		5			**BaP-equivalent**			**0.28**
CPB13	CPB13-SL-10	10	01/16/2006 10:15	56-55-3	Benzo(a)anthracene	4.3	0.1	0.4300
CPB13	CPB13-SL-10	10	01/16/2006 10:15	205-99-2	Benzo(b)fluoranthene	3.8	0.1	0.3800
CPB13	CPB13-SL-10	10	01/16/2006 10:15	218-01-9	Chrysene	12	0.01	0.1200
CPB13		10			**BaP-equivalent**			**0.93**
CPB14	CPB14-SL-1.5	1.5	01/10/2006 9:50	56-55-3	Benzo(a)anthracene	45	0.1	4.5
CPB14	CPB14-SL-1.5	1.5	01/10/2006 9:50	50-32-8	Benzo(a)pyrene	9.4	1	9.4
CPB14	CPB14-SL-1.5	1.5	01/10/2006 9:50	205-99-2	Benzo(b)fluoranthene	65	0.1	6.5
CPB14	CPB14-SL-1.5	1.5	01/10/2006 9:50	207-08-9	Benzo(k)fluoranthene	7.2	0.1	0.7200
CPB14	CPB14-SL-1.5	1.5	01/10/2006 9:50	218-01-9	Chrysene	160	0.01	1.6
CPB14		1.5			**BaP-equivalent**			**23**
CPB14	CPB14-SL-5	5	01/10/2006 10:00	56-55-3	Benzo(a)anthracene	0.0970	0.1	0.0097
CPB14	CPB14-SL-5	5	01/10/2006 10:00	205-99-2	Benzo(b)fluoranthene	0.1600	0.1	0.0160
CPB14	CPB14-SL-5	5	01/10/2006 10:00	207-08-9	Benzo(k)fluoranthene	0.0013	0.1	0.0001
CPB14	CPB14-SL-5	5	01/10/2006 10:00	218-01-9	Chrysene	0.1500	0.01	0.0015
CPB14	CPB14-SL-5	5	01/10/2006 10:00	53-70-3	Dibenz(a,h)anthracene	0.0270	0.34	0.0092
CPB14		5			**BaP-equivalent**			**0.04**
CPB14	CPB14-SL-10	10	01/10/2006 10:20	56-55-3	Benzo(a)anthracene	0.0023	0.1	0.0002

Notes: "ft bgs" feet below ground surface; "cPAH" carcinogenic polynuclear aromatic hydrocarbon; "BaP" benzo(a)pyrene; Converted Result = [cPAH] x TEF

Table A-1e
Derivation of BaP-Equivalent Concentrations
Gardena Sumps

Location	Sample Name	Sample Depth (ft bgs)	Sample Date	CAS Number	cPAH	Detected Value (mgkg)	Toxicity Equivalency Factor (TEF)	Converted Result (mg/kg)
CPB14	CPB14-SL-10	10	01/10/2006 10:20	50-32-8	Benzo(a)pyrene	0.0018	1	0.0018
CPB14	CPB14-SL-10	10	01/10/2006 10:20	205-99-2	Benzo(b)fluoranthene	0.0150	0.1	0.0015
CPB14	CPB14-SL-10	10	01/10/2006 10:20	207-08-9	Benzo(k)fluoranthene	0.0003	0.1	0.00003
CPB14	CPB14-SL-10	10	01/10/2006 10:20	218-01-9	Chrysene	0.3500	0.01	0.0035
CPB14		10			**BaP-equivalent**			**0.007**
CPB15R	CPB15R-SL-1.5	1.5	01/20/2006 10:00	56-55-3	Benzo(a)anthracene	81	0.1	8.1
CPB15R	CPB15R-SL-1.5	1.5	01/20/2006 10:00	50-32-8	Benzo(a)pyrene	100	1	100
CPB15R	CPB15R-SL-1.5	1.5	01/20/2006 10:00	205-99-2	Benzo(b)fluoranthene	62	0.1	6.2
CPB15R	CPB15R-SL-1.5	1.5	01/20/2006 10:00	207-08-9	Benzo(k)fluoranthene	8.6	0.1	0.8600
CPB15R	CPB15R-SL-1.5	1.5	01/20/2006 10:00	218-01-9	Chrysene	230	0.01	2.3
CPB15R		1.5			**BaP-equivalent**			**117**
CPB16	CPB16-2SL-1.5	1.5	01/17/2006 13:01	56-55-3	Benzo(a)anthracene	28	0.1	2.8
CPB16	CPB16-2SL-1.5	1.5	01/17/2006 13:01	50-32-8	Benzo(a)pyrene	6.7	1	6.7
CPB16	CPB16-2SL-1.5	1.5	01/17/2006 13:01	205-99-2	Benzo(b)fluoranthene	55	0.1	5.5
CPB16	CPB16-2SL-1.5	1.5	01/17/2006 13:01	207-08-9	Benzo(k)fluoranthene	4.8	0.1	0.4800
CPB16	CPB16-2SL-1.5	1.5	01/17/2006 13:01	218-01-9	Chrysene	120	0.01	1.2
CPB16	CPB16-SL-1.5	1.5	01/17/2006 13:00	53-70-3	Dibenz(a,h)anthracene	0.0450	0.34	0.0153
CPB16		1.5			**BaP-equivalent**			**17**
CPB16	CPB16-SL-5	5	01/17/2006 13:05	56-55-3	Benzo(a)anthracene	0.0005	0.1	0.00005
CPB16	CPB16-SL-5	5	01/17/2006 13:05	50-32-8	Benzo(a)pyrene	0.0008	1	0.0008
CPB16	CPB16-SL-5	5	01/17/2006 13:05	205-99-2	Benzo(b)fluoranthene	0.0015	0.1	0.0002
CPB16	CPB16-SL-5	5	01/17/2006 13:05	218-01-9	Chrysene	0.0041	0.01	0.00004
CPB16		5			**BaP-equivalent**			**0.001**
CPB16	CPB16-SL-10	10	01/17/2006 13:10	56-55-3	Benzo(a)anthracene	0.0160	0.1	0.0016
CPB16	CPB16-SL-10	10	01/17/2006 13:10	205-99-2	Benzo(b)fluoranthene	0.0350	0.1	0.0035
CPB16	CPB16-SL-10	10	01/17/2006 13:10	218-01-9	Chrysene	0.0750	0.01	0.0008
CPB16	CPB16-SL-10	10	01/17/2006 13:10	53-70-3	Dibenz(a,h)anthracene	0.0180	0.34	0.0061
CPB16		10			**BaP-equivalent**			**0.01**
CPB17	CPB17-SL-1.5	1.5	01/09/2006 15:19	56-55-3	Benzo(a)anthracene	45	0.1	4.5
CPB17	CPB17-SL-1.5	1.5	01/09/2006 15:19	205-99-2	Benzo(b)fluoranthene	51	0.1	5.1
CPB17	CPB17-SL-1.5	1.5	01/09/2006 15:19	207-08-9	Benzo(k)fluoranthene	6.1	0.1	0.6100
CPB17	CPB17-SL-1.5	1.5	01/09/2006 15:19	218-01-9	Chrysene	170	0.01	1.7
CPB17		1.5			**BaP-equivalent**			**12**
CPB17	CPB17-SL-5	5	01/09/2006 15:35	56-55-3	Benzo(a)anthracene	0.0020	0.1	0.0002
CPB17	CPB17-SL-5	5	01/09/2006 15:35	205-99-2	Benzo(b)fluoranthene	0.0034	0.1	0.0003
CPB17	CPB17-SL-5	5	01/09/2006 15:35	218-01-9	Chrysene	0.0130	0.01	0.0001
CPB17		5			**BaP-equivalent**			**0.0007**
CPB17	CPB17-SL-10	10	01/09/2006 15:45	56-55-3	Benzo(a)anthracene	0.0190	0.1	0.0019
CPB17	CPB17-SL-10	10	01/09/2006 15:45	50-32-8	Benzo(a)pyrene	0.0047	1	0.0047
CPB17	CPB17-SL-10	10	01/09/2006 15:45	205-99-2	Benzo(b)fluoranthene	0.0320	0.1	0.0032
CPB17	CPB17-SL-10	10	01/09/2006 15:45	207-08-9	Benzo(k)fluoranthene	0.0013	0.1	0.0001
CPB17	CPB17-SL-10	10	01/09/2006 15:45	218-01-9	Chrysene	0.3400	0.01	0.0034
CPB17		10			**BaP-equivalent**			**0.01**
CPB18	CPB18-SL-5'	5	12/20/2005 9:40	218-01-9	Chrysene	1.3	0.01	0.0130
CPB18		5			**BaP-equivalent**			**0.01**
CPB18	CPB18-SL-10'	10	12/20/2005 9:49	56-55-3	Benzo(a)anthracene	0.0570	0.1	0.0057
CPB18	CPB18-SL-10'	10	12/20/2005 9:49	205-99-2	Benzo(b)fluoranthene	0.1300	0.1	0.0130
CPB18	CPB18-SL-10'	10	12/20/2005 9:49	207-08-9	Benzo(k)fluoranthene	0.0048	0.1	0.0005
CPB18	CPB18-SL-10'	10	12/20/2005 9:49	218-01-9	Chrysene	0.2900	0.01	0.0029
CPB18	CPB18-SL-10'	10	12/20/2005 9:49	53-70-3	Dibenz(a,h)anthracene	0.0630	0.34	0.0214
CPB18		10			**BaP-equivalent**			**0.04**

Notes: "ft bgs" feet below ground surface; "cPAH" carcinogenic polynuclear aromatic hydrocarbon; "BaP" benzo(a)pyrene; Converted Result = [cPAH] x TEF

Table A-1e
Derivation of BaP-Equivalent Concentrations
Gardena Sumps

Location	Sample Name	Sample Depth (ft bgs)	Sample Date	CAS Number	cPAH	Detected Value (mgkg)	Toxicity Equivalency Factor (TEF)	Converted Result (mg/kg)
CPB19	CPB19-SL-1.5	1.5	01/16/2006 9:00	56-55-3	Benzo(a)anthracene	0.8000	0.1	0.0800
CPB19	CPB19-SL-1.5	1.5	01/16/2006 9:00	205-99-2	Benzo(b)fluoranthene	2.8	0.1	0.2800
CPB19	CPB19-SL-1.5	1.5	01/16/2006 9:00	218-01-9	Chrysene	6.5	0.01	0.0650
CPB19		1.5			**BaP-equivalent**			**0.43**
CPB19	CPB19-2SL-5	5	01/16/2006 9:11	56-55-3	Benzo(a)anthracene	0.0036	0.1	0.0004
CPB19	CPB19-2SL-5	5	01/16/2006 9:11	205-99-2	Benzo(b)fluoranthene	0.0270	0.1	0.0027
CPB19	CPB19-SL-5	5	01/16/2006 9:10	218-01-9	Chrysene	0.0160	0.01	0.0002
CPB19	CPB19-2SL-5	5	01/16/2006 9:11	53-70-3	Dibenz(a,h)anthracene	0.0100	0.34	0.0034
CPB19		5			**BaP-equivalent**			**0.007**
CPB19	CPB19-SL-10	10	01/16/2006 9:20	56-55-3	Benzo(a)anthracene	0.0010	0.1	0.0001
CPB19	CPB19-SL-10	10	01/16/2006 9:20	50-32-8	Benzo(a)pyrene	0.0032	1	0.0032
CPB19	CPB19-SL-10	10	01/16/2006 9:20	205-99-2	Benzo(b)fluoranthene	0.0011	0.1	0.0001
CPB19	CPB19-SL-10	10	01/16/2006 9:20	218-01-9	Chrysene	0.0052	0.01	0.0001
CPB19		10			**BaP-equivalent**			**0.003**
CPB20	CPB20-SL-1.5	1.5	01/17/2006 11:15	56-55-3	Benzo(a)anthracene	0.0300	0.1	0.0030
CPB20	CPB20-SL-1.5	1.5	01/17/2006 11:15	50-32-8	Benzo(a)pyrene	0.0250	1	0.0250
CPB20	CPB20-SL-1.5	1.5	01/17/2006 11:15	205-99-2	Benzo(b)fluoranthene	0.1300	0.1	0.0130
CPB20	CPB20-SL-1.5	1.5	01/17/2006 11:15	218-01-9	Chrysene	0.1300	0.01	0.0013
CPB20	CPB20-SL-1.5	1.5	01/17/2006 11:15	53-70-3	Dibenz(a,h)anthracene	0.0740	0.34	0.0252
CPB20		1.5			**BaP-equivalent**			**0.07**
CPB20	CPB20-SL-5	5	01/17/2006 11:20	56-55-3	Benzo(a)anthracene	0.0008	0.1	0.0001
CPB20	CPB20-SL-5	5	01/17/2006 11:20	50-32-8	Benzo(a)pyrene	0.0003	1	0.0003
CPB20	CPB20-SL-5	5	01/17/2006 11:20	205-99-2	Benzo(b)fluoranthene	0.0013	0.1	0.0001
CPB20	CPB20-SL-5	5	01/17/2006 11:20	218-01-9	Chrysene	0.0047	0.01	0.00005
CPB20		5			**BaP-equivalent**			**0.0005**
CPB20	CPB20-SL-10	10	01/17/2006 11:25	56-55-3	Benzo(a)anthracene	0.0023	0.1	0.0002
CPB20	CPB20-SL-10	10	01/17/2006 11:25	50-32-8	Benzo(a)pyrene	0.0010	1	0.0010
CPB20	CPB20-SL-10	10	01/17/2006 11:25	205-99-2	Benzo(b)fluoranthene	0.0077	0.1	0.0008
CPB20	CPB20-SL-10	10	01/17/2006 11:25	218-01-9	Chrysene	0.0130	0.01	0.0001
CPB20		10			**BaP-equivalent**			**0.002**
CPB21	CPB21-SL-1.5	1.5	01/13/2006 8:40	56-55-3	Benzo(a)anthracene	0.0200	0.1	0.0020
CPB21	CPB21-SL-1.5	1.5	01/13/2006 8:40	50-32-8	Benzo(a)pyrene	0.0050	1	0.0050
CPB21	CPB21-SL-1.5	1.5	01/13/2006 8:40	205-99-2	Benzo(b)fluoranthene	0.0480	0.1	0.0048
CPB21	CPB21-SL-1.5	1.5	01/13/2006 8:40	207-08-9	Benzo(k)fluoranthene	0.0038	0.1	0.0004
CPB21	CPB21-SL-1.5	1.5	01/13/2006 8:40	218-01-9	Chrysene	0.1200	0.01	0.0012
CPB21	CPB21-SL-1.5	1.5	01/13/2006 8:40	53-70-3	Dibenz(a,h)anthracene	0.0064	0.34	0.0022
CPB21		1.5			**BaP-equivalent**			**0.02**
CPB21	CPB21-SL-5	5	01/13/2006 8:50	218-01-9	Chrysene	0.0014	0.01	0.00001
CPB21		5			**BaP-equivalent**			**0.00001**
CPB22	CPB22-SL-1.5	1.5	01/12/2006 15:10	56-55-3	Benzo(a)anthracene	0.0980	0.1	0.0098
CPB22	CPB22-SL-1.5	1.5	01/12/2006 15:10	50-32-8	Benzo(a)pyrene	0.0270	1	0.0270
CPB22	CPB22-SL-1.5	1.5	01/12/2006 15:10	205-99-2	Benzo(b)fluoranthene	0.1300	0.1	0.0130
CPB22	CPB22-SL-1.5	1.5	01/12/2006 15:10	207-08-9	Benzo(k)fluoranthene	0.0190	0.1	0.0019
CPB22	CPB22-SL-1.5	1.5	01/12/2006 15:10	218-01-9	Chrysene	0.6100	0.01	0.0061
CPB22	CPB22-SL-1.5	1.5	01/12/2006 15:10	53-70-3	Dibenz(a,h)anthracene	0.1000	0.34	0.0340
CPB22		1.5			**BaP-equivalent**			**0.09**
CPB23	CPB23-SL-1.5	1.5	01/18/2006 14:30	56-55-3	Benzo(a)anthracene	0.0200	0.1	0.0020
CPB23	CPB23-SL-1.5	1.5	01/18/2006 14:30	50-32-8	Benzo(a)pyrene	0.0130	1	0.0130
CPB23	CPB23-SL-1.5	1.5	01/18/2006 14:30	205-99-2	Benzo(b)fluoranthene	0.0280	0.1	0.0028
CPB23	CPB23-SL-1.5	1.5	01/18/2006 14:30	218-01-9	Chrysene	0.0580	0.01	0.0006
CPB23	CPB23-SL-1.5	1.5	01/18/2006 14:30	53-70-3	Dibenz(a,h)anthracene	0.0380	0.34	0.0129

Notes: "ft bgs" feet below ground surface; "cPAH" carcinogenic polynuclear aromatic hydrocarbon; "BaP" benzo(a)pyrene; Converted Result = [cPAH] x TEF

Table A-1e
Derivation of BaP-Equivalent Concentrations
Gardena Sumps

Location	Sample Name	Sample Depth (ft bgs)	Sample Date	CAS Number	cPAH	Detected Value (mgkg)	Toxicity Equivalency Factor (TEF)	Converted Result (mg/kg)
CPB23		1.5			**BaP-equivalent**			**0.03**
CPB23	CPB23-SL-5	5	01/18/2006 14:35	56-55-3	Benzo(a)anthracene	0.0170	0.1	0.0017
CPB23	CPB23-SL-5	5	01/18/2006 14:35	50-32-8	Benzo(a)pyrene	0.0110	1	0.0110
CPB23	CPB23-SL-5	5	01/18/2006 14:35	205-99-2	Benzo(b)fluoranthene	0.0510	0.1	0.0051
CPB23	CPB23-SL-5	5	01/18/2006 14:35	207-08-9	Benzo(k)fluoranthene	0.0018	0.1	0.0002
CPB23	CPB23-SL-5	5	01/18/2006 14:35	218-01-9	Chrysene	0.0790	0.01	0.0008
CPB23	CPB23-SL-5	5	01/18/2006 14:35	53-70-3	Dibenz(a,h)anthracene	0.0290	0.34	0.0099
CPB23		5			**BaP-equivalent**			**0.03**
CPB23	CPB23-SL-10	10	01/18/2006 14:40	56-55-3	Benzo(a)anthracene	0.0005	0.1	0.00005
CPB23	CPB23-SL-10	10	01/18/2006 14:40	50-32-8	Benzo(a)pyrene	0.0002	1	0.0002
CPB23	CPB23-SL-10	10	01/18/2006 14:40	205-99-2	Benzo(b)fluoranthene	0.0006	0.1	0.0001
CPB23	CPB23-SL-10	10	01/18/2006 14:40	218-01-9	Chrysene	0.0032	0.01	0.00003
CPB23		10			**BaP-equivalent**			**0.0004**
CPB24	CPB24-SL-5.0	5	01/20/2006 9:25	56-55-3	Benzo(a)anthracene	4.4	0.1	0.4400
CPB24	CPB24-SL-5.0	5	01/20/2006 9:25	205-99-2	Benzo(b)fluoranthene	4.7	0.1	0.4700
CPB24	CPB24-SL-5.0	5	01/20/2006 9:25	218-01-9	Chrysene	18	0.01	0.1800
CPB24	CPB24-SL-5.0	5	01/20/2006 9:25	53-70-3	Dibenz(a,h)anthracene	0.9200	0.34	0.3128
CPB24		5			**BaP-equivalent**			**1.4**
CPB24	CPB24-SL-10.0	10	01/20/2006 9:30	56-55-3	Benzo(a)anthracene	1.1	0.1	0.1100
CPB24	CPB24-SL-10.0	10	01/20/2006 9:30	205-99-2	Benzo(b)fluoranthene	1.2	0.1	0.1200
CPB24	CPB24-SL-10.0	10	01/20/2006 9:30	218-01-9	Chrysene	4.8	0.01	0.0480
CPB24	CPB24-SL-10.0	10	01/20/2006 9:30	53-70-3	Dibenz(a,h)anthracene	0.0880	0.34	0.0299
CPB24		10			**BaP-equivalent**			**0.31**
CPB3	CPB3-SL-1.5	1.5	01/12/2006 14:00	56-55-3	Benzo(a)anthracene	84	0.1	8.4
CPB3	CPB3-SL-1.5	1.5	01/12/2006 14:00	50-32-8	Benzo(a)pyrene	170	1	170
CPB3	CPB3-SL-1.5	1.5	01/12/2006 14:00	205-99-2	Benzo(b)fluoranthene	100	0.1	10
CPB3	CPB3-SL-1.5	1.5	01/12/2006 14:00	207-08-9	Benzo(k)fluoranthene	15	0.1	1.5
CPB3	CPB3-SL-1.5	1.5	01/12/2006 14:00	218-01-9	Chrysene	410	0.01	4.1
CPB3		1.5			**BaP-equivalent**			**194**
CPB3	CPB3-SL-5	5	01/12/2006 14:10	56-55-3	Benzo(a)anthracene	9.2	0.1	0.9200
CPB3	CPB3-SL-5	5	01/12/2006 14:10	205-99-2	Benzo(b)fluoranthene	7.9	0.1	0.7900
CPB3	CPB3-SL-5	5	01/12/2006 14:10	218-01-9	Chrysene	31	0.01	0.3100
CPB3	CPB3-SL-5	5	01/12/2006 14:10	53-70-3	Dibenz(a,h)anthracene	3	0.34	1.02
CPB3		5			**BaP-equivalent**			**3**
CPB3	CPB3-SL-10	10	01/12/2006 14:15	56-55-3	Benzo(a)anthracene	0.1400	0.1	0.0140
CPB3	CPB3-SL-10	10	01/12/2006 14:15	50-32-8	Benzo(a)pyrene	0.2500	1	0.2500
CPB3	CPB3-SL-10	10	01/12/2006 14:15	205-99-2	Benzo(b)fluoranthene	0.1800	0.1	0.0180
CPB3	CPB3-SL-10	10	01/12/2006 14:15	207-08-9	Benzo(k)fluoranthene	0.0350	0.1	0.0035
CPB3	CPB3-SL-10	10	01/12/2006 14:15	218-01-9	Chrysene	0.7200	0.01	0.0072
CPB3	CPB3-SL-10	10	01/12/2006 14:15	53-70-3	Dibenz(a,h)anthracene	0.1000	0.34	0.0340
CPB3		10			**BaP-equivalent**			**0.33**
CPB-30	CPB-30-SL-8-10	10	12/06/2006 10:10	56-55-3	Benzo(a)anthracene	0.5900	0.1	0.0590
CPB-30	CPB-30-SL-8-10	10	12/06/2006 10:10	218-01-9	Chrysene	1.6	0.01	0.0160
CPB-30		10			**BaP-equivalent**			**0.08**
CPB5	CPB5-SL-1.5	1.5	01/19/2006 14:25	56-55-3	Benzo(a)anthracene	38	0.1	3.8
CPB5	CPB5-SL-1.5	1.5	01/19/2006 14:25	50-32-8	Benzo(a)pyrene	71	1	71
CPB5	CPB5-SL-1.5	1.5	01/19/2006 14:25	205-99-2	Benzo(b)fluoranthene	77	0.1	7.7
CPB5	CPB5-SL-1.5	1.5	01/19/2006 14:25	207-08-9	Benzo(k)fluoranthene	9.7	0.1	0.9700
CPB5	CPB5-SL-1.5	1.5	01/19/2006 14:25	218-01-9	Chrysene	210	0.01	2.1
CPB5	CPB5-SL-1.5	1.5	01/19/2006 14:25	53-70-3	Dibenz(a,h)anthracene	12	0.34	4.08
CPB5		1.5			**BaP-equivalent**			**90**

Notes: "ft bgs" feet below ground surface; "cPAH" carcinogenic polynuclear aromatic hydrocarbon; "BaP" benzo(a)pyrene; Converted Result = [cPAH] x TEF

Table A-1e
Derivation of BaP-Equivalent Concentrations
Gardena Sumps

Location	Sample Name	Sample Depth (ft bgs)	Sample Date	CAS Number	cPAH	Detected Value (mgkg)	Toxicity Equivalency Factor (TEF)	Converted Result (mg/kg)
CPB5	CPB5-SL-5	5	01/19/2006 14:30	56-55-3	Benzo(a)anthracene	4.9	0.1	0.4900
CPB5	CPB5-SL-5	5	01/19/2006 14:30	205-99-2	Benzo(b)fluoranthene	4.6	0.1	0.4600
CPB5	CPB5-SL-5	5	01/19/2006 14:30	218-01-9	Chrysene	16	0.01	0.1600
CPB5	CPB5-SL-5	5	01/19/2006 14:30	53-70-3	Dibenz(a,h)anthracene	0.2300	0.34	0.0782
CPB5		5			**BaP-equivalent**			**1.2**
CPB5	CPB5-SL-10	10	01/19/2006 14:35	56-55-3	Benzo(a)anthracene	0.0110	0.1	0.0011
CPB5	CPB5-SL-10	10	01/19/2006 14:35	50-32-8	Benzo(a)pyrene	0.0230	1	0.0230
CPB5	CPB5-SL-10	10	01/19/2006 14:35	205-99-2	Benzo(b)fluoranthene	0.0200	0.1	0.0020
CPB5	CPB5-SL-10	10	01/19/2006 14:35	207-08-9	Benzo(k)fluoranthene	0.0022	0.1	0.0002
CPB5	CPB5-SL-10	10	01/19/2006 14:35	218-01-9	Chrysene	0.0510	0.01	0.0005
CPB5	CPB5-SL-10	10	01/19/2006 14:35	53-70-3	Dibenz(a,h)anthracene	0.0051	0.34	0.0017
CPB5		10			**BaP-equivalent**			**0.03**
CPB7	CPB7-SL-1.5	1.5	01/12/2006 10:45	56-55-3	Benzo(a)anthracene	58	0.1	5.8
CPB7	CPB7-SL-1.5	1.5	01/12/2006 10:45	50-32-8	Benzo(a)pyrene	10	1	10
CPB7	CPB7-SL-1.5	1.5	01/12/2006 10:45	205-99-2	Benzo(b)fluoranthene	68	0.1	6.8
CPB7	CPB7-SL-1.5	1.5	01/12/2006 10:45	207-08-9	Benzo(k)fluoranthene	12	0.1	1.2
CPB7	CPB7-SL-1.5	1.5	01/12/2006 10:45	218-01-9	Chrysene	410	0.01	4.1
CPB7	CPB7-SL-1.5	1.5	01/12/2006 10:45	53-70-3	Dibenz(a,h)anthracene	29	0.34	9.86
CPB7		1.5			**BaP-equivalent**			**38**
CPB7	CPB7-SL-5	5	01/12/2006 11:00	56-55-3	Benzo(a)anthracene	38	0.1	3.8
CPB7	CPB7-SL-5	5	01/12/2006 11:00	50-32-8	Benzo(a)pyrene	7.6	1	7.6
CPB7	CPB7-SL-5	5	01/12/2006 11:00	205-99-2	Benzo(b)fluoranthene	48	0.1	4.8
CPB7	CPB7-SL-5	5	01/12/2006 11:00	207-08-9	Benzo(k)fluoranthene	7.3	0.1	0.7300
CPB7	CPB7-SL-5	5	01/12/2006 11:00	218-01-9	Chrysene	240	0.01	2.4
CPB7		5			**BaP-equivalent**			**19**
CPB7	CPB7-SL-10	10	01/12/2006 11:10	56-55-3	Benzo(a)anthracene	1.7	0.1	0.1700
CPB7	CPB7-SL-10	10	01/12/2006 11:10	50-32-8	Benzo(a)pyrene	0.1200	1	0.1200
CPB7	CPB7-SL-10	10	01/12/2006 11:10	205-99-2	Benzo(b)fluoranthene	2.3	0.1	0.2300
CPB7	CPB7-SL-10	10	01/12/2006 11:10	218-01-9	Chrysene	6.1	0.01	0.0610
CPB7		10			**BaP-equivalent**			**0.58**
CPB9	CPB9-SL-1.5	1.5	01/13/2006 9:40	56-55-3	Benzo(a)anthracene	0.0056	0.1	0.0006
CPB9	CPB9-SL-1.5	1.5	01/13/2006 9:40	50-32-8	Benzo(a)pyrene	0.0160	1	0.0160
CPB9	CPB9-SL-1.5	1.5	01/13/2006 9:40	205-99-2	Benzo(b)fluoranthene	0.0076	0.1	0.0008
CPB9	CPB9-SL-1.5	1.5	01/13/2006 9:40	218-01-9	Chrysene	0.0230	0.01	0.0002
CPB9		1.5			**BaP-equivalent**			**0.02**
DPW01	DPW01-SS-1.5	1.5	01/18/2006 13:10	56-55-3	Benzo(a)anthracene	0.0660	0.1	0.0066
DPW01	DPW01-SS-1.5	1.5	01/18/2006 13:10	50-32-8	Benzo(a)pyrene	0.0520	1	0.0520
DPW01	DPW01-SS-1.5	1.5	01/18/2006 13:10	205-99-2	Benzo(b)fluoranthene	0.1300	0.1	0.0130
DPW01	DPW01-SS-1.5	1.5	01/18/2006 13:10	218-01-9	Chrysene	0.1300	0.01	0.0013
DPW01	DPW01-SS-1.5	1.5	01/18/2006 13:10	53-70-3	Dibenz(a,h)anthracene	0.0520	0.34	0.0177
DPW01		1.5			**BaP-equivalent**			**0.09**
DPW01	DPW01-SS-5	5	01/18/2006 13:15	53-70-3	Dibenz(a,h)anthracene	0.0820	0.34	0.0279
DPW01		5			**BaP-equivalent**			**0.03**
DPW02	DPW02-SS-2	2	01/13/2006 10:25	56-55-3	Benzo(a)anthracene	1.2	0.1	0.1200
DPW02	DPW02-SS-2	2	01/13/2006 10:25	50-32-8	Benzo(a)pyrene	1.3	1	1.3
DPW02	DPW02-SS-2	2	01/13/2006 10:25	205-99-2	Benzo(b)fluoranthene	0.8300	0.1	0.0830
DPW02	DPW02-SS-2	2	01/13/2006 10:25	207-08-9	Benzo(k)fluoranthene	0.4600	0.1	0.0460
DPW02	DPW02-SS-2	2	01/13/2006 10:25	218-01-9	Chrysene	1.3	0.01	0.0130
DPW02	DPW02-SS-2	2	01/13/2006 10:25	53-70-3	Dibenz(a,h)anthracene	0.7900	0.34	0.2686
DPW02	DPW02-SS-2	2	01/13/2006 10:25	193-39-5	Indeno(1,2,3-cd)pyrene	0.7200	0.1	0.0720
DPW02		2			**BaP-equivalent**			**1.9**

Notes: "ft bgs" feet below ground surface; "cPAH" carcinogenic polynuclear aromatic hydrocarbon; "BaP" benzo(a)pyrene; Converted Result = [cPAH] x TEF

Location	Sample Name	Sample Depth (ft bgs)	Sample Date	CAS Number	cPAH	Detected Value (mgkg)	Toxicity Equivalency Factor (TEF)	Converted Result (mg/kg)
DPW02	DPW02-SS-5	5	01/13/2006 10:30	53-70-3	Dibenz(a,h)anthracene	0.2200	0.34	0.0748
DPW02		5			**BaP-equivalent**			**0.07**
DPW03	DPW03-SS-2	2	01/13/2006 10:50	56-55-3	Benzo(a)anthracene	0.1000	0.1	0.0100
DPW03	DPW03-SS-2	2	01/13/2006 10:50	50-32-8	Benzo(a)pyrene	0.3000	1	0.3000
DPW03	DPW03-SS-2	2	01/13/2006 10:50	205-99-2	Benzo(b)fluoranthene	0.1900	0.1	0.0190
DPW03	DPW03-SS-2	2	01/13/2006 10:50	207-08-9	Benzo(k)fluoranthene	0.0120	0.1	0.0012
DPW03	DPW03-SS-2	2	01/13/2006 10:50	218-01-9	Chrysene	1.1	0.01	0.0110
DPW03	DPW03-SS-2	2	01/13/2006 10:50	53-70-3	Dibenz(a,h)anthracene	0.1200	0.34	0.0408
DPW03		2			**BaP-equivalent**			**0.38**
DPW03	DPW03-SS-5	5	01/13/2006 11:00	56-55-3	Benzo(a)anthracene	0.1100	0.1	0.0110
DPW03	DPW03-SS-5	5	01/13/2006 11:00	50-32-8	Benzo(a)pyrene	0.2900	1	0.2900
DPW03	DPW03-SS-5	5	01/13/2006 11:00	205-99-2	Benzo(b)fluoranthene	0.2200	0.1	0.0220
DPW03	DPW03-SS-5	5	01/13/2006 11:00	207-08-9	Benzo(k)fluoranthene	0.0160	0.1	0.0016
DPW03	DPW03-SS-5	5	01/13/2006 11:00	218-01-9	Chrysene	0.5800	0.01	0.0058
DPW03	DPW03-SS-5	5	01/13/2006 11:00	53-70-3	Dibenz(a,h)anthracene	0.1100	0.34	0.0374
DPW03		5			**BaP-equivalent**			**0.37**
DPW04	DPW04-SS-2	2	01/13/2006 11:15	56-55-3	Benzo(a)anthracene	2.6	0.1	0.2600
DPW04	DPW04-SS-2	2	01/13/2006 11:15	50-32-8	Benzo(a)pyrene	0.6200	1	0.6200
DPW04	DPW04-SS-2	2	01/13/2006 11:15	205-99-2	Benzo(b)fluoranthene	4.6	0.1	0.4600
DPW04	DPW04-SS-2	2	01/13/2006 11:15	207-08-9	Benzo(k)fluoranthene	0.2700	0.1	0.0270
DPW04	DPW04-SS-2	2	01/13/2006 11:15	218-01-9	Chrysene	82	0.01	0.8200
DPW04	DPW04-SS-2	2	01/13/2006 11:15	53-70-3	Dibenz(a,h)anthracene	2.2	0.34	0.7480
DPW04		2			**BaP-equivalent**			**2.9**
DPW04	DPW04-SS-5	5	01/13/2006 11:20	56-55-3	Benzo(a)anthracene	0.0770	0.1	0.0077
DPW04	DPW04-SS-5	5	01/13/2006 11:20	50-32-8	Benzo(a)pyrene	0.1900	1	0.1900
DPW04	DPW04-SS-5	5	01/13/2006 11:20	205-99-2	Benzo(b)fluoranthene	0.1500	0.1	0.0150
DPW04	DPW04-SS-5	5	01/13/2006 11:20	207-08-9	Benzo(k)fluoranthene	0.0150	0.1	0.0015
DPW04	DPW04-SS-5	5	01/13/2006 11:20	218-01-9	Chrysene	0.4400	0.01	0.0044
DPW04	DPW04-SS-5	5	01/13/2006 11:20	53-70-3	Dibenz(a,h)anthracene	0.0570	0.34	0.0194
DPW04		5			**BaP-equivalent**			**0.24**
HPB01	HPB01-SL-1.5	1.5	02/08/2006 11:00	205-99-2	Benzo(b)fluoranthene	0.0780	0.1	0.0078
HPB01	HPB01-SL-1.5	1.5	02/08/2006 11:00	218-01-9	Chrysene	0.0930	0.01	0.0009
HPB01		1.5			**BaP-equivalent**			**0.009**
HPB01	HPB01-SL-10	10	02/08/2006 11:15	56-55-3	Benzo(a)anthracene	0.0028	0.1	0.0003
HPB01	HPB01-SL-10	10	02/08/2006 11:15	50-32-8	Benzo(a)pyrene	0.0010	1	0.0010
HPB01	HPB01-SL-10	10	02/08/2006 11:15	205-99-2	Benzo(b)fluoranthene	0.0057	0.1	0.0006
HPB01	HPB01-SL-10	10	02/08/2006 11:15	207-08-9	Benzo(k)fluoranthene	0.0012	0.1	0.0001
HPB01	HPB01-SL-10	10	02/08/2006 11:15	218-01-9	Chrysene	0.0320	0.01	0.0003
HPB01		10			**BaP-equivalent**			**0.002**
HPB02	HPB02-2SL-5	5	02/09/2006 10:21	218-01-9	Chrysene	0.7100	0.01	0.0071
HPB02		5			**BaP-equivalent**			**0.007**
HPB02	HPB02-SL-10	10	02/09/2006 10:30	218-01-9	Chrysene	0.6600	0.01	0.0066
HPB02		10			**BaP-equivalent**			**0.007**
HPB03	HPB03-SL-1.5	1.5	02/08/2006 14:00	56-55-3	Benzo(a)anthracene	0.0058	0.1	0.0006
HPB03	HPB03-SL-1.5	1.5	02/08/2006 14:00	50-32-8	Benzo(a)pyrene	0.0020	1	0.0020
HPB03	HPB03-SL-1.5	1.5	02/08/2006 14:00	205-99-2	Benzo(b)fluoranthene	0.0170	0.1	0.0017
HPB03	HPB03-SL-1.5	1.5	02/08/2006 14:00	218-01-9	Chrysene	0.0320	0.01	0.0003
HPB03		1.5			**BaP-equivalent**			**0.005**
HPB03	HPB03-SL-5	5	02/08/2006 14:10	205-99-2	Benzo(b)fluoranthene	0.0610	0.1	0.0061
HPB03	HPB03-SL-5	5	02/08/2006 14:10	53-70-3	Dibenz(a,h)anthracene	0.3200	0.34	0.1088
HPB03		5			**BaP-equivalent**			**0.11**

Notes: "ft bgs" feet below ground surface; "cPAH" carcinogenic polynuclear aromatic hydrocarbon; "BaP" benzo(a)pyrene; Converted Result = [cPAH] x TEF

Table A-1e
Derivation of BaP-Equivalent Concentrations
Gardena Sumps

Location	Sample Name	Sample Depth (ft bgs)	Sample Date	CAS Number	cPAH	Detected Value (mgkg)	Toxicity Equivalency Factor (TEF)	Converted Result (mg/kg)
HPB03	HPB03-SL-10	10	02/08/2006 14:15	56-55-3	Benzo(a)anthracene	3.4	0.1	0.3400
HPB03	HPB03-SL-10	10	02/08/2006 14:15	205-99-2	Benzo(b)fluoranthene	9.1	0.1	0.9100
HPB03	HPB03-SL-10	10	02/08/2006 14:15	207-08-9	Benzo(k)fluoranthene	2.9	0.1	0.2900
HPB03	HPB03-SL-10	10	02/08/2006 14:15	218-01-9	Chrysene	28	0.01	0.2800
HPB03		10			**BaP-equivalent**			**1.8**
HPB05	HPB05-SL-1.5	1.5	02/06/2006 11:10	56-55-3	Benzo(a)anthracene	2.7	0.1	0.2700
HPB05	HPB05-SL-1.5	1.5	02/06/2006 11:10	50-32-8	Benzo(a)pyrene	8.7	1	8.7
HPB05	HPB05-SL-1.5	1.5	02/06/2006 11:10	205-99-2	Benzo(b)fluoranthene	6.8	0.1	0.6800
HPB05	HPB05-SL-1.5	1.5	02/06/2006 11:10	207-08-9	Benzo(k)fluoranthene	0.8100	0.1	0.0810
HPB05	HPB05-SL-1.5	1.5	02/06/2006 11:10	218-01-9	Chrysene	52	0.01	0.5200
HPB05		1.5			**BaP-equivalent**			**10**
HPB05	HPB05-SL-5	5	02/06/2006 11:25	56-55-3	Benzo(a)anthracene	4	0.1	0.4000
HPB05	HPB05-SL-5	5	02/06/2006 11:25	205-99-2	Benzo(b)fluoranthene	11	0.1	1.1
HPB05	HPB05-SL-5	5	02/06/2006 11:25	207-08-9	Benzo(k)fluoranthene	0.7900	0.1	0.0790
HPB05	HPB05-SL-5	5	02/06/2006 11:25	218-01-9	Chrysene	24	0.01	0.2400
HPB05		5			**BaP-equivalent**			**1.8**
HPB05	HPB05-SL-10	10	02/06/2006 11:40	56-55-3	Benzo(a)anthracene	0.0230	0.1	0.0023
HPB05	HPB05-SL-10	10	02/06/2006 11:40	50-32-8	Benzo(a)pyrene	0.1100	1	0.1100
HPB05	HPB05-SL-10	10	02/06/2006 11:40	205-99-2	Benzo(b)fluoranthene	0.0840	0.1	0.0084
HPB05	HPB05-SL-10	10	02/06/2006 11:40	218-01-9	Chrysene	0.1800	0.01	0.0018
HPB05		10			**BaP-equivalent**			**0.12**
HPB06	HPB06-SL-1.5	1.5	02/06/2006 9:45	56-55-3	Benzo(a)anthracene	6.4	0.1	0.6400
HPB06	HPB06-SL-1.5	1.5	02/06/2006 9:45	50-32-8	Benzo(a)pyrene	5.7	1	5.7
HPB06	HPB06-SL-1.5	1.5	02/06/2006 9:45	205-99-2	Benzo(b)fluoranthene	4.5	0.1	0.4500
HPB06	HPB06-SL-1.5	1.5	02/06/2006 9:45	207-08-9	Benzo(k)fluoranthene	5.2	0.1	0.5200
HPB06	HPB06-SL-1.5	1.5	02/06/2006 9:45	218-01-9	Chrysene	7.2	0.01	0.0720
HPB06	HPB06-SL-1.5	1.5	02/06/2006 9:45	193-39-5	Indeno(1,2,3-cd)pyrene	2.8	0.1	0.2800
HPB06		1.5			**BaP-equivalent**			**7.7**
HPB06	HPB06-SL-5	5	02/06/2006 10:00	205-99-2	Benzo(b)fluoranthene	6.3	0.1	0.6300
HPB06	HPB06-SL-5	5	02/06/2006 10:00	218-01-9	Chrysene	1.4	0.01	0.0140
HPB06		5			**BaP-equivalent**			**0.64**
HPB06	HPB06-SL-10	10	02/06/2006 10:10	56-55-3	Benzo(a)anthracene	0.0140	0.1	0.0014
HPB06	HPB06-SL-10	10	02/06/2006 10:10	50-32-8	Benzo(a)pyrene	0.0860	1	0.0860
HPB06	HPB06-SL-10	10	02/06/2006 10:10	205-99-2	Benzo(b)fluoranthene	0.0760	0.1	0.0076
HPB06	HPB06-SL-10	10	02/06/2006 10:10	218-01-9	Chrysene	0.1200	0.01	0.0012
HPB06	HPB06-SL-10	10	02/06/2006 10:10	53-70-3	Dibenz(a,h)anthracene	0.0370	0.34	0.0126
HPB06		10			**BaP-equivalent**			**0.11**
HPB07	HPB07-SL-1.5	1.5	02/06/2006 13:40	56-55-3	Benzo(a)anthracene	0.1900	0.1	0.0190

Notes: "ft bgs" feet below ground surface; "cPAH" carcinogenic polynuclear aromatic hydrocarbon; "BaP" benzo(a)pyrene; Converted Result = [cPAH] x TEF

Table A-1f
Derivation of BaP-Equivalent (Samples with Elevated DLs)
Gardena Sumps

Location	Sample Name	Sample Depth (ft bgs)	Sample Date	CAS Number	cPAH	Result (mgkg)	Result (1/2 DL) (mgkg)	Toxicity Equivalency Factor (TEF)	Converted Result (mg/kg)
CPB11	CPB11-SL-1.5	1.5	12/22/2005 12:50	56-55-3	Benzo(a) anthracene	<1000	500	0.1	50
CPB11	CPB11-SL-1.5	1.5	12/22/2005 12:50	50-32-8	Benzo(a) pyrene	<1000	500	1	500
CPB11	CPB11-SL-1.5	1.5	12/22/2005 12:50	205-99-2	Benzo(b) fluoranthene	<1000	500	0.1	50
CPB11	CPB11-SL-1.5	1.5	12/22/2005 12:50	207-08-9	Benzo(k) fluoranthene	<1000	500	0.1	50
CPB11	CPB11-SL-1.5	1.5	12/22/2005 12:50	218-01-9	Chrysene	<1000	500	0.01	5
CPB11	CPB11-SL-1.5	1.5	12/22/2005 12:50	53-70-3	Dibenz(a,h) anthracene	<1300	650	0.34	221
CPB11	CPB11-SL-1.5	1.5	12/22/2005 12:50	193-39-5	Indeno(1,2,3-cd)pyrene	<1000	500	0.1	50
CPB11	CPB11-SL-1.5	1.5			**BaP-equivalent**				**926**
CPB11	CPB11-SL-10	10	12/22/2005 13:00	56-55-3	Benzo(a) anthracene	<1000	500	0.1	50
CPB11	CPB11-SL-10	10	12/22/2005 13:00	50-32-8	Benzo(a) pyrene	<1000	500	1	500
CPB11	CPB11-SL-10	10	12/22/2005 13:00	205-99-2	Benzo(b) fluoranthene	<1000	500	0.1	50
CPB11	CPB11-SL-10	10	12/22/2005 13:00	207-08-9	Benzo(k) fluoranthene	<1000	500	0.1	50
CPB11	CPB11-SL-10	10	12/22/2005 13:00	218-01-9	Chrysene	<1000	500	0.01	5
CPB11	CPB11-SL-10	10	12/22/2005 13:00	53-70-3	Dibenz(a,h) anthracene	<1300	650	0.34	221
CPB11	CPB11-SL-10	10	12/22/2005 13:00	193-39-5	Indeno(1,2,3-cd)pyrene	<1000	500	0.1	50
CPB11	CPB11-SL-10	10			**BaP-equivalent**				**926**
CPB11	CPB11-SL-5	5	12/22/2005 12:55	56-55-3	Benzo(a) anthracene	<8	4	0.1	0.4
CPB11	CPB11-SL-5	5	12/22/2005 12:55	50-32-8	Benzo(a) pyrene	<8	4	1	4
CPB11	CPB11-SL-5	5	12/22/2005 12:55	205-99-2	Benzo(b) fluoranthene	<8	4	0.1	0.4
CPB11	CPB11-SL-5	5	12/22/2005 12:55	207-08-9	Benzo(k) fluoranthene	<8	4	0.1	0.4
CPB11	CPB11-SL-5	5	12/22/2005 12:55	218-01-9	Chrysene	<8	4	0.01	0.04
CPB11	CPB11-SL-5	5	12/22/2005 12:55	53-70-3	Dibenz(a,h) anthracene	<10	5	0.34	1.7
CPB11	CPB11-SL-5	5	12/22/2005 12:55	193-39-5	Indeno(1,2,3-cd)pyrene	<8	4	0.1	0.4
CPB11	CPB11-SL-5	5			**BaP-equivalent**				**7.3**
CPB15	CPB15-SL-1.5'	1.5	12/20/2005 13:40	56-55-3	Benzo(a) anthracene	<480	240	0.1	24
CPB15	CPB15-SL-1.5'	1.5	12/20/2005 13:40	50-32-8	Benzo(a) pyrene	<480	240	1	240
CPB15	CPB15-SL-1.5'	1.5	12/20/2005 13:40	205-99-2	Benzo(b) fluoranthene	<480	240	0.1	24
CPB15	CPB15-SL-1.5'	1.5	12/20/2005 13:40	207-08-9	Benzo(k) fluoranthene	<480	240	0.1	24
CPB15	CPB15-SL-1.5'	1.5	12/20/2005 13:40	218-01-9	Chrysene	<480	240	0.01	2.4
CPB15	CPB15-SL-1.5'	1.5	12/20/2005 13:40	53-70-3	Dibenz(a,h) anthracene	<600	300	0.34	102
CPB15	CPB15-SL-1.5'	1.5	12/20/2005 13:40	193-39-5	Indeno(1,2,3-cd)pyrene	<480	240	0.1	24
CPB15	CPB15-SL-1.5'	1.5			**BaP-equivalent**				**440**
CPB15	CPB15-SL-10'	10	12/20/2005 14:50	56-55-3	Benzo(a) anthracene	<0.33	0.165	0.1	0.0165
CPB15	CPB15-SL-10'	10	12/20/2005 14:50	50-32-8	Benzo(a) pyrene	<0.33	0.165	1	0.165
CPB15	CPB15-SL-10'	10	12/20/2005 14:50	205-99-2	Benzo(b) fluoranthene	<0.33	0.165	0.1	0.0165
CPB15	CPB15-SL-10'	10	12/20/2005 14:50	207-08-9	Benzo(k) fluoranthene	<0.33	0.165	0.1	0.0165
CPB15	CPB15-SL-10'	10	12/20/2005 14:50	218-01-9	Chrysene	<0.33	0.165	0.01	0.00165
CPB15	CPB15-SL-10'	10	12/20/2005 14:50	53-70-3	Dibenz(a,h) anthracene	<0.42	0.21	0.34	0.0714
CPB15	CPB15-SL-10'	10	12/20/2005 14:50	193-39-5	Indeno(1,2,3-cd)pyrene	<0.33	0.165	0.1	0.0165
CPB15	CPB15-SL-10'	10			**BaP-equivalent**				**0.30**
CPB15	CPB15-SL-11'	11	12/20/2005 14:55	56-55-3	Benzo(a) anthracene	<0.33	0.165	0.1	0.0165
CPB15	CPB15-SL-11'	11	12/20/2005 14:55	50-32-8	Benzo(a) pyrene	<0.33	0.165	1	0.165
CPB15	CPB15-SL-11'	11	12/20/2005 14:55	205-99-2	Benzo(b) fluoranthene	<0.33	0.165	0.1	0.0165
CPB15	CPB15-SL-11'	11	12/20/2005 14:55	207-08-9	Benzo(k) fluoranthene	<0.33	0.165	0.1	0.0165
CPB15	CPB15-SL-11'	11	12/20/2005 14:55	218-01-9	Chrysene	<0.33	0.165	0.01	0.00165
CPB15	CPB15-SL-11'	11	12/20/2005 14:55	53-70-3	Dibenz(a,h) anthracene	<0.42	0.21	0.34	0.0714
CPB15	CPB15-SL-11'	11	12/20/2005 14:55	193-39-5	Indeno(1,2,3-cd)pyrene	<0.33	0.165	0.1	0.0165
CPB15	CPB15-SL-11'	11			**BaP-equivalent**				**0.30**

Notes: "ft bgs" feet below ground surface; "cPAH" carcinogenic polynuclear aromatic hydrocarbon; "BaP" benzo(a)pyrene; Converted Result = [cPAH] x TEF

Table A-1f
Derivation of BaP-Equivalent (Samples with Elevated DLs)
Gardena Sumps

Location	Sample Name	Sample Depth (ft bgs)	Sample Date	CAS Number	cPAH	Result (mgkg)	Result (1/2 DL) (mgkg)	Toxicity Equivalency Factor (TEF)	Converted Result (mg/kg)
CPB15	CPB15-SL-5'	5	12/20/2005 13:45	56-55-3	Benzo(a) anthracene	<3.3	1.65	0.1	0.165
CPB15	CPB15-SL-5'	5	12/20/2005 13:45	50-32-8	Benzo(a) pyrene	<3.3	1.65	1	1.65
CPB15	CPB15-SL-5'	5	12/20/2005 13:45	205-99-2	Benzo(b) fluoranthene	<3.3	1.65	0.1	0.165
CPB15	CPB15-SL-5'	5	12/20/2005 13:45	207-08-9	Benzo(k) fluoranthene	<3.3	1.65	0.1	0.165
CPB15	CPB15-SL-5'	5	12/20/2005 13:45	218-01-9	Chrysene	<3.3	1.65	0.01	0.0165
CPB15	CPB15-SL-5'	5	12/20/2005 13:45	53-70-3	Dibenz(a,h) anthracene	<4.2	2.1	0.34	0.714
CPB15	CPB15-SL-5'	5	12/20/2005 13:45	193-39-5	Indeno(1,2,3-cd)pyrene	<3.3	1.65	0.1	0.165
CPB15	CPB15-SL-5'	5			**BaP-equivalent**				**3.0**
CPB18	CPB18-SL-1.5'	1.5	12/20/2005 9:28	56-55-3	Benzo(a) anthracene	<990	495	0.1	49.5
CPB18	CPB18-SL-1.5'	1.5	12/20/2005 9:28	50-32-8	Benzo(a) pyrene	<990	495	1	495
CPB18	CPB18-SL-1.5'	1.5	12/20/2005 9:28	205-99-2	Benzo(b) fluoranthene	<990	495	0.1	49.5
CPB18	CPB18-SL-1.5'	1.5	12/20/2005 9:28	207-08-9	Benzo(k) fluoranthene	<990	495	0.1	49.5
CPB18	CPB18-SL-1.5'	1.5	12/20/2005 9:28	218-01-9	Chrysene	<990	495	0.01	4.95
CPB18	CPB18-SL-1.5'	1.5	12/20/2005 9:28	53-70-3	Dibenz(a,h) anthracene	<1200	600	0.34	204
CPB18	CPB18-SL-1.5'	1.5	12/20/2005 9:28	193-39-5	Indeno(1,2,3-cd)pyrene	<990	495	0.1	49.5
CPB18	CPB18-SL-1.5'	1.5			**BaP-equivalent**				**902**
CPB-28	CPB-28-SL-5-7	7	12/05/2006 14:50	56-55-3	Benzo(a) anthracene	<0.33	0.165	0.1	0.0165
CPB-28	CPB-28-SL-5-7	7	12/05/2006 14:50	50-32-8	Benzo(a) pyrene	<0.33	0.165	1	0.165
CPB-28	CPB-28-SL-5-7	7	12/05/2006 14:50	205-99-2	Benzo(b) fluoranthene	<0.33	0.165	0.1	0.0165
CPB-28	CPB-28-SL-5-7	7	12/05/2006 14:50	207-08-9	Benzo(k) fluoranthene	<0.33	0.165	0.1	0.0165
CPB-28	CPB-28-SL-5-7	7	12/05/2006 14:50	218-01-9	Chrysene	<0.33	0.165	0.01	0.00165
CPB-28	CPB-28-SL-5-7	7	12/05/2006 14:50	53-70-3	Dibenz(a,h) anthracene	<0.42	0.21	0.34	0.0714
CPB-28	CPB-28-SL-5-7	7	12/05/2006 14:50	193-39-5	Indeno(1,2,3-cd)pyrene	<0.33	0.165	0.1	0.0165
CPB-28	CPB-28-SL-5-7	7			**BaP-equivalent**				**0.30**
CPB-28	CPB-28-SL-9-11	11	12/05/2006 15:00	56-55-3	Benzo(a) anthracene	<0.33	0.165	0.1	0.0165
CPB-28	CPB-28-SL-9-11	11	12/05/2006 15:00	50-32-8	Benzo(a) pyrene	<0.33	0.165	1	0.165
CPB-28	CPB-28-SL-9-11	11	12/05/2006 15:00	205-99-2	Benzo(b) fluoranthene	<0.33	0.165	0.1	0.0165
CPB-28	CPB-28-SL-9-11	11	12/05/2006 15:00	207-08-9	Benzo(k) fluoranthene	<0.33	0.165	0.1	0.0165
CPB-28	CPB-28-SL-9-11	11	12/05/2006 15:00	218-01-9	Chrysene	<0.33	0.165	0.01	0.00165
CPB-28	CPB-28-SL-9-11	11	12/05/2006 15:00	53-70-3	Dibenz(a,h) anthracene	<0.42	0.21	0.34	0.0714
CPB-28	CPB-28-SL-9-11	11	12/05/2006 15:00	193-39-5	Indeno(1,2,3-cd)pyrene	<0.33	0.165	0.1	0.0165
CPB-28	CPB-28-SL-9-11	11			**BaP-equivalent**				**0.30**
DPW10	DPW10-SS-2'	2	01/11/2006 10:20	56-55-3	Benzo(a) anthracene	<0.33	0.165	0.1	0.0165
DPW10	DPW10-SS-2'	2	01/11/2006 10:20	50-32-8	Benzo(a) pyrene	<0.33	0.165	1	0.165
DPW10	DPW10-SS-2'	2	01/11/2006 10:20	205-99-2	Benzo(b) fluoranthene	<0.33	0.165	0.1	0.0165
DPW10	DPW10-SS-2'	2	01/11/2006 10:20	207-08-9	Benzo(k) fluoranthene	<0.33	0.165	0.1	0.0165
DPW10	DPW10-SS-2'	2	01/11/2006 10:20	218-01-9	Chrysene	<0.33	0.165	0.01	0.00165
DPW10	DPW10-SS-2'	2	01/11/2006 10:20	53-70-3	Dibenz(a,h) anthracene	<0.42	0.21	0.34	0.0714
DPW10	DPW10-SS-2'	2	01/11/2006 10:20	193-39-5	Indeno(1,2,3-cd)pyrene	<0.33	0.165	0.1	0.0165
DPW10	DPW10-SS-2'	2			**BaP-equivalent**				**0.30**
HPB02	HPB02-SL-1.5	1.5	02/09/2006 10:00	56-55-3	Benzo(a) anthracene	<0.67	0.335	0.1	0.0335
HPB02	HPB02-SL-1.5	1.5	02/09/2006 10:00	50-32-8	Benzo(a) pyrene	<0.67	0.335	1	0.335
HPB02	HPB02-SL-1.5	1.5	02/09/2006 10:00	205-99-2	Benzo(b) fluoranthene	<0.67	0.335	0.1	0.0335
HPB02	HPB02-SL-1.5	1.5	02/09/2006 10:00	207-08-9	Benzo(k) fluoranthene	<0.67	0.335	0.1	0.0335
HPB02	HPB02-SL-1.5	1.5	02/09/2006 10:00	218-01-9	Chrysene	<0.67	0.335	0.01	0.00335
HPB02	HPB02-SL-1.5	1.5	02/09/2006 10:00	53-70-3	Dibenz(a,h) anthracene	<0.83	0.415	0.34	0.1411
HPB02	HPB02-SL-1.5	1.5	02/09/2006 10:00	193-39-5	Indeno(1,2,3-cd)pyrene	<0.67	0.335	0.1	0.0335
HPB02	HPB02-SL-1.5	1.5			**BaP-equivalent**				**0.61**

Notes: "ft bgs" feet below ground surface; "cPAH" carcinogenic polynuclear aromatic hydrocarbon; "BaP" benzo(a)pyrene; Converted Result = [cPAH] x TEF

Table A-1f
Derivation of BaP-Equivalent (Samples with Elevated DLs)
Gardena Sumps

Location	Sample Name	Sample Depth (ft bgs)	Sample Date	CAS Number	cPAH	Result (mgkg)	Result (1/2 DL) (mgkg)	Toxicity Equivalency Factor (TEF)	Converted Result (mg/kg)
HPB04	HPB04-SL-1.5	1.5	02/09/2006 14:25	56-55-3	Benzo(a) anthracene	<0.33	0.165	0.1	0.0165
HPB04	HPB04-SL-1.5	1.5	02/09/2006 14:25	50-32-8	Benzo(a) pyrene	<0.33	0.165	1	0.165
HPB04	HPB04-SL-1.5	1.5	02/09/2006 14:25	205-99-2	Benzo(b) fluoranthene	<0.33	0.165	0.1	0.0165
HPB04	HPB04-SL-1.5	1.5	02/09/2006 14:25	207-08-9	Benzo(k) fluoranthene	<0.33	0.165	0.1	0.0165
HPB04	HPB04-SL-1.5	1.5	02/09/2006 14:25	218-01-9	Chrysene	<0.33	0.165	0.01	0.00165
HPB04	HPB04-SL-1.5	1.5	02/09/2006 14:25	53-70-3	Dibenz(a,h) anthracene	<0.42	0.21	0.34	0.0714
HPB04	HPB04-SL-1.5	1.5	02/09/2006 14:25	193-39-5	Indeno(1,2,3-cd)pyrene	<0.33	0.165	0.1	0.0165
HPB04	HPB04-SL-1.5	1.5			**BaP-equivalent**				**0.30**
HPB04	HPB04-SL-10	10	02/09/2006 14:40	56-55-3	Benzo(a) anthracene	<0.33	0.165	0.1	0.0165
HPB04	HPB04-SL-10	10	02/09/2006 14:40	50-32-8	Benzo(a) pyrene	<0.33	0.165	1	0.165
HPB04	HPB04-SL-10	10	02/09/2006 14:40	205-99-2	Benzo(b) fluoranthene	<0.33	0.165	0.1	0.0165
HPB04	HPB04-SL-10	10	02/09/2006 14:40	207-08-9	Benzo(k) fluoranthene	<0.33	0.165	0.1	0.0165
HPB04	HPB04-SL-10	10	02/09/2006 14:40	218-01-9	Chrysene	<0.33	0.165	0.01	0.00165
HPB04	HPB04-SL-10	10	02/09/2006 14:40	53-70-3	Dibenz(a,h) anthracene	<0.42	0.21	0.34	0.0714
HPB04	HPB04-SL-10	10	02/09/2006 14:40	193-39-5	Indeno(1,2,3-cd)pyrene	<0.33	0.165	0.1	0.0165
HPB04	HPB04-SL-10	10			**BaP-equivalent**				**0.30**
HPB04	HPB04-SL-5	5	02/09/2006 14:35	56-55-3	Benzo(a) anthracene	<0.33	0.165	0.1	0.0165
HPB04	HPB04-SL-5	5	02/09/2006 14:35	50-32-8	Benzo(a) pyrene	<0.33	0.165	1	0.165
HPB04	HPB04-SL-5	5	02/09/2006 14:35	205-99-2	Benzo(b) fluoranthene	<0.33	0.165	0.1	0.0165
HPB04	HPB04-SL-5	5	02/09/2006 14:35	207-08-9	Benzo(k) fluoranthene	<0.33	0.165	0.1	0.0165
HPB04	HPB04-SL-5	5	02/09/2006 14:35	218-01-9	Chrysene	<0.33	0.165	0.01	0.00165
HPB04	HPB04-SL-5	5	02/09/2006 14:35	53-70-3	Dibenz(a,h) anthracene	<0.42	0.21	0.34	0.0714
HPB04	HPB04-SL-5	5	02/09/2006 14:35	193-39-5	Indeno(1,2,3-cd)pyrene	<0.33	0.165	0.1	0.0165
HPB04	HPB04-SL-5	5			**BaP-equivalent**				**0.30**
HPB-12	HPB-12-SL-10-12	12	12/04/2006 13:05	56-55-3	Benzo(a) anthracene	<0.33	0.165	0.1	0.0165
HPB-12	HPB-12-SL-10-12	12	12/04/2006 13:05	50-32-8	Benzo(a) pyrene	<0.33	0.165	1	0.165
HPB-12	HPB-12-SL-10-12	12	12/04/2006 13:05	205-99-2	Benzo(b) fluoranthene	<0.33	0.165	0.1	0.0165
HPB-12	HPB-12-SL-10-12	12	12/04/2006 13:05	207-08-9	Benzo(k) fluoranthene	<0.33	0.165	0.1	0.0165
HPB-12	HPB-12-SL-10-12	12	12/04/2006 13:05	218-01-9	Chrysene	<0.33	0.165	0.01	0.00165
HPB-12	HPB-12-SL-10-12	12	12/04/2006 13:05	53-70-3	Dibenz(a,h) anthracene	<0.42	0.21	0.34	0.0714
HPB-12	HPB-12-SL-10-12	12	12/04/2006 13:05	193-39-5	Indeno(1,2,3-cd)pyrene	<0.33	0.165	0.1	0.0165
HPB-12	HPB-12-SL-10-12	12			**BaP-equivalent**				**0.30**
HPB-12	HPB-12-SL-5-7	7	12/04/2006 13:00	56-55-3	Benzo(a) anthracene	<0.33	0.165	0.1	0.0165
HPB-12	HPB-12-SL-5-7	7	12/04/2006 13:00	50-32-8	Benzo(a) pyrene	<0.33	0.165	1	0.165
HPB-12	HPB-12-SL-5-7	7	12/04/2006 13:00	205-99-2	Benzo(b) fluoranthene	<0.33	0.165	0.1	0.0165
HPB-12	HPB-12-SL-5-7	7	12/04/2006 13:00	207-08-9	Benzo(k) fluoranthene	<0.33	0.165	0.1	0.0165
HPB-12	HPB-12-SL-5-7	7	12/04/2006 13:00	218-01-9	Chrysene	<0.33	0.165	0.01	0.00165
HPB-12	HPB-12-SL-5-7	7	12/04/2006 13:00	53-70-3	Dibenz(a,h) anthracene	<0.42	0.21	0.34	0.0714
HPB-12	HPB-12-SL-5-7	7	12/04/2006 13:00	193-39-5	Indeno(1,2,3-cd)pyrene	<0.33	0.165	0.1	0.0165
HPB-12	HPB-12-SL-5-7	7			**BaP-equivalent**				**0.30**
RB01	RB01-SL-1.5	1.5	02/14/2006 9:40	56-55-3	Benzo(a) anthracene	<1.3	0.65	0.1	0.065
RB01	RB01-SL-1.5	1.5	02/14/2006 9:40	50-32-8	Benzo(a) pyrene	<1.3	0.65	1	0.65
RB01	RB01-SL-1.5	1.5	02/14/2006 9:40	205-99-2	Benzo(b) fluoranthene	<1.3	0.65	0.1	0.065
RB01	RB01-SL-1.5	1.5	02/14/2006 9:40	207-08-9	Benzo(k) fluoranthene	<1.3	0.65	0.1	0.065
RB01	RB01-SL-1.5	1.5	02/14/2006 9:40	218-01-9	Chrysene	<1.3	0.65	0.01	0.0065
RB01	RB01-SL-1.5	1.5	02/14/2006 9:40	53-70-3	Dibenz(a,h) anthracene	<1.7	0.85	0.34	0.289
RB01	RB01-SL-1.5	1.5	02/14/2006 9:40	193-39-5	Indeno(1,2,3-cd)pyrene	<1.3	0.65	0.1	0.065
RB01	RB01-SL-1.5	1.5			**BaP-equivalent**				**1.2**

Notes: "ft bgs" feet below ground surface; "cPAH" carcinogenic polynuclear aromatic hydrocarbon; "BaP" benzo(a)pyrene; Converted Result = [cPAH] x TEF

Table A-1f
Derivation of BaP-Equivalent (Samples with Elevated DLs)
Gardena Sumps

Location	Sample Name	Sample Depth (ft bgs)	Sample Date	CAS Number	cPAH	Result (mgkg)	Result (1/2 DL) (mgkg)	Toxicity Equivalency Factor (TEF)	Converted Result (mg/kg)
RB02	RB02-SL-1.5	1.5	02/14/2006 13:40	56-55-3	Benzo(a) anthracene	<0.67	0.335	0.1	0.0335
RB02	RB02-SL-1.5	1.5	02/14/2006 13:40	50-32-8	Benzo(a) pyrene	<0.67	0.335	1	0.335
RB02	RB02-SL-1.5	1.5	02/14/2006 13:40	205-99-2	Benzo(b) fluoranthene	<0.67	0.335	0.1	0.0335
RB02	RB02-SL-1.5	1.5	02/14/2006 13:40	207-08-9	Benzo(k) fluoranthene	<0.67	0.335	0.1	0.0335
RB02	RB02-SL-1.5	1.5	02/14/2006 13:40	218-01-9	Chrysene	<0.67	0.335	0.01	0.00335
RB02	RB02-SL-1.5	1.5	02/14/2006 13:40	53-70-3	Dibenz(a,h) anthracene	<0.83	0.415	0.34	0.1411
RB02	RB02-SL-1.5	1.5	02/14/2006 13:40	193-39-5	Indeno(1,2,3-cd)pyrene	<0.67	0.335	0.1	0.0335
RB02	RB02-SL-1.5	1.5			**BaP-equivalent**				**0.61**
RB02	RB02-SL-10	10	02/14/2006 14:05	56-55-3	Benzo(a) anthracene	<8.3	4.15	0.1	0.415
RB02	RB02-SL-10	10	02/14/2006 14:05	50-32-8	Benzo(a) pyrene	<8.3	4.15	1	4.15
RB02	RB02-SL-10	10	02/14/2006 14:05	205-99-2	Benzo(b) fluoranthene	<8.3	4.15	0.1	0.415
RB02	RB02-SL-10	10	02/14/2006 14:05	207-08-9	Benzo(k) fluoranthene	<8.3	4.15	0.1	0.415
RB02	RB02-SL-10	10	02/14/2006 14:05	218-01-9	Chrysene	<8.3	4.15	0.01	0.0415
RB02	RB02-SL-10	10	02/14/2006 14:05	53-70-3	Dibenz(a,h) anthracene	<10	5	0.34	1.7
RB02	RB02-SL-10	10	02/14/2006 14:05	193-39-5	Indeno(1,2,3-cd)pyrene	<8.3	4.15	0.1	0.415
RB02	RB02-SL-10	10			**BaP-equivalent**				**7.6**
RB03	RB03-2SL-1.5	1.5	02/15/2006 9:16	56-55-3	Benzo(a) anthracene	<0.33	0.165	0.1	0.0165
RB03	RB03-2SL-1.5	1.5	02/15/2006 9:16	50-32-8	Benzo(a) pyrene	<0.33	0.165	1	0.165
RB03	RB03-2SL-1.5	1.5	02/15/2006 9:16	205-99-2	Benzo(b) fluoranthene	<0.33	0.165	0.1	0.0165
RB03	RB03-2SL-1.5	1.5	02/15/2006 9:16	207-08-9	Benzo(k) fluoranthene	<0.33	0.165	0.1	0.0165
RB03	RB03-2SL-1.5	1.5	02/15/2006 9:16	218-01-9	Chrysene	<0.33	0.165	0.01	0.00165
RB03	RB03-2SL-1.5	1.5	02/15/2006 9:16	53-70-3	Dibenz(a,h) anthracene	<0.42	0.21	0.34	0.0714
RB03	RB03-2SL-1.5	1.5	02/15/2006 9:16	193-39-5	Indeno(1,2,3-cd)pyrene	<0.33	0.165	0.1	0.0165
RB03	RB03-2SL-1.5	1.5			**BaP-equivalent**				**0.30**
SV02	SV02-SS-10	10	03/13/2006 13:40	56-55-3	Benzo(a) anthracene	<0.33	0.165	0.1	0.0165
SV02	SV02-SS-10	10	03/13/2006 13:40	50-32-8	Benzo(a) pyrene	<0.33	0.165	1	0.165
SV02	SV02-SS-10	10	03/13/2006 13:40	205-99-2	Benzo(b) fluoranthene	<0.33	0.165	0.1	0.0165
SV02	SV02-SS-10	10	03/13/2006 13:40	207-08-9	Benzo(k) fluoranthene	<0.33	0.165	0.1	0.0165
SV02	SV02-SS-10	10	03/13/2006 13:40	218-01-9	Chrysene	<0.33	0.165	0.01	0.00165
SV02	SV02-SS-10	10	03/13/2006 13:40	53-70-3	Dibenz(a,h) anthracene	<0.42	0.21	0.34	0.0714
SV02	SV02-SS-10	10	03/13/2006 13:40	193-39-5	Indeno(1,2,3-cd)pyrene	<0.33	0.165	0.1	0.0165
SV02	SV02-SS-10	10			**BaP-equivalent**				**0.30**
SV02	SV02-SS-5	5	03/13/2006 13:20	56-55-3	Benzo(a) anthracene	<0.33	0.165	0.1	0.0165
SV02	SV02-SS-5	5	03/13/2006 13:20	50-32-8	Benzo(a) pyrene	<0.33	0.165	1	0.165
SV02	SV02-SS-5	5	03/13/2006 13:20	205-99-2	Benzo(b) fluoranthene	<0.33	0.165	0.1	0.0165
SV02	SV02-SS-5	5	03/13/2006 13:20	207-08-9	Benzo(k) fluoranthene	<0.33	0.165	0.1	0.0165
SV02	SV02-SS-5	5	03/13/2006 13:20	218-01-9	Chrysene	<0.33	0.165	0.01	0.00165
SV02	SV02-SS-5	5	03/13/2006 13:20	53-70-3	Dibenz(a,h) anthracene	<0.42	0.21	0.34	0.0714
SV02	SV02-SS-5	5	03/13/2006 13:20	193-39-5	Indeno(1,2,3-cd)pyrene	<0.33	0.165	0.1	0.0165
SV02	SV02-SS-5	5			**BaP-equivalent**				**0.30**
SV10	SV10-SS-10	10	03/13/2006 14:50	56-55-3	Benzo(a) anthracene	<0.33	0.165	0.1	0.0165
SV10	SV10-SS-10	10	03/13/2006 14:50	50-32-8	Benzo(a) pyrene	<0.33	0.165	1	0.165
SV10	SV10-SS-10	10	03/13/2006 14:50	205-99-2	Benzo(b) fluoranthene	<0.33	0.165	0.1	0.0165
SV10	SV10-SS-10	10	03/13/2006 14:50	207-08-9	Benzo(k) fluoranthene	<0.33	0.165	0.1	0.0165
SV10	SV10-SS-10	10	03/13/2006 14:50	218-01-9	Chrysene	<0.33	0.165	0.01	0.00165
SV10	SV10-SS-10	10	03/13/2006 14:50	53-70-3	Dibenz(a,h) anthracene	<0.42	0.21	0.34	0.0714
SV10	SV10-SS-10	10	03/13/2006 14:50	193-39-5	Indeno(1,2,3-cd)pyrene	<0.33	0.165	0.1	0.0165
SV10	SV10-SS-10	10			**BaP-equivalent**				**0.30**

Notes: "ft bgs" feet below ground surface; "cPAH" carcinogenic polynuclear aromatic hydrocarbon; "BaP" benzo(a)pyrene; Converted Result = [cPAH] x TEF

APPENDIX D

Table D-1

Table D-1
Summary of Risk-Based Concentrations for Soil and Soil Gas
Gardena Sumps

Chemical of Potential Concern	Commercial/Industrial Worker Scenario		Construction Worker Scenario		Residential Scenario				Trespasser Scenario	
	Soil		Soil		Soil		Soil Gas (5 ft bgs)		Soil	
	RBCnc (mg/kg)	RBCc (mg/kg)	RBCnc (mg/kg)	RBCc (mg/kg)	RBCnc (mg/kg)	RBCc (mg/kg)	RBCnc (µg/L)	RBCc (µg/L)	RBCnc (mg/kg)	RBCc (mg/kg)
Inorganics										
Arsenic[1]	2.7E+02	1.7E+01	6.2E+01	1.2E+02	2.2E+01	3.9E-01	--	--	3.8E+03	8.5E+01
Chromium VI	3.0E+03	5.4E+01	6.1E+02	7.3E+01	2.3E+02	1.2E+00	--	--	4.9E+04	3.2E+02
PAHs										
Benzo(a)pyrene[2]	2.0E+04	1.6E+00	5.5E+03	1.1E+01	1.7E+03	3.7E-02	--	--	2.2E+05	6.2E+00
VOCs										
Benzene	6.7E+02	2.4E+01	1.6E+02	1.4E+02	1.2E+02	4.8E-01	1.6E+02	4.3E-01	1.4E+04	1.8E+02
Naphthalene	8.5E+02	2.5E+02	1.9E+02	1.4E+03	1.8E+02	4.9E+00	--	--	1.8E+04	1.9E+03

Notes:

" -- " not applicable; " ft bgs " feet below ground surface

RBCnc: risk-based concentration based on noncancer effects

RBCc: risk-based concentration based on cancer effects

[1] For arsenic, the DTSC screening level of 12 mg/kg was used as background (Cal-EPA DTSC, 2007).

[2] For benzo(a)pyrene, a concentration of 0.9 mg/kg was used as background (considered representative of background PAH concentrations in southern California soils.

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FINAL FEASIBILITY STUDY

GARDENA SUMPS

Prepared by

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LIST OF ACRONYMS

amsl	above mean sea level
APA	Air pathway analysis
API	American Petroleum Institute
ARAR	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
$CaCO_3$	calcium carbonate
CalDWR	California Department of Water Resources
CalEPA	California Environmental Protection Agency
Cal-OSHA	California Occupational Safety and Health
CaO	calcium oxide
$Ca(OH)_2$	calcium hydroxide, hydrated lime
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act

CHHSLs	California Human Health Screening Levels
cm/s	centimeters per second
COC	chemicals of concern
COPC	constituents of potential concern
cP	centipoises
CQA	Construction Quality Assurance
CY	cubic yard
DRO	diesel range organics
DTSC	Department of Toxic Substances Control
EEI	Ecology and Environmental, Inc.
FS	Feasibility Study
ft	feet
ft bgs	feet below ground surface
GAC	Granular Activated Carbon
GCL	geosynthetic clay liner
GRA	general response action
GRO	gasoline range organics
H_2S	hydrogen sulfide
HASP	Health and Safety Plan
HDPE	high-density polyethylene
HHRA	human health risk assessment
in	inch
LACDPW	Los Angeles County Department of Public Works
LADPW	Los Angeles Department of Public Works
LUCs	land use covenants
MCL	maximum contaminant level
NPDES	National Pollution Discharge Elimination System
O&M	operation and maintenance
OMM	Operations, Maintenance, and Monitoring
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon

PEL	permissible exposure limit
ppmv	parts per million by volume
PVC	polyvinyl chloride
QC	quality control
RAOs	Remedial Action Objectives
RAP	Remedial Action Phase
RBC	risk-based concentration/value
RI	Remedial Investigation
RL	Reporting Limit
RMP	Risk Management Plan
ROD	Record of Decision
RTC	response to comments
RWQCB	Regional Water Quality Control Board
SCAQMD	South Coast Air Quality Management District
SCBA	Self-Contained Breathing Apparatus
SO_2	sulfur dioxide
SPLP	synthetic precipitation leaching procedure
SSAL	site-specific action levels
SVOC	semi-volatile organic compound
SWPPP	Stormwater Pollution Prevention Plan
TBC	to be considered
TCLP	toxic characteristic leaching procedure
THE	total extractable hydrocarbon
USEPA	United States Environmental Protection Agency
VFH	volatile fuel hydrocarbons
VOC	volatile organic compounds
w/w	mass concentration

EXECUTIVE SUMMARY

This Final Feasibility Study Report (FS Report) was prepared for the Gardena Sumps Site (Site) in Gardena, California. This FS Report was prepared for submittal to the California Environmental Protection Agency (CalEPA), Department of Toxic Substances Control (DTSC) in accordance with the California Health and Safety Code. The FS Report is a requirement of Consent Decree CV04-7882-AHM (JTLx), (Consent Decree). This FS Report incorporates the comments and requests made by the DTSC on the original draft FS dated February 2011 and subsequent revisions dated November 2012, April 2013, and November 2013.

Background

The Site is located in the southwest corner of the Artesia Boulevard and Normandie Avenue intersection in the City of Gardena, Los Angeles County, California. Generally, the area surrounding the Site is bordered to the south by the Los Angeles County Department of Public Works (LACDPW) Dominguez Flood Channel, to the east by the Southern Pacific Railroad right-of-way, to the west by the western Haack property line, and to the north by Artesia Boulevard, although a small portion of Artesia Boulevard is included within the Site. Commercial and residential properties are currently located to the north, east, and west of the Site (Stantec, 2008).

The site was developed as a clay mine during the 1920s by the Moneta Brick Company. Clay mining resulted in excavations that were reportedly used for sludge disposal beginning in approximately 1940. By September 1946, the Haack, Cooper South and Cooper North Sumps had been filled with sludge, and vegetation had reclaimed the Haack Rework Area (Stantec, 2008).

By December 1951, the western portion of the Haack Sump had been covered with dirt and was converted into a parking lot. On October 1, 1952, the northern-most strip of the Site property was sold to the State of California for a highway easement. By early 1956, Artesia Boulevard (Highway 91) had been constructed, with the southern portion of the roadway encroaching into the Haack Sump northern berm. By January 1958, the Dominguez Channel had been reconstructed and extended eastward south of the Site (Stantec, 2008).

By November 1962, the bluff on the Haack Property had been excavated southward to expand the Haack parking lot, although the eastern portion of the Haack property contained sludge immediately west of the Cooper North Sump. The Haack Rework Area appeared altered and may have received soil cover from excavation activities that occurred immediately north of the Haack Rework Area. The future Cooper property

was unchanged even after it was sold to Thomas Cooper in December 1977 (Stantec, 2008).

Currently, the two Cooper sumps are capped by a geosynthetic liner that was installed by OHM Corporation (OHM) in July 1993 as part of the DTSC's environmental program at the Site. An additional geosynthetic liner was placed over the 1993 liner in August 2013. Details of the new liner construction are provided in the Annual Cover Inspection and Maintenance Report prepared by Stantec Consulting Services, Inc. (Stantec) dated 31 January 2014 (Stantec, 2014). The Haack Sump has been covered by asphalt and a concrete slab. Currently the Haack property is leased to various tenants who operate small businesses, including a U-Haul rental agency, a metal fabricating, sand blasting and painting company, and an auto body repair shop. Three buildings and numerous small trailer-type storage structures are present on the Haack property (Stantec 2008).

Geology and Hydrogeology

The Site is located in the Los Angeles Coastal Plain and is underlain by a thick sequence of marine and continental sediments that were deposited in a broad synclinal depression generally referred to as the Los Angeles Basin. The Los Angeles Basin is bisected by the northwest trending Newport-Inglewood uplift, which divides the Coastal Plain into two smaller synclinal troughs. The Site is located in the West Coast Basin, which constitutes the southwest portion of the Los Angeles Basin (Stantec, 2008).

The Site is located near the junction of the Torrance Plain and the Dominguez Erosion Gap. The Torrance Plain runs west of and parallel to the hills of the Newport-Inglewood uplift from the Ballona Gap southeast to the Dominguez Gap. The Plain is a broad featureless area only slightly dissected locally by the Dominguez Creek (Dominguez Channel) (Stantec, 2008).

According to boring logs in the Ecology and Environmental, Inc. (EEI) (1986), Metcalf and Eddy (1992), CalEPA (1994) and URS (1994) reports, sediments underlying the Site, to the maximum explored depth of 92 feet below ground surface (ft bgs), consist primarily of a mixture of clays and silts with interbeds of sand (Stantec, 2008).

The Site is underlain by the Bellflower Aquiclude at the ground surface, and beneath that, the Gardena and/or Gage Aquifers of the Lakewood Formation within the larger, West Coast Groundwater Basin. Regionally, the Bellflower Aquiclude contains interfingered zones of permeable and less permeable sediments with modest to relatively high hydraulic conductivity. Little beneficial use is made of water in these shallow, discontinuous hydraulic zones because well yields tend to be low and water quality generally poor (CalDWR, 1961).

Immediately beneath the Site, there are two hydraulic zones within the Bellflower Aquiclude: Zone A (upper) and Zone B (lower), which are approximately 15 to 25 and 75 to 80 ft bgs, respectively. Site groundwater monitoring wells are screened within these two zones (Stantec, 2008). Presently the shallow groundwater beneath the Site is influenced by the concrete lined Dominguez Channel and flows southward (Stantec, 2010c).

Beneath the Lakewood Formation are the Lynwood and the Silverado Aquifers, which are capable of storing or conveying groundwater in significant quantities and constitute major sources of groundwater in the West Coast Groundwater Basin. While these aquifers are designated as primary and secondary sources of domestic water supply, neither the Gardena nor Gage Aquifers are currently pumped for domestic use (Stantec, 2008).

The area surrounding the Site is urbanized, with surface waters that drain via storm drains into the Dominguez Channel. The upstream portion of the modern day Dominguez Channel originates several miles west-northwest of the Site, and it drains surface water to the southeast where it discharges to the Cerritos Channel of the Los Angeles Harbor. Historically, the Dominguez Channel flowed along a natural channel bed located approximately several hundred feet west and north of the Site, where it flowed eastward into Laguna Dominguez. Surface water at the Site generally drains towards the north and east following site topography, and is intercepted by a flood control storm drain located at the northeast corner of the Site adjacent to the intersection of Artesia Boulevard and Normandie Avenue (Stantec, 2008).

Contaminant Distribution

During the 2006, 2008, 2009, and 2010 Remedial Investigation (RI) activities, Stantec collected subsurface soil, sludge, surface water, groundwater, perched groundwater, soil gas, and soil vapor flux samples to identify the nature and extent of contamination. Results of the sampling activities are summarized in the following paragraphs.

Sludge

The Cooper North and South Sumps have a maximum thickness of 17.5 ft and 13.5 ft, respectively, while the Haack Sump varies in thickness from 0.5 to 3 ft to depths up to 14.6 ft bgs. Based on analytical results, attenuation of sludge was typically 1 to 7.5 ft below the bottom of the sludge (Stantec, 2008). The sludge volumes in the sumps are 6,700 cubic yards (cy), 7,000 cy, and 2,250 cy in the Cooper South, Cooper North, and Haack Sumps, respectively (Stantec, 2010c).

The Haack rework area consists of deposited sludge, soil, and debris in discontinuous and mixed layers beneath a soil cover with thickness varying from less than 1 foot to 10 feet. Stantec calculated approximately 650 CY of sludge material is in the Haack Rework Area (Stantec, 2010c).

Constituents identified in the sludge included volatile fuel hydrocarbons (VFHs), total extractable hydrocarbons (TEHs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons (PAHs), Title 22 metals, mercury, and hexavalent chromium.

Surface Water

Surface water samples were collected upstream and downstream of the Site from the Dominguez Channel in 2006 and 2008. Analytical data from surface water samples indicated elevated concentrations of gasoline range organics (GRO) and VOC analytes in contrast to the non-detections for those analytes in groundwater monitored at the Site. Based on the organic chemical parameters, the Site is not impacting surface water quality in the channel.

Soil Gas

The soil gas investigation activities evaluated the subsurface concentrations of VOCs, hydrogen sulfide, and methane at various locations across the Site for use in the baseline human health risk assessment (HHRA). Constituent concentrations reported above the detection limit for targeted VOCs include benzene, toluene, ethylbenzene, m-,p-,o-xylenes, 1,3,5-trimethylbenzene, and Freon 113. Methane and hydrogen sulfide were also detected in samples collected during the 2006 RI activities.

Soil Vapor Flux

Air pathway analysis (APA) was performed on ambient air samples, exposed disturbed and undisturbed sludge on the Cooper property, soil on both the Cooper and Haack properties, and asphalt and concrete slab-covered soil on the Haack property. Results of the APA indicated methane and select VOCs were present in ambient air likely due to industrial activities on the Haack property and sludge on the Cooper property. The undisturbed sludge had low to moderate emissions, while the disturbed condition can be generally characterized as having moderate to high area source emissions. Odor analyses confirmed the potential for sulfuric compounds from disturbed sludge to create nuisance odors to people in the area or downwind of the disturbed sludge. The infiltration analysis in locations above cracks and seams in the asphalt and concrete indicated that the individual compound emissions are greatly affected by the surface coverings and slab.

Groundwater

The *First Quarter 2010 Groundwater Monitoring Report* identified nine of ten groundwater monitoring wells as having no detectable concentrations of GRO, VOCs, or PAHs above the Reporting Limit (RL). Samples from MW-05A had detections of GRO and VOCs above the RL. SVOCs were reported in wells MW-01A, MW-01B, and MW-02A. Generally, groundwater samples from onsite wells have a pH ranging between 4.5 and 8.0. Metals detected in samples collected from the groundwater wells included barium, arsenic, cobalt, copper, nickel, and zinc.

Perched Groundwater

Perched groundwater has been detected at several locations beneath the Site. Total metals detected above primary and/or secondary MCLs included: antimony, arsenic, beryllium, cadmium, chromium, copper, nickel, selenium, and zinc. Dissolved metals above primary and/or secondary MCLs included: nickel and zinc. Benzene was detected in a perched groundwater sample below the MCL, and some SVOCs were detected above the detection limit but below the RL.

Treatability Study

A treatability study was conducted by Stantec to define and evaluate the physical and chemical characteristics of the sludge and evaluate neutralization/stabilization options. Acidity, wet density, moisture, viscosity, softening point, and leaching were evaluated on untreated sludge samples. Different reagent mixes were tested with the sludge to evaluate their neutralization/stabilization ability. Thermal treatment and asphaltic recycling were also evaluated during the treatability study.

The treatability study indicated the following:

- The acidity of the sludge ranged from 6.1 to 20.8 percent by weight;
- The densities for the samples ranged from 63 lb/ft^3 to 79 lb/ft^3;
- The average moisture of the sludge ranged from 9.8 to 22.3 percent on a wet basis;
- The sludge is highly viscous, ranging from 1.7×10^6 to 2.5×10^6 centipoises (cP) at a reference temperature of 140ºF;
- The softening point of the sludge varied from 158ºF for samples collected from the Cooper property to over 210 ºF for samples collected from the Haack Rework area;

- A mixture of 50 percent hydrated lime ($Ca(OH)_2$) and 50 percent calcium carbonate fines ($CaCO_3$) with the addition of 10 percent water and 50 percent soil by weight effectively solidifies the sludge, fixates lead, and neutralizes acid gases such as hydrogen sulfide (H_2S) and sulfur dioxide (SO_2);
- Disrupting or heating the sludge will result in the release of H_2S and SO_2 gases, but the release of VOCs from the sludge should be minimal unless the sludge is heated;
- The SPLP extracts for untreated sludge contained detectable lead, but lead was below the detection limits in SPLP extracts for treated sludge;
- The permeability of the untreated sludge was less than $1x10^{-8}$ cm/sec due to the monolithic, asphaltic properties of the untreated sludge, but the permeability of the material increased to $9x10^{-3}$ cm/sec after treatment;
- The sludge has a high BTU value of 13,000 BTUs/lb, but the high sulfur content of the sludge (7 percent sulfur) would make incineration or use of the sludge as a fuel prohibitively expensive due to sulfur-removal and vapor treatment requirements; and
- Testing for asphaltic qualities of the sludge indicates that it will be unsuitable for use as recycled asphalt for road construction or roofing since it has no ductility, high viscosity, and high solids content.

Feasibility Study Process

The Feasibility Study (FS) process is specified by the USEPA. The purpose of the FS process is to provide sufficient information on potential remedial options so that informative treatment decisions can be made. The FS process consists of developing remedial alternatives, screening those alternatives, and then performing a detailed analysis of the most applicable alternatives. The steps to this process include:

- Developing Remedial Action Objectives (RAOs) based on the results of the RI, HHRA, and future site use;
- Identifying and selecting applicable remedial technologies for soil based on effectiveness, implementability, and cost;
- Developing alternatives from the retained remedial technologies that satisfy the RAOs;
- Screening the alternatives and performing a detailed analysis of each of the final alternatives; and
- Performing a comparative analysis of the final alternatives sufficient to provide the information necessary to select an appropriate remedy for the site.

Remedial Action Objectives and Cleanup Criteria

RAOs are goals specific to various media and apply to those media that have been identified as posing an unacceptable risk based on the HHRA work performed for the Site. The RAOs for onsite soils, soil gas, and groundwater are:

- Prevent ingestion/direct contact with sludge and/or soil having 10^{-5} to 10^{-6} excess cancer risk from carcinogenic constituents as represented by arsenic, hexavalent chromium, naphthalene, and the BaP-eq concentration;
- Prevent dermal contact with shallow groundwater having 10^{-5} excess cancer risk from carcinogenic polycyclic aromatic hydrocarbons (PAHs) as represented by dibenz(a,h)anthracene;
- Prevent dermal contact with low pH, PAH containing sludge;
- Prevent inhalation of volatile organic compounds (VOCs), as represented by benzene, posing excess cancer risk levels of 10^{-5} to 10^{-6}; and
- Prevent explosive risks associated with methane.

Applicable Remedial Technologies

Potentially applicable technologies for soil remediation were screened based on effectiveness, implementability, and cost. The remedial technologies determined to be most applicable to the Site are:

- No action;
- Institutional controls;
- Treatment;
- Stabilization/neutralization;
- Containment;
- Excavation and removal for offsite disposal;
- Engineered controls;
- Vapor and gas control systems; and
- Groundwater monitoring.

Other technologies identified but eliminated from further consideration are:

- Treatment;
- Thermal treatment; and

- Sludge recycling.

These technologies were eliminated primarily due to their ineffectiveness as identified during the treatability study.

Development of Remedial Alternatives

Four alternatives were developed from the retained remedial technologies:

- Alternative 1 – No action: This consists of no remedial actions or institutional controls to address soils above target cleanup levels;
- Alternative 2A – Capping with selective excavation: This alternative consists of excavating the Haack Rework area and disposing of the sludge material offsite. A cap consisting of a high strength geotextile, foundation layer, low-hydraulic conductivity layer, and erosion resistance layer would be constructed above the sumps. A gas control and monitoring system would be installed beneath the cap and around the sumps, and groundwater monitoring would continue. Institutional controls consisting of a Health and Safety Plan (HASP), land use covenants (LUCs), Construction Quality Assurance (CQA) Plan, and Risk Management Plan (RMP) would be implemented. The Alternative 2A cover configuration was developed to address the City's concerns with a proposed retaining wall adjacent to Artesia Blvd.
- Alternative 3 – Capping with selective excavation and stabilization/neutralization: This alternative includes mixing the top three feet of sludge in the Cooper North and South Sumps with reagent to stabilize/neutralize the sludge. The Haack Rework area and a portion of sludge overflow along the eastern Cooper sump would be mixed with the stabilized/neutralized material. A cap consisting of a foundation layer, low-hydraulic conductivity layer, and erosion resistance layer would be constructed above the Cooper North and South and Haack Sumps. A gas control and monitoring system would be installed beneath the cap and around the sumps, and groundwater monitoring would remain ongoing. Institutional controls consisting of a Health and Safety Plan (HASP), Construction Quality Assurance (CQA) Plan, and Risk Management Plan (RMP) would be implemented.
- Alternative 4 – Excavation with offsite disposal: This alternative includes excavation of sludge with disposal offsite. The sludge would be mixed with the neutralizing agent and loaded into trucks for disposal offsite. Major components of this alternative include concrete and asphalt removal, excavation and mixing of sludge, transportation to the disposal facility, confirmation sampling, sump backfill, and groundwater monitoring.

Detailed Analysis of Alternatives

The CERCLA guidance document explains the nine criteria that are used to evaluate each remedial alternative [USEPA, 1988]. The first two criteria are categorized as threshold criteria that a selected remedy must meet:

- Overall Protection of Human Health and the Environment; and
- Compliance with ARARs.

The following seven criteria are "balancing" criteria. They represent the primary criteria upon which the detailed analysis is based and that are used to distinguish among alternatives that meet the threshold requirements above:

- Long-term Effectiveness and Permanence;
- Reduction of Toxicity, Mobility, and Volume Through Treatment;
- Short-term Effectiveness;
- Implementability;
- Cost;
- State Acceptance; and
- Community Acceptance.

State and community acceptance are evaluated following public comment on the FS Report.

Overall Protection of Human Health and the Environment

Alternative 1, No Action, does not provide adequate protection of human health and the environment. No further assessment or comparison with this alternative is provided. Alternative 2A would perform better than Alternative 3. While Alternative 3 stabilizes/neutralizes a portion of the sludge, the mixing of the reagent releases potentially hazardous amounts of hydrogen sulfide and sulfuric acid gas. Alternative 4 would provide very good protection of human health and the environment with the removal of the impacted materials; however, because of the risks associated with hazardous gas generation during excavation and transportation of the material, the overall protection is deemed moderate.

Compliance with ARARs

Alternative 2A would perform better with respect to ARARs due to the reduction of gas emissions when compared to Alternatives 3 and 4.

Long-term Effectiveness and Permanence

Alternative 3 is ranked higher than 2A with respect to long-term effectiveness and permanence. Both alternatives would be effective and permanent over the long-term with maintenance; however, because Alternative 3 neutralizes a portion of the sludge, the treatment is likely more permanent. Alternative 4 provides the greatest long-term effectiveness and permanence since the sludge is removed from the site and disposed offsite.

Reduction of Toxicity, Mobility, and Volume Through Treatment

Alternative 3 would slightly reduce toxicity and mobility through partial in-situ treatment of the source zone; however, toxicity would increase as acid gases are released during mixing of the sludge for treatment. Alternatives 2A and 3 would reduce mobility of the sludge by limiting infiltration and wind erosion. Alternative 4 would reduce the mobility of the sludge after offsite disposal since the disposal landfill would be equipped with a liner system to collect leachate; however, transport of the material would temporarily increase the potential mobility.

Short-term Effectiveness

Alternative 2A would perform the best with respect to short-term effectiveness. Unlike Alternatives 3 and 4, Alternative 2A does not significantly disturb the sludge, thereby minimizing the release of acid gas. Both Alternatives 2A and 3 incorporate a cap into the final design which would provide an immediate reduction in risk due to inhalation, dermal exposure, and ingestion. Alternative 4 would provide a reduction in risk after the sludge was transported offsite; however, risk is temporarily increased in the short-term during sludge disturbance and transport.

Implementability

Alternatives 3 and 4 pose significant implementation issues due to the gas generation during mixing and excavation of the sludge. Gas control and treatment would be necessary during mixing and excavation of the sludge. Construction of a tent to contain the gases would be difficult to perform due to low bearing capacity of the sludge and the area the tent would need to span (minimum of the Cooper North sump). Gases captured by the tent would need treatment prior to discharge.

Alternative 2A is relatively easy to implement. A stabilization layer on the Cooper sumps would be placed first to provide a surface in which to install the foundation and gas collection, barrier, and cover layers. Disturbance of the sludge would be limited to the eastern overflow and Haack Rework Area, which are significantly degraded and would release significantly less acid gas than the sludge in the Haack and Cooper

Sumps (Appendix B, Stantec, 2008). The materials necessary for construction are available and do not require admixtures or special equipment.

All Alternatives are difficult to implement due to the Site's urban setting, size, and proximity to sensitive receptors; however, the design of Alternative 2A limits the effects of these challenges on construction. The urban setting with high traffic flows will be impacted with the significant truck traffic entering and exiting the site with imported soil and exported waste. Alternative 2A limits the traffic by only exporting Haack Rework material and importing minimal soil for backfill and foundation. The size of the Site is limited due to the extent of the sumps leaving little space available for storage, staging, and construction activities. Alternative 2A is not as affected by the space limitations because neutralization materials will not be required, and as such, storage area for these materials is not required for this Alternative.

Alternatives 3 and 4 pose significant implementation issues due to the gas generation during mixing and excavation of the sludge and the potential impacts to neighboring sensitive receptors. Limiting work to night-time only would not reduce the risks to near-by businesses which operate 24-hours a day. Implementation of Alternative 2A has fewer engineering and health and safety complications since the sludge is not fully disturbed, thus limiting the release of hazardous gas.

While Alternative 2A has implementation challenges due to the Site size and location, the design of the Alternative 2A cap results in the most implementable remedial alternative.

Cost

Alternative 2A has the lowest capital cost of approximately $5,844,150. Alternative 3 has a capital cost highly dependent on neutralization admixture costs ranging from $11,219,880 to $12,646,280. Similarly to Alternative 3, Alternative 4 has a cost highly dependent on the admixture price ranging from a low of $26,217,950 to a high of $28,991,650. Alternatives 2A and 3 have identical net present value O&M costs of approximately $4,882,500 over 30 years. Alternative 4 has the lowest net present value O&M cost of approximately $113,200. Alternative 2A has the lowest combined remedial cost.

State Acceptance

In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the ROD is being prepared. Alternative 2A with the optional final cover configuration (Optional Alternative 2A) is the State's preferred remedial alternative.

Community Acceptance

In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the ROD is being prepared. During the May 10, 2011 meeting between the DTSC and the City, the City expressed concerns regarding the appearance of the former Alternative 2 being similar to a "landfill," and the height of the cap being too high. The City expressed the desire that the final remedial Alternative be consistent with the vision and goal of future development for the Site.

Alternative 2A provides a reduced cap thickness, and accounts for future use as a parking lot subgrade consistent with the City's vision for commercial development. During the 11 July 2013 meeting, the DTSC expressed the City's concern with the Alternative 2A retaining wall adjacent to Artesia Blvd. As a result, the Optional Alternative 2A Cover was developed to meet the City's request for a "no retaining wall" option. The Optional Alternative 2A Cover has reduced foundation and cover soil thicknesses where the cover slopes down towards Artesia Blvd. As a result, future development over this portion of the cap is limited to landscaping. Alternative 3 proposes a cap sloping upward to a maximum elevation of 35 ft amsl, which makes parking lot construction more difficult above the high grades and slopes of the Site. Alternative 4 proposes the Site is excavated and filled. Alternative 4 best incorporates the City's vision for commercial development; however, given the implementation, short-term effectiveness, and cost challenges, Alternative 2A with the Optional Alternative 2A Cover provides the best compromise to meet the City's development vision.

Remedy Selection

Based on the comparative analysis of the remedial alternatives, the alternative that meets the RAOs and ranks the highest is Alternative 2A, capping with selective excavation with the Optional Alternative 2A Cover. The elements of Alternative 2A are:

- Prepare a construction HASP and CQA Plan;
- Prepare a Risk Management Plan;
- High-strength geotextile installation;
- Select excavation of impacted material;
- Containment of sludge along Artesia Boulevard;
- Capping of sludge;
- Installation of gas control and monitoring system;

- Institutional controls;
- Perform semi-annual groundwater monitoring; and
- Complete a formal review of cap effectiveness after five years.

This remedial alternative effectively mitigates the risk from ingestion, inhalation, and dermal contact with onsite soils for future non-residential occupants of buildings onsite, and future landscapers and utility workers. This alternative also effectively mitigates the risk from dermal contact with Site groundwater through the cap and institutional controls including the Health and Safety Plan and Risk Management Plan.

Alternative 2A readily meets the criteria of overall protection of human health and the environment and satisfies ARARs. When evaluated against the balancing criteria, Alternative 2A provides short-term effectiveness as well as long-term effectiveness and permanence. It is implementable and presents an effective balance of cost against the other criteria. Alternative 2A with the Optional Alternative 2A Cover could also accommodate the City's request for future potential redevelopment of the Site as a parking lot to support a commercial operation.

1. INTRODUCTION

1.1 Terms of Reference

This document presents the Final Feasibility Study Report (FS Report) for the Gardena Sumps Site (Site) in Gardena, California. The FS Report is a requirement of Consent Decree CV04-7882-AHM (JTLx), (Consent Decree). The original draft FS Report (Draft FS) was prepared for submittal to the California Environmental Protection Agency (CalEPA), Department of Toxic Substances Control (DTSC) in accordance with the California Health and Safety Code on 11 February 2011. After submittal of the Draft FS, the following timeline of correspondence and revisions occurred:

- A meeting with the DTSC and City of Gardena in May 2011 and receipt of comments from the DTSC 9 June 2011.

- Responses to comments including the Draft Feasibility Study Addendum – Alternative 2A (FS Addendum) were prepared by Geosyntec Consultants, Inc. (Geosyntec) and submitted to the DTSC on 29 September 2011.

- Comments on the FS Addendum were from the DTSC dated 31 October 2011 and 11 November 2011 were received on 11 January 2012.

- Calculations supporting the preliminary cap design were requested by the DTSC 28 January 2012. The calculations were subsequently transmitted to the DTSC on 1 February 2012.

- A letter in response to DTSC comments dated 31 October 2011 and 11 November 2011 was issued by Geosyntec on 7 February 2012.

- Additional DTSC comments on the Addendum and 10 February 2012 response to comments package were received on 7 March 2012 and 30 March 2012.

- A response to comments package was submitted to DTSC by Geosyntec on 4 April 2012 as the Revised Draft Feasibility Study (Revised FS) which included clarification sheets for the Draft FS and FS Addendum.

- Comments were received from the DTSC on the Draft FS, comment responses, and Revised Draft FS on 6 September 2012.

- Revised Draft FS Report was issued by Geosyntec to DTSC on 15 November 2012.

- Comments were received from the DTSC on the Revised Draft FS Report on 17 January 2013.

- A response to comments package was submitted to DTSC by Geosyntec on 12 April 2013 as the Revised Final Draft FS Report.

- Comments were received from the City of Gardena through the DTSC during meetings on 11 July, 30 August, and 5 September 2013. Appendix F, Alternative 2A Cover Option is the response to those comments.

- Comments were received from DTSC on the Revised Final Draft FS on 3 October 2013 and a response was issued 13 November 2013.

- Comments from the DTSC on the Revised Final Draft FS dated 13 December 2013 and 6 January 2014. A response was issued 27 January 2014.

- Comments were received from the DTSC on the Revised Final Draft FS on 19 February and a response was issued 24 March 2014.

- Comments were received from the DTSC on the May 2014 Final FS on 24 June 2014 and a response was issued 1 July 2014.

A summary table of comments received through September 2012 from the DTSC and their responses is included as Appendix A. Subsequent comments and responses after September 2012 are also provided in Appendix A.

This report was prepared by Ms. Rebecca Flynn Oliver, P.E., of Geosyntec and reviewed by Mr. Gregory Corcoran, P.E., of Geosyntec, in accordance with Geosyntec's peer review policy.

1.2 Description of Feasibility Study Process

The Remedial Investigation (RI) for the Site comprises three separate reports: the *Revised Draft Remedial Investigation Report* (Stantec, 2008); the *Draft Memorandum – Data Gap Analysis* (Stantec, 2010a); *Draft Human Health Risk Assessment* (HHRA) (Geosyntec, 2010); and the *Addendum to the August 22, 2008 Revised Draft 2006 Remedial Investigation Report* (Stantec, 2010c). This FS Report includes the following information and evaluations in general accordance with *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA, 1988):

- Background information on the Site, including a summary of investigative and remedial work performed to date;

- Future use of the Site, future risk exposure pathways, and receptors that may be at risk;
- Remedial Action Objectives (RAOs) and cleanup criteria;
- Identification of remedial technologies that potentially can be employed to remediate the Site contaminants;
- Screening of the remedial technologies to identify those that can realistically remediate or isolate wastes at the Site;
- Development of a range of potential remedial technologies to address impacted soil, soil gas, and groundwater, and remedial alternatives, which are combinations of remedial technologies that can address impacted media at the Site;
- Screening of the remedial alternatives to identify those that can realistically address conditions at the Site;
- Analysis of remedial alternatives using United States Environmental Protection Agency (USEPA) criteria; and
- Comparative analysis of remedial alternatives that will result in identification of the preferred remedial alternative for the Site.

1.3 Organization

This document is organized into the following sections:

- Section 2 – "Site Background," describes the history and physical characteristics of the Site, including hydrogeology;
- Section 3 – "Remedial Investigation Summary," summarizes the results of the remedial investigation;
- Section 4 – "Remedial Action Objectives and Cleanup Criteria," summarizes the findings of the draft HHRA and identifies the potential future use of the Site, future risk exposure pathways, and potential receptors that may be at risk. The RAOs also are identified, along with cleanup criteria selected to achieve those objectives;
- Section 5 – "Identification and Screening of Technologies," identifies potential remedial technologies. The remedial technologies are then screened based on their effectiveness, implementability, and cost to address human health risks and ecological risks associated with these media;
- Section 6 – "Development of Remedial Alternatives," uses the retained technologies from Section 5 to compile remedial alternatives that address a range of potential response actions and technical approaches for the Site.

Remedial alternatives are further screened, evaluated and ranked in terms of effectiveness, implementability, and cost to identify the final set of remedial alternatives for detailed analysis;

- Section 7 – "Detailed Analysis of Alternatives," presents a nine-criteria analysis of the final set of remedial alternatives;
- Section 8 – "Comparative Analysis of Alternatives," uses the nine-criteria analysis results to compare the alternatives to assess which alternative provides the best balance of the nine criteria, and is, therefore, the recommended alternative; and
- Section 9 – "References," presents the FS Report references.

Tables, figures, and appendices are included at the end of this FS Report. Appendices attached to this FS Report include the following:

- Appendix A contains the responses to regulatory comments. Comments up to September 2012 are provided in Table A-1; copies of subsequent response to comment letters are also provided in Appendix A;
- Appendix B contains the Treatability Study prepared by Stantec and provided in the Remedial Investigation (Stantec, 2008);
- Appendix C contains the derivation of the risk-based concentrations;
- Appendix D contains calculation packages for the high-strength geotextile and anchor trenches;
- Appendix E contains estimated construction schedules for Alternatives 2A through 4; and
- Appendix F contains the Conceptual Design of the Alternative 2A with the Optional Alternative 2A cover.

2. SITE BACKGROUND

2.1 General

This section includes the following background information on the Site:

- Site location and description;
- Site history;
- Geology; and
- Hydrogeology

The information presented in this section generally has been excerpted from the *Revised Draft RI* (Stantec, 2008).

2.2 Site Location and Description

The Site is located in the southwest corner of the Artesia Boulevard and Normandie Avenue intersection in the City of Gardena, Los Angeles County, California (Figure1-1). Generally, the area surrounding Site is bordered to the south by the Los Angeles County Department of Public Works (LACDPW) Dominguez Flood Channel, to the east by the Southern Pacific Railroad right-of-way, to the west by the western Haack property line, and to the north by Artesia Boulevard, although a small portion of Artesia Boulevard is included within the Site. Commercial and residential properties are currently located to the north, east, and west of the Site (Figure 1-2) (Stantec, 2008). For the purpose of this report, the Site is comprised of the Cooper, Haack, and four (4) residential properties as shown on Figure 1-2.

The Site is greater than 5.6 acres of mixed-use development and primarily consists of two properties, the Cooper property and the Haack property. The Cooper property is approximately 3.0 acres, approximately 90 percent of which is comprised of two large sumps (referred to as the "Cooper North" and "Cooper South" sumps) containing primarily petroleum refining wastes. The Haack property is approximately 2.6 acres, contains one modified sump (referred to as the "Haack sump") and the "Haack Rework Area", which is a reworked and mixed soil-sludge area south of the Haack sump. The Haack Rework Area encroaches onto the extreme northern portions of the two easternmost residential lots. In this FS Report, the wastes in the sumps will be referred to as "sludge" for ease of reference. This FS Report will address the three sumps and the Haack Rework Area, constituting the areas of concern (Figure 1-2) (Stantec, 2008).

2.3 Site History

The *Revised Draft RI* documents the site history and presents historic aerial photographs. The following section summarizes the site history and evaluation of the photographs presented by Stantec (Stantec, 2008).

Early topographic maps show that the eastern (Cooper property area) and southern (southern Haack and residential areas) portions of the Site were elevated, which suggests that some amount of clay material could have been extracted from excavations into the elevated bluff.

During the 1920's, the Moneta Brick Company leased the Site. By 1928 the area of the two Cooper sumps had been excavated to a lower surface elevation than the current LACDPW land to the south and most of the Haack and residential properties. The railroad tracks east of the Cooper property were elevated above the land surface of the current Cooper property, and clay mining at the Cooper property had been completed by this time. Clay mining operations were occurring on the northern Haack property in 1928 and 1929. By 1929 the southern portion of the Haack property (present Haack Rework Area) had an elevated scoured slope. This elevated area sloped eastward towards the land surface of the current southern Cooper property. Boring logs from RB-2 and RB-3 indicate that fill material (including brick and concrete debris and glass) extended to elevations of approximately 8 feet above mean sea level (amsl) (depths of 17 to 20 feet below the scoured slope surface) in portions of the Haack Rework Area. An aerial photograph from May 1938 documents that creation of the disposal sumps at the Site had not yet begun. Denys Goddard purchased the land consisting of the current Haack, Cooper, and residential properties in May 1939.

Newspaper reports indicate that sludge disposal had commenced by March 1940. The Haack Sump, Cooper South Sump, and the Haack Rework Area had been constructed and contained sludge by March 1941. The Cooper North Sump had not yet been constructed. By early December 1941 the eastern and northern berms of the Cooper North Sump had been constructed and initiation of sludge disposal into this sump had commenced. Sludge deposition at the Site had occurred at the Haack Sump, the Haack Rework Area, a small pit between these two locations (constructed after March 1941), and the Cooper South Sump by this time.

By September 1946, the Haack and two Cooper sumps were filled with sludge, and vegetation had reclaimed the small pit and the Haack Rework Area. Some excavation of soil had occurred into the bluffs west and south of the western portion of the Haack Sump, but there had been no further development of the Haack and Cooper properties. Denys Goddard sold the future Haack and Cooper property parcels to Wendell and

Golda Hopkins in March 1947, but maintained ownership of the residential lots. The Hopkins' sold their property to S&L Manufacturing in January 1948.

By December 1951, the western portion of the Haack Sump had been covered with dirt and was converted to a parking lot. The eastern portion of the Haack Sump does not appear to have been altered. A significant portion of the bluff south and southwest of the Haack Sump had been excavated. This excavation activity removed the small sludge pit that was located between the Haack Sump and the Haack Rework Area. Two structures had been constructed in the northwestern portion of the Haack property. The Haack Rework Area remained vegetated and the two easternmost residential lots (on the Goddard property) had structures on them.

On October 1, 1952, S&L Manufacturing sold the northern-most strip of their property to the State of California for a highway easement. By early 1956, Artesia Blvd (Highway 91) had been constructed with the southern portion of the roadway encroaching into the Haack Sump northern berm.

By January 1958, the Dominguez Channel had been reconstructed and extended eastward south of the Site. A third structure (the "administrative building") had been constructed on the Haack property at the southern edge of the parking lot. The Cooper property had not significantly changed since 1951. The two westernmost residential lots had structures on them by this time. In May 1958, S&L Manufacturing sold the current Haack and Cooper properties to Charles Warfel. Warfel then sold the current Cooper property to William Ward in January 1959 and the Haack property to Clarence and Genevieve Haack in May 1960. In late 1960, the City of Gardena annexed the area of the Site from the County of Los Angeles.

By November 1962 significant changes had occurred at the Haack property. The bluff immediately south of the "administrative building" had been excavated back to the present day cut-bank (located west of boring HPB11). This excavation expanded the parking lot south of the "administrative building." The parking lot on the Haack property appeared to have been paved, although the eastern portion of the Haack property remains a vegetated area immediately west of the Cooper North Sump. The Haack Rework Area appeared altered and may have received soil cover from the excavation activities that occurred immediately north of the Haack Rework Area. The future Cooper property was unchanged. William Ward sold his property to Thomas Cooper in December 1977.

The two Cooper sumps currently are capped by a geosynthetic liner that was installed by OHM Corporation (OHM) in July 1993 as part of the DTSC's environmental program at the Site. A second geosynthetic liner was installed above the 1993 liner by ARC in August 2013 (Stantec, 2014). The Haack Sump has been covered by asphalt

and a concrete slab. Currently the Haack property is leased to various tenants who operate small businesses, including a U-Haul rental agency, a metal fabricating, sand blasting and painting company, and an auto body repair shop. Three buildings and numerous small trailer-type storage structures are present on the Haack property.

2.4 Geology

The following discussion is based on California Department of Water Resources (CalDWR) Bulletin No. 104, Planned Utilization of the Ground-water Basins of the Coastal Plain of Los Angeles County, Appendix A — Ground Water Geology, dated June 1961, reprinted April 1988 (CalDWR, 1961) and discussions contained in reports from previous investigations (CalEPA 1994, URS 1994, and Stantec, 2008).

The Site is located in the Los Angeles Coastal Plain and is underlain by a thick sequence of marine and continental sediments that were deposited in a broad synclinal depression. This depression is generally referred to as the Los Angeles Basin. The Los Angeles Basin is bisected by the northwest trending Newport-Inglewood uplift, which divides the Coastal Plain into two smaller synclinal troughs. The Site is located in the West Coast Basin, which constitutes the southwest portion of the Los Angeles Basin.

The Site is located near the junction of the Torrance Plain and the Dominguez Erosion Gap. The Torrance Plain runs west of and parallel to the hills of the Newport-Inglewood uplift from the Ballona Gap southeast to the Dominguez Gap. The Plain is a broad featureless area only slightly dissected locally by the Dominguez Creek (Dominguez Channel).

According to boring logs in the Ecology and Environmental, Inc. (EEI) (1986), Metcalf and Eddy (1992), CalEPA (1994) and URS (1994) reports, sediments underlying the Site, to the maximum explored depth of 92 feet below ground surface (bgs), consist primarily of a mixture of clays and silts with interbeds of sand. Copies of the available boring logs from these previous studies are provided in Appendix F and summarized in Table 13 of the *Revised Draft RI* (Stantec, 2008). This stratigraphy correlates in general with the observed conditions in borings completed in conjunction with the *Revised Draft RI* (Stantec 2008), which reached a maximum depth of 100 feet bgs.

2.5 Hydrogeology

The following discussion is based on CalDWR *Bulletin No. 104, Planned Utilization of the Ground-water Basins of the Coastal Plain of Los Angeles County, Appendix A - Ground Water Geology*, dated June 1961, reprinted April 1988 (CalDWR, 1961) and discussions contained in reports from previous investigations (CalEPA 1994, URS 1994, Stantec, 2008).

The Site is located in what is known as the West Coast Groundwater Basin. The West Coast Groundwater Basin has existing beneficial uses for municipal and domestic supply wells, agricultural supply, industrial process supply, industrial service supply, and aquaculture (LARWQCB, 1994). This basin is hydraulically isolated from other, larger groundwater basins in the Coastal Plain by the regional Newport-Inglewood Fault. The Site is underlain by Holocene and late-Pleistocene Age alluvial and marine deposits, which include the Bellflower Aquiclude at the ground surface, and the Gardena and/or Gage Aquifers of the Lakewood Formation beneath the aquiclude. Major underlying aquifers (beneath the Lakewood Formation) are the Lynwood and the Silverado Aquifers of the San Pedro Formation.

The uppermost defined unit within the basin, and the unit that the Site is located within, is the Bellflower Aquiclude. Regionally, the Bellflower Aquiclude contains interfingered zones of permeable and less permeable sediments. The zones with modest to relatively high hydraulic conductivity consist of fine to coarse sand with gravel and silty sand. These coarser grained sediments vary in thickness from 10 to 60 feet and are not laterally continuous. However, in some areas, these permeable zones can contain significant amounts of water. Little beneficial use is made of water in these shallow, discontinuous hydraulic zones because well yields tend to be low and water quality generally poor (CalDWR, 1961).

The Gardena/Gage, Silverado, and Lynwood Aquifers are all capable of storing or conveying groundwater in significant quantities and constitute major sources of groundwater in the West Coast Groundwater Basin. The Lynwood and Silverado Aquifers are primary sources for domestic water supply, while the Gardena and Gage Aquifers are a secondary domestic water supply source. Neither the Gardena nor Gage Aquifers are currently pumped for domestic use. The intervening finer-grained aquitards have not been named. These aquitards, including those that separate the Gardena and Gage Aquifers from the Lynwood Aquifer and the Lynwood Aquifer from the Silverado Aquifer, are discontinuous in nature and absent in some areas.

Immediately beneath the Site, there are two hydraulic groundwater zones within the Bellflower Aquiclude: Zone A (upper) and Zone B (lower), which are approximately 15 to 25 and 75 to 80 ft bgs, respectively. Site groundwater monitoring wells are screened within these two zones. General groundwater chemistry analyses were performed at the Site to evaluate if a hydraulic interconnection exists between Zone A and Zone B due to the existence of a downward vertical gradient between the two zones. The groundwater chemistry analysis indicated that the two zones are characterized by different groundwater geochemistry. The concrete lined Dominguez Channel influences the flow direction of the shallow Zone A groundwater southward while the deeper Zone B groundwater has a flow direction to the east – southeast. Groundwater monitoring at the

Site over the past seven years indicates that COCs are not migrating vertically or laterally over any significant distance from the locations of the waste material.

The area surrounding the Site is urbanized, with surface waters that drain via storm drains into the Dominguez Channel. The Dominguez Channel is a concrete-lined flood-control structure immediately south of the Site. The upstream portion of the modern day Dominguez Channel originates several miles west-northwest of the Site, and it drains surface water to the southeast where it discharges to the Cerritos Channel of the Los Angeles Harbor. Surface water at the Site generally drains towards the north and east following site topography, and is intercepted by a flood control storm drain located at the northeast corner of the Site adjacent to the intersection of Artesia Boulevard and Normandie Avenue.

Historically, the Dominguez Channel flowed along a natural channel bed located approximately several hundred feet west and north of the Site where it flowed eastward into Laguna Dominguez. Presently the shallow groundwater beneath the Site is influenced by the concrete lined Dominguez Channel and flows southward.

3. REMEDIAL INVESTIGATION SUMMARY

3.1 General

The nature and extent of hydrocarbon and metal impacts at and surrounding the Site have been evaluated through several investigation programs conducted since 1982. Sludge, soil, surface water, groundwater, and soil vapor have been investigated. The following sections provide a summary of findings for each of these media. Details of the investigations and findings can be found in the *Revised Draft RI* (Stantec, 2008) and the *Addendum to the Revised Draft RI* (Stantec, 2010c).

3.2 Nature and Extent of Contamination

3.2.1 Soil/Sludge

As part of the RI investigation, Stantec collected over 300 subsurface soil and sludge samples from beneath and surrounding the sumps and rework area to delineate the vertical and horizontal extents of continuous (nonreworked) sludge and sludge-induced impacts to the adjacent soil. The samples were analyzed for organic and inorganic constituents. In addition, pH was measured to determine the effects of the sludge on the soil pH near the sumps and adjacent berms. Organic constituents analyzed were: volatile fuel hydrocarbons (VFHs), total extractable hydrocarbons (TEHs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and polynuclear aromatic hydrocarbons (PAHs). Inorganic constituents analyzed were: Title 22 metals, mercury, and hexavalent chromium.

Sludge constituents are as follows (Stantec, 2008):

- **VFH and TEH**: Heavier hydrocarbon compounds predominate in the sludge.
- **VOCs**: Most commonly detected include ethylbenzene, p-isopropyltoluene, naphthalene, toluene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and m-, o-, p-xylene compounds.
- **Non-PAH SVOCs**: Not typically detected in sludge samples due to the dilution factor necessary to analyze the sludge samples.
- **PAHs**: The most predominant PAH compounds include benzo(a)-pyrene, benzo(b)-fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene.
- **Title 22 Metals**: Background, offsite soil, onsite non-reworked soil, and sludge samples were collected during the RI. Antimony, barium, cadmium, vanadium, and zinc were all reportedly lower in the sludge when compared with background soil, while lead and molybdenum were higher in the sludge when compared to background soil. Arsenic and thallium concentrations were similar

in the sludge and background soil while copper had a wider range (higher and lower) of concentrations in sludge compared to background soil. During the 2006 RI field investigation, arsenic was detected in background soil on the LADPW property at 82 milligrams per kilogram (mg/kg). Sampling was performed during the subsequent 2009 RI field investigation at this location and immediate vicinity and resulted in arsenic concentrations of less than 5.5 mg/kg; therefore, the 82 mg/kg concentration could not be confirmed (Stantec, 2010a). Isolated areas on the Haack property had significantly higher concentrations of antimony, arsenic, chromium, copper, molybdenum, nickel, and zinc than typically found at the Site (Stantec, 2010c).

- **Chromium VI**: Analytical results for hexavalent chromium and total chromium in sludge ranged from <0.026 to 0.73 mg/kg and 0.55 to 4.7mg/kg, respectively. Analytical results for hexavalent chromium and total chromium in background soil ranged from <0.026 to 1.3 mg/kg and 6.0 to 28 mg/kg, respectively. One background 2006 soil sample was suspect for hexavalent chromium, having hexavalent chromium and total chromium values of 100 mg/kg and 33 mg/kg respectively (Stantec, 2008; Geosyntec, 2010). Subsequent resampling of this location resulted in hexavalent chromium and total chromium values of <1.0 mg/kg and 17 mg/kg respectively; therefore, the 2006 hexavalent chromium test result of 100 mg/kg is suspect (Geosyntec, 2010).
- **pH**: The pH of the sludge samples ranged from 0.39 to 9.05 while pH of the background soil averaged 6.57 (Stantec, 2008). The 2009 RI activities included an assessment of pH in soil adjacent to the sludge. Results of testing indicate pH ranges from 5.2 to 10.3 in soil adjacent to the sludge (Stantec, 2010a).

During the RI, four areas of sludge disposal were investigated: the Cooper South Sump, the Cooper North Sump, the Haack Sump, and the Haack Rework Area. The delineation of nonreworked sludge is shown on Figure 1-2 and illustrates the lateral extent of congruent sludge having any thickness. Below is a summary of the results of the delineation (Stantec, 2008):

- **Cooper South Sump**: The Cooper South Sump has an identified maximum thickness of 13.5 feet. Figure 10A of the *Revised Draft RI* (Stantec, 2008) illustrates the general vertical profile of this sump. Vertical attenuation of sludge impacts in soil typically ranged from 1.5 to 3 feet beneath the sludge; lateral impacts of sludge in soil are negligible. Approximately 6,700 cubic yards (CY) of sludge was calculated by Stantec to be in the Cooper South Sump (Stantec, 2010c). Approximately 8,000 CY of sludge containing soil interbeds was calculated by Stantec to be in the Cooper South Sump (Stantec, 2008).
- **Cooper North Sump**: The Cooper North Sump has an identified maximum thickness of 17.5 feet. Figure 10A of the *Revised Draft RI* (Stantec, 2008)

illustrates the general vertical profile of this sump. Vertical attenuation of sludge impacts in soil typically ranged from 5 to 7.5 feet beneath the sludge, with the exception of one boring where chrysene was detected up to 11 feet beneath the sludge. Some TEH and PAH constituents were detected approximately 6 feet laterally from this sump in depths up to 15 feet bgs indicating some lateral migration in soil to the north; however, other borings indicated lateral impacts of sludge in soil is negligible. Stantec calculated approximately 7,000 CY of sludge is in the Cooper North Sump (Stantec, 2010c). Approximately 9,300 CY of sludge containing soil interbeds was calculated by Stantec to be in the Cooper North Sump (Stantec, 2008).

- **Haack Sump**: The Haack sump consists of several discontinuous layers of sludge varying in thickness from 0.5 to 3.0 feet to a depth up to 14.6 feet bgs. Boring logs indicated the western and central areas of the sump had been reworked, possibly during site development in the late 1940's. Figure 10B of the *Revised Draft RI* (Stantec 2008) illustrates the general vertical profile of this sump. Stantec calculated approximately 2,250 CY of sludge is in the Haack Sump (Stantec, 2010c). Approximately 2,900 CY of sludge containing soil interbeds was calculated by Stantec to be in the Haack Sump (Stantec, 2008).
- **Haack Rework Area**: The Haack rework area consists of deposited sludge, soil, and debris in discontinuous and mixed layers beneath a soil cover with thickness varying from less than 1 foot to 10 feet. The thickness of sludge in the western portion of the Haack Rework Area is thinner and occurs at a higher elevation than at the eastern edge of the Haack Rework Area. Figures 10E and 10F of the *Revised Draft RI* (Stantec, 2008) illustrate the general vertical profile of this area. Stantec calculated approximately 670 CY of sludge material is in the Haack Rework Area (Stantec, 2010c). Approximately 1,200 CY of sludge containing soil interbeds (soil-sludge material) was calculated by Stantec to be in Haack Rework Area (Stantec, 2008).

Delineation borings were conducted at several specific areas of the Site. The results of the sampling are provided in the *Revised Draft RI* (Stantec, 2008) and summarized below:

- **Eastern LACDPW Easement**: Borings were performed to determine if sludge had migrated offsite onto the LACDPW property east of the Cooper property. The 2006 delineation borings encountered sludge within 6 inches bgs in all five delineation borings (Stantec, 2008). Subsequent delineation borings were performed in 2009 east of the 2006 delineation borings which delineated the extent of the continuous sludge shown on Figure 1-2 (borings DPW116 through DPW121 and GWP102) (Stantec, 2010a).

- **East-Central Haack Property (Former Drum Storage Area)**: Sampling of the former drum storage area on the Haack property was performed in 2006 to determine if metal concentrations in soil were elevated when compared to background soil concentrations. Elevated lead concentrations were detected at a depth of 1.5 feet in all four borings, but lead concentrations were in the range of background at a depth of 5 feet. Elevated concentrations of antimony, arsenic, copper, and molybdenum were detected in one boring at a depth of 1.5 feet. One hexavalent chromium concentration above background was detected at 5 feet bgs.
- **Sludge Surface Samples**: Sludge surface samples were collected to determine if analytical interference resulted in high arsenic, antimony, and thallium concentrations during the 1982 investigation. With the exception of the low level of antimony detected in one boring, antimony, arsenic, and thallium were not detected in the samples; therefore, it suggests the 1982 data is not valid.
- **Sump Perimeter**: Borings were performed around the perimeters of the sumps to assess the lateral extent of continuous sludge during both the 2006 and 2009 RI activities. Continuous sludge is a sludge-only deposit and excludes soil mixed with sludge. The results of the step-out borings indicate the extent of the continuous sludge, which is illustrated on Figure 1-2.
- **Offsite Adjacent Residential Properties**: Borings were advanced in the residential properties in the southern portion of the site during the 2006 and 2009 RI activities to investigate the presence of sludge. The results of these borings indicate that the extent of the sludge has been delineated as illustrated on Figure 1-2.

3.2.2 Surface Water

Surface water samples were collected upstream and downstream of the Site from the Dominguez Channel in 2006 and 2008. During both sampling events, the samples had gasoline range organics (GRO) concentrations of 58 µg/L and 50 µg/L in 2006 and 2008, respectively. No SVOCs were observed. Two VOCs, tetrachlorothene and trichloroethene, were observed during both events; upstream samples had higher concentrations of both VOCs than the downstream samples. Barium was found in surface water at concentrations approximately double what was detected in the soil and sludge samples. Copper, lead, and vanadium were detected at levels below background for the Site (Stantec, 2008).

Analytical data from surface water samples collected from the inner channel of the Dominguez Channel indicated elevated concentrations of GRO and VOC analytes in contrast to the non-detections for those analytes in groundwater monitored at the Site. Based on the organic chemical parameters, the Site is not impacting surface water

quality in the channel. Overall, the observed concentrations of metals in surface water adjacent to the Site support the same conclusion, that the Site groundwater conditions are not impacting surface water quality. Both upstream and downstream surface water samples have at least twice the concentration of antimony, molybdenum, nickel, barium, lead, and copper compared to shallow groundwater at the southern boundary of the Site (Stantec, 2010b).

3.2.3 Soil Gas

The soil gas investigation activities evaluated the subsurface concentrations of VOCs, hydrogen sulfide, and methane at various locations across the Site for use in the baseline HHRA. Constituent concentrations reported above the detection limit for targeted VOCs include benzene, toluene, ethylbenzene, m-,p-,o-xylenes, 1,3,5-trimethylbenzene, and Freon 113. Concentrations ranged from non-detect to 2.2 µg/L-vapor (toluene) (Stantec, 2008).

During the 2006 RI activities, benzene concentrations in the soil gas samples ranged from non-detect to 0.3 µg/L-vapor by Method 8260B and from non-detect to 0.260 µg/L-vapor by Method TO-15. Hydrogen sulfide concentrations in the soil vapor samples ranged from non-detect to 5.1 parts per million by volume (ppmv) except for one sample location with results of greater than 50 ppmv. Methane concentrations in the soil gas samples ranged from non-detect to 220 ppmv (Stantec, 2008).

During the 2009 RI activities, additional samples were collected from 22 semi-permanent direct-push soil gas probes. Samples collected near the Haack administrative building showed no VOCs greater than California Human Health Screening Levels (CHHSLs). On the residential properties, benzene from the sample collected from the former corral was the only constituent reported higher than the specific constituent CHHSL value. The results elsewhere at the Site during the 2009 RI activities generally confirmed the results of the 2006 RI (Stantec, 2010a).

3.2.4 Soil Vapor Flux

An Air Pathway Analysis (APA) was performed during the 2006 investigation to evaluate the exposure pathway of outdoor inhalation of vapors. The surfaces evaluated included:

- exposed, undisturbed sludge on the Cooper property;
- exposed, disturbed sludge on the Cooper property;
- soil on both the Cooper and Haack properties; and
- asphalt and concrete-slab covered soil on the Haack property.

The results of the APA are provided in the *Revised Draft RI* (Stantec, 2008) and are summarized below:

- **Ambient Air**: Methane and select VOCs were reported above the quality control (QC) criteria and/or reporting limit in the four ambient air samples collected. Detected methane levels are typical of global, outdoor, ambient air. Detections of VOCs on the Haack property are most likely related to industrial activities on the property and not from undisturbed surface emissions from the nearby sumps. The VOCs detected on the Cooper property may be related to the presence of sludge in the sumps.
- **Undisturbed**: Twenty (20) open (undisturbed) soil flux samples of 61 collected were reported to have specific compounds above the QC criteria and/or reporting limit. The undisturbed sludge had low to moderate emissions and, in general, more compounds were detected at Cooper property locations than Haack property locations. Higher emissions and more detectable compounds were detected at Cooper Sump locations overlying sludge.
- **Disturbed**: All nine (9) disturbed flux samples collected were reported to have specific compounds above the QC criteria and/or reporting limit. The disturbed condition can be generally characterized as having moderate to high area source emissions as compared to the undisturbed sludge condition. In addition, more compounds were detected in the emissions from the disturbed sludge condition than from the undisturbed sludge condition. Odor analyses confirmed the potential for sulfuric compounds from disturbed sludge to create nuisance odors to people in the area or downwind of the disturbed sludge.
- **Infiltration**: Specific compounds were detected above the QC criteria and/or reporting limits for each of the infiltration flux samples. The flux chamber was used to test the air emissions through seams and cracks in the concrete and asphalt. Compounds having the maximum detections represent a different mixture of sulfur and hydrocarbon compounds as detected in the undisturbed sludge condition, indicating that the individual compound emissions are greatly affected by the surface coverings and slab.

3.2.5 Groundwater

3.2.5.1 Summary of Groundwater Monitoring

Well clusters MW-01A/B, MW-02A/B, and MW-03A/B were periodically sampled from 1994 through 2002. Analytical results of these samples supported the findings of earlier investigators, with trace amounts of volatile organic compounds (VOCs) detected in 1994 samples immediately after installation, and no VOC detections in the

next ten years of sampling. Detections in 1994 were likely the result of cross-contamination during well installation (Stantec, 2008).

Groundwater samples obtained on February 28, 2002, contained detectable concentrations of antimony, lead, and thallium that were above the maximum concentration level (MCL), as defined in Title 22 CCR §64431. With a very few exceptions, prior to the 2002 sampling event, analytes tested in groundwater samples were either not detected or found below the laboratory reporting limit. Quarterly groundwater monitoring and sampling of MW-01A/B, MW-02A/B, MW-03A/B, and G-4 was agreed to as part of a Consent Decree entered into between DTSC and Atlantic Richfield Company, which became effective November 4, 2004 (§VIIC, paragraph 2, lines 2-3). Wells MW-4A, MW-4B and MW-5A have been installed during Atlantic Richfield Company's RI investigation of the Site.

The following summary is abstracted from the *First Quarter 2010 Groundwater Monitoring Report* (Stantec, 2010b):

The depth to Site groundwater in the A-zone ranges between 10.5 and 18 feet below the ground surface. The groundwater in the A-zone flows southward with an approximate velocity of 0.04 feet per day. The depth to Site groundwater in the B-zone ranges between 15.5 and 22 feet below the ground surface. The groundwater in the B-zone flows east-southeast with an approximate velocity of 0.18 feet per day.

Nine of the ten groundwater monitoring wells showed no detectable concentrations of GRO, VOCs, or PAHs above the RL during the first quarter 2010 sampling event. Samples from the recently installed MW-05A well indicated a GRO detection of 390 µg/L. VOCs detected above the reporting limit in well MW-05A included benzene (0.73 µg/L), naphthalene (3.4 µg/L), m-,p-xylenes (1.5 µg/L), 1,2,4-trimethylbenzene (2.8 µg/L), and 1,3,5-trimethylbenzene (23 µg/L). Total xylene levels in MW-05A were 1.7 µg/L.

Wells with SVOCs detected included well MW-01A with acenaphthylene (5.6 µg/L), bis(2-ethylhexyl)phthalate (3.2 J[1] µg/L; detected below the reporting limit), and naphthalene (3.2 J µg/L; detected below the reporting limit); MW-01B had bis(2-ethylhexyl)phthalate (3.9 µg/L); MW-02A had acenaphthylene (2.1 µg/L), bis(2-ethylhexyl)phthalate (10 µg/L), 2-methylphenol 2.3 µg/L, naphthalene (2.6 µg/L), and phenol (1.2 µg/L); and MW-02B had acenaphthylene (0.75 µg/L).

[1] J = Analyte was detected between the method detection limit and reporting limit; reported value is estimated.

The groundwater pH levels have remained relatively constant since project sampling began in the first quarter of 2006. The anomalously high pH levels reported during the 1994 and 2002 sampling events have not been observed recently. Generally, groundwater samples from onsite wells (with the exception of MW-5A) have a pH ranging between 6.0 and 8.0. Recently installed well MW-05A has had groundwater pH readings ranging from 4.5 to 5.8.

For each groundwater sampling event since the year 2000, both dissolved (starting in 2006) and non-dissolved phase barium have been detected above the RL in all wells. The highest concentration of barium continues to be detected up-gradient and off site in well MW-01B.

During the second quarter 2010 sampling event, reportable trace amounts of arsenic were detected in both non-dissolved phase (total metals) in wells MW-01A, MW-02A, MW-02B, MW-03A, MW-05A, and G-4 and in the dissolved phase in wells MW-02A, MW-02B, MW-03A, and MW-05A. Well MW-04B showed the highest levels of arsenic in both dissolved and non-dissolved phases (4.4 and 4.4 µg/L, respectively).

Well MW-05A had elevated non-dissolved levels of cobalt (140 µg/L), copper (62 µg/L), nickel (190 µg/L), and zinc (3,800 µg/L) (total metals), and elevated dissolved levels of cobalt (190 µg/L), copper (74 µg/L), nickel (240 µg/L), and zinc (4,400 µg/L) compared to the other site monitoring wells.

3.2.5.2 Summary of Hydropunch Sampling

During the 2009 RI activities, additional groundwater assessment was performed using hydropunch sampling. Groundwater samples were collected in the A and B horizons, respectively to test for VOCs, SVOCs, PAHs, metals, and pH. No VOCs, SVOCs, or PAHs were detected above MCLs. Dissolved metal concentrations of beryllium, cadmium, and nickel were reported in one sample (GWP-100) from the A horizon. pH ranged from 6.74 to 7.44 in the A horizon with the exception of a 4.74 pH value from GWP-100. pH was not measured in the B horizon (Stantec, 2010a).

3.2.6 Perched Groundwater

Ten temporary groundwater wells were installed during the 2009 RI activities to investigate suspected perched groundwater. The results of the investigation are discussed in the *Data Gaps Memorandum* (Stantec, 2010a). In summary, benzene was detected at 1.6 µg/L, and some SVOCs were detected above the detection limit but below the reporting limit (J-flag). Lab pH ranged from 3.82 to 6.93, and PAHs were not detected in concentrations greater than 5 µg/L. Total metals above primary and/or secondary MCLs included: antimony, arsenic, beryllium, cadmium, chromium, copper,

nickel, selenium, and zinc. Dissolved metals above primary and/or secondary MCLs included: nickel and zinc.

3.3 Fate and Transport

Based on the results from previous investigations and the extensive field work performed as part of the *Revised Draft RI* (Stantec, 2008), the current Conceptual Site Model (CSM) suggests that:

- The undisturbed sludge at the Site does not pose a threat to surface water and does not pose a threat to shallow (A-horizon) or deeper (B-horizon) groundwater quality throughout much of the Site. Shallow groundwater is impacted (lower pH, total & dissolved metals) south of the Haack sump; however, these impacts are not detected in samples collected downgradient of the sumps.
- The undisturbed sludge at the Site does not pose a substantive threat to the air quality in the immediate vicinity of the Site. However, isolation of the sludge from temperature fluctuations above approximately 100 degrees would further minimize this potential impact; and
- The undisturbed sludge does not pose a threat to further contamination of soil surrounding the sludge by leaching of constituents of potential concern (COPCs) from the sludge (Stantec, 2008).

The transport mechanisms identified during the HHRA are discussed further in Section 4.2 but in summary are: wind erosion and dust, volatilization to indoor and ambient air, and leaching to groundwater.

3.4 Treatability Studies Conducted

3.4.1 General

A treatability study was conducted by Stantec to define and evaluate the physical and chemical characteristics of the sludge and evaluate neutralization/stabilization options. The following sections summarize the results of the treatability study found in Appendix J of the *Revised Draft RI* (Stantec, 2008) and included as Appendix B of this FS Report.

3.4.2 Acidity

The testing showed that the acidity of the sludge ranged from 6.1 to 20.8 percent by weight. The Cooper South Sump had the highest acidity, with an average value of 19 percent by weight (Stantec, 2008).

3.4.3 Wet Density

Wet densities of the sludge samples were determined from samples collected using a Fann Model 140 mud balance. The densities for the samples ranged from 63 lb/ft^3 to 79 lb/ft^3. The average density of the sludge collected from the Cooper North Sump was 65.7 lb/ft^3, and the average density of the sludge from the Cooper South Sump was denser at 72.8 lb/ft^3. The sludge collected in the Haack Rework Area had an average density of 74.9 lb/ft^3 (Stantec, 2008).

3.4.4 Moisture

The average moisture of the sludge ranged from 9.8 to 22.3 percent on a wet basis. The moisture of the soil below the sludge sumps ranged from 12.1 to 25.6 percent on a wet basis. The soil below the Cooper North Sump was noted to have higher moisture content (24.2 percent) when compared to the soil below the Haack Rework Area, which averaged 14 and 16.9 percent moisture, respectively (Stantec, 2008).

3.4.5 Viscosity

The viscosities of sludge samples were tested at different temperatures to determine material viscosity as a function of temperature. This data was plotted as semi-log graphs to generate trend lines for modeling the viscosity as a function of temperature in accordance with ASTM Method D 2493. The sludge is highly viscous, ranging from 1.7×10^6 to 2.5×10^6 centipoises (cP) at a reference temperature of 140ºF. The results of the testing show that the sludge in the Cooper North Sump had a slightly lower viscosity than the sludge in the Cooper South Sump. The sludge in the Cooper North Sump had an average viscosity of 1.7×10^6 cP at 140ºF while the viscosity of sludge in the Cooper South Sump averaged 2.5×10^6 cP at 140ºF. Sludge collected from the Haack property in the Haack Rework Area was heated to 220ºF, but it was still too viscous to test for viscosity, thus indicating the sludge may contain other solids from disruption during development activities in that area (Stantec, 2008).

3.4.6 Softening Point

The softening point of the sludge was evaluated by the softening point test defined in ASTM Method D36. The results of the testing show that the softening point of the sludge samples from the Cooper property ranged from 158ºF to 185ºF. The sludge in the Cooper North Sump had a slightly lower softening point than the sludge in the Cooper South Sump. The sludge in the Cooper North Sump had an average softening point of 159ºF while the average softening point for the sludge in the Cooper South Sump was 180ºF. The softening point of the sludge collected in the Haack Rework Area was greater than 210ºF (Stantec, 2008).

3.4.7 Neutralization and Stabilization Testing

Five different reagent mixes were tested with the sludge to evaluate their neutralization/stabilization ability. The five mixes included: calcium oxide (CaO), 50/50 (w/w) mix of CaO and calcium carbonate ($CaCO_3$), calcium hydroxide ($Ca(OH)_2$), a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$, and Portland cement (Stantec, 2008).

Testing indicated that the sludge can be neutralized by treatment using 25 percent treatment reagent addition by weight where the treatment reagent is comprised of 50 percent hydrated lime ($Ca(OH)_2$) and 50 percent $CaCO_3$ fines. Approximately 10 percent water addition was also required to help activate the lime and carbonate reactions. The addition of 50 percent soil by weight during this mixing will also effectively solidify the waste so it is no longer susceptible to viscoelastic deformation. This treatment also effectively fixates lead, as demonstrated through long-term leaching tests, and neutralizes acid gases such as hydrogen sulfide (H_2S) and sulfur dioxide (SO_2) (Stantec, 2008).

3.4.8 Vapor Evolution

Stantec also evaluated the potential rates of off-gas evolution during full-scale mixing operations as a function of temperature. Headspace analyses were performed on the sludge samples at temperatures of 60ºF, 100ºF, 140ºF, 180ºF, and 212ºF (Stantec, 2008).

3.4.8.1 VOC and TPH Headspace Results

The analyses indicated no benzene was emitted from the sludge samples at temperatures ranging from 60 to 212ºF. Toluene was not detected at 60ºF; however, detected concentrations increased as temperature increased. Similarly, ethylbenzene and xylenes were near detection limits at 60ºF, and detected concentrations increased as temperatures increased. Detected concentrations of toluene, ethylbenzene, and xylenes did not exceed the Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) (Stantec, 2008).

Total petroleum hydrocarbons (TPH) was monitored in the vapor headspace as a function of temperature, where TPH represents the total concentration of VOCs detected for GRO and diesel range organics (DRO). Initial concentrations of TPH in the vapor headspace were below 12.5 ppmv in the Cooper North and Cooper South Sump samples at 60ºF. However, TPH concentrations increased exponentially with increasing temperature. At 212ºF, the concentrations of TPH in the vapor headspace of samples from the Cooper North and Cooper South Sump were 259 ppmv and 223 ppmv, respectively. These data indicate that TPH (as petroleum distillates) will not

present a health and safety issue with respect to construction work since the concentrations are less than the OSHA PEL of 500 ppmv for petroleum distillates (Stantec, 2008).

Samples collected from the Haack Rework Area did not have detectable concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) and TPH, with the exception of toluene and xylenes. These compounds were only detected when temperatures were increased to 212ºF. TPH was below detection limits at 60ºF, and detected concentrations rose to a maximum at 212ºF (Stantec, 2008).

3.4.8.2 H_2S and SO_2 Headspace Results

H_2S and SO_2 were monitored in the headspace of sludge samples at various temperatures. The results showed that these sulfurous gases were readily emitted from disturbed and heated sludge samples in the Cooper North and Cooper South Sumps. The vapor concentrations of SO_2 in equilibrium with sludge samples from both sumps exceeded 150 ppmv at 60ºF. The vapor concentration of H_2S was 408 ppmv for the Cooper North Sump and 471 ppmv for the Cooper South Sump at 60ºF, but at higher temperatures it exceeded 500 ppmv for both sumps. These data show that H_2S and SO_2 will both be present at an exposure risk to workers and the community if the sludge is disturbed for neutralization and stabilization treatment, as the OSHA PELs for H_2S and SO_2 are 10 ppmv and 2 ppmv, respectively (Stantec, 2008).

The sludge samples collected from the Haack Rework Area had substantially lower concentrations of H_2S and SO_2 in the vapor headspace. The vapor concentrations of SO_2 in equilibrium with sludge samples ranged from 8 to 71 ppmv. The vapor concentration of H_2S ranged from 2 to 50 ppmv. These data show that H_2S and SO_2 emissions from sludge on the Haack property could present an exposure risk to workers and the community if the sludge is disturbed for neutralization and stabilization (Stantec, 2008).

3.4.9 Metal and Organic Mobilization

Treated and untreated composite samples of sludge from the Cooper North and Cooper South Sumps were analyzed for total RCRA metals, VOCs, SVOCs, and PAHs and for analyses of leachable RCRA metals and organics by both the toxic characteristic leaching procedure (TCLP) and synthetic precipitation leaching procedure (SPLP) (Stantec, 2008).

3.4.9.1 Untreated Sludge Leaching

Analyses showed that the composite sludge sample contained 22.4 mg/kg lead and 1.2 mg/kg barium. The TCLP extract contained 0.24 mg/L lead and 0.06 mg/L barium, thus indicating that the sludge would not be characterized as a hazardous waste under the definitions and exclusions given in 40 CFR Part 21 for lead or barium, even in a final TCLP extract of pH 3.97. The SPLP extract contained 0.31 mg/L lead and less than 0.01 mg/L barium at a final SPLP extract pH of 2.15. This indicates that the SPLP will be more likely to produce leaching effects in laboratory analyses than the TCLP (Stantec, 2008).

The analyses for total SVOCs, PAHs and VOCs identified the following constituents in the sludge:

- Benzo(a)anthracene 70,000 µg/kg;
- Chrysene 160,000 µg/kg;
- 2-Methylnaphthalene 30,000 µg/kg;
- Phenanthrene 200,000 µg/kg;
- Pyrene 60,000 µg/kg;
- Ethylbenzene 200 µg/kg;
- Toluene 400 µg/kg;
- Xylenes 1,000 µg/kg;
- 2-Methylnapthalene 1,900 µg/kg;
- 1,2,4-Trimethylbenezene 700 µg/kg;
- 1,3,5-Trimethylbenzene 500 µg/kg; and
- 1,2,3-Trimethylbenzene 1,100 µg/kg.

Despite the presence of these compounds within the sludge itself, no PAHs or SVOCs were identified in the SPLP extract for the untreated sludge above the detection limit of 5 µg/L. This indicates that the SVOCs and PAHs within the sludge are largely immobile. Toluene was detected in the SPLP extract of the untreated sludge at 7 µg/L, and 1,2,3-trimethylbenzere was detected in the SPLP extract at 1 µg/L (Stantec, 2008).

Analysis of the sludge for TPH as GRO and DRO showed that the sludge contained 70 mg/kg GRO and 39,000 DRO. This shows that only 3.9 percent of the sludge is comprised of organics in the C6 to C28 hydrocarbon range, thus showing that the majority of organics in the sludge have a very high molecular weight in excess of 400 (Stantec, 2008).

3.4.9.2 Treated Sludge Leaching

Samples of composite sludge treated with a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$ at dosage rates of 22, 24, 26, and 28 percent reagent by weight with respect to the original mass of untreated sludge were subjected to SPLP testing. The results showed that the treatment produced non-detectable concentrations of RCRA metals and SVOCs in each of the SPLP extracts, with the exception of barium which was detected at 0.01 mg/L. This shows that the treatment reduced the concentration of leachable lead by the SPLP to less than 0.03 mg/L (Stantec, 2008).

3.4.10 Long-Term Leaching Analysis

A long-term leaching test was performed on a composite sludge sample from the Cooper North and Cooper South Sumps that was treated at a dosage of 25 percent of the 50/50 (w/w) $Ca(OH)_2$ and $CaCO_3$ reagent mix. The sample was subjected to the SPLP extraction procedure daily, with new extract water being added to the sample after each SPLP extraction to evaluate the long-term leaching effects after multiple extractions. The leachate from every other extraction was filtered and sent for analyses of PNAs, RCRA metals, and VOCs. The extracts were also tested in the laboratory for pH and alkalinity (Stantec, 2008).

Testing indicated lead did not leach from the sludge even after ten sequential SPLP extractions, indicative that treatment of the sludge with $Ca(OH)_2$ and $CaCO_3$ provides long-term stability for lead. Trace concentrations of barium, ethylbenzene, toluene and xylenes leached from the treated sludge, but the concentrations were well below the primary drinking water standards. Additionally, trace concentrations of trimethylbenzene isomers, 2-methylnapthalene, and acetone leached from the treated sludge, but there are no primary or secondary drinking water standards for these compounds. Minimal alkalinity was removed from the sludge during the ten sequential extractions, thus indicating that many more extractions could have been performed while still maintaining alkaline stability in the treated material (Stantec, 2008).

3.4.11 Permeability

Composite samples of untreated and treated sludge from the Cooper North and Cooper South Sumps were tested for permeability by modified American Society for Testing and Materials (ASTM) D5084, Method C. The treated samples consisted of composite sludge samples treated with 15 percent calcium hydroxide and 15 percent $CaCO_3$ fines by weight. Stantec reported that the untreated sludge exhibited permeability less than $1x10^{-8}$ centimeters per second (cm/s), while the treated sludge exhibited permeability of approximately $9x10^{-3}$ cm/s (Stantec, 2008).

3.4.12 Evaluation of Soil Additive

Four composite samples of sludge were treated with 25 percent reagent comprised of a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$. Prior to adding the reagent, the samples were amended with 0, 25, 50, and 75 percent soil, by weight (Stantec, 2008).

The testing showed that the addition of soil to the neutralized sludge improved the density of the treated material and maintained high strength. Because the sludge at the Site is so viscous, it was difficult to assess how the soil additive worked as a stabilization material for bituminous stabilization at ambient temperatures. Therefore, samples of neutralized sludge treated with 0, 25, 50, and 75 percent soil were compacted into cores using a Harvard compaction apparatus, and the cores were placed into a convection oven at 220ºF to test the stability of the sludge. The testing showed that the neutralized samples containing no soil exhibited viscoelastic flow at 220ºF. The samples containing 25 percent soil exhibited minor viscoelastic properties, and the samples containing 50 and 75 percent soil by weight exhibited no viscoelastic properties. These test results show that the addition of 50 percent soil to neutralized sludge by weight converts the sludge into a stable solid material, even at elevated temperatures that exceed the softening point of the sludge (Stantec, 2008).

3.4.13 Evaluation of Thermal Treatment

Although the sludge was found to contain approximately 4 percent diesel-range organics, the majority of hydrocarbon in the sludge was comprised of very large chain hydrocarbons having a molecular weight greater than 400. When the sludge was tested for BTU value, it was found to have a very high heating value of 13,000 BTUs per pound. This confirms that the sludge is comprised primarily of organics. However, the sludge also had an elevated sulfur content of approximately 7 percent. This high sulfur content suggests that incineration or fuel combustion of the sludge is not a viable treatment alternative due to the large amount of SO_2 gas that would be emitted during combustion. Stantec has estimated over 1,800 cubic feet (280 pounds) of SO_2 gas could be emitted for each ton of sludge incinerated or combusted. Site-wide, the total mass of SO_2 generated by thermal treatment of the sludge would exceed 2,600 tons (Stantec, 2008).

3.4.14 Evaluation of Moisture/Density Relationship for Treated Sludge

Four samples of sludge treated with 25 percent of a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$ were tested for moisture/density relationship to determine optimal dry density and moisture content for compaction after treatment. Testing was performed on a sample without soil amendment and on three samples amended with 25, 50, and

75 percent soil by weight with respect to the initial weight of untreated sludge (Stantec, 2008).

The test results showed that the neutralized sludge without soil amendment had a very low maximum dry density of 52.3 lb/ft^3 and high optimum moisture content of 46.7 percent. When the neutralized sludge was amended with 25 percent soil, the maximum dry density increased to 64.1 lb/ft^3 and the optimum moisture content decreased to a more reasonable value of 29.5 percent. The neutralized sludge sample amended with 50 percent soil had a maximum dry density of 68.8 lb/ft^3 and an optimum moisture content of 25.7 percent, and the sample amended with 75 percent soil had a maximum dry density of 71.6 lb/ft^3 and an optimum moisture content of 24.4 percent. Based on Table 13, stabilized sludge amended with 12 percent $CaCO_3$ and 12 percent $Ca(OH)_2$ has a density of 81 lb/ft^3 (Stantec, 2008).

3.4.15 Testing for Asphaltic Qualities

Testing of the sludge indicated that it will have low marketability as recycled asphalt, even when neutralized, for the following reasons:

- The sludge is a brittle, glass-like material with little to no ductility;
- The viscosity of the sludge is too high for use as asphalt cement in road construction;
- The sludge contains a high concentration of impurities and suspended solids which causes it to fail to meet the test for asphalt solubility for both asphalt cement and roofing asphalt;
- The sludge has a negative American Petroleum Institute (API) gravity;
- The softening point falls into acceptable ranges for a Type II roofing asphalt, but the sludge fails to meet most of the remaining specifications for Type II roofing asphalt; and
- Penetration values for the sludge were too low for use as asphalt cement but meet the specifications for Type IV roofing asphalt.

Although the sludge shares the softening point specifications for Type II roofing asphalt and the penetration specifications for Type IV roofing asphalt, it fails to meet the ductility requirements for either of these asphalt grades. The brittle nature of the material gives it undesirable properties because the material is easily cracked and sheared, thus making it unsuitable for roofing or pavement construction applications (Stantec, 2008).

Section VII.C. of the Consent Decree requires the evaluation of the proposal of Mr. Thomas Cooper for recycling the sludge as one of the alternatives in the FS. The

Cooper Sumps sludge, in a non-neutralized state, releases significant quantities of H_2S and SO_2 gas when disturbed. The release of these gases from the sludge as well as the physical characteristics of the sludge, makes the sludge unacceptable for recycled asphalt application. The sludge recycling alternative is not evaluated further in this FS.

4. REMEDIAL ACTION OBJECTIVES AND CLEANUP CRITERIA

4.1 General

This section describes the development of remedial action objectives (RAOs) and target cleanup levels for the Site. The development of RAOs is required by RI/FS guidance as part of the FS. The process of developing the RAOs depends upon the assessment of risk to identified receptors at the Site and in the Site vicinity. A discussion of the risk assessment (RA) at the Site follows.

4.2 Chemicals of Potential Concern

The chemicals of potential concern (COPCs) for the Site were developed and discussed in the hazard identification section of the *Draft Human Health Risk Assessment* (HHRA) (Geosyntec, 2010). USEPA guidance states that the list of chemicals should include all chemicals that were:

- Positively detected in at least one sample;
- Detected above levels of the same chemicals found in associated blank samples;
- Tentatively identified, but may be associated with the Site based on historical information;
- Transformation products of detected chemicals; and
- Detected above naturally occurring levels (background).

During the RA, those contaminants posing a potential risk to receptors at the Site were identified as COPCs and can be found in Table 4-1 for soil, soil gas, and groundwater.

4.3 Human Health Risk Assessment

4.3.1 Approach

The draft HHRA included an evaluation of health risks to potentially exposed receptor populations consisting of: commercial/industrial workers, construction workers, hypothetical future residents, and trespassers. Potential exposures were evaluated for these populations assuming existing physical site conditions (without the existence of the protective caps on the Cooper and Haack properties and prior to any future remediation efforts at the Site). In addition, a current residential scenario has been included for the immediate adjacent offsite residential area (Geosyntec, 2010).

Future development of the Site and the immediate adjacent offsite residential area would be commercial as designated in the City of Gardena's report titled *Artesia Corridor Specific Plan* (TPC, 2006). To conservatively evaluate the potential risks

under an unrestricted land use scenario, a more conservative hypothetical future residential scenario was included in the HHRA to evaluate potential risks under an unrestricted land use scenario. Additionally, the conservative construction worker, shallow groundwater to outdoor vapor inhalation and dermal contact scenario was evaluated to represent groundwater in an open excavation (Geosyntec, 2010).

To evaluate the spatial distribution of risk driving chemicals, two types of comparison criteria were developed for each chemical identified in the risk characterization: (1) those based on background; and (2) risk-based values (RBCs) or target risk concentrations which are based on each receptor group and assuming site-specific soil characteristics and a target risk goal. For worker exposures (commercial/industrial and construction worker) a target risk goal of 1 in 100,000 (1×10^{-5}) was used. For residential and trespasser scenarios a 1 in 1,000,000 (1×10^{-6}) target risk goal was used. For those chemicals in which the risk-based concentrations are below background, the background concentration is used as the comparison criteria. This is the case for arsenic and residential and commercial/industrial worker scenarios, and benzo(a)pyrene toxicity equivalent (BaP-eq) for the residential scenarios (Geosyntec, 2010).

4.3.2 Results

The results of the HHRA indicate that exposures to onsite soils may potentially exceed target risk goals for all potential receptor scenarios evaluated: commercial/industrial worker, construction worker, hypothetical future onsite/current offsite resident, and trespasser. The primary contributors to the risk estimates were arsenic, hexavalent chromium, naphthalene, and predominantly the carcinogenic PAHs as represented by the BaP-eq concentration. The majority of locations where concentrations of these chemicals were elevated occurred within areas of known sludge material which are currently covered by the existing geomembrane cap, soil, concrete, and/or asphalt (Geosyntec, 2010).

4.4 Chemicals of Concern

Following completion of the HHRA, primary risk driving chemicals were identified from the list of COPCs (see Section 4.2) as chemicals of concern (COCs). These chemicals were identified as primary risk drivers because they are the most ubiquitous chemicals throughout the Site and because they are co-located with a majority of the COPCs (i.e., the risk associated with the COCs would encompass the COPCs). Based on the HHRA, the primary COCs at the Site are:

- **Soil**: arsenic, hexavalent chromium, naphthalene, and the BaP-eq
- **Air**: benzene, hydrogen sulfide
- **Groundwater**: dibenz(a,h)anthracene

These COCs are present in the Cooper and Haack Sumps as well as in the Haack rework area. Methane has been detected at low concentrations around the site but was not identified as a COC based on the HHRA. Due to the potential explosive risk associate with methane, it has been included with as a Remedial Action Objective.

4.5 Remedial Action Objectives

RAOs are goals specific to various media and apply to those media that have been identified as posing an unacceptable risk based on the HHRA work performed for the Site. The RAOs for onsite soils, soil gas, and groundwater are:

- Prevent ingestion/direct contact with sludge and/or soil having 10^{-5} to 10^{-6} excess cancer risk from carcinogenic constituents as represented by arsenic, hexavalent chromium, naphthalene, and the BaP-eq concentration;
- Prevent dermal contact with shallow groundwater having 10^{-5} excess cancer risk from carcinogenic polycyclic aromatic hydrocarbons (PAHs) as represented by dibenz(a,h)anthracene;
- Prevent dermal contact with low pH, PAH containing sludge;
- Prevent inhalation of volatile organic compounds (VOCs), as represented by benzene, posing excess cancer risk levels of 10^{-5} to 10^{-6}; and
- Prevent explosive risks associated with methane.

4.6 Applicable or Relevant and Appropriate Requirements

The Applicable or Relevant and Appropriate Requirements (ARARs), as defined by 40 CFR 300.5, presented in this section were identified for the remedial actions presented in this document to comply with Federal environmental law or more stringent standards promulgated under State environmental law. Federal and State environmental laws are evaluated to determine if they are either applicable or relevant and appropriate.

"To Be Considered" (TBC) criteria have also been identified to cover Federal and State nonpromulgated standards, policies, or guidance documents and local requirements for constituents which do not have developed preliminary remedial goals or ARARs.

The ARARs are divided up into the following three categories according to the type of CERCLA action they govern: chemical-specific, location-specific, and action-specific requirements. ARARs and TBC criteria are presented in Table 4-2.

4.6.1 Potential Chemical-Specific Requirements

At the Site, chemical-specific requirements include RCRA provisions defining hazardous waste, maximum contaminant levels (MCLs) derived from the Safe Drinking

Water Act, and primary and secondary national standards for ambient air quality. The Draft HHRA identifies the site-specific, risk-based cleanup levels (Geosyntec, 2010).

4.6.2 Potential Location-Specific Requirements

No location-specific ARARS were identified since the Site is not located in any sensitive or protected area.

4.6.3 Potential Action-Specific Requirements

The potential action-specific requirements for the Site include:

- **Porter-Cologne Water Quality Control Act**: Set on a case by case basis by the Regional Water Quality Control Board (RWQCB), water emission standards are applied to waste water, groundwater, and stormwater runoff from the Site.
- **South Coast Air Quality Management District (SCAQMD)**: Emissions of gases, particulate matter, and fugitive dust are set by the SCAQMD and may apply if they are part of the State Implementation Plan pursuant to the Clean Air Act.
- **National Pollution Discharge Elimination System (NPDES)**: Requires the elimination of most non-stormwater discharges, Stormwater Pollution Prevention Plan (SWPPP) preparation, and stormwater discharge monitoring.
- California Civil Code and California Health and Safety Code governing land use restrictions.
- DTSC hazardous constituent regulations as outlined in 22 CCR Division 4.5.

4.7 Future Site Use

The Site is currently used for residential and commercial/industrial applications. The DTSC has requested the following three future land use scenarios be evaluated for the Site:

- Current land use will continue; residential properties would remain and Cooper and Haack areas would remain commercial/industrial;
- Use the Site for residential only; and
- Use the Site for commercial/industrial only.

As a conservative approach to meet the DTSC request, the residential cleanup goals will be used, which are the most stringent.

The City of Gardena has developed the City of Gardena Master Plan (TPC, 2006) which indicates the Site would be developed in the future as commercial property with a mix

of commercial buildings and parking. To accommodate this development plan and constraints of the Site, ARC requested the remedial design be compatible with a parking lot or open space end use incorporating curbs, gutters, light poles, and utilities.

4.8 Target Cleanup Levels

The target cleanup levels for the Site were developed with consideration given to the following factors:

- Hypothetical future use scenario;
- Remedial action objectives; and
- Potential site health risk.

The cleanup levels shown in Tables 4-3, 4-4, and 4-5 were developed for each of the COCs identified in Section 4.3. Cleanup criteria either are numeric goals to be achieved through remediation or are non-numeric, performance-based criteria. The cleanup levels shown in Tables 4-3, 4-4, and 4-5 will be used subsequently in this FS Report to guide the selection and screening of remedial technologies and the development and detailed analysis of remedial alternatives. A discussion of the development of cleanup criteria follows.

4.8.1 Site-Specific Action Levels

Soil cleanup criteria are based on the derivation of risk-based concentrations (RBCs) for site COCs. RBCs were developed for each chemical identified as a COC or "risk driver" in the risk characterization of the HHRA (Geosyntec, 2010) based on each receptor group and assuming site-specific soil characteristics as presented in Appendix C. RBCs were derived for arsenic, BaP-eq, hexavalent chromium, benzene, and naphthalene in soil (Table 4-3); benzene in soil gas (Table 4-4); and dibenz(a,h)anthracene in groundwater (Table 4-5). The derivation of these concentrations is provided in Appendix C. RBCs are presented for both cancer and noncancer effects; cancer effects generally produce lower RBCs. The selected site-specific action levels (SSALs), considering background concentrations, are presented in the last column for each receptor group.

For arsenic in soil, the DTSC screening level of 12 mg/kg, which is considered background for southern California sites (Cal-EPA DTSC, 2007), was used as the SSAL for residential receptors.

For BaP-eq in soil, a concentration of 0.9 mg/kg, considered representative of background PAH concentrations in southern California soils, was used as the SSAL for residential receptors.

The SSALs for the residential, commercial/industrial, and trespasser scenarios were compared to soil, soil gas, and groundwater sample results collected during the RI. The results of the comparisons are provided on Figures 4-1 through 4-5.

5. IDENTIFICATION AND SCREENING OF TECHNOLOGIES

5.1 Introduction

General response actions (GRAs) describe remedial actions that would address RAOs and achieve cleanup criteria for hypothetical future receptors that may be exposed to soil, soil gas, and groundwater contaminants. This section provides a discussion of GRAs and also provides identification of potential remedial technology types and specific technologies. A screening analysis was conducted to reduce the number of potentially applicable technologies to those that were determined to be potentially able to achieve the RAO for the COCs.

5.2 General Response Actions

Specific GRAs identified for onsite impacts include the following:

- No action;
- Remediate or remove soils that present potential ingestion and/or dermal contact risk;
- Containment;
- Reduce concentrations of COCs that present a potential inhalation risk;
- Gas monitoring and treatment;
- Monitor groundwater; and
- Implement institutional controls to restrict access to sludge and to control and manage risk associated with future mixed-use redevelopment.

5.3 Technology Identification and Screening

In accordance with USEPA guidance, potential remedial technology types and specific technologies that can be used to implement the GRAs were identified and then screened to assess their effectiveness, implementability, and cost. This section provides a screening of technologies to identify those that will be combined into remedial alternatives in Section 6 of this FS Report. The following technologies have been identified for remediation and are listed in Table 5-1:

- No action;
- Institutional controls;
- Treatment;
- Stabilization/neutralization;

- Thermal treatment;
- Sludge recycling;
- Containment;
- Excavation and removal for offsite disposal;
- Engineered controls;
- Vapor and gas control systems; and
- Groundwater monitoring.

In accordance with US EPA Feasibility Study guidance, Table 5-1 presents the screening of each technology based on its relative effectiveness, implementability, and cost. This screening provides the rationale behind the decision to retain or eliminate each technology type. Therefore, based on the screening, the following technology types were retained for further evaluation:

- No action (as required by USEPA guidance);
- Institutional controls;
- Treatment;
- Stabilization/neutralization;
- Containment;
- Excavation;
- Engineering Controls;
- Gas control systems; and
- Groundwater Monitoring.

A summary of technologies retained is presented in Table 5-2. Each retained technology will be integrated into one or more remedial alternatives, described in Section 6.

6. DEVELOPMENT OF REMEDIAL ALTERNATIVES

In this section, remedial alternatives for the Site are assembled from those technologies that remain after the initial screening in Section 5. Each remedial alternative includes a remedial approach that accommodates the hypothetical future use scenario described in Section 4 and assumes that Site features are removed prior to remedy implementation. Each remedial alternative listed in Table 6-1 is designed to address each impacted media at the Site.

6.1 Remedial Alternatives

Table 6-1 presents the four remedial alternatives that were retained for evaluation:

- Alternative 1 – No action;
- Alternative 2A – Capping with selective excavation;
- Alternative 3 – Capping with selective excavation and stabilization/neutralization; and
- Alternative 4 – Excavation with offsite disposal.

Alternatives 2A and 3 include institutional controls, gas control and monitoring, and groundwater monitoring. All four alternatives are described below.

Alternatives 2A through 4 are depicted on Figures 6-1 through 6-16. Details shown are conceptual for estimating and comparison purposes only, and do not represent the results of full engineering design and analysis.

6.1.1 Alternative 1 – No Action

This alternative consists of performing no work now or in the future to attempt to mitigate an existing condition. The current geomembrane cover would remain and no deed restrictions would be placed on the property.

For No Action to be considered an acceptable alternative, the concentrations of COCs would have to be below RAOs. This alternative would provide no exposure pathway reductions. There would be no controls to prevent future site development or site access. Groundwater contamination would not be known since monitoring would not be performed. Future site development would be hindered due to the instability of the sludge material. The No Action Alternative is required by USEPA FS guidance.

6.1.2 Alternative 2A – Capping with Selective Excavation

Alternative 2 was originally presented in the Draft FS dated February 2011. Alternative 2A replaced Alternative 2 in the Draft FS Addendum dated 29 September 2011.Alternative 2A is consistent with the former Alternative 2 in that capping and selective excavation of the sludge in the Haack Rework area are evaluated. However, the evaluated cap proposed in Alternative 2A is significantly lower in overall height than the cap of former Alternative 2. Additionally, different disposal scenarios for the Haack Rework material are proposed in Alternative 2A. The lower profile cap and different Haack Rework material disposal alternative presented in this FS Report is in response to comments received from the City of Gardena during the 10 May 2011 meeting. In addition to the layout and cap profile presented herein, the Optional Alternative 2A Cover which eliminates the retaining wall adjacent to Artesia Blvd. is summarized in Section 6.1.2.3 below and provided in greater detail in Appendix F.

6.1.2.1 General Overview

The Site is generally divided into three areas: the Cooper North and South Sumps on the Cooper Property, the Haack Sump and the Haack Rework Area located primarily within the Haack property, four residential properties, land owned by Los Angeles County and a small area of land beneath the Artesia Boulevard right-of-way. Because these areas of the Site are divided among different property owners, the properties may not all be available for remedial construction at one time. The following sections describe, in general, the proposed Alternative 2A approach for each area. Section 6.1.2.2 describes the remedial implementation approach for the entire Site in greater detail.

As described previously, the sludge material beneath the Artesia Boulevard South sidewalk and Artesia Boulevard are below road base material and asphalt or sidewalk concrete. The concrete and asphalt surface prevent ingestion and direct contact with the sludge as well as reduce its mobility by containing the sludge. This sludge material is considered to be already capped.

Future access from current and/or future utility and/or construction workers will be addressed in the Risk Management Plan (RMP). The RMP will describe contaminants remaining onsite, known locations of impacts, contact information, and minimum, recommended personal protective equipment for current and future utility and/or construction workers. Institutional controls will include requirements that the City of Gardena and/or Caltrans provide notice of potential subsurface hazardous materials in the area of Artesia Boulevard where sludge is potentially located, prior to issuing work permits. Institutional controls will also include requirements related to Site development and cap loading restrictions.

Cooper North and South Sumps

The existing geomembranes will remain in place with the cap installed above. The geomembrane will provide a construction surface and preliminary support during installation of the overlying materials. Furthermore, the existing surfaces minimize the dermal contact and gas inhalation exposure risks to the construction workers during installation of the cap.

The sludge and overlying geomembranes in the Cooper North and South Sumps will be capped, from bottom to top, with the following materials: (1) high-strength geotextile; (2) between 0 and 4.5 feet (ft) of foundation layer material; (3) a horizontal gas collection system: gas collection geostrips and gas collection geocomposite; (4) geosynthetic clay liner (GCL); (5) high-density polyethylene (HDPE) geomembrane; (6) drainage geocomposite; and (7) up to 12-inches (in.) of Class II aggregate base.

Haack Sump

The existing asphalt and concrete will remain in place with the cap installed above. The asphalt and concrete will provide a construction surface and preliminary support during installation of the overlying materials. Furthermore, the existing surfaces minimize the dermal contact and gas inhalation exposure risks to the construction workers during installation of the cap. In areas where sludge has migrated to the surface, asphalt repair will be performed prior to installation of the cap.

The sludge in the Haack Sump will be capped, from bottom to top, with the following materials: (1) between 0 and 4.5 ft of foundation layer material; (2) a horizontal gas collection system made up of gas collection geostrips and gas collection geocomposite; (3) geosynthetic clay liner (GCL); (4) HDPE geomembrane; (5) drainage geocomposite; and (6) up to 12 in. of Class II aggregate base.

Haack Rework Area

The Haack Rework area is composed of soil-sludge material and soil overburden. The Haack Rework overburden material will be disposed of as foundation material beneath the Cooper North and/or South sumps cap. Approximately 2,670 CY of Haack Rework soil-sludge material and 2,450 CY Haack Rework overburden are anticipated to be relocated during construction activities. Disposal of the Haack Rework material will be dependent on the material properties of the soil-sludge and availability of staging areas within the property during construction, as described in greater detail in Section 6.1.2.2.

6.1.2.2 Detailed Alternative 2A Components

Alternative 2A includes the following major elements:

- Existing surface preservation;
- High-strength geotextile installation;
- Select excavation of impacted material (Haack Rework material);
- Containment of sludge along Artesia Boulevard;
- Installation of gas control and monitoring system;
- Capping of the sumps;
- Institutional controls;
- Groundwater monitoring; and
- Optional Alternative 2A Cover.

The approximate area of Alternative 2A is depicted on Figures 6-1 and 6-2. The construction and cap components are discussed further in the following sections.

Existing Surface Preservation

The existing geomembrane surface on the Cooper Property and concrete and asphalt surfaces above the Haack Sump will remain in place and the cap will be installed above these surfaces. New asphalt will be placed above the existing, degraded areas of asphalt surface over the Haack Sump prior to the initiation of cap construction on the Haack property. The geomembrane, asphalt, and concrete surfaces will provide a barrier to minimize worker dermal exposure to sludge contact as well as gas generation and release. Additionally, the concrete and asphalt surfaces will provide strength to the cap on the Haack Sump, eliminating the need for the high-strength geotextile described below.

High-Strength Geotextile Installation

A polypropylene high-strength geotextile will be placed above the existing geomembrane surface in the Cooper North and South sump areas; no polypropylene high-strength geotextile is proposed above the Haack sump area. The geotextile will be used to provide reinforcement during installation of the foundation soil to support both the weight of the soil and construction equipment. The polypropylene high-strength geotextile will be anchored around the perimeter of the two Cooper sumps with an anchor trench and/or secured to sheet piling along Artesia Boulevard. The minimum tensile strength and anchorage of the high-strength geotextile have been evaluated and are included in Appendix D. A typical anchor trench is shown as Detail 7 on Figure 6-14.

Haack Rework Material Excavation and Disposal

The Haack Rework area is comprised of approximately 2,670 CY of sludge and a soil-sludge material beneath approximately 2,450 CY of soil overburden; therefore, a total of approximately 5,120 CY of material is anticipated to be relocated during construction activities. Haack rework material excavation will be performed using standard construction equipment. A contingency plan will be developed which establishes gas concentration thresholds and corresponding actions such as odor suppression, soil replacement, and/or evacuation. Odor suppressant equipment (foaming units) will be present during excavation to control odors and gas emissions, if necessary. South Coast Air Quality Management District (AQMD) Rule 1166 and applicable California Occupational Safety and Health (Cal-OSHA) exposure limits will be followed during excavation and handling of the Haack Rework material.

As previously described, the Haack Rework soil-sludge material will be removed and disposed of offsite. The Haack Rework area overburden soil will be used as foundation material beneath the Cooper or Haack Sumps caps.

The Haack Rework soil-sludge material would be excavated and disposed of at a commercial, non-RCRA hazardous landfill (assumed to be the Buttonwillow Facility). Assuming all 2,670 CY of soil-sludge material is disposed of offsite and assuming 16 CY capacity end-dump trucks are used, approximately 164 truckloads would be necessary to transport the material an estimated 150 miles one-way to the Buttonwillow Facility. An estimated 18 trucks[2] per day could be loaded and transported to the Buttonwillow Facility, resulting in approximately 10 days of hauling from the Site (Appendix E).

The Haack Rework area will be excavated no deeper than an elevation of approximately 20 ft above mean sea level (amsl) as shown on Figure 6-5. Following excavation of material from the Haack Rework area using visual means to guide the limits of the excavation, confirmation sampling to determine the absence of sludge and COCs at 5 ft intervals to a depth of 10 ft below the planned excavation grade would be performed to confirm the material was removed. Confirmation sample results will be compared to risk-based cleanup goals described in Section 4.8. Where testing indicates concentrations in excess of cleanup goals, additional material would be excavated, hauled, disposed of offsite or reused as foundation material, and additional confirmation testing would be performed.

[2] Assumptions: (1) 3 trucks are loaded per hour between 7 am and 1 pm, such that trucks can get to the disposal facility prior to closing

Upon completion of excavation, confirmation sampling, and receipt of test results indicating that the samples are below risk-based cleanup goals, the area will be backfilled with clean on- or off-site soil and graded to drain. The slope from the southern residential properties resulting from the excavation of the Haack Rework area will be contoured to a 3 ft horizontal to 1 ft vertical (3H:1V) grade while portions of the excavations lower than the surrounding land will be backfilled and graded to drain (Figures 6-1 and 6-2).

Vapor Control During Construction

Health and safety controls will be implemented during construction, specifically during the excavation of the Haack Rework material. The Treatability Study performed by Stantec (Stantec, 2007) indicated the Haack Rework soil-sludge material is significantly degraded; however, detectable concentrations of hydrogen sulfide and sulfur dioxide are still produced when the sludge material is disturbed. Therefore, during construction activities, vapor suppressing foams can be used and workers will be provided health and safety monitoring devices such as hydrogen sulfide and sulfur dioxide indicator badges. The badges alert workers when the permissible exposure limit (PEL, 10 parts per million [ppm] and 2 ppm for hydrogen sulfide and sulfur dioxide, respectively) is nearing so the worker can exit the work area or change practices. Additionally, fixed monitoring will be performed around the perimeter of the Site to alert workers when the PEL is detected so work activities can pause and/or be altered to minimize impacts to off-site receptors.

At the completion of excavation activities each day, a vapor suppressing foam or soil cover will be used to cover the exposed excavation and stockpiles to minimize release of vapors.

6.1.2.3 Capping of the Sumps

The proposed, conceptual Haack and Cooper cap grades of Alternative 2A are shown on Figure 6-2 with cross sections shown on Figures 6-3 and 6-4. This preliminary cap design is in accordance with 22 CCR §66264.228. In accordance with 22 CCR, the cap consists of a foundation layer, low-hydraulic conductivity layer, and erosion-resistance layer. The Alternative 2A cap is illustrated on Figure 6-13, in Details 1-A and 1-B, and would consist of the layers described below. An alternative cap design is described in the Section *Optional Final Cover Configuration (No Retaining Wall),* below, which eliminates the retaining wall adjacent to Artesia Blvd. The Optional Alternative 2A cover is described in greater detail in Appendix F.

Foundation and Gas Collection Layers

The foundation soil and gas collection layers would be placed above the high-strength geotextile and asphalt and concrete for the Cooper and Haack Sumps, respectively, and consist of, from bottom to top, minimum 1 ft of foundation soil, gas collection geostrips, and a gas collection geocomposite. The minimum 1 ft foundation and gas collection layer will support the low-hydraulic conductivity layer and erosion resistance layer in accordance with 22 CCR §66264.228(e)(4). The foundation soil would consist of Haack Rework overburden soil, on-site soils and/or imported fill material. Approximately 13,000 CY of foundation material will be required for the Cooper Sumps and Haack Sump.

The foundation material would initially be placed using the "finger fill soil placement technique," which incorporates the use of parallel, narrow berms over the polypropylene high-strength geotextile. Approximately 3,900 CY of material would be placed using the "finger fill soil placement technique." The initial, 1-ft berms will then gradually be expanded across the sumps until the entire sump surface is covered with one foot of foundation soil.

During finger fill placement of soil above the polypropylene high-strength geotextile, movement of the sludge will be minimized and contained by the existing berms and the anchor trenches securing the polypropylene high strength geotextile and existing geomembrane. Where available space onsite limits traditional anchor trenches, the high-strength geotextile may be secured with concrete anchors or attached to sheet piles with battens.

After the initial 1-ft placement of soil across the sump, an additional 9,100 CY of foundation soil will be placed in lifts until final foundation grades are met (1 ft below the final cover grades shown on Figures 6-1 and 6-2). The slopes will be a minimum of 2 percent (%) to reduce impacts on drainage due to settlement of the foundation material and/or sludge.

Rows of gas collection geostrips will be placed at the surface of the foundation layer. The geostrips are 6 to 12 in. wide and consist of a geosynthetic filter fabric surrounding a molded polyethylene core (US Fabrics, 2011a). The molded polyethylene core provides a pathway for the gas to travel, while the filter fabric prevents soil intrusion and clogging. A polyethylene core and polypropylene geotextile, which are more resistant to acidic environments, will be required in the technical specifications. The gas collection geocomposite will be placed above the geostrip rows and the foundation layer (Details 1-A and 1-B, Figure 6-13). The gas collection and control system is described in greater detail below.

Low-Hydraulic Conductivity Layer

The low-hydraulic conductivity layer would be placed above the foundation soil and gas collection geostrips and geocomposite and would consist of a geosynthetic clay liner (GCL) overlain by a 60-mil HDPE geomembrane (Details 1-A and 1-B, Figure 6-13). In accordance with 22 CCR §66264.228(e)(5), the low-hydraulic conductivity layer would reduce the downward migration of precipitation and the upward migration of gas. The low-hydraulic conductivity layers would be secured within an anchor trench around the perimeter of the sumps as described below.

Anchor Trenches

The existing geomembrane (located above the two Cooper Sumps), the high strength geotextile, and the low-hydraulic conductivity layer (60-mil HDPE geomembrane overlying a GCL) are or will be anchored above the sumps using separate anchor trenches. The existing geomembrane is secured above the sumps using a 2 ft by 2 ft anchor trench (OHM, 1994). These anchor trenches act similarly to shallow, vertical barriers by minimizing the opportunity for lateral "overspilling" of surface sludge. Lateral migration of the sludge at depth has not been shown to occur through the soil based on soil borings outside the immediate areas of the sumps.

The high strength woven geotextile will be secured in a separate 2 ft by 2 ft anchor trench located outside the limits of the Cooper Sumps. During excavation of the anchor trenches, a Contingency Plan will be implemented with gas levels and corresponding corrective actions to be taken. Corrective actions will include but not be limited to odor suppression, soil replacement, and/or evacuation.

The GCL and HDPE geomembrane will be secured by an additional anchor trench around the perimeter of the Haack and Cooper Sumps. The anchor trench will vary in configuration depending on the termination condition. On the eastern, southern, and portions of the northern and western perimeters, the anchor trench will consist of a vee-trench filled with concrete to form a surface water drainage ditch (Detail 6 on Figure 6-14). On portions of the northern and western perimeters, the anchor trench will consist of a 1 ft deep by 2 ft wide anchor trench (Detail 7 on Figure 6-14). Where sheet piles are located on the northern edge of the site and space is limited, the geosynthetic materials will be secured to the sheet piles using battens.

Erosion Resistance Layer

The erosion resistance layer is comprised of a drainage geocomposite overlain by 1 ft of Class II aggregate base, in accordance with 22 CCR §66264.228(e)(10). The drainage geocomposite minimizes hydrostatic head buildup above the hydraulic barrier and

provides a means to drain precipitation that has infiltrated the overlying Class II aggregate base toward the outside of the cap and perimeter drainage channels. The Class II aggregate base will be resistant to foreseeable erosion effects caused by wind-scour, raindrop impact, and runoff prior to site development.

Sheet Pile Cut-Off Wall

Along a portion of the northern Site boundary, limited space is available to allow for grading to install the cap system. As a result, sheet piles would be installed to allow for the vertical rise of the cap without altering the Artesia Boulevard right-of-way. The sheet piles would be installed to a maximum depth of 18 feet bgs, consistent with the deepest known sludge in the Cooper North and Haack Sumps, and extend upwards to approximately 3 feet from the ground surface to accommodate the cap. The sheet piles would be coated to minimize corrosion of the steel due to the low pH and high hydrogen sulfide environment. A decorative exterior wall will cover the exposed portion of the sheet piles along Artesia Boulevard. The sheet pile cut-off wall will provide a barrier between the Haack sump sludge and Artesia Blvd and its adjacent sidewalk.

Final Cap Topography

The final cap surface is shown on Figures 6-1 and 6-2. Cross sections of the final cap topography are provided on Figures 6-3 and 6-4. Drainage channels are shown on the exterior of the sumps to the north, south, east, and west as well as bisecting the Cooper North and South sumps. The channels drain with a 0.5% slope to the northeast and northwest corners of the Cooper North and Haack sumps, respectively. The cap slopes up from the drainage channels with a minimum 2% slope to a maximum elevation of 25.7, 24.8, and 25.6 ft amsl on the Haack, Cooper North, and Cooper South sumps, respectively. Along Artesia Boulevard, the approximate height of the cap will be 22 to 23 ft amsl which includes the maximum 3 ft wall to support the final cover and an additional 6-inch curb to direct stormwater runoff to the perimeter drainage channels. The Haack Rework area will be backfilled and graded to drain as shown on Figures 6-1 and 6-2.

Optional Final Cover Configuration (No Retaining Wall)

An optional final cover configuration was identified which eliminated the retaining wall described in the *Sheet Pile Cut-off Wall* section, above. The grading in the area affected by the elimination of the retaining wall was revised to accommodate a minimum 5 percent (%) slope draining to the north and terminating at a 6 to 9 inch (in.) concrete curb immediately adjacent to the Artesia Boulevard (Blvd.) sidewalk (Optional Alternative 2A). The minimum foundation layer thickness is reduced to 0 ft adjacent to the curb to accommodate the lower cap height. The curb will deter unintended light

traffic across the slope, act as a water-stop for drainage from the slope, and accommodate the slight variations in the existing Haack Sump concrete slab surface elevation.

The high-strength geotextile will be protected by the overlying geocomposite and geomembrane. Landscaping in the form of decorative rock, artificial turf, or planter box-type vegetation structures will limit maintenance and potential impacts to the geomembrane. If necessary, cushion geotextiles may be used above the geomembrane where geocomposite is not present to prevent damage from installed landscaping.

The modifications necessary to eliminate the retaining wall and allow for the Optional Alternative 2A Cover will require waivers of some requirements in California Code of Regulations, Title 22 (22 CCR). A complete description of the alternative cover configuration is provided in Appendix F.

6.1.2.4 Gas Control and Monitoring System

The gas control system would be comprised of perimeter vertical gas migration control wells and a below-cap horizontal gas collection system. The proposed layouts of the vertical and horizontal gas collection systems are shown on Figures 6-6 and 6-7, respectively.

Vertical Gas Migration Wells

The system of gas migration control wells is designed to be a passive system that, as a contingency, can be converted readily to an active system. The system will operate actively for a period of two weeks following completion of the remedial action construction at the Site. Based on the concentrations of constituents detected during the two-week startup period, the system will remain active or switch to passive operation with the option for active control in the future. The system may be converted to passive operation with written prior approval from the DTSC. The decision to make the system active again would be based upon future gas monitoring at the Site.

A series of alternating air inlet and gas extraction piping would be placed approximately every 80 ft along the perimeter of the cap, except where sheet piles are installed as shown on Figure 6-6. The wells would be installed to approximately 2 ft above the groundwater "A" horizon ("A" horizon approximate elevation between 5.85 and 11.55 ft amsl [Stantec, 2011]). The air inlet and gas extracting wells act to create a "curtain" of air surrounding the sumps, minimizing the horizontal migration of gas without extracting gas from the sludge.

During active gas extraction, a vacuum will be applied to the gas extraction wells, thus extracting gases from these wells, which will be conveyed to a treatment system for

treatment prior to discharge to the atmosphere. The location of the system is shown on Figures 6-6 and 6-7. The vacuum pressure in the gas extraction wells imparts a vacuum on the soils surrounding each gas extraction well. With the air inlet wells equally spaced between the gas extraction wells, the air inlet forces a "short-circuiting" of the flow into the gas extraction wells. The "short circuiting" effect creates a preferential flow path between the air inlet and gas extraction wells, thereby allowing the system to "sweep" or "flush" gases migrating from the sludge material laterally without extracting gases from within the sludge (Figure 6-8).

During passive gas extraction, subsurface gas movement is non-existent or very small, allowing barometric pumping and diffusion to vent subsurface gases from the vertical gas migration control wells.

Below-Cap Horizontal Gas Collection System

A horizontal gas collection system (utilizing geostrips) would be placed within the foundation layer of the cap, as discussed above. Similar to the vertical gas migration control wells around the perimeter of the cap, the horizontal gas collection system is designed to initially operate as an active system, during a start-up period of two weeks. The system would then be operated as a passive system, but is designed as a contingent measure to be readily converted to active, if necessary. As a passive system, it would be vented to the atmosphere and rely on barometric pumping and diffusion to vent subsurface gases from the system. The decision to make the system active would be based upon post-cap construction gas monitoring at the Site as described in *Gas Treatment System*, below.

The design of the gas collection system incorporates gas collection geostrips and air inlet geostrips, both connected to separate gas collection and air inlet piping. Piping is connected to the treatment compound where actively extracted gases can be treated prior to discharge to the atmosphere and fresh air can be pulled into the system through the air inlet piping. Gases fluxing out of the sludge and vertically rising to the base of the hydraulic barrier component of the cap will be collected in the continuous gas collection geocomposite layer. Parallel geostrips will allow collected gases to be "flushed" or "swept" from the gas extraction geocomposite to the gas extraction geostrips by allowing fresh air into the air inlet geostrips. Geostrips will convey the collected gases to the gas extraction piping and the treatment compound.

Gas Treatment System

The gas extracted from the control system would be treated using specialized granular activated carbon (GAC). Specialized Granular Activated Carbon (GAC) products have been manufactured to include hydrogen sulfide and sulfur dioxide oxidation.

Specifically, Calgon Carbon has a number of specialized GAC products for hydrogen sulfide and sulfur dioxide environments.

The gas system will be operated actively for a period of time defined in a future Operations, Maintenance, and Monitoring (OMM) Plan. During initial operation, soil gas data, including constituents extracted and their concentrations, will be collected. The need for active gas collection will be based on the extracted soil gas COC concentrations and associated, calculated health risk goals. If start-up data indicates that COC concentrations are below risk-based trigger concentrations, and therefore, active gas collection is not needed, the system may be converted to a passive system which vents to the atmosphere or is turned off with no venting.

Soil gas samples will be collected from the treatment system and perimeter soil gas probes on a regularly basis to evaluate the operation of the system and/or migration of soil gas. Sample results will be compared to risk-based trigger concentrations developed with the OMM Plan for each COC. Development of the risk-based trigger concentrations will assume soil gas will cause outdoor air to become impacted with COCs; however, the outdoor air concentration used to develop the trigger concentration will be low enough to not result in adverse health effects. Based on the assumed conditions at the Site, if soil gas trigger concentrations are not exceeded, outdoor air concentrations will remain below human-health risk based concentrations. If soil gas concentrations are triggered, the gas collection and treatment system may be activated.

Gas Monitoring System

Multi-level gas migration probes would be placed outside of the perimeter of the cap. The probes are designed to be outside of the vertical gas migration control wells.

The gas probes are shown on Figure 6-7. A total of nine probes were selected based on the average distance between probes of 300 ft to provide multiple locations to detect potential gas migration, if any. Each monitoring location will consist of three nested probes with 1 ft screen lengths at 5 ft intervals for discrete sample collection. The rationale for the location was based on a location outside of the radius of influence of the vertical gas migration control wells and within the property boundary and/or in a location accessible for monitoring which increased or decreased some distances between the probes. For example, probes were placed within the median of Artesia Boulevard rather than in the street to provide a safer location for monitoring. With further refinement of design, the location and number of probes may change with adjustments to the radius of influence of the vertical gas migration control wells and the locations of buildings and utilities for future site development.

Regular monitoring of gas concentrations at the probe locations would be performed before, during, and after system operation. The decision to convert the gas collection

systems to an active system would be partially based upon the results of the probe monitoring activities and threshold contaminant concentrations developed in the Operations, Maintenance, and Monitoring (OMM) Plan as described in the *Gas Treatment System* section, above.

6.1.2.5 Institutional Controls

The anticipated institutional controls for the Site would consist of governmental controls, such as zoning and building permit restrictions, proprietary controls that restrict property use, and informational controls. Governmental controls would restrict the zoning of the Site to commercial (as identified in the Artesia Corridor Specific Plan) and prohibit sensitive land uses (i.e., residential, hospitals, schools, or child-care centers), specify building construction requirements (i.e., inclusion of gas control system beneath new structures). Environmental land use restrictions may also be applicable. Proprietary controls would place use restrictions on the Site properties. Restrictions would include future land use, the prevention of excavation or drilling within certain areas of the Site (i.e., within the capped areas), controlled traffic loads over the caps, prohibit onsite groundwater extraction for municipal and domestic use (i.e., drinking water purposes), industrial, and agricultural (i.e., irrigation) use, future building location restrictions, provide for potential easements (i.e., for O&M activities) and conveyance of proprietary control restrictions to future property owners (i.e., restrictions "run with the land"). Informational controls would include deed notices on the Site property titles and ensure inclusion of the Site on a California registry of contaminated sites. Land use covenants (LUCs) to place deed restrictions on the site will be filed with the Los Angeles County Recorder's Office and annual LUC restriction inspections will be conducted by DTSC to ensure compliance. The asphalt cap above the sludge within Artesia Boulevard will have increased maintenance to repair cracking and normal wear that increase the permeability.

Furthermore, a Health and Safety Plan (HASP) and Construction Quality Assurance (CQA) Plan would be required to establish minimum health and safety protocol during construction, and provide documentation of proper excavation, cap, and gas control system construction. A Risk Management Plan (RMP) would be developed for the Site to reduce the risk of future construction worker exposure to groundwater if the Site is developed. The RMP would discuss the hazards at the Site, minimum PPE requirements, and notification requirements.

6.1.2.6 Groundwater Monitoring

Eight of the existing ten groundwater monitoring wells would be properly abandoned prior to commencement of the remedial action. Upgradient wells MW-1A and MW-1B would not be abandoned. During the remedial action activities, an appropriate

groundwater monitoring network would be agreed upon with input from the DTSC. After the completion of the remedial action, the future groundwater monitoring wells would be installed. Groundwater monitoring would continue to be performed on a semi-annual basis. A typical groundwater monitor well is shown as Detail 3 on Figure 6-13.

The future development plans of the Site, which are currently unknown, would control where future monitoring wells would be installed. The well locations of the future monitoring well network would be agreed upon in consultation with the DTSC prior to completion of the remedial action. It is anticipated that the new monitoring wells would be installed shortly after completion of the remedial action.

6.1.2.7 Future Site Development

Following completion of the cap construction, the resulting Site conditions will facilitate the construction of a parking lot and an ingress/egress road to accommodate future commercial development at the Site. The 12-in. thick Class II aggregate base will provide a working surface for construction equipment used for parking lot construction, prevent the accumulation of free water within or below the pavement structure, and affect the rate of load distribution on the cap (Caltrans, 2008). Final landscape development designed in conjunction with the future parking lot above the cap will require the use of above grade planters to prevent biological intrusion into the cap.

The grades and final elevation of the cap have been reduced to allow for a flatter surface on which to construct a parking lot and be a less prominent feature along Artesia Boulevard. As described in Section 6.1.2.3, the maximum elevation of the cap will be 25.7 ft amsl and the slopes will vary between 2H:1V and 2 percent. During commercial development of the Site, the slopes of the parking lot can be further reduced by adding fill above the lower portions of the cap, provided drainage from the geocomposite is maintained. Selective fill would allow for a flatter surface and ramp features to facilitate car movement. The cap has been shown to support construction loads at the surface (Appendix D). During final design of the cap, traffic load restrictions will be developed and incorporated into the institutional controls.

6.1.3 Alternative 3 – Capping with Selective Excavation and Stabilization/ Neutralization

Alternative 3 includes the following major elements (Figures 6-9 and 6-10):

- Existing surface removal;
- Consolidation of material;
- Stabilization/neutralization of the current upper 3 feet of sludge in the Cooper Sumps;

- Capping of sludge remaining onsite;
- Installation of gas control and monitoring system;
- Institutional controls; and
- Groundwater monitoring.

Some of these elements were discussed in Section 6.1.2; therefore, the installation of the gas control and monitoring system (Section 6.1.2.4), institutional controls (Section 6.1.2.5), and groundwater monitoring (Section 6.1.2.6) will not be repeated herein. Existing surface removal, the consolidation of material, sludge stabilization/neutralization, and capping are discussed further in the following sections.

6.1.3.1 Existing Surface Removal

A geomembrane liner is currently above the Cooper North and South Sumps. Prior to initiating neutralization and stabilization activities, the existing geomembranes will be removed to permit access to the sludge. The reinforced concrete and asphalt covers above the Haack Sump will remain in place.

6.1.3.2 Consolidation of Material

In general, the sludge is contained in the three sumps: Cooper North and South, and Haack. As previously discussed in Section 3.2.1, approximately 2,670 CY of a soil-sludge material is located outside of the sumps in the Haack Rework area. To excavate the soil-sludge material, approximately 2,450 CY of overburden will need to be excavated. Additionally, along the eastern property line, a thin layer of sludge exists which appears to be the result of spillage or overflow from the sumps.

The Haack Rework and eastern overflow areas would be consolidated into one of the three sumps prior to capping, and used as fill beneath the cap low-hydraulic conductivity layer (to be discussed in Section 6.1.3.4). The Haack Reworked material will be tracked during placement and will not be placed where it will be in contact with the gas collection system. Approximately 5,380 CY of Haack Rework (2,670 CY), Haack Rework overburden (2,450 CY), and eastern overflow (260 CY) are anticipated to be placed above the sumps.

Following visual excavation of material from the Haack Rework and eastern overflow, confirmation sampling would be performed to confirm the material was removed. Confirmation sample results would be compared to cleanup goals. Where testing indicates concentrations in excess of cleanup goals, additional material would be removed and consolidated above the sumps. Haack Rework and eastern overflow excavations will be backfilled using soils obtained from nonimpacted areas of the site.

6.1.3.3 Stabilization/Neutralization of Cooper North and South Sludge

Stabilization/neutralization of the sludge material would be performed to the top 3 feet of the sludge to solidify the sludge for support of the proposed overlying cap. From the treatability studies performed by Stantec, it was determined that the addition of a 50/50 weight for weight (w/w) mix of calcium hydroxide ($Ca(OH)_2$) and calcium carbonate ($CaCO_3$) at a dosage rate of 20 to 30 percent reagent to sludge mix and 10 percent water neutralizes the sludge material. The addition of 50 percent soil (by weight) to this mix would effectively solidify the waste such that it is no longer susceptible to viscoelastic deformation (Stantec, 2008).

In-situ mixing would be performed through use of an excavator. The sludge on the edges of the sump would be mixed first to establish a foundation for equipment to move inward. Mixing would be performed to the minimum depth to support equipment, which is estimated at 3 feet. Due to the difficulty segregating the sludge and interbedded soil layers, it is assumed both the sludge and soil materials within the top 3 feet would be mixed as sludge. Therefore, the sludge volume used to calculate the reagent volume was the 2008 sludge volume in the top 3 feet, or 13,500 CY (Stantec, 2008).

Mixing with the reagents and soil would cause bulking of the materials. According to the Treatability Study performed by Stantec, the sumps are expected to bulk 69 percent, based on the mix design specified (Appendix B, Stantec, 2008). Therefore, the bulked materials are anticipated to increase the height of the sumps by approximately 2 feet, resulting in a total treated sludge thickness of approximately 5 feet.

Respirators (or if warranted by conditions, more stringent personal protective equipment such as Self-Contained Breathing Apparatus [SCBA]), engineering controls (potentially tenting over the excavation), and air monitoring may be required to address potential emissions of sulfurous gases from the sludge generated during mixing (Stantec, 2008).

6.1.3.4 Capping of the Sumps

Similar to Alternative 2A, the Alternative 3 cap would consist of foundation, gas collection, barrier, drainage, and protective layers covering the Cooper North and South, and Haack sumps contiguously within the Site boundary; however, the gas collection layer, erosion protection layer, and sheet piling proposed for Alternative 3 are different than Alternative 2A, as described below. As discussed in Section 6.1.2.1, the portion of the Haack sump outside of the Site boundary beneath the sidewalk and Artesia Blvd. is considered to be already capped in this Alternative (Stantec, 2010a).

The proposed final grades are shown on Figure 6-10. The Alternative 3 cap is depicted on Figure 6-15 in Details 1-C and 1-D.

Foundation and Gas Collection Layers

The foundation soil and gas collection layers would be placed above the stabilized sludge layer and consist of, from bottom to top, minimum 1 foot of foundation soil, gas collection piping, and a gas collection geocomposite. The minimum 1 ft foundation and gas collection layer will support the low-hydraulic conductivity layer and erosion resistance layer in accordance 22 CCR §66264.228(e)(4). The foundation soil would consist of onsite, impacted soil and Haack Rework material where available. Impacted foundation layer material would be supplemented with soil material imported from offsite. Impacted soil and Haack Rework material will be tracked during placement and placed such that it is not in contact with the gas collection system. Horizontal gas collection pipes surrounded by gas collection aggregate would be embedded in the foundation layer. Nonwoven geotextile would surround the aggregate to prevent clogging of the aggregate due to fines intrusion. The foundation layer would be graded with 3 percent slopes to accommodate drainage.

Low-Hydraulic Conductivity Layer

The low-hydraulic conductivity layer would be placed above the foundation and gas collection layers and would consist of a geosynthetic clay liner (GCL) and a 60-mil high density polyethylene (HDPE) geomembrane. In accordance with 22 CCR §66264.228(e)(5), the low-hydraulic conductivity layer would reduce the downward migration of precipitation and the upward migration of sludge and gas.

Erosion Resistance Layer

The erosion resistance layer is comprised of a drainage geocomposite and 2 feet of vegetated cover soil. In accordance with 22 CCR §66264.228(e)(10), the drainage geocomposite would prevent hydrostatic head buildup and drain precipitation that has infiltrated the overlying vegetated cover soil toward the outside of the cap and perimeter drainage channels while the vegetative cover soil will be resistant to foreseeable erosion effects by wind-scour, raindrop impact, and runoff.

Along the northern property boundary, limited space is available to allow for grading to install the cap system. As a result, sheet piles would be installed to allow for the vertical rise of the cap without altering Artesia Boulevard or the railroad property. The sheet piles would be installed to an average depth of 18 feet bgs and extend between 4 and 10 feet from the ground surface to accommodate the cap.

Final Cap Topography

The final cover grades are shown on Figure 6-10. The minimum thickness of the cover is 6 feet which accounts for the 3-foot stabilization layer (with bulking, 3 ft sludge layer increases to a total thickness of 5 feet), 1-foot (minimum) foundation layer, and 2-foot erosion resistance layer. The maximum cover thickness would be approximately 12.5 feet due to increasing the foundation layer to 9.5 feet to create a cover surface with 3 percent (%) slopes.

The maximum elevation of the cover for Alternative 3 is 35 feet amsl. Artesia Boulevard north of the Haack property has an elevation of approximately 20 feet amsl. Along Artesia Boulevard, the Alternative 3 cap elevation varies from approximately 26 feet amsl to 29 feet amsl resulting in a retaining wall height along Artesia Boulevard between 4 and 10 feet high.

Gas Monitoring System

The gas control and monitoring system is shown on Figures 6-11 and 6-12. The design of the Alternative 3 system is the same Alternative 2A; however, Alternative 3 will incorporate 3-inch solid and perforated polyvinyl chloride (PVC) pipes rather than geostrips. Pipes are proposed for Alternative 3 because the thicker foundation layer can accommodate the pipes and filter material.

6.1.3.5 Future Site Development

The resulting Site conditions following cap construction will facilitate an open-space end use; however, use as a parking lot may be difficult due to steep slopes around the cap edges. The maximum height of the cap is approximately 34.5 ft amsl or approximately 14.5 ft above the surrounding area (Figure 6-10). Areas around the site are available for future development such as the residential properties to the south.

6.1.4 Alternative 4 – Excavation with Offsite Disposal

Excavation and offsite disposal of the sludge would involve excavating the sludge materials to depths between 0.5 and 17.5 feet bgs (Figure 6-16). Shoring would be required in areas to support the sump walls in locations shown on Figure 6-16, at a minimum. Active dewatering would be required to remove perched groundwater and shallow groundwater when excavation and backfill are below the water table. Additionally, dewatering would be necessary to remove ponded misting agents. Respirators (or if warranted by conditions, more stringent personal protective equipment such as Self-Contained Breathing Apparatus [SCBA]), engineering controls (potentially tenting over the excavation), and air monitoring may be required to address potential emissions of sulfurous gases from the sludge generated during excavation (Stantec, 2008). Alternative 4 includes the following major elements:

- Concrete and asphalt removal;
- Excavation of sludge material from the Cooper North and South and Haack Sumps;
- Excavation of soil-sludge material from the Haack Rework Area;
- Transportation to a disposal facility;
- Confirmation sampling;
- Backfill of sumps; and
- Groundwater monitoring.

Groundwater monitoring was discussed in Section 6.1.2.6, and will not be repeated herein. Surface covering material removal, sludge stabilization/neutralization, and capping are discussed further in the following sections. These elements are discussed further in the following sections.

6.1.4.1 Concrete and Asphalt Removal

In order to access the Haack sump, the existing 6-inch reinforced concrete slab and 8-inch asphalt pavement would need to be removed. Since the underside of the concrete slab is in contact with the sludge material, after the concrete is demolished, it would be stockpiled onsite to allow for characterization sampling. Representative concrete samples should be collected and analyzed for metals, PAHs, and VOCs. Concrete found to contain metals, PAHs, or metals at concentrations exceeding hazardous waste classification thresholds would require disposal at an offsite hazardous waste facility. If materials are found to be nonhazardous, they may be recycled or disposed of at a nonhazardous facility.

6.1.4.2 Excavation of Sumps

The sumps would be excavated to the maximum depth of sludge as reported during the RI. Based on the boring logs, sludge depth varies between 0.5 and 17.5 ft bgs (Figure 6-16) (Stantec, 2008). Where significant overburden is present, such as on the Haack Sump, the overburden may be stockpiled separately, sampled, and used as backfill if testing indicates concentrations of constituents are below cleanup objectives. Using an excavator, sludge and interbedded soil would be mixed with the $Ca(H)_2/CaCO_3$ reagent and loaded directly into trucks for transport to the disposal facility. Due to the difficulty segregating the sludge and interbedded soil layers, it is assumed both the sludge and soil materials would be excavated and managed as sludge. Because of the acid gas generation during mixing, a tent would be necessary around the excavator and working surface to capture and treat the gas during mixing. As discussed in Section 6.1.3.3, the addition of the reagent would result in bulking of the material. With only the addition of

the reagent, it is anticipated bulking of the sludge would be approximately 25% and assuming 15% over-excavation, resulting in a total disposal volume of approximately 45,923 CY or 50,200 tons (based on a bulk density assumption of 81 lb/cy [Stantec, 2008]). It is assumed that the sludge containing 25% admixture will be acceptable as-is for disposal at a landfill permitted to accept non-RCRA hazardous waste such as the Buttonwillow Facility.

During excavation below the groundwater table or within the perched water zones, some dewatering may be necessary. The area where this is most likely is in the Haack Sump near the northern border of the Site. In this region, groundwater entering the excavation would be pumped to a tank where it would be sampled prior to disposal.

6.1.4.3 Excavation of Haack Rework Area

The Haack Rework area would be excavated without the addition of the reagent. Based on the Treatability Study, the rework material is significantly degraded indicating stabilization/neutralization is likely not necessary. Furthermore, the Treatability Study demonstrated that significant quantities of gas are not likely to be produced when the Haack Rework material is disturbed; therefore, a tent system with gas treatment is not necessary (Stantec, 2008).

The Haack Rework overburden would be excavated and stockpiled separately. Similar to the Haack overburden, the overburden material would be sampled and used as backfill if testing indicates concentrations of constituents are below cleanup objectives. Using an excavator, the Haack Rework sludge material would be loaded directly into trucks for transport to the disposal facility.

6.1.4.4 Confirmation Sampling

Following excavation of the sumps and Rework area, confirmation samples would be collected and analyzed for the COCs. Where confirmation sampling indicates sludge material remains, additional material would be excavated in the area represented by the confirmation sample. When confirmation sampling indicates sludge material has been removed, the removal would be considered complete and backfill would be initiated.

6.1.4.5 Backfill of Sumps

Following removal completion, the sumps would be backfilled with non-impacted, imported soil. The sumps would be backfilled to pre-excavation grades.

6.1.4.6 Transportation to Disposal Facility

The neutralized sludge material would be transported to the Buttonwillow Facility in covered trucks. This disposal facility was selected because it accepts non-RCRA hazardous wastes containing petroleum. The total volume estimated for disposal includes the sludge volume with interbedded soil calculated by Stantec in 2008, 0.5 foot over-excavation at the base of the sumps, and reagent volume for a total disposal volume of 45,923 CY and the total disposal weight of 50,200 tons. Based on testing performed by Stantec during the treatability study, the neutralized sludge would be disposed at a non-hazardous facility (Appendix B, Stantec, 2008); however, due to avoid potential future disposal liability, a non-RCRA hazardous waste facility, the Buttonwillow Facility, was selected for this Alternative analysis.

7. DETAILED ANALYSIS OF ALTERNATIVES

7.1 General

This section includes a detailed analysis of the final remedial alternatives for the Site. An overview of the nine criteria used for the detailed analysis is presented below.

7.2 Detailed Analysis Criteria

The CERCLA guidance document explains the nine criteria that are used to evaluate each remedial alternative [USEPA, 1988]. The first two criteria relate directly to findings that must be made in the Record of Decision (ROD) for the Site. These are categorized as threshold criteria that a selected remedy must meet.

1. **Overall Protection of Human Health and the Environment** – This criterion requires evaluation of how the alternative achieves and maintains protection of human health and the environment. The overall assessment of protectiveness draws on the assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. Evaluation of the overall protectiveness of an alternative focuses on whether an alternative achieves adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineered controls or institutional controls. This evaluation also considers whether an alternative poses any unacceptable short-term or cross-media impacts.
2. **Compliance with ARARs** – This criterion requires an evaluation of how the alternative complies with identified ARARs and applicable advisories or guidance that are "to be considered." ARARs are generally categorized as action-specific, location-specific, or chemical-specific Federal or state-promulgated requirements. A list of potential Federal and state action-specific, location-specific, or chemical-specific ARARs have been identified for the Site and are included in Table 4-2.

The following seven criteria are "balancing" criteria. They represent the primary criteria upon which the detailed analysis is based and that are used to distinguish among alternatives that meet the threshold requirements above. The alternative that strikes the best balance among these seven criteria and that meets the threshold criteria generally is the preferred alternative.

3. **Long-term Effectiveness and Permanence** – Requires evaluation of the long-term effectiveness of the remedial alternative in maintaining protection

of human health and the environment following implementation of the alternative.

4. **Reduction of Toxicity, Mobility, and Volume Through Treatment** – The assessment against this criterion evaluates the anticipated performance of the treatment technologies that the alternative comprises, and assesses their ability to reduce the toxicity, mobility and volume of contaminated materials through the use of treatment.
5. **Short-term Effectiveness** – Requires an assessment of the protection of human health and the environment during construction and implementation of the remedial alternative until RAOs are met. The following factors are addressed as appropriate for each alternative: protection of the community during remedial actions; protection of workers during remedial actions; environmental impacts; and time until remedial response objectives are achieved.
6. **Implementability** – This criterion requires an assessment of the technical and administrative feasibility of an alternative, including the availability of required services and materials to execute the alternative. How each alternative is impacted by the property ownership (i.e., one, large, single property or seven individual properties) will also be discussed.
7. **Cost –** Requires evaluation of the anticipated capital costs and operation and maintenance (O&M) costs of an alternative. For this FS Report, O&M costs are presented in 2012 dollars using a 2 percent discount rate per EPA Guidance (EPA, 2000).
8. **State Acceptance** – Allows for consideration of preferences or apparent concerns by the State of California Department of Toxic Substances Control (DTSC).
9. **Community Acceptance** – Allows for consideration of the community's preferences or concerns regarding remedial alternatives. DTSC formally considers the community's preferences or concerns after this FS Report and proposed plan are prepared.

7.3 Final Remedial Alternatives – Detailed Analysis

7.3.1 General

This section includes the detailed analysis of the four final remedial alternatives presented in Section 6.1 and in Table 6-1. Each alternative is analyzed separately according to the nine criteria listed above. The common elements of the final remedial alternatives are not evaluated as they are the same for each alternative.

7.3.2 Final Remedial Alternative 1– No Action

7.3.2.1 Overall Protection of Human Health and the Environment

The no action alternative does not effectively mitigate potential future risks associated with the ingestion, inhalation, or direct contact of Site soils or soil gas. It does not provide any means for source zone mass removal or containment and would not be protective of human health under the hypothetical future scenario use. Because the no action alternative does not meet the threshold requirement of providing overall protection of human health and the environment, no further analysis of this alternative is performed.

7.3.3 Alternative 2A – Capping with Selective Excavation

7.3.3.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is moderate to high with this remedial alternative. The exposure routes for receptors as identified in the HHRA are dermal contact with sludge, ingestion of sludge, and inhalation of soil gas. Selective excavation would remove the Haack Rework area sludge material that is associated with potential gas risks. The sludge in the three sumps would be capped, reducing the risk associated with dermal contact and ingestion. Additionally, a gas control and monitoring system would be installed beneath the cap to control gas which may be generated by the sludge. High overall protection is not achieved with this method due to the source remaining onsite.

7.3.3.2 Compliance with ARARs

Compliance with ARARS is moderate with this remedial alternative. ARARs potentially applicable to Site remedial actions are provided in Table 4-2. Precautions would be required to ensure that short-term community and worker exposures to dust, noise, truck traffic, and VOC emissions are limited to acceptable levels during soil excavation and handling, per AQMD standards. This remedial alternative is compliant with the Groundwater ARARs by implementing institutional controls limiting onsite extraction of groundwater. Groundwater data has indicated that the sumps are not contributing to offsite impacts; therefore, institutional controls limiting onsite extraction are sufficient for groundwater ARAR compliance.

At some locations of the Site groundwater in the A-zone may encounter the waste material where excavations are the deepest. Waste impacted groundwater has been documented at Well MW-5A which is located immediately down gradient of the Haack Sump. Where these impacts occur the groundwater is characterized by a lower pH, occurrence of gasoline range hydrocarbons, the occurrence of some volatile organic

compounds in the low ppb range, elevated concentrations of some metals and modifications to its inorganic groundwater chemistry. However these impacts are attenuated over a short lateral distance down-gradient of the waste as documented in wells MW-3A and MW-4A which are located within or downgradient of the Site's sumps. Impacts to deeper water bearing zones have not been confirmed as the groundwater impacts observed in Well MW-5A are not observed in the B-zone monitoring wells at the Site and the geochemistry of the two water bearing zones are noticeably different suggesting limited hydraulic communication.

The Bellflower Aquiclude groundwater in the vicinity of the Site is naturally degrade as evidence by the Total Dissolved Solids (TDS) concentrations in the A-zone and the TDS and chloride concentrations in the B-zone which exceed the recommended secondary MCL values as documented in the up-gradient, background wells (wells MW-1A and MW-1B). During development of the Site's existing monitoring wells prior to reinstituting the groundwater monitoring program in 2006, some wells were pumped dry and development operations were halted to allow for recharge. This observation suggests that the two hydraulic zones immediately beneath the Site have limited yield that cannot be sustained over time. The naturally degraded groundwater quality and limited yield of the Bellflower Aquiclude at the Site indicates that human use of the groundwater beneath the Site is not likely.

The California Regional Boards are required to assure that the beneficial uses of municipal and domestic supply are designated for protection wherever those uses are presently being attained. This ARAR requirement may not be applicable to the Site because the groundwater upgradient of the Site is naturally degraded and the beneficial uses requirement is not presently being attained . Institutional controls preventing onsite extraction or use of groundwater should be sufficient for groundwater ARAR compliance.

7.3.3.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence is moderate to high for this remedial alternative. The permanent cap with the below-cap and perimeter passive gas control system provides long-term effectiveness. To maintain the long-term integrity of the cap and related remedial measure components, maintenance and monitoring would be provided. If the Site is developed, the parking lot surface above the cap should be maintained by the future property owner(s) to prevent cracking and/or ponding of surface water. If gas monitoring indicates concentrations in excess of acceptable values, the below-cap and perimeter vertical gas migration control wells can be made active, which adds to long-term effectiveness in controlling the migration of gas to the environment.

Based on its location, the Site is potentially at risk for high ground shaking and liquefaction during an earthquake. High ground shaking would minimally affect this alternative because its planned future use is a parking lot. Liquefaction may result in differential settlement of the cap; however, the differential settlement can be corrected with maintenance of the cap. High ground shaking would minimally affect this alternative because its planned future use is a parking lot; however, veneer stability may be compromised. Damage due to a loss of veneer stability may be repaired with maintenance.

High long-term effectiveness and permanence is not achieved with this method due to maintenance requirements.

7.3.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction in toxicity, mobility, or volume through treatment is moderate with this remedial alternative. The cap design would include a gas collection system that can be connected to a treatment system during start-up and continued use, if necessary, based upon start-up monitoring results. If the gases are treated, some reduction in toxicity would be realized. The cap and site drainage improvements would provide a reduction in mobility of the waste as infiltration of water would be mitigated. Waste volume would be reduced with the removal of the Haack Rework material; however, the sludge contained in the Cooper and Haack sumps would not be reduced.

Mobility of the sludge would be reduced with this Alternative. On the Haack Sump, there is evidence of sludge movement from beneath the cap at the edges of the concrete and asphalt cover. The installation of low-hydraulic conductivity layer, associated anchor trench, along with existing soil containment, will minimize the lateral migration of sludge.

Gas transport at the Site occurs as a result of diffusion; therefore, the rate of lateral migration of gas constituents is very low. If necessary, the perimeter vertical gas migration control wells can be activated to collect potentially migrating gases and/or remove in-place gases from subsurface soils. The collected gas can be treated if necessary, which results in reduction of the toxicity of the waste.

7.3.3.5 Short-Term Effectiveness

The short-term effectiveness of Alternative 2A is moderate to high. Cap construction would be performed above the existing surfaces on the Cooper and Haack sumps reducing gas generation, gas migration, and dermal contact risks from the exposed sludge. The Cooper sumps currently have an exposed geomembrane covering the sludge which minimizes dermal contact and gas migration. The high-strength geotextile will be installed above the existing geomembrane in a manner that minimizes damage to the

existing liner surface (e.g., hand placement). Prior to the installation of the high-strength geotextile, only limited foot traffic will be permitted above the sumps.

The existing concrete and asphalt surfaces will be maintained above the Haack Sump. The geosynthetic cap components (geostrips, gas extraction geocomposite, GCL, HDPE geomembrane, and drainage geocomposite) will be installed directly above the foundation soil overlying the concrete and asphalt surfaces and anchored outside of the perimeter of the sumps as identified in the RI, between the Cooper North and Haack Sumps, or to the sheet pile along Artesia Boulevard. The sludge between the Cooper North and Haack Sumps is discontinuous and degraded, and occurs deeper than the proposed anchor trench depth of 3 ft bgs, as identified in the RI. Therefore gas generation due to the construction of the anchor trench between the Cooper North and Haack Sumps is anticipated to be minimal to non-existent. By maintaining the current concrete and asphalt surfaces, the dermal contact and gas migration risks are minimized during construction.

The short-term effectiveness of Alternative 2A is not high due to the excavation and offsite transport of the Haack Rework material. If the Haack Rework soil material were used as fill beneath the cap, a reduced construction time is achievable as less imported material would be needed. Additionally, there would be a reduced risk of exposure to the public during transport to the final disposal facility.

In addition, based on borings CPB28, CPB29, and CPB30 performed during the Remedial Investigation (RI) between the Haack and Cooper North sumps, degraded soil-sludge was encountered intermittently between the ground surface and 7 to 8 feet below the ground surface (ft bgs). As a result, degraded soil-sludge may be encountered during both anchor trench excavations in this area. Degraded soil-sludge will be removed as necessary during anchor trench construction and anchor trenches will be backfilled with non-impacted soil. Degraded soil-sludge handling and potential gas generation will be managed in accordance with the Contingency Plan.

The cap construction would provide immediate short-term effectiveness since worker risk is low and impacts on environment are minor (grading operations). Liquid infiltration, gas migration, and physical contact would remain controlled due to limited disturbance of the existing surfaces. Because the disturbance to the sludge would be limited, hazardous gas generation would be minimal.

The duration of Alternative 2A, not including preliminary startup of the gas control system, is estimated at approximately 129 calendar days. The estimated construction breakdown schedule is provided in Appendix E.

7.3.3.6 Implementability

Technical implementation of Alternative 2A is relatively easy; however, construction implementation due to the urban setting of the Site, as well as Site size constraints and property owner agreements, create implementation challenges as discussed below.

Urban Setting

Due to the urban setting of the Site, traffic and close proximity to sensitive receptors affect the implementability of Alternative 2A. Traffic will increase the length of time to haul impacted material to an offsite disposal facility and the time to import material such as fill for the foundation layer. Alternative work hours may be proposed to reduce the effects of traffic on construction activities. Close proximity to sensitive receptors concerns are mitigated by leaving the existing surfaces on the sumps in place and by providing continuous monitoring during excavation of the Haack Rework area. The technologies for continuous monitoring are readily available and can easily be deployed at the Site during construction.

Site Size

The majority of the Cooper property contains sludge within the North and South sumps, while approximately one quarter of the Haack property contains the Haack Sump. Of the Haack property not containing the sump, approximately half is sloped and elevated leaving the one quarter available for construction staging and storage. As a result, easements and/or leases may be necessary on the southern Los Angeles Department of Public Works (LADPW) property to provide additional space and additional site ingress/egress. Furthermore, due to the eastern sludge boundary corresponding to the Cooper property boundary, the eastern drainage channel and anchor trench will be located within the LADPW property and will require fill to be placed to maintain and control drainage of that parcel. Additional agreements with the LADPW will be required in order to construct the cap.

By leaving the existing surfaces in place, material may be staged above the Haack Sump while construction is occurring on the Cooper Sumps. Additionally, the reduced fill needed for Alternative 2A requires less imported material and material stockpiling. The lower ground pressure equipment which will be used to place the fill above the high strength geotextile is generally smaller than traditional equipment, thereby requiring less storage space than larger, heavier equipment. As a result, while Alternative 2A has implementation challenges due to the Site size and location, the design of the Alternative 2A cap reduces the effect of the challenges.

7.3.3.7 Cost

The estimated capital cost of Alternative 2A is $5,844,150 based on 2012 estimates. However, a cost savings of approximately $314,500 may be achieved by using the Haack Rework soil-sludge material onsite as foundation soil. The estimated net present value of operating and maintenance costs assuming quarterly groundwater and soil vapor probe monitoring for 30 years is $4,882,500 based on 2012 estimates. Therefore, the total present value cost of Alternative 2A is $10,726,650 based on 2012 estimates. Table 7-1 presents a cost breakdown of Alternative 2A.

7.3.3.8 State Acceptance

State acceptance is high for Alternative 2A including the Optional Alternative 2A Cover. The health and environmental risks during implementation of the remedy are low, the overall cap height is minimal, and it achieves the City's redevelopment goals.

7.3.3.9 Community Acceptance

During the May 10, 2011 meeting between the DTSC and City of Gardena (City), the City expressed concerns regarding the appearance of Alternative 2 (since removed) being similar to a "landfill," and the height of the cap being too high. The City expressed the desire that the final remedial alternative be consistent with the vision and goal of future development for the Site.

Alternative 2A is a lower cap option for the Site. The maximum height of the cap is approximately 25.5 ft amsl near the center of the Site. This elevation is approximately 5.5 ft higher than Artesia Boulevard north of the Haack Property. Immediately adjacent to Artesia Boulevard, the maximum height of the cap and associated retaining wall is 23 ft amsl, or 3 ft higher than Artesia Boulevard. The Optional Alternative 2A Cover removes the retaining wall along Artesia Boulevard, further achieving the City vision and goal of future site development.

The elevation of the cap on the Cooper Property is similar to the elevation of the railroad grade immediately east of the Cooper Property. The final cap surface will consist of Class II aggregate base to support construction of a parking lot consistent with the future commercial development of the Site. Additionally, the cap structure has been designed to support loading associated with traffic and parking. Lower areas of the cap such as drainage channels may be filled to provide a more level surface on which to construct a future parking lot, provided the functionality of the cap is not compromised. As a result, Alternative 2A with the Optional Alternative 2A cover achieves medium to high community acceptance.

7.3.4 Alternative 3 – Capping with Neutralization/Stabilization and Selective Excavation

7.3.4.1 Overall Protection of Human Health and the Environment

Capping of the partially stabilized/neutralized sludge, combined with selective excavation, would provide moderate overall protection of human health and the environment. The exposure routes for receptors as identified in the HHRA are dermal contact with sludge, ingestion of sludge, and inhalation of soil gas. Neutralization/stabilization of the sludge would further improve the pH, neutralize acid gases, fixate lead, and provide long-term strength (Stantec, 2008). This Alternative is not ranked higher because the neutralization/stabilization process would require substantial mixing of the sludges, releasing hazardous gases and odors, thereby requiring a tent and gas treatment system to control gas emissions during construction. Selective excavation and consolidation within the sumps would remove the eastern overflow and Haack Rework area with the associated gas risks. Further, this Alternative does not address localized groundwater impacts at the Site. The sumps would be capped, reducing the risk associated with dermal contact and ingestion. Additionally, a gas control and monitoring system would be installed beneath the cap to control gas which may be generated by the sludge.

7.3.4.2 Compliance With ARARs

ARARs potentially applicable to Site remedial actions are shown in Table 4-2. Alternative 3 would provide moderate compliance with ARARs. Precautions would be required to ensure that short-term community and worker exposures to dust, noise, truck traffic, and VOC emissions are limited to acceptable levels during soil mixing and handling, per ambient air quality health standards.

This remedial alternative is compliant with the Groundwater ARARs by implementing institutional controls limiting onsite extraction of groundwater. Groundwater data has indicated that the sumps are not contributing to offsite impacts; therefore, institutional controls limiting onsite extraction are sufficient for groundwater ARAR compliance. This Alternative does not remediate the groundwater; therefore, this Alternative is not given a "high" ARAR compliance rating.

7.3.4.3 Long-Term Effectiveness and Permanence

The permanent cap with stabilization/neutralization and the below-cap and perimeter passive gas control system provide moderate to high long-term effectiveness. Routine maintenance and monitoring would be provided and would positively contribute to the long-term effectiveness of the remedial measure. If gas monitoring indicates impacts in excess of acceptable values, the below-cap and perimeter vertical gas migration control

wells can be made active, which adds to long-term effectiveness in controlling the migration of gas to the environment.

Based on its location, the Site is potentially at risk for high ground shaking and liquefaction during an earthquake. High ground shaking would minimally affect this alternative because its planned future use is open space; however, veneer stability may be compromised. Damage due to a loss of veneer stability may be repaired with maintenance. Liquefaction may result in differential settlement of the cap; however, the differential settlement can be corrected with maintenance of the cap.

7.3.4.4 Reduction of Toxicity, Mobility, and Volume Through Treatment

Reduction of toxicity, mobility, and volume through treatment is Moderate for Alternative 3. The toxicity of the sludge would be reduced through stabilization/neutralization by improving the pH, neutralizing acid gases, fixating lead, and providing long-term strength (Stantec, 2008). The cap design would include a gas collection system that can be connected to a treatment system during start-up and continued use, if necessary, based upon start-up monitoring results. If the gases are treated, some reduction in toxicity would be realized. The cap and Site drainage improvements would provide a reduction in mobility of the waste as infiltration of water would be mitigated; hence, migration of liquids from waste would be reduced. An increase in waste volume through bulking would be realized with the remedial measure.

Gas transport at the Site occurs as a result of diffusion; therefore, the rate of lateral migration of gas constituents is very low. If necessary, the perimeter vertical gas migration control wells can be activated to collect potentially migrating gases and/or remove in-place gases from subsurface soils. The collected gas can be treated if necessary, which results in reduction of the toxicity of the waste.

7.3.4.5 Short-Term Effectiveness

Short-term effectiveness of Alternative 3 is low to moderate. Stabilization/neutralization would require the mixing of the top 3 feet of sludge with $Ca(OH)_2/CaCO_3$. In order to mix the top 3 feet of sludge, the existing cover on the Cooper Sumps would require removal, temporarily increasing the risks associated with the sumps and decreasing the effectiveness of this Alternative. During the exposed period, stormwater could come into contact with the sludge, increasing the volume of materials requiring treatment. While fencing around the Site would be continuously maintained to prevent trespasser entry, animals, such as birds, may enter the Site and either become entrapped in the sludge or potential spread sludge to off-site areas. Additionally, during sludge mixing, significant quantities of acid gases would be released. Therefore, there may be an

increased, short-term risk during mixing activities which would require mitigation through treatment of the acidic gases. The cap construction would provide short-term effectiveness as liquid infiltration, gas migration, and physical contact would be controlled upon cap placement.

7.3.4.6 Implementability

Implementability of Alternative 3 is low. Alternative 3 may be difficult to implement due to the mixing of $Ca(OH)_2/CaCO_3$ compounded with the urban setting of the Site and the Site size. During mixing operations, significant quantities of acid gases would be released which would require treatment. Uncontrolled reactions have been known to occur when neutralizing acid sludges which require constant supervision to prevent the uncontrolled release of hydrogen sulfide gas. A tent would be necessary to contain the gases for treatment prior to discharge to the atmosphere. Due to the size of the sumps, a tent large enough to span the sumps to locations where stable foundations can be achieved may be difficult or impossible to engineer or construct. Similarly to Alternative 2A, the urban setting of the Site increases the impacts the construction would have on area traffic and the proximity to sensitive receptors. Business operations near the Site operate 24-hours a day meaning limiting mixing activities to night-time work only would still affect the public. Significant quantities of neutralizing material as well as soil would need to be imported and stored at the Site; the importing of material could significantly impact traffic as large trucks are forced to enter the Site off Artesia Blvd. Storage at the Site is limited due to the sumps and topography with staging, office, and storage areas limited to the eastern portion of the Haack Property. Stormwater controls or treatment systems, such as retention basins, would be limited by the amount of space at the site.

7.3.4.7 Cost

The estimated capital cost of Alternative 3 ranges between $11, 219,880 and $12,646,280 based on 2012 estimates. This range is due to the variable cost of neutralization admixture, $CaCO_3$ and $CaOH_2$. The costs are highly variable based where the material is sourced from, shipping costs, and construction activities. The high cost variability adds to the low cost rating of this Alternative due to the uncertainty of prices during construction. The estimated net present value of operating and maintenance costs assuming quarterly groundwater and soil vapor probe monitoring for 30 years is $4,882,500 based on 2012 estimates. Therefore, the total present value cost of Alternative 3 ranges from $16,102,380 to $17,528,780 based on 2012 estimates. Table 7-2 presents a cost breakdown of Alternative 3.

7.3.4.8 State Acceptance

State acceptance of Alternative 3 is low due to the health risks associated with neutralizing the sludge as well as the overall height of the cap..

7.3.4.9 Community Acceptance

As discussed in Section 7.3.3.9, the City of Gardena expressed concerns regarding the appearance of Alternative 3 and the desire for a final remedial alternative to be consistent with future development plans. As a result, Alternative 3 has low community acceptance.

7.3.5 Alternative 4 – Excavation with Offsite Disposal

7.3.5.1 Overall Protection of Human Health and the Environment

Alternative 4 would provide moderate to high protection of human and health and the environment by removing the sludge and rework material from the Site. The risk to human health through dermal contact, inhalation, or ingestion would be eliminated because the sludge and rework material would be removed and disposed of offsite. During construction activities and transport of the material, risk to human health and the environment would be increased as significant quantities of acid gases would be released when the sludge is disturbed. Furthermore, there is an increased risk to human health during transport of the material as it would require hauling to a facility where transport would potentially expose many more individuals to the sludge than if it were to remain onsite.

7.3.5.2 Compliance With ARARs

ARARs potentially applicable to Site remedial actions are shown in Table 4-2. Alternative 4 would provide high compliance with ARARs. Excavation and offsite disposal of sludge can be difficult or impossible to perform in compliance with applicable emissions, disposal, and transportation regulations. Precautions would be required to ensure that short-term community and worker exposures to dust, noise, truck traffic, and VOC emissions are limited to acceptable levels during soil excavation and handling, per ambient air quality health standards. Poor groundwater quality (as documented in MW-05A immediately adjacent) may be improved as the suspected sludge source is removed.

7.3.5.3 Long-Term Effectiveness and Permanence

Alternative 4 would provide high long-term effectiveness and permanence since the impacted material would be removed from the Site.

7.3.5.4 Reduction of Toxicity, Mobility, and Volume Through Treatment

Alternative 4 would provide low to moderate reduction of toxicity, mobility, and volume of the sludge or rework material through treatment. This alternative creates a large amount of waste compared to the other alternatives presented and discussed. This waste should be taken into consideration for evaluating these criteria. Alternative 4 will not reduce the toxicity or volume of the sludge or rework material. The mobility of the sludge would be temporarily increased due to transportation of the sludge, then reduced since it would be disposed of in an appropriate facility with a bottom liner system. The migration of sludge constituents is further reduced by the admixture prior to transport which was shown to reduce leaching and gas generation during the Treatability Study (Appendix B, Stantec, 2008). The volume of the sludge would increase approximately 20 to 40 percent following admixture. Other wastes that would be produced during treatment include impacted groundwater, vapor treatment associated liquid and solid wastes, and decontamination wastes. Taking these wastes into consideration, Alternative 4 would provide low to moderate reduction of toxicity, mobility, and volume of sludge and associated wastes through treatment.

7.3.5.5 Short-Term Effectiveness

Alternative 4 would provide moderate short-term effectiveness by removing the sludge and rework material from the Site; however, in order to neutralize the sludge for off-site disposal, risks associated with the sludge are temporarily increased. Neutralization of the sludge requires deep mixing of the sludge with $Ca(OH)_2/CaCO_3$. In order to mix the sludge, the existing sump covers would require removal, temporarily increasing the risks associated with the sumps and decreasing the effectiveness of this Alternative. During the exposed period, stormwater could come into contact with the sludge, increasing the volume of materials requiring treatment. While fencing around the Site would be continuously maintained to prevent trespasser entry, animals, such as birds, may enter the Site and either become entrapped in the sludge or potentially spread sludge to off-site areas. Additionally, during sludge mixing, significant large quantities of acid gases, when compared to the other alternatives presented and discussed, would be released. Therefore, there may be an increased, short-term risk during mixing activities which would require mitigation through treatment of the acidic gases.

7.3.5.6 Implementability

Implementability of Alternative 4 would be low due to the sludge depth, site proximity to sensitive receptors, site size, and site access issues. The majority of the sludge to be excavated is previously undisturbed sludge, which has a less viscous consistency than the degraded soil-sludge material that is proposed to be removed in Alternative 2A and Alternative 3. As an area is excavated, sludge would flow to the newly excavated

portion of the sump. The depth of the excavation would be between 0.5 and 17.5 ft bgs, depending on the sump, and due to the size of the Site there would not be enough room to slope the sides of the excavation. Therefore, shoring would be required, which would limit the ability to "chase" impacted materials laterally during excavation and obtain side wall conformance samples. During mixing of the reagent and sludge, acid gas containment and treatment would be necessary. A tent would be necessary to contain the gases for treatment prior to discharge to the atmosphere. Due to the size of the sumps, a tent large enough to span the sumps to locations where stable foundations may be achieved would be difficult to implement. An equipment hood may provide the necessary containment; however, the working area is limited by the size of the hood.

Similarly to Alternatives 2A and 3, the urban setting of the Site increases the impacts the construction would have on area traffic and the proximity to sensitive receptors. Business operations near the Site operate 24-hours a day meaning limiting mixing activities to night-time work only would still affect the public. Significant quantities of neutralizing material as well as soil would need to be imported and stored at the Site; the importing of material could significantly impact traffic as large trucks are forced to enter the Site off Artesia Blvd. Storage at the Site is limited due to the sumps and topography with staging, office, and storage areas limited to the eastern portion of the Haack Property. Stormwater controls or treatment systems, such as retention basins, would be limited by the amount of space at the site.

7.3.5.7 Cost

The estimated capital cost of Alternative 4 is high compared to the alternatives presented and discussed, and ranges between $26,217,950 and $28,991,650 based on 2012 estimates. The costs are highly variable based where the admixture material is sourced from, shipping costs, and construction activities. The high cost variability adds to the low cost rating of this Alternative due to the uncertainty of prices during construction. The estimated net present value of groundwater monitoring costs over 30 years is $113,200 based on 2012 estimates. Therefore, the total present value cost of Alternative 4 is between $26,331,150 and $29,104,850 based on 2012 estimates. Table 7-3 presents a cost breakdown of Alternative 4.

7.3.5.8 State Acceptance

State acceptance of Alternative 4 is low due to constructability challenges.

7.3.5.9 Community Acceptance

During the 10 May 2011 meeting with the DTSC and City of Gardena, the City felt Alternative 4 best achieved their future development goals; therefore, this Alternative receives a moderate to high ranking for community acceptance.

8. COMPARATIVE ANALYSIS OF ALTERNATIVES

8.1 General

In this section, the final remedial alternatives are compared by using the detailed analysis criteria. The purpose of this comparative analysis is to identify the relative advantages and disadvantages of each final remedial alternative and to provide a basis for identifying the preferred remedial alternative.

8.2 Final Remedial Alternatives

8.2.1 General

In Table 8-1, each final remedial alternative is assigned a ranking for each detailed analysis criterion. These rankings range from "low" to "high" and are accompanied by a numeric ranking from 1 to 5 (Note 3, below). At the conclusion of the comparative analysis, the preferred remedial alternative is identified.

8.2.2 Overall Protection of Human Health and the Environment

Alternative 1, No Action, does not provide adequate protection of human health and the environment. No further assessment or comparison with this alternative is provided. Alternative 2A performs better than Alternatives 3 and 4 due to disturbance of only the degraded Haack Rework sludge material. As demonstrated in the Treatability Study and Surface Flux Testing (Stantec, 2007), disturbing the non-degraded sludge results in the generation of significant quantities of hydrogen sulfide and sulfur dioxide. Significant mechanical disturbance of the non-degraded sludge occurs in Alternatives 3 and 4. Both Alternatives 2A and 3 would leave the majority of the sludge onsite, which reduces their overall protection of human health and the environment; however, Alternative 4 excavates the sludge from the Site and transports the sludge along public streets and highways en route to final disposal at the Buttonwillow Facility. During transport, the public may become potentially exposed to the sludge due to traffic accidents resulting in a sludge release or gas release from the truck. The same transport risks are not anticipated with transport of the Haack Rework soil-sludge material as proposed in Alternative 2A due to the degraded nature of this sludge and the significantly reduced volume of sludge to be transported.

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(3) A numeric ranking of "1" is lowest, or worst; "5" is highest, or best. With respect to cost, "1" is most expensive; "5" is least expensive.

8.2.3 Compliance With ARARs

Alternative 4 would perform the best with respect to ARARs due to the removal of the sludge and source for potential onsite groundwater impacts. All Alternatives perform well with respect to ARAR compliance; however, Alternatives 2A and 3 are ranked lower because a potential source for onsite groundwater impacts remains in place.

8.2.4 Long-Term Effectiveness and Permanence

Alternative 4 is ranked the highest for long-term effectiveness and permanence because the sludge is removed from the site and disposed of offsite. Alternative 3 is ranked higher than Alternative 2A with respect to long-term effectiveness and permanence. Both alternatives would be effective and permanent over the long term with maintenance; however, because Alternative 3 neutralizes some of the sludge, the treatment is likely more permanent.

Based on its location, the Site is at risk for high ground shaking and liquefaction during an earthquake regardless of the remedial alternative. High ground shaking would minimally affect Alternatives 2A and 3 because of their planned future use as a parking lot or open space, respectively. High ground shaking on Alternatives 2A and 3 slopes may result in veneer failure and liquefaction may result in differential settlement of the cap. Both the veneer failure and differential settlement can be corrected with maintenance of the cap. Alternative 4 provides the greatest long-term effectiveness and permanence since the sludge is removed from the site and disposed of offsite.

8.2.5 Reduction of Toxicity, Mobility, and Volume through Treatment

Alternatives 2A and 3 would reduce mobility of the sludge by limiting infiltration and wind erosion. Alternative 3 would slightly reduce toxicity and mobility through partial in-situ treatment of the source zone; however, toxicity would increase as gases are released during mixing of the sludge for treatment. The volume of material within the sumps would increase due to bulking during neutralization and increase the cap height by a minimum of 3 ft. In Alternative 3, the net toxic material (non-stabilized sludge) would be reduced. The volume of sludge material in the sumps would remain the same with Alternative 2A. Treatment of sludge with Alternative 4 would increase the volume of waste material to be disposed of by 20 to 40 percent due to neutralization as well as generate more waste from decontamination water, spent vapor treatment carbon, and ponded dust and emissions control liquid. Alternative 4 would reduce the mobility of the sludge after offsite disposal since the disposal landfill would be equipped with a liner system to collect leachate; however, transport of the material would temporarily increase the potential mobility.

8.2.6 Short-Term Effectiveness

Alternative 2A would perform the best with respect to short-term effectiveness. Unlike Alternatives 3 and 4, Alternative 2A does not significantly disturb the sludge, thereby minimizing the release of gas. The existing surfaces, which have been shown to reduce the migration of gas, will remain in place during construction resulting in limited sludge disturbance and therefore, gas generation. Alternatives 2A and 3 incorporate a cap into the final design which would provide a reduction in risk due to inhalation, dermal exposure, and ingestion.

Alternatives 3 and 4 significantly disturb the sludge, which has been demonstrated to generate significant quantities of hydrogen sulfide and sulfur dioxide gas requiring tenting and gas control systems during mixing and excavation operations. The gas control system, incorporating a tent, blower, and treatment system, would significantly increase the amount of time to remediate the Site due to the limited operating space within the enclosed facility. Additionally, waste materials from the treatment system components, such as a scrubber, could generate additional waste, which could increase the total volume of hazardous materials at the Site. The length of time would be increased due to the use of smaller equipment as well as down time during treatment system maintenance.

Alternative 4 would provide a reduction in risk after the sludge was transported offsite; however, risk is temporarily increased in the short-term during sludge disturbance and transport. Given that the weight of material estimated for offsite disposal is approximately 45,900 CY and a typical end dump truck capacity is 16 CY, approximately 2,870 truck loads are anticipated for Alternative 4. Smaller, 16 CY trucks are proposed for Site work due to the limited space available onsite for staging and operating larger trucks. Additionally, using the estimated 20 trucks per day discussed in Section 6.1.2.2, trucks transport of the sludge would require a minimum of 160 days for transport, which does not include additional delays due to limitations from tenting and gas control during excavation.

Due to the nature of the sludge disposal within the sumps, Alternative 4 would require the excavated sumps to be exposed for periods of time during confirmation sampling. Temporary backfill of sludge in the interim would generate the potential for non-impacted material to become impacted through contact, thereby increasing the amount of material excavated and the time to remediate.

The durations of the Alternatives are estimated at 129, 235, and 301 calendar days for Alternatives 2A, 3, and 4, respectively. The construction duration of Alternative 2A is approximately half of Alternative 3 and 4 times less than Alternative 4, meaning the potential exposure time of sludge hazards to workers is significantly reduced.

Additionally, the construction impacts on the community including truck traffic and visual distractions are significantly reduced with Alternative 2A. The estimated construction schedules are provided in Appendix E.

8.2.7 Implementability

All Alternatives are difficult to implement due to the site location and size; however, the design of Alternative 2A limits the effects of these challenges on construction. These challenges are discussed in further detail below:

Urban Setting

Due to the urban setting of the Site, traffic and close-proximity to sensitive receptors affect the implementability of all Alternatives. Traffic will increase the length of time to haul impacted material to an offsite disposal facility and the time to import construction materials such as fill.

Alterative 2A requires the least amount of imported and exported material, thus reducing overall truck traffic on Artesia Boulevard. Both Alternatives 3 and 4 require significant truck traffic to import stabilization material as well as, in the case of Alternative 4, export sludge offsite. As discussed previously in Section 6.1.4.2, 3,565 truck loads are estimated for transport of excavated sludge to an offsite facility, which could negatively affect the traffic flows in the vicinity of the Site.

Site Size

The majority of the Cooper property contains sludge in the North and South sumps, while approximately one quarter of the Haack property contains the Haack Sump. The portion of the Haack property not containing the sump is split into a sloped and elevated portion and a flatter portion that could be available for construction staging and material storage. Furthermore, easements and/or leases may be necessary on the Los Angeles Department of Public Works (LADPW) property for grading and fill placement to provide for surface water flow and collection, as well as providing additional space and additional site ingress/egress.

Alternatives 3 and 4 require stockpiling of stabilization material; therefore, the time for stabilization is directly proportional to how much material is available onsite to mix. If only limited quantities of material are available onsite due to storage area constraints, the length of time to implement Alternatives 3 and 4 will increase.

Site Proximity to Sensitive Receptors

Alternatives 3 and 4 pose significant implementation issues due to the gas generation during mixing and excavation of the sludge and the potential impacts to neighboring

sensitive receptors. Gas control and treatment would be necessary during mixing and excavation of the sludge. Construction of a tent to contain the gases would be difficult to perform due to low bearing capacity of the sludge and the area the tent would need to span (minimum of the Cooper North sump). Gases captured by the tent would need treatment prior to discharge. In addition, the size of the tent and treatment system would further reduce the space available on the Site to stage construction including equipment storage, stockpiling of fill material, and construction facilities.

Implementation of Alternative 2A has fewer engineering and health and safety complications. By maintaining the existing surfaces, gas generation from the sumps would be minimized and continuous monitoring with readily available vapor suppression equipment will provide a means to minimize potential effects of gas generation during excavation in the Haack Rework area. In addition, Alternative 2A requires less imported material and material stockpiling, thus reducing the effects of traffic and the reduced Site size on construction. As a result, while Alternative 2A has implementation challenges due to the Site size and location, the design of the Alternative 2A cap reduces the effect of the challenges.

8.2.8 Cost

Alternative 2A has the lowest capital cost of approximately $5.8 million, with Alternatives 3 and 4 having low-range capital costs of approximately $11.2 million and $26.2 million, respectively and high-range costs of approximately $12.6 and $29.1 million. Alternatives 2A and 3 have identical net present value 30 year O&M costs of approximately $4.9 million based on 2012 estimates. Alternative 4 has the lowest net present value O&M cost of approximately $113,200. Alternative 2A has the lowest combined remedial cost and is not dependent on the highly variable neutralization admixture cost which may vary from as low as $300/ton to as high as $750/ton or more. All costs are based on 2012 estimates.

8.2.9 State Acceptance

The DTSC has identified Alternative 2A with the Optional Alternative 2A Cover to be the preferred remedial approach.

8.2.10 Community Acceptance

In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the ROD is being prepared.

During the 10 May 2011 meeting between the DTSC and the City, the City expressed concerns regarding the appearance of the former Alternative 2 being similar to a “landfill,” and the height of the cap being too high. The City expressed the desire that

the final remedial Alternative be consistent with the vision and goal of future development for the Site.

Alternative 2A provides a reduced cap thickness, and accounts for future use as a parking lot subgrade consistent with the City's vision for commercial development. Alternative 3 proposes a cap sloping upward to a maximum elevation of 35 ft amsl, which makes parking lot construction more difficult above the high grades and slopes of the Site. Alternative 4 proposes the Site is excavated and filled. Alternative 4 best incorporates the City's vision for commercial development; however, given the potential health risks associated with implementation, short-term effectiveness, and cost challenges, Alternative 2A with the Optional Alternative 2A Cover provides the best compromise to meet the City's development vision.

8.3 Preferred Remedial Alternative

Based on the comparative analysis of the remedial alternatives, the alternative that meets the RAOs and ranks the highest is Alternative 2A, capping with selective excavation. The elements of Alternative 2A are:

- Prepare a construction HASP and CQA Plan;
- Prepare a Risk Management Plan;
- High-strength geotextile installation;
- Select excavation of impacted material;
- Containment of sludge along Artesia Boulevard;
- Capping of sludge;
- Installation of gas control and monitoring system;
- Institutional controls;
- Perform semi-annual groundwater monitoring; and
- Complete a formal review of cap effectiveness after five years.

This remedial alternative effectively mitigates the risk from ingestion, inhalation, and dermal contact with onsite soils for future non-residential occupants of buildings onsite, and future landscapers and utility workers. This alternative also effectively mitigates the risk from dermal contact with Site groundwater through the cap and institutional controls including the Health and Safety Plan and Risk Management Plan.

Alternative 2A readily meets the criteria of overall protection of human health and the environment and satisfies ARARs. When evaluated against the balancing criteria, Alternative 2A provides short-term effectiveness as well as long-term effectiveness and

permanence. It is implementable and presents an effective balance of cost against the other criteria. Alternative 2A also would accommodate future potential redevelopment of the Site.

Figures 1 through 8 in Appendix F demonstrate the conceptual design of Alternative 2A with the Optional Alternative 2A Cover. The design for Alternative 2A with Optional Alternative 2A Cover will be presented in the Remedial Action Plan.

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TABLES

TABLE 4-1
CONSTITUENTS OF POTENTIAL CONCERN
Gardena Sumps, Gardena, California

Geosyntec consultants

Soil		
1,1,1,2-Tetrachloroethane	Chlorobenzene	Methylene chloride
1,2,3-Trichlorobenzene	Chloroethane	Molybdenum
1,2,4-Trimethylbenzene	Chromium	Naphthalene
1,3,5-Trimethylbenzene	Chromium VI	n-Butylbenzene
1,3-Dichlorobenzene	Chrysene	Nickel
Acenaphthene	Cobalt	n-Propylbenzene
Acenaphthylene	Copper	Oil range organics (C29-C40)
Aluminum	Dibenz(a,h)anthracene	o-Xylene
Anthracene	Dibromochloromethane	Phenanthrene
Antimony	Diethyl phthalate	p-Isopropyltoluene
Arsenic	Diesel range organics (C13 - C28)	Pyrene
Barium	Extractable fuel hydrocarbons (C10 - C40)	sec-Butylbenzene
Benzene	Extractable fuel hydrocarbons (C13 - C40)	sec-Butylbenzene
Benzo(a)anthracene	Extractable fuel hydrocarbons (C8 - C40)	Selenium
Benzo(a)pyrene	Ethylbenzene	Silver
Benzo(b)fluoranthene	Fluoranthene	Styrene
Benzo(g,h,i)perylene	Fluorene	tert-Butylbenzene
Benzo(k)fluoranthene	Gasoline range organics (C4 - C12)	Thallium
Benzoic acid	Indeno(1,2,3-cd)pyrene	Toluene
Beryllium	Iron	trans-1,3-Dichloropropene
Bis(2-ethylhexyl)phthalate	Isopropylbenzene	Vanadium
Bromobenzene	Lead	Volatile fuel hydrocarbons (C4-C12)
Butyl benzyl phthalate	m,p-Xylenes	Zinc
Cadmium	Mercury	
Soil Gas		
1,1-Difluoroethane (LCC)	Chloroethane	
1,2,4-Trimethylbenzene	Chloroform	
1,2-Dichloro-1,1,2,2-tetrafluoroethane	Chloromethane	
1,2-Dichloroethane	Cyclohexane	
1,3,5-Trimethylbenzene	Dichlorodifluoromethane	
1,3-Butadiene	Ethylbenzene	
1,4-Dioxane	Freon 113	
2,2,4-Trimethylpentane (Isoctane)	Heptane	
2-Butanone	Hexane	
4-Ethyltoluene	m,p-Xylene	
4-Methyl-2-pentanone	Methylene chloride	
Acetone	Naphthalene	
Benzene	o-Xylene	
Bromodichloromethane	Propylene	
Bromoform	Styrene	
Carbon disulfide	Tetrachloroethene	
Carbon tetrachloride	Toluene	
Chlorobenzene	Trichloroethene	
Chloroethane	Trichlorofluoromethane	

TABLE 4-1
CONSTITUENTS OF POTENTIAL CONCERN
Gardena Sumps, Gardena, California

Geosyntec consultants

Groundwater		
1,2,4-Trimethylbenzene	Chloride	Mercury
1,2-Dichlorobenzene	Chloroethane	Methylene chloride
1,2-Diphenylhydrazine/Azobenzene	Chloromethane	Molybdenum
1,3,5-Trimethylbenzene	Chromium	Naphthalene
1,4-Dichlorobenzene	Chromium VI	Nickel
2,4-Dimethylphenol	Chrysene	Nitrate-N
2-Methylnaphthalene	Cobalt	Oil range organics (C29-C40)
2-Methylphenol	Copper	o-Xylene
Acenaphthylene	Dibenz(a,h)anthracene	Phenanthrene
Antimony	Diethyl phthalate	Phenol
Arsenic	Di-n-butyl phthalate	Potassium
Barium	Di-n-octyl phthalate	Pyrene
Benzene	Diesel range organics (C13 - C28)	Selenium
Benzo(a)anthracene	Extractable fuel hydrocarbons (C13 - C40)	Silver
Benzo(b)fluoranthene	Ethylbenzene	Sodium
Benzo(g,h,i)perylene	Fluorene	Sulfate
Benzo(k)fluoranthene	Gasoline range organics (C4 - C12)	Sulfide
Benzoic acid	Indeno(1,2,3-cd)pyrene	Thallium
Benzyl alcohol	Iron	Toluene
Beryllium	Isophorone	Vanadium
Bis(2-ethylhexyl)phthalate	Lead	Xylenes, total
Butyl benzyl phthalate	m,p-Xylenes	Zinc
Cadmium	Magnesium	
Calcium	Manganese	

TABLE 4-2
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
Gardena Sumps, Gardena, California

Geosyntec consultants

Requirement	Prerequisites	Citation	ARAR Determination (A, RA, or TBC)	Comments
CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS				
Clean Air Act (42 USC 7401-7671) Regulated by the SCAQMD				
Primary and secondary national standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead)	Air contamination affecting public health and welfare	40 CFR 50.4-50.12	A	SCQAMD standards from State Implementation Plan and California Air Resources Board are more restrictive
Resources Conservation and Recovery Act (42 USC 6901-6991[i]) Regulated by the CalEPA, DTSC				
Defines RCRA hazardous waste. A solid waste is toxic, based on the TCLP, if the waste exceeds the TCLP maximum concentrations.	Waste	22 CCR 66261.21-66261.24, 66261.100	A	Applicable for material disposed of offsite
Definition of "non-RCRA hazardous waste"	Waste	22 CCR 66261.22, 66261.24, 66261.101, 66261.3	A	Applicable for determining whether a waste is non-RCRA hazardous waste.
Safe Drinking Water Act (42 USC 300(f-j) - 26) Regulated by the SWRCB				
Maximum contaminant levels (MCLs) for organic and inorganic chemicals of concern in drinking water.	Public water system	40 CFR 141.61 (a,b), 141.62(b), & 141.11	RA	Leachate from the sumps may impact groundwater that has a designated beneficial use as municipal water. The Lynwood, Silverado, Gardena, and Gage aquifers have designated domestic water supply use.
Non-zero maximum contaminant level goals (MCLGs) for organic and inorganic chemicals of concern in drinking water	Public water system	40 CFR 141.50 & 141.51	RA	Leachate from the sumps may impact groundwater that has a designated beneficial use as municipal water. The Lynwood, Silverado, Gardena, and Gage aquifers have designated domestic water supply use.
California Safe Drinking Water and Toxic Enforcement Act (California Health and Safety Code 25249.5 - 25249.13) Regulated by the SWRCB				
Primary MCLs for inorganic chemicals of concern in drinking water	Drinking water source	22 CCR 64431 and 64449	RA	Leachate from the sumps may impact groundwater that has a designated beneficial use as municipal water. The Lynwood, Silverado, Gardena, and Gage aquifers have designated domestic water supply use.
Public health goals for inorganic chemicals in drinking water	Drinking water source	Health and Safety Code 116365	TBC	Guidelines established by the Office of Environmental Health Hazard assessment based on health considerations; HHRA was performed with site-specific conditions and acceptable risk was identified
LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS				
No location-specific ARARs were identified for the Gardena Sumps Site. The site is not located in a sensitive or protected area	----	----	----	----
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS				
Porter-Cologne Water Quality Control Act (California Water Code, Division 7) Regulated by the SWRCB				
Any activitiy that could affect water quality must not result in water quality parameters exceeding appropriate beneficial use water quality objectives	Contaminants affecting waters of the state	Los Angeles Basin Water Quality Control Plan	A	Groundwater protection standards are set at levels consistent with identified beneficial use for the area
State antidegradation policy applicable to both surface and ground water requiring that discharges to waters of the state be regulated to achieve the "highest water quality consistent with maximum benefit to the people of the State."	Contaminants affecting waters of the state	Los Angeles Basin Water Quality Control Plan	A	Groundwater protection standards are set at levels consistent with identified beneficial use for the area
Requires that quality of the waters of the state that is better than needed to protect all beneficial uses be maintained unless certain findings are made. Discharges to high-quality waters must be treated using best practicable treatement or control necessary to prevent pollution or nuisance and to maintain the highest quality water. Requires cleanup to background water quality or to lowest concetrations technically and economically feasible to achieve. Beneficial uses must, at least, be protected	Contaminants affecting waters of the state	SWRCB Res. 68-16	A	Groundwater protection standards are set at levels consistent with identified beneficial use for the area
California Hazardous Waste Control Laws Regulated by the Cal EPA, DTSC				
Person who generates waste shall determine if that waste is hazardous waste.	Waste	22 CCR 66262.10 & 66262.11	A	Materials in sumps are hazardous due to H_2S emissions in excess of 500 ppm_v. After neutralization, the gases are fixed indicating the material is no longer hazardous.

TABLE 4-2
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
Gardena Sumps, Gardena, California

Geosyntec consultants

Requirement	Prerequisites	Citation	ARAR Determination (A, RA, or TBC)	Comments
California Hazardous Waste Control Laws Regulated by the Cal EPA, DTSC (cont.)				
Owners and operators of a RCRA surface impoundment, waste pile, land treatment unit, or landfill shall conduct a monitoring and response program for each regulated unit	Unit which has waste which may pose a threat to human health or the environment	22 CCR 66264.91	NA	----
Requirements for monitoring groundwater, surface water, and the vadose zone	Hazardous waste unit	22 CCR 66264.97	NA	----
Design and construction requirements for the foundation, earth-barrier, and vegetation-support layers of the final cover	Discharge of hazardous waste to land after 7/18/97 for treatment, storage, or disposal	22 CCR 66264.228	NA	----
Requires that hazardous wastes be covered by a low-permeability cover of specific properties. The cover will prevent the downward entry of water to the closed unit for at least 100 years. Provides for post-closure care and maintenance of the cover and related components. Toxic or flammable gas or vapor must be controlled for as long as it is emitted from the site	Discharge of hazardous waste to land after 7/18/97 for treatment, storage, or disposal	22 CCR 66264.310	NA	----
Solid Waste Disposal Regulatory Reform Act Regualted by the SWRCB and CalRecycle				
Waste discharges are responsible for accurate characterization of waste. Defines designated nonhazardous solid waste and inert waste	Discharge of nonhazardous waste to land after 7/18/97 for treatment, storage, or disposal	27 CCR 20220 (b,c,d) and 20230 (b)	A	----
Requires detection monitoring. Once a significant release has occurred, evaluation or corrective action monitoring is required	Discharge of water to land after 7.18.1997	27 CCR 20385 (a) (1) and (2)	A	Water quality monitoring required for closed units, unless they are clean-closed.
Defines water quality protection standards that apply during closure and post-closure maintenance periods	Discharge of water to land after 7.18.1997	27 CCR 20390, 20395, and 20400	A	Water quality protection standards in WDRs must be met as demonstrated in detection monitoring program
Establishes requirements for gas monitoring and controls as related to closure and post-closure of units	Discharge of water to land after 7.18.1997	27 CCR 20921 to 20937	A	Gas monitoring required for closed units
Defines point of compliance as hydraulically downgradient from the unit and requires soil, surface water, and groundwater monitoring with RAOs for 3 years after cleanup.	Discharge of water to land after 7.18.1997	27 CCR 20405, 20410, and 20415	A	WDRs will specify monitoring locations
Closure and postclosure maintainence submittal requirement showing that the unit will meet performance standards and will comply with waste containment and precipitation and drainage control	Discharge of water to land after 7.18.1997	27 CCR 20950	A	Relevant to site closure
Requirements for final cover slopes, foundation layer, low-hydraulic conductivity layer, and erosion-resistance layer and mandates cover maintenance plan and annual cost estimates.	Discharge of water to land after 7.18.1997	27 CCR 21090	A	Relevant to site closure
Requires access control, site protection, and signage during closure and postclosure	Discharge of water to land after 7.18.1997	27 CCR 21135	A	Relevant to site closure
Sets design criteria for final covers of units	Discharge of water to land after 7.18.1997	27 CCR 21140	A	Relevant to site closure
Requires monitoring and analysis of differential settlement during the postclosure period	Discharge of water to land after 7.18.1997	27 CCR 21142	A	Relevant to site closure
Requires minimum of 1.5 factor of safety for static and seismic stability of final unit face	Discharge of water to land after 7.18.1997	27 CCR 21145 and 21750	A	Relevant to site closure
Requires postclosure maintenance of final cover and control systems for no less than 30 years.	Discharge of water to land after 7.18.1997	26 CCR 21180	A	Relevant to site closure
Requires that postclosure land uses shall protect public health and safety, prevent damage to the unit, and prevent public contact with waste	Discharge of water to land after 7.18.1997	26 CCR 221190 (a)	A	Relevant to site closure

TABLE 4-2
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
Gardena Sumps, Gardena, California

Geosyntec consultants

Requirement	Prerequisites	Citation	ARAR Determination (A, RA, or TBC)	Comments
Clean Air Act (42 USC 7401-7671) Regulated by the SCAQMD				
Limits visible emissions from a single source	Air emissions	SCAQMD Rule 401	A	Applicable for construction activities
Prohibits discharge of materials that cause injury, detriment, nuisance, or annoyance to the public; endanger the comfort, repose, health, or safety of the public; or cause or have tendency to cause injury or damage to business or property	Air emissions	SCAQMD Rule 402	A	Applicable for construction activities
Shall not cause or allow emissions of fugitive dust such that the presence of dust remains visible in the atmosphere beyond the property line of the emission source and shall not allow PM10 levels to exceed 50 mg/m^3	Generation of fugitive dust	SCAQMD Rule 403	A	Applicable for construction activities
Prohibits discharge into the atmosphere of particulate matter in excess of specified concentrations	Generation of particulates	SCAQMD Rule 404	A	Applicable for construction activities
Limits equipment from discharging particulate emissions in excess of 0.99 to 30 lbs/hr, based on a given process weight	Generation of particulates	SCAQMD Rule 405	A	Applicable for construction activities
Limits cabon monoxide and sulfur dioxide from any equipment other than that used for mobile equipment propulsion or stationary equipment engines	Air contaminant sources except mobile equipment or stationary engines	SCAQMD Rule 407	A	Applicable for construction activities
Prohibits building or using equipment which reduces or conceals an emission otherwise consituting a violation	Air emissions	SCAQMD Rule 408	A	Applicable for construction activities
Limits particulate emissions from the exhaust of a combustion source (other than an internal combustion engine) to 0.23 g/m^3 at 12% CO_2 averaged over 15 minutes	Combustion sources except internal combustion engines	SCAQMD Rule 409	A	Applicable for construction activities
Limits emissions of sulfur compounds from gaseous fuels to no more than 40 parts per million, 0.05 percent by weight (liquid fuels), and 0.56 pounds of sulfur per million BTUs (solid fossil fuels)	Combustion sources using liquid or solid fossil fuels	SCAQMD Rules 431.1, 431.2, 431.3	A	Applicable for construction activities
Limits concentrations of oxides of nitrogen from any non-mobile sources fuel-burning equipment, averaged over 15-minutes, to a rage of 125 to 300 ppm (gaseous fuels) and 225 to 400 ppm depending on equipment size	Non-mobile equipment using gaseous, liquid, or solid fuels	SCAQMD Rule 474	A	Applicable for construction activities
Specifies emissions testing, monitoring procedures, or handling or hazardous pollutants such as beryllium, benzene, mercury, vinyl chloride, and asbestos	Hazardous air pollution	SCAQMD Reg. X NESHAPS	A	Applicable for construction activities
Sets emissions standards for nitrous oxides, voliatile organic compounds, and carbon monoxide from gaseous and liquid fuels portable engines	Portable engines used on construction site	SCAQMD Rule 1110-2	A	Applicable for construction activities
Requires person excavating a landfill to identifiy mitigation measures to enure that a public nuisance does not occur.	Excavation of inactive landfill	SCAQMD Rule 1150	A	Applicable for construction activities
Limits volatile organic compound emissions from contaminated soil to less than 50 ppm. For higher emissions an approved mitigation plan, describing removal methods and mitigations measures must be obtained.	Volatile organic compounds in soil being excavated	SCAQMD Rule 1166	A	Applicable for construction activities
All new sources of air pollution that may result in a net emission increase of any nonattainment air contaminant or any halogenated hydrocarbon are to employ Best Available Control Technology. Limits emissions of nonmethane organic compounds to less than 1 lb/day	Nonattainment contaminant or halogenated hydrocarbon	SCAQMD Rule 1303	A	Applicable for construction activities
Requires equipment to be constructed with Best Available Control Technology. Non-attainment emission increases must be offset and substantianted with modeling that the equipment will not significantly increase concentrations of non-attainment emissions.	New/modified equipment which may cause issuance of a non-attainment contaminant	SCAQMD Reg XII New Source Review	A	Applicable for construction activities
Defines health risk assessment methodology; exempts nonmethane organic compounds from controls if the health risk is less than 1 in 1 million.	nonmethane organic compounds	SCAQMD Rule 1401	A	----

TABLE 4-2
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
Gardena Sumps, Gardena, California

Geosyntec consultants

Requirement	Prerequisites	Citation	ARAR Determination (A, RA, or TBC)	Comments
Clean Water Act (33 USC 1251-1387) and Porter-Cologne Water Quality Control Act (California Water Code, Division 7) Regulated by the SWCRB and Los Angeles RWQCB				
Waste Management Units undergoing final closure, with 1 acre of disturbance or more, must comply with substantive requirements for eliminating most nonstormwater discharges, developing and implementing a stormwater pollution prevention plan, and monitoring stormwater discharges	Construction activity on site larger than 1 acre	SWRCB Order 99-08-DWQ; SWRCB Res. 2001-046	A	Site exceeds 1 acre
Requires incorporation of permanent Best Management Practices to control storm water runoff pullution after completion of the project. Requires monitoring, sampling, and analysis of stormwater discharges under specified circumstances.	Long-term operation and maintenance of site	SWRCB Order R8-2002-0012	A	Stormwater pollution controls required for long-term maintenance
Miscellaneous State Provisions for Institutional Controls				
Provides conditions under which land-use restrictions apply to successive owners of land	Transfer site to new owner	Ca. Civil Code 1471	A	Institutional controls apply to future site use
Prohibits certain uses of land containing hazardous waste without a specific variance.	Hazardous waste property	California Health and Safety Code 25232 (b)(1)(A-E)	RA	Materials in the sumps are hazardous waste due to H_2S concentrations; however closed conditions are similar to conditions of a closed hazardous landfill.
OSWER Directive – Air Stripper Control Guidance (9355.8-28)				
Guidance regarding the use of emission controls at CERCLA sites. Will be used to develop air emissions controls if necessary.	----	----	----	----
Air Toxic "Hot Spot" Act (California Health and Safety Code § 44300 et seq.) as implemented by the SCAQMD and overseen by the Air Resources Board under CCR, Title 17, Section 93300 et seq.				
This statute and its regulations require operators of regulated facilities to prepare and submit inventory emission plans and reports and, in some cases, the preparation of health risk assessments. Only applicable if facility uses or releases a "listed" substance and releases more than 25 tons/year of total organic gases, particulate matter, nitrogen oxides or sulfur oxides.	----	----	TBC	The risk assessment required under the "Hot Spot" Act is more stringent than that performed under the FS because the FS risk assessment calculated risks due to exposure to soil and groundwater at the Site, not risks attributable to treatment processes from the remedial alternatives.

NOTES:

A - Applicable requirement (cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal or State environmental or facility citing laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site)

RA - Relevant and appropriate requirement (cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site)

TBC - To be considered (Federal and State nonpromulgated standards, policies, or guidance documents and local requirements)
NA - Not applicable

CalEPA - California Environmental Protection Agency
CCR - California Code of Regulations
CFR - Code of Federal Regulations
DTSC - California Department of Toxic Substances Control
DWQ - Division of Water Quality
MCL - Maximum contaminant level
MCLG - Maximum contaminant level goal
RCRA - Resources Conservation and Recovery Act
RWQCB - Regional Water Quality Control Board
SCAQMD - South Coast Air Quality Management District
SWRCB - California State Water Resources Control Board
TCLP - Toxic characteristic leaching procedure
USC - United States Code

lbs/hr - pounds per hour
g/m^3 - grams per cubic meter
mg/m^3 - milligrams per cubic meter
ppm - parts per million

TABLE 4-3
SUMMARY OF SITE-SPECIFIC ACTION LEVELS FOR SOIL
Gardena Sumps, Gardena, California

Geosyntec consultants

Chemicals of Concern	Site-Specific Action Levels for Soil (mg/kg)											
	Commercial/Industrial			Construction			Residential			Trespasser		
	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL
Inorganics												
Arsenic	2.7E+02	1.7E+01	1.7E+01	6.2E+01	1.2E+02	6.2E+01	2.2E+01	3.9E-01	1.2E+01[(1)]	3.8E+03	8.5E+01	8.5E+01
Chromium VI	3.0E+03	5.4E+01	5.4E+01	6.1E+02	7.3E+01	7.3E+01	2.3E+02	1.2E+00	1.2E+00	4.9E+04	3.2E+02	3.2E+02
Polyaromatic Hydrocarbons												
Benzo(a)pyrene	2.0E+04	1.6E+00	1.6E+00	5.5E+03	1.1E+01	1.1E+01	1.7E+03	3.7E-02	9.0E-01[(2)]	2.2E+05	6.2E+00	6.2E+00
Volatile Organic Compounds												
Benzene	6.7E+02	2.4E+01	2.4E+01	1.6E+02	1.4E+02	1.4E+02	1.2E+02	4.8E-01	4.8E-01	1.4E+04	1.8E+02	1.8E+02
Naphthalene	8.5E+02	2.5E+02	2.5E+02	1.9E+02	1.4E+03	1.9E+02	1.8E+02	4.9E+00	4.9E+00	1.8E+04	1.9E+03	1.9E+03

Notes:

BaP-eq: benzo(a)pyrene toxicity equivalent

mg/kg: milligram per kilogram

RBCc: risk-based concentration based on cancer effects

RBCnc: risk-based concentration based on noncancer effects

SSAL: site-specific action level

Selected SSALs are the lowest between RBCc and RBCnc, or the background concentration for chemicals in which the RBCs were below background (e.g., arsenic and BaP-eq for the residential scenario).

(1) For arsenic, the DTSC screening level of 12 mg/kg (Cal-EPA DTSC, 2007), considered representative of background in southern California soils, was selected as the SSAL.

(2) For benzo(a)pyrene, a concentration of 0.9 mg/kg, considered representative of background PAH concentrations in southern California soils, was selected as the SSAL.

TABLE 4-4

SUMMARY OF SITE-SPECIFIC ACTION LEVELS FOR SOIL GAS

Gardena Sumps, Gardena, California

Geosyntec consultants

Chemical of Concern	Site-Specific Action Levels for Soil Gas (µg/L)					
	Commercial/Industrial			Residential		
	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL
Benzene						
5-ft bgs	3.2E+02	1.0E+01	1.0E+01	3.8E+01	1.0E-01	1.0E-01
10-ft bgs	5.5E+02	1.8E+01	1.8E+01	6.5E+01	1.8E-01	1.8E-01
12-ft bgs	6.4E+02	2.1E+01	2.1E+01	7.6E+01	2.1E-01	2.1E-01
15-ft bgs	7.8E+02	2.5E+01	2.5E+01	9.3E+01	2.5E-01	2.5E-01

Notes:

Soil gas to indoor air pathway

RBCc: risk-based concentration based on cancer effects

RBCnc: risk-based concentration based on noncancer effects

SSAL: site-specific action level

µg/L: micrograms per liter

Selected RBCs are the lowest between RBCc and RBCnc

Soil gas RBCs were derived using default soil properties for soil type loam in the model

Values revised per response to comments package dated 4/4/12

TABLE 4-5

SUMMARY OF SITE-SPECIFIC ACTION LEVEL FOR GROUNDWATER

Gardena Sumps, Gardena, California

Geosyntec consultants

Chemical of Concern	Site-Specific Action Levels for Groundwater (µg/L)		
	Construction		
	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL
Polyaromatic Hydrocarbons			
Dibenz[a,h]anthracene	--	2.0E+00	2.0E+00

Notes:

" -- " not applicable

RBCc: risk-based concentration based on cancer effects

RBCnc: risk-based concentration based on noncancer effects

SSAL: site-specific action level

µg/L: micrograms per liter

Selected SSAL is the lowest between RBCc and RBCnc

TABLE 5-1
PRELIMINARY TECHNOLOGY SCREENING
Gardena Sumps, Gardena, California

Geosyntec consultants

Technology Type	Technology	Description	Screening Criteria			Comments
			Effectiveness	Implementability	Cost	
No Action	No Action	No work is performed, now or in the future, to attempt to mitigate existing conditions.	Minimal. Existing cap systems mitigate potential exposure to impacted materials; however, without maintenance, caps could degrade over time	Implementable.	Minimal cost	Retained as required by the RI/FS Guidance
Institutional Controls	Deed Restriction	Prohibit sensitive land uses.	Effective. Exposure mitigation depends on level of restriction	Implementable with owner cooperation and agency approval. Must meet legal requirements. May be implemented in combination with other technologies.	Minimal cost	Retained.
	Plans	Health and Safety and Risk Management Plans.	Effective. Requires minimum safety standards and site information to reduce exposure risks	Implementable.	Minimal cost.	Retained.
Treatment	Solidification/Neutralization	Chemically treat sludges to bind contaminants into a soil-like matrix.	Effective. Increases strength of sludge, neutralizes acidity of sludge	Implementable. Would require sludge handling and create significant on-site management issues such as emissions	High capital, minimal O&M	Retained.
	Thermal	Excavate impacted sludge and soil and treat by heating to volatalize contaminants.	Effective.	Implementable. Would require caustic scrubber system to capture sulfur dioxide and hydrogen sulfide as well as combustion units or afterburners.	High capital and high O&M	Eliminated due to large amounts of sulfur dioxide and hydrogen sulfide generation
	Recycling	Excavate impacted sludge and transport offsite for use in road construction or roofing.	Not effective. Sludge has high viscocity, high solids content, and no ductility.	Implementable. Would require sludge handling and create significant on-site management issues such as emissions	High capital, minimal O&M	Eliminated due to ineffectiveness of sludge recycling
Containment	Low permeability clay liner	Horizontal cap installed to mitigate contact with impacted sludge and soil, rainwater infiltration, and reduce vapor migration to surface by constructing a low permeability clay barrier, a geosynthetic membrane, and an erosion protection layer over sludge and impacted soils.	Effective. Mitigates downward migration of liquid.	Implementable. May require restriction on future land use.	Moderate capital, low O&M.	Retained.
	Geosynthetic membrane		Effective. Mitigates downward migration of liquid, vertical migration of gases, and dermal exposure.	Implementable. May require restriction on future land use.	Moderate capital, low O&M.	Retained.
	Erosion protection layer		Effective. Mitigates erosion of impacted soil and/or damage to underlying layers due to erosion.	Implementable. May require restriction on future land use.	Moderate capital, low O&M.	Retained.
Excavation	Excavation	Excavate sludge and/or impacted soil. Backfill excavation with imported soil. Dispose of sludge and impacted soil in Class I landfill, non-hazardous landfill, or TSCA cell, depending upon waste classification.	Effective. Impacted materials are removed from the Site.	Implementable. Potential major difficulties due to traffic and air emissions.	High capital, no O&M	Retained.
Engineered Controls	Vapor control systems	Install subsurface barriers and vapor control systems to mitigate soil vapor migration.	Effective. Migration of constituents is reduced or eliminated.	Implementable. May be implemented in combination with other technologies	Moderate capital, moderate O&M	Retained.
	Groundwater Monitoring	Monitor natural attenuation of consituents once source of constituents is isolated, treated, and/or removed.	Effective. Migration of constituents is identified prior to offsite transport and/or public exposure	Implementable. Currently ongoing at the site	Minimal capital, moderate O&M.	Retained.

TABLE 5-2
SUMMARY OF RETAINED TECHNOLOGIES
Gardena Sumps, Gardena, California

Geosyntec consultants

Technology Type	Technology
No Action	None.
Institutional Controls	Deed restriction on type of future development and use of the Gardena Sumps Site. Groundwater monitoring of natural attenuation. Health and safety plans and risk management plan for construction and future site use.
Treatment	Neutralization/Stabilization
Containment	Cap
Excavation	Excavation of sludge, excavation of impacted soil
Engineered Controls	Vapor control system
	Groundwater Monitoring

TABLE 6-1

REMEDIAL ALTERNATIVE TECHNOLOGIES

Gardena Sumps, Gardena, California

Geosyntec consultants

Technology Type	Technology	Remedial Alternatives			
		1	2A	3	4
No Action	No Action	X			
Containment	Cap		X	X	
Excavation	Excavation of sludge				X
Excavation	Excavation of impacted soils - on-site management			X	
Excavation	Excavation of impacted soils - off-site disposal		X		X
Treatment	Neutralization/ Stabilization			X	
Institutional Controls	Deed restriction		X	X	
Engineered Controls	Gas Control System		X	X	
	Groundwater Monitoring		X	X	X

Preliminary Remedial Alternatives

1 No Action

2A Capping with selective excavation

3 Capping with stabilization/neutralization and selective excavation

4 Excavation with offsite disposal

TABLE 7-1
ALTERNATIVE 2A COST ESTIMATE
Gardena Sumps, Gardena, California

Geosyntec consultants

	Unit	Unit Price	Quantity	Amount
Institutional Controls				
Deed Restrictions	EA	$ 25,000.00	1	$ 25,000.00
Site Preparation				
Mobilization/Demobilization	LS	$ 372,700.00	1	$ 372,700.00
Security	Month	$ 20,000.00	5	$ 100,000.00
Construction Facilities	Month	$ 10,000.00	5	$ 50,000.00
Health and Safety	Month	$ 35,000.00	5	$ 175,000.00
Air Monitoing	Month	$ 48,000.00	5	$ 240,000.00
Temporary Fencing and Signage	LS	$ 10,000.00	1	$ 10,000.00
Surveying (Baseline and As-Built)	LS	$ 75,000.00	1	$ 75,000.00
Temporary Traffic Control	LS	$ 20,000.00	1	$ 20,000.00
Clearing and Grubbing	ACRE	$ 2,000.00	7	$ 14,000.00
Groundwater Monitoring Well Destruction	EA	$ 4,000.00	8	$ 32,000.00
Containment				
Install sheet piles	SF	$ 30.00	5,100	$ 153,000.00
Overhead Electrical Relocation	EA	$ 50,000.00	2	$ 100,000.00
Retaining wall façade	SF	$ 9.00	675	$ 6,075.00
Batten Anchors	LF	$ 20.00	225	$ 4,500.00
Earthworks				
Clean Excavation	CY	$ 7.00	2,450	$ 17,150.00
Clean Fill (Import, place, Compact)	CY	$ 40.00	1,500	$ 60,000.00
Haack Rework Disposal				
Impacted Excavation	CY	$ 20.00	2,670	$ 53,400.00
Haul and Dispose of Waste at Non-RCRA Hazardous Facility	TON	$ 120.00	4,600	$ 552,000.00
Cap				
High Strength Geotextile				
Material (Import and place)	SF	$ 5.00	102,978	$ 514,890.00
Foundation Layer Installation				
Fingerfill Soil Placement	CY	$ 50.00	3,900	$ 195,000.00
Fill (Import, Place, and Grade Soil)	CY	$ 40.00	9,100	$ 364,000.00
Geosynthetics				
Furnish and Install Gas Geocomposite	SF	$ 0.72	169,005	$ 121,684.00
Furnish and Install Geosynthetic Clay Liner	SF	$ 0.75	169,005	$ 126,754.00
Furnish and Install 60-mil HDPE Geomembrane	SF	$ 0.62	169,005	$ 104,783.00
Furnish and Install Drainage Geocomposite	SF	$ 0.72	169,005	$ 121,684.00
Cover Soil				
Fill (Import, Place, and Grade 1 ft Class II Aggregate Base)	CY	$ 35.00	6,444	$ 225,556.00
Horizontal Gas Collection System				
Furnish and Install Strip Composite	LF	$ 3.00	3,288	$ 9,864.00
Furnish and Install Outlet Pipe	LF	$ 10.00	1,480	$ 14,800.00
Import and Place Gravel	CY	$ 40.00	20	$ 800.00
Furnish and Install Blower (0.5 hp, 50 scfm)	EA	$ 10,000.00	1	$ 10,000.00
Furnish and Install Granular Activated Carbon	EA	$ 22,000.00	1	$ 22,000.00
Vertical Gas Probes				
Probe Drilling	LF	$ 20.00	180	$ 3,600.00
Furnish and Install Pipe (3 - 3/8" ϕ Perforated PVC)	LF	$ 10.00	180	$ 1,800.00
Import and Place Gravel	CY	$ 40.00	3	$ 120.00
Perimeter Vertical Gas Migration Control System				
Well Drilling	LF	$ 20.00	380	$ 7,600.00
Furnish and Install Air Inlet Header Pipe (4" ϕ HDPE)	LF	$ 10.00	1,770	$ 17,700.00
Furnish and Install Air Outlet Header Pipe (4" ϕ HDPE)	LF	$ 10.00	1,770	$ 17,700.00
Furnish and Install 4" ϕ perforated HDPE Vertical Gas Migration Control Pipes	LF	$ 10.00	380	$ 3,800.00

TABLE 7-1
ALTERNATIVE 2A COST ESTIMATE
Gardena Sumps, Gardena, California

Geosyntec consultants

	Unit	Unit Price	Quantity	Amount
Import and Place Gravel	CY	$ 40.00	10	$ 400.00
Furnish and Install Blower (15 hp, 400 scfm)	EA	$ 30,000.00	1	$ 30,000.00
Concrete Pad	EA	$ 5,000.00	1	$ 5,000.00
Fencing	EA	$ 2,000.00	1	$ 2,000.00
Electrical/Connection And Switch Gear	EA	$ 22,000.00	1	$ 22,000.00
Other Construction Costs				
Groundwater Monitoring Wells	EA	$ 8,000.00	8	$ 64,000.00
Revegetation	SY	$ 1.00	32,390	$ 32,390.00
Other Direct Costs				
Contingency (20%)	LS	$ 894,500.00	1	$ 894,500.00
Project Management (5%)	LS	$ 223,700.00	1	$ 223,700.00
Engineering Design (8%)	LS	$ 357,800.00	1	$ 357,800.00
Construction Management (6%)	LS	$ 268,400.00	1	$ 268,400.00
Construction Costs Subtotal:				**$ 5,844,150.00**
Operations and Maintenance Costs				
Blower, Granular Activated Carbon	LS	$ 1,612,600.00	1	$ 1,612,600.00
Annual Inspection	LS	$ 44,800.00	1	$ 44,800.00
Groundwater and Vapor Sampling & Analysis (Quarterly)	LS	$ 3,180,300.00	1	$ 3,180,300.00
Miscellaneous Cap Maintenance	LS	$ 44,800.00	1	$ 44,800.00
Operation and Maintenance Costs Subtotal:				**$ 4,882,500.00**
			Total:	**$ 10,726,650.00**

TABLE 7-2
ALTERNATIVE 3 COST ESTIMATE
Gardena Sumps, Gardena, California

Geosyntec consultants

	Unit	Unit Price (Low)	Unit Price (High)	Quantity	Amount (Low)	Amount (High)
Institutional Controls						
Deed Restrictions	EA	$ 25,000.00	$ 25,000.00	1	$ 25,000.00	$ 25,000.00
Site Preparation						
Mobilization/Demobilization	EA	$ 733,800.00	$ 827,100.00	1	$ 733,800.00	$ 827,100.00
Security	Month	$ 20,000.00	$ 20,000.00	8	$ 160,000.00	$ 160,000.00
Construction Facilities	Month	$ 10,000.00	$ 10,000.00	8	$ 80,000.00	$ 80,000.00
Health and Safety	Month	$ 35,000.00	$ 35,000.00	8	$ 280,000.00	$ 280,000.00
Air Monitoring	Month	$ 48,000.00	$ 48,000.00	8	$ 384,000.00	$ 384,000.00
Temporary Fencing and Signage	LS	$ 10,000.00	$ 10,000.00	1	$ 10,000.00	$ 10,000.00
Surveying (Baseline and As-Built)	LS	$ 75,000.00	$ 75,000.00	1	$ 75,000.00	$ 75,000.00
Temporary Traffic Control	LS	$ 20,000.00	$ 20,000.00	1	$ 20,000.00	$ 20,000.00
Admixture Mobilization/Demobilization	EA	$ 175,000.00	$ 175,000.00	1	$ 175,000.00	$ 175,000.00
Clearing and Grubbing	ACRE	$ 2,000.00	$ 2,000.00	7	$ 14,000.00	$ 14,000.00
Existing Geomembrane Cutting	SF	$ 0.05	$ 0.05	103,000	$ 5,150.00	$ 5,150.00
Groundwater Monitoring Well Destruction	EA	$ 4,000.00	$ 4,000.00	8	$ 32,000.00	$ 32,000.00
Containment						
Install sheet piles	SF	$ 30.00	$ 30.00	13,800	$ 414,000.00	$ 414,000.00
Overhead Electrical Relocation	EA	$ 50,000.00	$ 50,000.00	2	$ 100,000.00	$ 100,000.00
Retaining wall façade	SF	$ 9.00	$ 9.00	4,400	$ 39,600.00	$ 39,600.00
Batten Anchors	LF	$ 15.00	$ 20.00	600	$ 9,000.00	$ 12,000.00
Earthworks						
Clean Excavation	CY	$ 7.00	$ 7.00	300	$ 2,100.00	$ 2,100.00
Impacted Excavation	CY	$ 20.00	$ 20.00	5,800	$ 116,000.00	$ 116,000.00
Stabilization/Neutralization						
Stabilization Mobilization	LS	$ 175,000.00	$ 175,000.00	1	$ 175,000.00	$ 175,000.00
CaOH2/CaCO3 Stabilizer	TON	$ 300.00	$ 600.00	3,100	$ 930,000.00	$ 1,860,000.00
Soil for Stabilization	CY	$ 40.00	$ 40.00	3,400	$ 136,000.00	$ 136,000.00
Deep Soil Mixing with Hood	CY	$ 60.00	$ 60.00	11,400	$ 684,000.00	$ 684,000.00
Vapor Control Tent with Air Handling and Treatment System	LS	$ 1,100,000.00	$ 1,100,000.00	1	$ 1,100,000.00	$ 1,100,000.00
Vapor Treatment System	DAY	$ 1,000.00	$ 1,000.00	70	$ 70,000.00	$ 70,000.00
Cap						
Foundation Soil						
Fill (Import, place, grade, compact, moisture condition)	CY	$ 40.00	$ 40.00	20,100	$ 804,000.00	$ 804,000.00
Fill (Place and Grade Excavated Site Sludge/Soil Mix)	CY	$ 10.00	$ 10.00	5,800	$ 58,000.00	$ 58,000.00
Geosynthetics						
Furnish and Install Woven Geotextile	SF	$ 2.00	$ 2.00	103,000	$ 206,000.00	$ 206,000.00
Furnish and Install Gas Geocomposite	SF	$ 0.72	$ 0.72	169,000	$ 121,680.00	$ 121,680.00
Furnish and Install Geosynthetic Clay Liner	SF	$ 0.75	$ 0.75	169,000	$ 126,750.00	$ 126,750.00
Furnish and Install 60-mil HDPE Geomembrane	SF	$ 0.62	$ 0.62	169,000	$ 104,780.00	$ 104,780.00
Furnish and Install Drainage Geocomposite	SF	$ 0.72	$ 0.72	169,000	$ 121,680.00	$ 121,680.00
Cover Soil						
Fill (Import, Place, and Grade 2 ft Cover Soil)	CY	$ 40.00	$ 40.00	11,800	$ 472,000.00	$ 472,000.00
Horizontal Gas Collection System						
Furnish and Install Perforated Pipes	LF	$ 13.00	$ 13.00	3,300	$ 42,900.00	$ 42,900.00
Furnish and Install Outlet Pipe	LF	$ 10.00	$ 10.00	900	$ 9,000.00	$ 9,000.00
Import and Place Gravel	CY	$ 40.00	$ 40.00	100	$ 4,000.00	$ 4,000.00
Furnish and Install Blower (0.5 hp, 50 scfm)	EA	$ 10,000.00	$ 10,000.00	1	$ 10,000.00	$ 10,000.00
Furnish and Install Granular Activated Carbon	EA	$ 22,000.00	$ 22,000.00	1	$ 22,000.00	$ 22,000.00
Vertical Gas Probes						
Probe Drilling	LF	$ 20.00	$ 20.00	80	$ 1,600.00	$ 1,600.00
Furnish and Install Pipe (4" ϕ Perforated PVC)	LF	$ 10.00	$ 10.00	80	$ 800.00	$ 800.00
Import and Place Gravel	CY	$ 40.00	$ 40.00	2	$ 80.00	$ 80.00
Perimter Vertical Gas Migration Control System						
Well Drilling	LF	$ 20.00	$ 20.00	300	$ 6,000.00	$ 6,000.00
Furnish and Install Air Inlet Header Pipe (4" ϕ HDPE)	LF	$ 10.00	$ 10.00	1,300	$ 13,000.00	$ 13,000.00
Furnish and Install Air Outlet Header Pipe (4" ϕ HDPE)	LF	$ 10.00	$ 10.00	1,300	$ 13,000.00	$ 13,000.00
Furnish and Install 4" ϕ perforated HDPE Vertical Gas Migration Control Pipes	LF	$ 10.00	$ 10.00	300	$ 3,000.00	$ 3,000.00
Import and Place Gravel	CY	$ 40.00	$ 40.00	9	$ 360.00	$ 360.00
Furnish and Install Blower (15 hp, 400 scfm)	EA	$ 30,000.00	$ 30,000.00	1	$ 30,000.00	$ 30,000.00
Furnish and Install Granular Activated Carbon	EA	$ 22,000.00	$ 22,000.00	1	$ 22,000.00	$ 22,000.00
Other Construction Costs						
Groundwater Monitoring Wells	EA	$ 8,000.00	$ 8,000.00	8	$ 64,000.00	$ 64,000.00
Revegetation	SY	$ 1.00	$ 1.00	32,400	$ 32,400.00	$ 32,400.00
Stormwater Channel	SF	$ 2.00	$ 2.00	6,500	$ 13,000.00	$ 13,000.00
Other Direct Costs						
Contingency (20%)	LS	$ 1,614,400.00	$ 1,819,600.00	1	$ 1,614,400.00	$ 1,819,600.00
Project Management (5%)	LS	$ 403,600.00	$ 454,900.00	1	$ 403,600.00	$ 454,900.00
Engineering Design (8%)	LS	$ 645,800.00	$ 727,900.00	1	$ 645,800.00	$ 727,900.00
Construction Management (6%)	LS	$ 484,400.00	$ 545,900.00	1	$ 484,400.00	$ 545,900.00

TABLE 7-2
ALTERNATIVE 3 COST ESTIMATE
Gardena Sumps, Gardena, California

Geosyntec consultants

	Unit	Unit Price (Low)	Unit Price (High)	Quantity	Amount (Low)	Amount (High)
Construction Costs Subtotal:					**$ 11,219,880.00**	**$ 12,646,280.00**
Operations and Maintenance Costs						
Blower, Granular Activated Carbon	LS	$ 1,612,600.00	$ 1,612,600.00	1	$ 1,612,600.00	$ 1,612,600.00
Annual Inspection	LS	$ 44,800.00	$ 44,800.00	1	$ 44,800.00	$ 44,800.00
Groundwater and Vapor Sampling & Analysis (Quarterly)	LS	$ 3,180,300.00	$ 3,180,300.00	1	$ 3,180,300.00	$ 3,180,300.00
Miscellaneous Cap Maintenance	LS	$ 44,800.00	$ 44,800.00	1	$ 44,800.00	$ 44,800.00
Operation and Maintenance Costs Subtotal:					**$ 4,882,500.00**	**$ 4,882,500.00**
				Total:	**$ 16,102,380.00**	**$ 17,528,780.00**

TABLE 7-3
ALTERNATIVE 4 COST ESTIMATE
Gardena Sumps, Gardena, California

Geosyntec consultants

	Unit	Unit Price (Low)	Unit Price (High)	Quantity	Amount (Low)	Amount (High)
Site Preparation						
Mobilization/Demobilization	EA	$ 1,714,700.00	$ 1,896,100.00	1	$ 1,714,700.00	$ 1,896,100.00
Security	Month	$ 20,000.00	$ 20,000.00	10	$ 200,000.00	$ 200,000.00
Construction Facilities	Month	$ 10,000.00	$ 10,000.00	8	$ 80,000.00	$ 80,000.00
Health and Safety	Month	$ 35,000.00	$ 35,000.00	8	$ 280,000.00	$ 280,000.00
Air Monitoring	Month	$ 48,000.00	$ 48,000.00	8	$ 384,000.00	$ 384,000.00
Temporary Fencing and Signage	LS	$ 10,000.00	$ 10,000.00	1	$ 10,000.00	$ 10,000.00
Surveying (Baseline and As-Built)	LS	$ 75,000.00	$ 75,000.00	1	$ 75,000.00	$ 75,000.00
Temporary Traffic Control	LS	$ 20,000.00	$ 20,000.00	1	$ 20,000.00	$ 20,000.00
Admixture Mobilization/Demobilization	EA	$ 175,000.00	$ 175,000.00	1	$ 175,000.00	$ 175,000.00
Clearing and Grubbing	ACRE	$ 2,000.00	$ 2,000.00	7	$ 14,000.00	$ 14,000.00
Concrete Demolition	CY	$ 100.00	$ 100.00	200	$ 20,000.00	$ 20,000.00
Asphalt Demolition	SY	$ 8.00	$ 8.00	1,200	$ 9,600.00	$ 9,600.00
Existing Geomembrane Cutting	SF	$ 0.05	$ 0.05	103,000	$ 5,150.00	$ 5,150.00
Groundwater Monitoring Well Destruction	EA	$ 4,000.00	$ 4,000.00	8	$ 32,000.00	$ 32,000.00
Shoring						
Overhead Electrical Relocation	EA	$ 50,000.00	$ 50,000.00	2	$ 100,000.00	$ 100,000.00
Install Temporary Sheet Piles	SF	$ 25.00	$ 20.00	24,400	$ 610,000.00	$ 488,000.00
Earthworks						
Impacted Excavation	CY	$ 20.00	$ 20.00	51,800	$ 1,036,000.00	$ 1,036,000.00
Sump Backfill						
Fill (Import, Place, and Grade Soil)	CY	$ 40.00	$ 40.00	40,000	$ 1,600,000.00	$ 1,600,000.00
Neutralization						
Stabilization Mobilization	LS	$ 175,000.00	$ 175,000.00	1	$ 175,000.00	$ 175,000.00
CaOH2/CaCO3 Stabilizer	TON	$ 300.00	$ 600.00	9,800	$ 2,940,000.00	$ 5,880,000.00
Deep Soil Mixing with Hood	CY	$ 60.00	$ 60.00	30,900	$ 1,854,000.00	$ 1,854,000.00
Vapor Control Tent with Air Handling and Treatment Syste	LS	$ 1,100,000.00	$ 1,100,000.00	1	$ 1,100,000.00	$ 1,100,000.00
Vapor Treatment System	DAY	$ 1,000.00	$ 1,000.00	200	$ 200,000.00	$ 200,000.00
Dewatering						
Dewatering	DAY	$ 900.00	$ 900.00	30	$ 27,000.00	$ 27,000.00
Transportation and Disposal	GAL	$ 2.00	$ 2.00	60,000	$ 120,000.00	$ 120,000.00
Disposal Costs						
Transportation and Disposal	TON	$ 120.00	$ 100.00	50,200	$ 6,024,000.00	$ 5,020,000.00
Other Construction Costs						
Groundwater Monitoring Wells	EA	$ 8,000.00	$ 8,000.00	3	$ 24,000.00	$ 24,000.00
Revegetation	SY	$ 1.00	$ 1.00	32,400	$ 32,400.00	$ 32,400.00
Other Direct Costs						
Contingency (20%)	LS	$ 3,772,400.00	$ 4,171,500.00	1	$ 3,772,400.00	$ 4,171,500.00
Project Management (5%)	LS	$ 943,100.00	$ 1,042,900.00	1	$ 943,100.00	$ 1,042,900.00
Engineering Design (8%)	LS	$ 1,508,900.00	$ 1,668,600.00	1	$ 1,508,900.00	$ 1,668,600.00
Construction Management (6%)	LS	$ 1,131,700.00	$ 1,251,400.00	1	$ 1,131,700.00	$ 1,251,400.00
Construction Costs Subtotal:					**$ 26,217,950.00**	**$ 28,991,650.00**
Operations and Maintenance Costs						
Groundwater (Semi-annual)	LS	$ 113,200.00	$ 113,200.00	1	$ 113,200.00	$ 113,200.00
Operation and Maintenance Costs Subtotal:					**$ 113,200.00**	**$ 113,200.00**
				Total:	**$ 26,331,150.00**	**$ 29,104,850.00**

TABLE 8-1
COMPARATIVE ANALYSIS OF ALTERNATIVES
Gardena Sumps, Gardena, California

Geosyntec consultants

Alternative	Description	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-term effectiveness and permanence	Reduction of toxicity, mobility, or volume	Short-term effectiveness	Implementability	Cost	Total
Alternative 1	Score:	1	1	1	1	2	5	5	16
	No Action: no ongoing maintenance of geomembrane, asphalt, or concrete covers or fencing.	Low: Current geomembrane cover provides limited protection of human health and the environment. Asphalt and concrete caps provide protection of human health and the environment. Without on-going maintenance of caps which is not included with the alternative, protection of human health and the environment is limited.	Low: Does not provide compliance with ARARs.	Low: Caps are not effective over long-term without on-going maintenance.	Low: Toxicity, mobility, and/or volume are not reduced with this option.	Low to moderate: The caps and fenced conditions provide some short-term effectiveness as contact with the sludge is reduced through the clean cover (Haack Rework), geomembrane (Cooper Sumps), and concrete (Haack Sump).	High: Easy to implement	Low: No associated cost	
Alternative 2A	Score:	4	3	4	3	4	4	3	25
	Capping with selective excavation: Excavate Haack Rework and dispose offsite	Moderate to high: Exposure routes would be eliminated through capping; however, source would remain onsite. Gas would not be generated during implementation of this Alternative.	Moderate: complies with ARARS but requires additional monitoring and treatment to do so.	Moderate to high: With maintenance, will provide long-term protection.	Moderate: Reduces mobility of sludge by limited surface water infiltration and wind erosion. Gas treatment will reduce the toxicity of the waste. Onsite volume will be reduced.	Moderate to High: Excavation of Haack Rework reduces short-term effectiveness	Moderate to high: Technical implementation is relatively easy.	Moderate	
Alternative 3	Score:	3	3	4	3	2	1	2	18
	Capping with partial stabilization/neutralization and selective excavation: Partially stabilize/neutralize sludge, excavate Haack Rework and consolidate beneath composite cap system above sumps.	Moderate: Exposure routes would be eliminated through capping; however, source would remain onsite and gas generation would be high during mixing and stabilization	Moderate: complies with ARARS but requires additional monitoring and treatment to do so.	Moderate to high: With maintenance, will provide long-term protection, some sludge is neutralizaed reducing long-term concerns with untreated sludge remaining.	Moderate: Reduces mobility of sludge by neutralization, limited infiltration and wind erosion. Gas treatment and partial neutralization will reduce the toxicity of the waste. Overall volume will increase but toxicity will be reduced.	Low to moderate: Mixing of materials will release significant quantities of gas; however cap will provide immediate short-term effectiveness.	Low: Difficult to implement due to gas generation and mixing	Moderate to high: Costs associated with partial neutralization/stabilization and gas treatment	
Alternative 4	Score:	4	5	5	2	3	1	1	21
	Excavate impacted materials and dispose with off-site.	Moderate to High:Sludge and rework material would be disposed of offsite eliminating the exposure routes; however, excavation and transport of material temporarily increases risk with gas generation and public exposure.	High: Complies with ARARS	High: Very effective as material is removed from the Site.	Low to moderate: The toxicity is reduced but volume is doubled. Mobility is significantly increased when material is exposed, excavated, and hauled on public roads for final disposal.	Moderate: Removal will result in immediate effectiveness; however, excavation will generate significant gas and transport will expose public to hazards.	Low: Difficult to implement due to material properties and gas generation	High: Costs associated with partial neutralization/stabilization, gas treatment, transport, and disposal	

Notes:
ARARs - Applicable or Relevant and Appropriate Requirements
State Acceptance and Community Acceptance criteria will be assessed during comment periods and are not presented in this table.
Ranking - A numeric ranking of "1" is lowest, or worst; "5" is highest, or best. With respect to cost, "1" is most expensive; "5" is lease expensive

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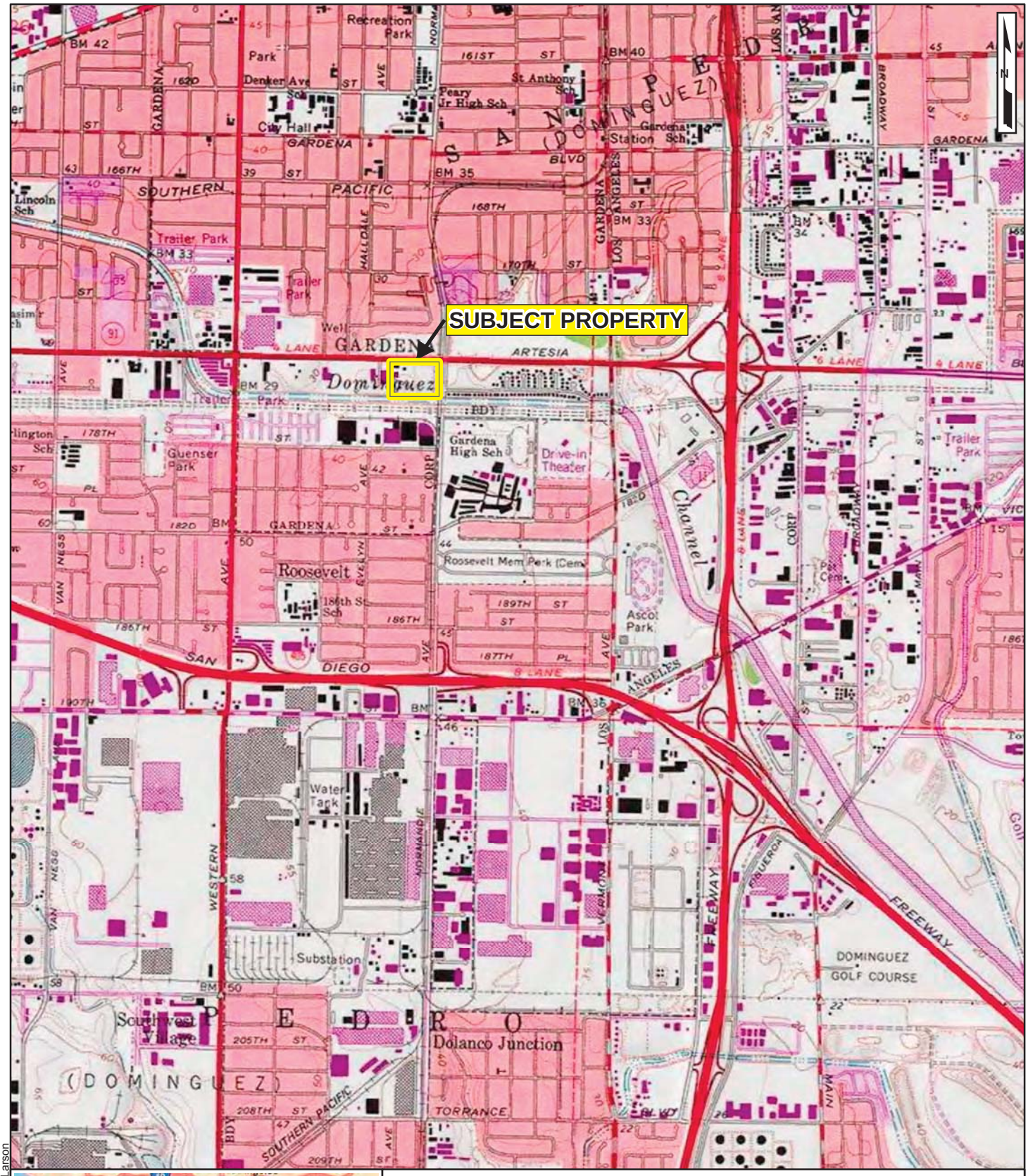

SITE LOCATION
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CA

Geosyntec consultants

DATE: JULY 2014

PROJECT NO: SC0467A

FIGURE
1-1

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ARTESIA BOULEVARD

NORMANDIE AVENUE

HAACK NORTH SUMP

COOPER NORTH SUMP

COOPER SOUTH SUMP

HAACK REWORK AREA

PAVED AREA

ACCESS ROAD

RESIDENTIAL

VACANT LADPW PROPERTY

ACCESS FRONTAGE ROAD

DOMINGUEZ CHANNEL

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN-LINK FENCE
- WOODEN FENCE
- FENCE
- RAIL ROAD
- BUILDING
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- APPROXIMATE DISTRIBUTION OF SLUDGE
- APPROXIMATE LOCATION OF HAACK REWORK AREA

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.

0 80' 160'

SCALE IN FEET

SITE LAYOUT
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2012

PROJECT NO. SC0467A

FIGURE 1-2

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Legend

- Site Property Line
- L.A. County Department of Public Works Property Line
- Private Residence Property Line
- Lateral Extent of Geo Fabric Membrane Covering Sumps on Cooper Property
- Chain-link Fence
- Building
- Railroad
- Dominguez Channel
- Approximate Sump Locations
- Approximate Location of Haack Rework Area
- Cooper Property Soil/Sludge Borings
- LA County Department of Public Works Soil Samples
- Haack Property Soil/Sludge Borings
- Private Residential Property Soil/Sludge Samples
- Soil Gas Samples

Notes

1. Site Features provided by Stantec on 5/15/2009 (file name: BP-GS-RI_Phase2.DWG).
2. Site Features are approximate.
3. Remedial Investigation Locations included in Risk Assessment.

Soil Matrix Sample Locations

Gardena Sumps
1440 West Artesia Boulevard, Gardena, CA

Geosyntec consultants

San Diego, CA

Figure 3-1

S:\GIS\GardenaSumps\Projects\Fig03_Soil_Boring_Locations.mxd

ARTESIA BOULEVARD

NORMANDIE AVENUE

ACCESS ROAD

PAVED AREA

PAVED AREA

PAVED AREA

PAVED AREA

Haack
North Sump

Haack
Rework Area

Cooper
North Sump

Cooper
South Sump

SV01 SV02 SV03 SV04 SV06 SV07 SV08 SV09 SV11 SV12 SV13 SV14 SV15 SV16 SV17 SV18 SV19 SV21 SV22 SV23 SV24 SV25 SV26 SV27 SV28 SV29 SV30 SV111 SV116 SV117 SV118 SV119 SV120 SV121 SV122 SV123 SV124 SV125 SV126 SV127 SV128 SV129 SV131 SV132 SV133 SV134 SV135 SV136 SV137

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

VACANT LADPW PROPERTY

ACCESS FRONTAGE ROAD

DOMINGUEZ CHANNEL

N

Legend

- Site Property Line
- L.A. County Department of Public Works Property Line
- Private Residence Property Line
- Lateral Extent of Geo Fabric Membrane Covering Sumps on Cooper Property
- Chain-link Fence
- Building
- Railroad
- Dominguez Channel
- Approximate Sump Locations
- Approximate Location of Haack Rework Area
- Soil Gas Samples

Notes

1. Site Features provided by Stantec on 5/15/2009 (file name: BP-GS-RI_Phase2.DWG).
2. Site Features are approximate.
3. Remedial Investigation Locations included in Risk Assessment.

100 50 0 100 Feet

Soil Gas Sample Locations

Gardena Sumps
1440 West Artesia Boulevard, Gardena, CA

Geosyntec consultants

San Diego, CA | February 2011

Figure **3-2**

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Legend

- Site Property Line
- L.A. County Department of Public Works Property Line
- Private Residence Property Line
- Lateral Extent of Geo Fabric Membrane Covering Sumps on Cooper Property
- Chain-link Fence
- Building
- Railroad
- Dominguez Channel
- Approximate Sump Locations
- Approximate Location of Haack Rework Area
- Groundwater Hydropunch Sample Location (A + B Water-Bearing Zones)
- Cluster Wells (A + B)
- Temporary Groundwater Monitoring Well

Notes

1. Site Features provided by Stantec on 5/15/2009 (file name: BP-GS-RI_Phase2.DWG).
2. Site Features are approximate.
3. Remedial Investigation Locations included in Risk Assessment.

Groundwater Sample Locations

Gardena Sumps
1440 West Artesia Boulevard, Gardena, CA

Geosyntec consultants

San Diego, CA | February 2011

Figure 3-3

S:\GIS\GardenaSumps\Projects\Fig05_Groundwater_Sample_Locations.mxd

ARTESIA BOULEVARD

NORMANDIE AVENUE

N

HPB08
BaP-eq; 3.3 mg/kg; 1.5'

SV10
BaP-eq; 2.3 mg/kg; 5'

HPB113
Arsenic; 42 mg/kg; 2'

HPB03
BaP-eq; 1.8 mg/kg; 10'

Haack
North Sump

CPB01
BaP-eq; 67 mg/kg; 1.5'
BaP-eq; 22 mg/kg; 5'
BaP-eq; 40 mg/kg; 10'

CPB02
BaP-eq; 8.1 mg/kg; 1.5'

Cooper
North Sump

CPB03
BaP-eq; 194 mg/kg; 1.5'
BaP-eq; 3 mg/kg; 5'

DPW02
BaP-eq; 1.9 mg/kg; 2'

CPB05
BaP-eq; 90 mg/kg; 1.5'

CPB06
BaP-eq; 167 mg/kg; 1.5'
BaP-eq; 6.2 mg/kg; 5'

CPB07
BaP-eq; 38 mg/kg; 1.5'
BaP-eq; 19 mg/kg; 5'

CPB10
BaP-eq; 15 mg/kg; 1.5'
BaP-eq; 20 mg/kg; 5'

HPB06
BaP-eq; 7.7 mg/kg; 1.5'

CPB11R
BaP-eq; 16 mg/kg; 1.5'
BaP-eq; 6.4 mg/kg; 5'

CPB14
BaP-eq; 23 mg/kg; 1.5'

DPW04
BaP-eq; 2.9 mg/kg; 2'

HPB05
BaP-eq; 10 mg/kg; 1.5'
BaP-eq; 1.8 mg/kg; 5'

Haack
Rework Area

Cooper
South Sump

HPB07
BaP-eq; 42 mg/kg; 10'

CPB13
BaP-eq; 3.7 mg/kg; 1.5'

CPB15R
BaP-eq; 117 mg/kg; 1.5'

CPB16
BaP-eq; 17 mg/kg; 1.5'

RB01
BaP-eq; 5.5 mg/kg; 5'

RB03
BaP-eq; 9.6 mg/kg; 10'

CPB17
BaP-eq; 12 mg/kg; 1.5'

PAVED AREA

ACCESS ROAD

RESIDENTIAL

VACANT LADPW PROPERTY

ACCESS FRONTAGE ROAD

DOMINGUEZ CHANNEL

Legend

- No risk-driving chemicals detected
- Background locations
- [Chemical] ≤ RBC and/or background
- [Chemical] > RBC and/or background
- Site Property Line
- L.A. County Department of Public Works Property Line
- Private Residence Property Line
- Lateral Extent of Geo Fabric Membrane Covering Sumps on Cooper Property
- Chain-link Fence
- Building
- Railroad
- Dominguez Channel
- Approximate Sump Locations
- Approximate Location of Haack Rework Area

RB01
BaP-eq; 5.5 mg/kg; 5' = **Location ID** = Risk Driver(s); Concentration; Depth (ft bgs)

Notes

1. RBC = Risk-based concentration
2. BaP-eq = benzo(a)pyrene equivalent concentration
3. Background concentration for Arsenic = 12 mg/kg; BaP-eq = 0.90 mg/kg
4. Arsenic RBC = 17 mg/kg; BaP-eq = 1.6 mg/kg; Chromium VI (Cr VI) RBC = 54 mg/kg
5. Site-specific soil type used for vapor modeling
6. ft bgs = feet below ground surface
7. Remedial Investigation Locations included in Risk Assessment.
8. Site Features provided by Stantec on 5/15/2009 (file name: BP-GS-RI_Phase2.DWG)
9. Site Features are approximate

0 75 150 Feet

Soil Exceedances
Commercial/Industrial Worker Scenario

Gardena Sumps
1440 West Artesia Boulevard, Gardena, CA

Geosyntec consultants

San Diego, CA | NOVEMBER 2012

Figure
4-1

S:\GIS\GardenaSumps\Projects\Final_Draft_RA_SOW\Fig07_RA_Commercial_Industrial_Soil.mxd

ARTESIA BOULEVARD

NORMANDIE AVENUE

N

PAVED AREA

ACCESS ROAD

Haack North Sump

Haack Rework Area

Cooper North Sump

Cooper South Sump

CPB01
BaP-eq; 67 mg/kg; 1.5'
BaP-eq; 22 mg/kg; 5'
BaP-eq; 40 mg/kg; 10'

CPB03
BaP-eq; 194 mg/kg; 1.5'

CPB07
BaP-eq; 38 mg/kg; 1.5'
BaP-eq; 19 mg/kg; 5'

CPB05
BaP-eq; 90 mg/kg; 1.5'

CPB06
BaP-eq; 167 mg/kg; 1.5'

CPB10
BaP-eq; 15 mg/kg; 1.5'
BaP-eq; 20 mg/kg; 5'

CPB11R
BaP-eq; 16 mg/kg; 1.5'

MW-02A
Dibenz(a,h)anthracene; 4.2 µg/L

CPB14
BaP-eq; 23 mg/kg; 1.5'

HPB07
BaP-eq; 42 mg/kg; 10'

CPB16
BaP-eq; 17 mg/kg; 1.5'

CPB15R
BaP-eq; 117 mg/kg; 1.5'

CPB17
BaP-eq; 12 mg/kg; 1.5'

RESIDENTIAL

VACANT LADPW PROPERTY

ACCESS FRONTAGE ROAD

DOMINGUEZ CHANNEL

Legend

- [Chemical] in GW > RBC
- No risk-driving chemicals detected
- Background locations
- [Chemical] ≤ RBC and/or background
- [Chemical] > RBC and/or background
- Groundwater and Temporary Well
- Site Property Line
- L.A. County Department of Public Works Property Line
- Private Residence Property Line
- Lateral Extent of Geo Fabric Membrane Covering Sumps on Cooper Property
- Chain-link Fence
- Building
- Railroad
- Dominguez Channel
- Approximate Sump Locations
- Approximate Location of Haack Rework Area

HPB07
BaP-eq; 42 mg/kg; 10'
= **Location ID**
= Risk Driver(s); Concentration; Depth (ft bgs)

Notes

1. RBC = Risk-based concentration
2. BaP-eq = benzo(a)pyrene equivalent concentration
3. Background concentration for Arsenic = 12 mg/kg; BaP-eq = 0.90 mg/kg
4. Arsenic RBC for soil = 62 mg/kg; BaP-eq RBC for soil = 11 mg/kg; Chromium VI (Cr VI) RBC for soil = 73 mg/kg; Dibenz(a,h)anthracene RBC for dermal contact with groundwater(GW) = 2 µg/L
5. Site-specific soil type used for vapor modeling
6. ft bgs = feet below ground surface
7. Remedial Investigation Locations included in Risk Assessment.
8. Site Features provided by Stantec on 5/15/2009 (file name: BP-GS-RI_Phase2.DWG)
9. Site Features are approximate

0 75 150 Feet

Soil and Groundwater Exceedances
Construction Worker Scenario

Gardena Sumps
1440 West Artesia Boulevard, Gardena, CA

Geosyntec consultants

San Diego, CA | NOVEMBER 2012

Figure **4-2**

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ARTESIA BOULEVARD

NORMANDIE AVENUE

N

HPB08
BaP-eq; 3.3 mg/kg; 1.5 '

SV10
BaP-eq; 2.3 mg/kg; 5 '

CPB24
BaP-eq; 1.4 mg/kg; 5 '

CPB28
Cr VI; 31 mg/kg; 7'

CPB01
BaP-eq; 67 mg/kg; 1.5 '
BaP-eq; 22 mg/kg; 5 '
BaP-eq; 40 mg/kg; 10 '

CPB02
BaP-eq; 8.1 mg/kg; 1.5 '
BaP-eq; 0.98 mg/kg; 5 '
BaP-eq; 0.94 mg/kg; 10 '

CPB03
BaP-eq; 194 mg/kg; 1.5 '
Naphthalene; 13 mg/kg; 1.5'
BaP-eq; 3 mg/kg; 5 '

HPB113
Arsenic; 42 mg/kg; 2'
Arsenic; 13 mg/kg; 5'

HPB03
BaP-eq; 1.8 mg/kg; 10 '

Haack North Sump

Cooper North Sump

CPB06
BaP-eq; 167 mg/kg; 1.5 '
Naphthalene; 15 mg/kg; 1.5'
BaP-eq; 6.2 mg/kg; 5 '

DPW02
BaP-eq; 1.9 mg/kg; 2 '

CPB05
BaP-eq; 90 mg/kg; 1.5 '
BaP-eq; 1.2 mg/kg; 5 '

CPB08
BaP-eq; 1.2 mg/kg; 1.5 '

CPB07
BaP-eq; 38 mg/kg; 1.5 '
BaP-eq; 19 mg/kg; 5 '

HPB06
BaP-eq; 7.7 mg/kg; 1.5 '
Cr VI; 4.3 mg/kg; 5'

CPB10
BaP-eq; 15 mg/kg; 1.5 '
BaP-eq; 20 mg/kg; 5 '

HPB11
BaP-eq; 1 mg/kg; 1.5 '

CPB12
BaP-eq; 1.1 mg/kg; 10 '

HPB05
BaP-eq; 10 mg/kg; 1.5 '
BaP-eq; 1.8 mg/kg; 5 '
Naphthalene; 7.8 mg/kg; 5'

CPB14
BaP-eq; 23 mg/kg; 1.5 '

CPB11R
BaP-eq; 16 mg/kg; 1.5 '
BaP-eq; 6.4 mg/kg; 5 '

DPW04
BaP-eq; 2.9 mg/kg; 2 '

Haack Rework Area

Cooper South Sump

CPB16
BaP-eq; 17 mg/kg; 1.5 '

HPB07
BaP-eq; 42 mg/kg; 10 '

CPB13
BaP-eq; 3.7 mg/kg; 1.5 '
BaP-eq; 0.93 mg/kg; 10 '

CPB15R
BaP-eq; 117 mg/kg; 1.5 '

RB01
BaP-eq; 5.5 mg/kg; 5 '

RB02
BaP-eq; 1.5 mg/kg; 10.5 '

RB03
BaP-eq; 9.6 mg/kg; 10 '

CPB17
BaP-eq; 12 mg/kg; 1.5 '

PAVED AREA
ACCESS ROAD
RESIDENTIAL
VACANT LADPW PROPERTY
ACCESS FRONTAGE ROAD
DOMINGUEZ CHANNEL

Legend

- No risk-driving chemicals detected
- Background locations
- [Chemical] ≤ RBC and/or background
- [Chemical] > RBC and/or background
- Site Property Line
- L.A. County Department of Public Works Property Line
- Private Residence Property Line
- Lateral Extent of Geo Fabric Membrane Covering Sumps on Cooper Property
- Chain-link Fence
- Building
- Railroad
- Approximate Sump Locations
- Approximate Location of Haack Rework Area

RB01
BaP-eq; 5.5 mg/kg; 5'
= **Location ID**
= Risk Driver; Concentration; Depth (ft bgs)

Notes

1. RBC = Risk-based concentration
2. BaP-eq = benzo(a)pyrene equivalent concentrations
3. Background concentrations for Arsenic = 12 mg/kg; BaP-equivalent = 0.90 mg/kg
4. Chromium VI (Cr VI) RBC = 1.2 mg/kg; Naphthalene RBC = 4.9 mg/kg
5. Site-specific soil type used for vapor modeling
6. ft bgs = feet below ground surface
7. Remedial Investigation Locations included in Risk Assessment.
8. Site Features provided by Stantec on 5/15/2009 (file name: BP-GS-RI_Phase2.DWG)
9. Site Features are approximate

0 75 150 Feet

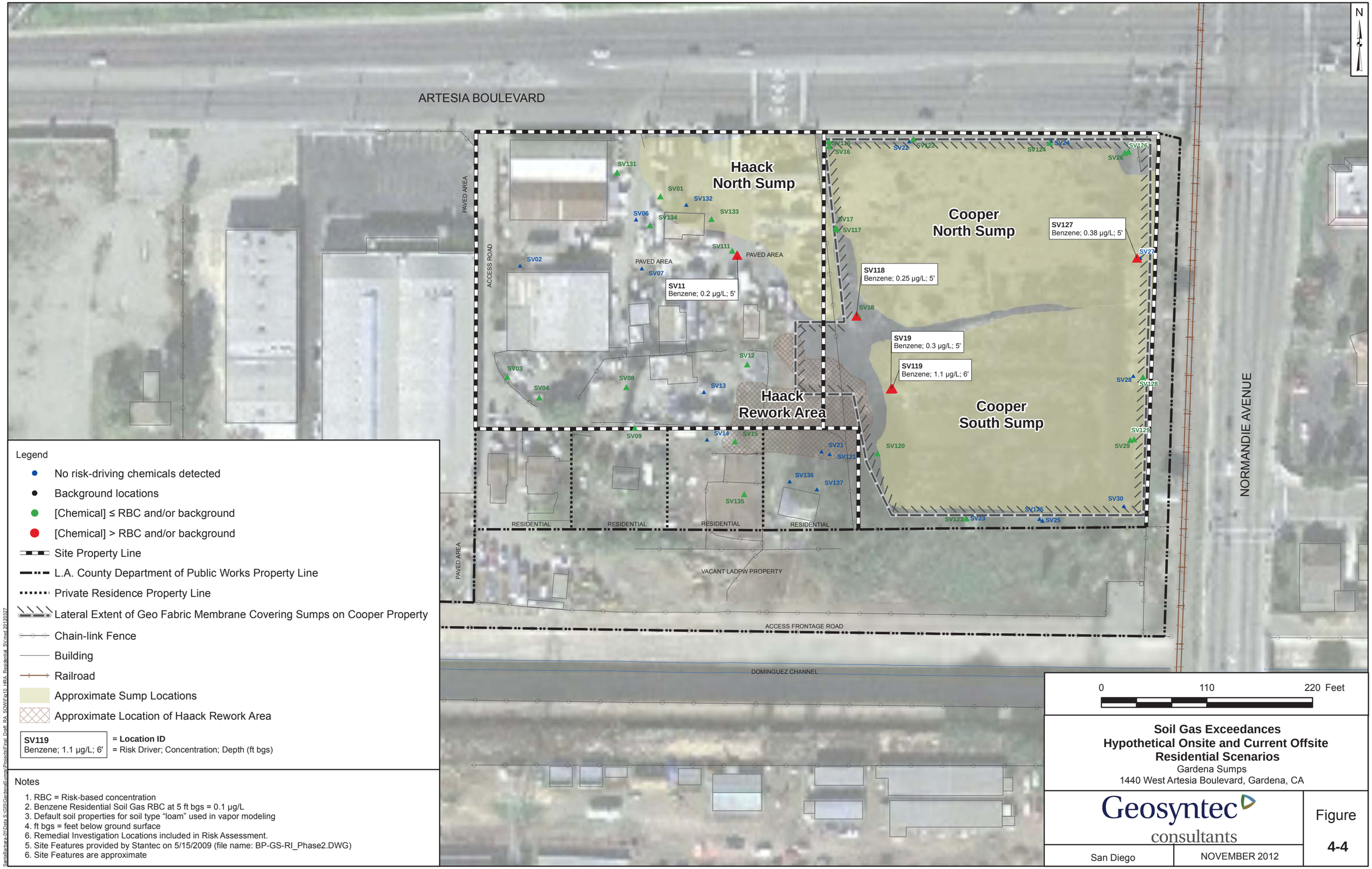
Soil Exceedances
Hypothetical Onsite and Current Offsite Residential Scenarios
Gardena Sumps
1440 West Artesia Boulevard, Gardena, CA

Geosyntec consultants

San Diego, CA | NOVEMBER 2012

Figure **4-3**

V:\GIS\Gardena Sumps\Projects\Final_Draft_RA_SOW\Fig09_HRA_Residential_Soil.mxd



Legend

- No risk-driving chemicals detected
- Background locations
- [Chemical] ≤ RBC and/or background
- [Chemical] > RBC and/or background
- Site Property Line
- L.A. County Department of Public Works Property Line
- Private Residence Property Line
- Lateral Extent of Geo Fabric Membrane Covering Sumps on Cooper Property
- Chain-link Fence
- Building
- Railroad
- Approximate Sump Locations
- Approximate Location of Haack Rework Area

SV119
Benzene; 1.1 µg/L; 6'

= Location ID
= Risk Driver; Concentration; Depth (ft bgs)

Notes

1. RBC = Risk-based concentration
2. Benzene Residential Soil Gas RBC at 5 ft bgs = 0.1 µg/L
3. Default soil properties for soil type "loam" used in vapor modeling
4. ft bgs = feet below ground surface
6. Remedial Investigation Locations included in Risk Assessment.
5. Site Features provided by Stantec on 5/15/2009 (file name: BP-GS-RI_Phase2.DWG)
6. Site Features are approximate

0 110 220 Feet

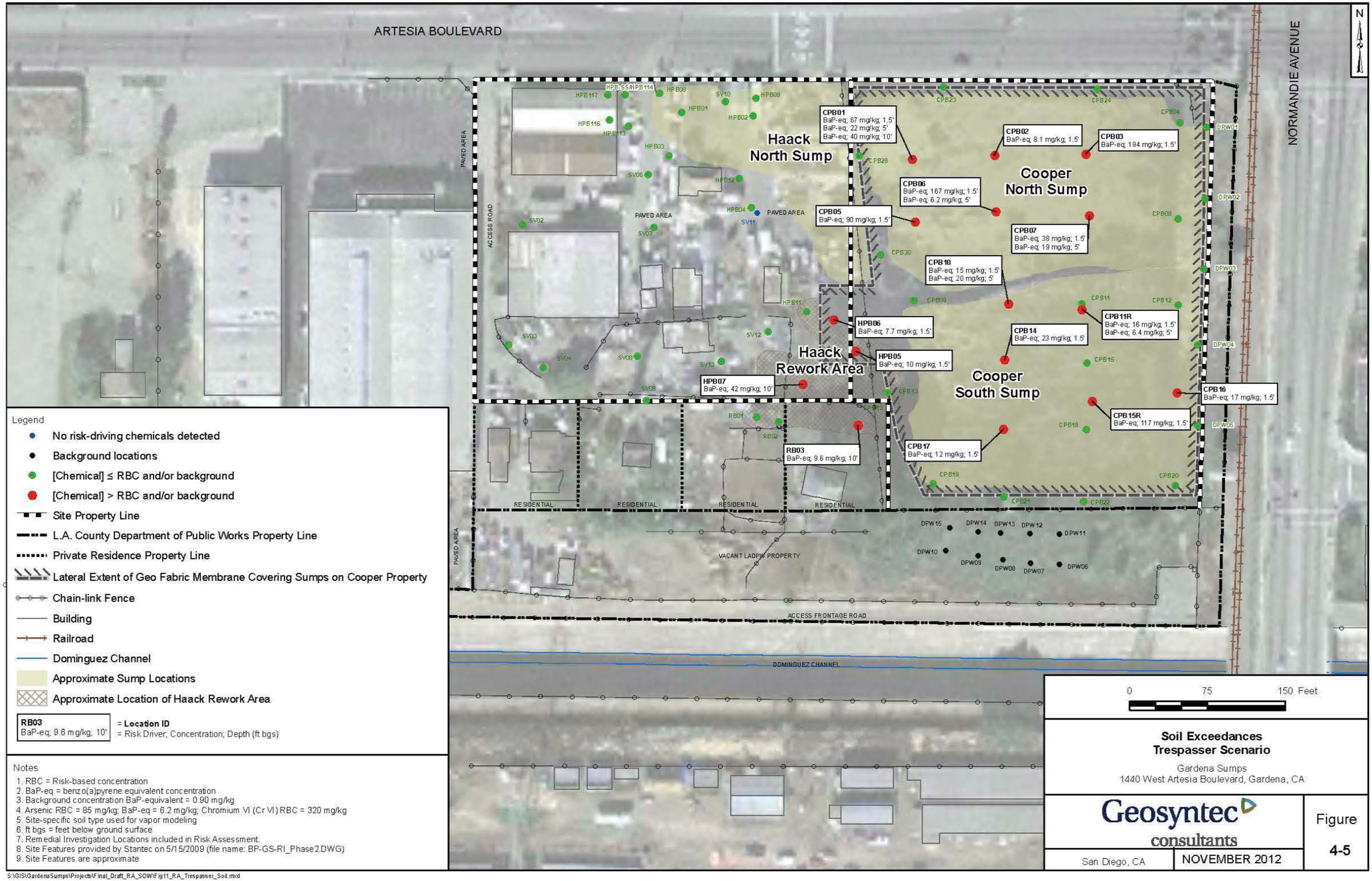
Soil Gas Exceedances
Hypothetical Onsite and Current Offsite Residential Scenarios
Gardena Sumps
1440 West Artesia Boulevard, Gardena, CA

Geosyntec consultants

San Diego | NOVEMBER 2012

Figure **4-4**

SantaBarbara-01\Data S:\GIS\Gardena\Sumps\Projects\Final Draft_RA_SOWP\Fig10_HRA_Residential_SV.mxd 20120327



Legend

- No risk-driving chemicals detected
- Background locations
- [Chemical] ≤ RBC and/or background
- [Chemical] > RBC and/or background
- Site Property Line
- L.A. County Department of Public Works Property Line
- Private Residence Property Line
- Lateral Extent of Geo Fabric Membrane Covering Sumps on Cooper Property
- Chain-link Fence
- Building
- Railroad
- Dominguez Channel
- Approximate Sump Locations
- Approximate Location of Haack Rework Area

RB03
BaP-eq; 9.6 mg/kg; 10'
= **Location ID**
= Risk Driver; Concentration; Depth (ft bgs)

Notes

1. RBC = Risk-based concentration
2. BaP-eq = benzo(a)pyrene equivalent concentration
3. Background concentration BaP-equivalent = 0.90 mg/kg
4. Arsenic RBC = 85 mg/kg; BaP-eq = 6.2 mg/kg; Chromium VI (Cr VI) RBC = 320 mg/kg
5. Site-specific soil type used for vapor modeling
6. ft bgs = feet below ground surface
7. Remedial Investigation Locations included in Risk Assessment.
8. Site Features provided by Stantec on 5/15/2009 (file name: BP-GS-RI_Phase2.DWG)
9. Site Features are approximate

Soil Exceedances
Trespasser Scenario

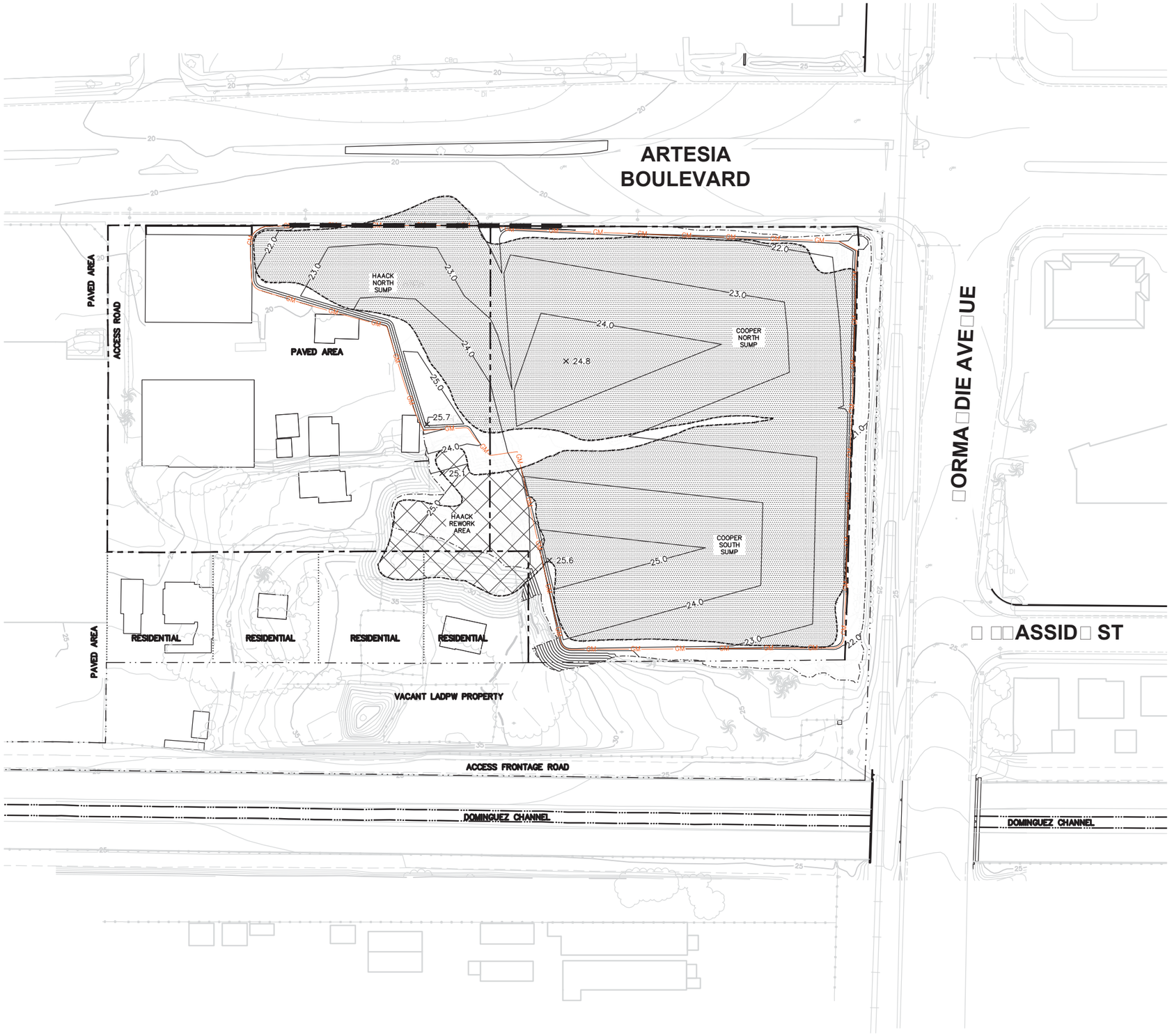
Gardena Sumps
1440 West Artesia Boulevard, Gardena, CA

Geosyntec consultants

San Diego, CA | NOVEMBER 2012

Figure **4-5**

S:\GIS\GardenaSumps\Projects\Final_Draft_RA_SOW\Fig11_RA_Trespasser_Soil.mxd



LE□E□D

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- LIMIT OF FINAL COVER GEOMEMBRANE
- PROPOSED RETAINING WALL (2 / 6–13)
- CHAIN–LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- PALM TREE
- APPROXIMATE DISTRIBUTION OF SLUDGE
- HAACK REWORK MATERIAL TO BE REMOVED

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.

0 100' 200'

SCALE IN FEET

ALTERNATIVE 2A FINAL COVER – OVERVIEW
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2012

PROJECT NO. SC0467A

FIGURE 6–1

P:\PRJ\SDCadd\CADD\SC0467A – Gardena Sumps\SC0467A-01-02\Planset_Current Set\SC0467A-6-1 to 6-4.dwg

ARTESIA BOULEVARD

C 6-4 | D 6-4 | E 6-4

1-B 6-13 | 1-A 6-13 | 2 6-13

HAACK NORTH SUMP

COOPER NORTH SUMP

COOPER SOUTH SUMP

HAACK REWORK AREA

PAVED AREA

6 6-14 | A 6-3 | B 6-3

SEE FIGURE 6-5 FOR HAACK EXCAVATION PLAN

RESIDENTIAL | RESIDENTIAL | RESIDENTIAL

VACANT LADPW PROPERTY

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- LIMIT OF FINAL COVER GEOMEMBRANE
- PROPOSED RETAINING WALL
- CHAIN-LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- APPROXIMATE DISTRIBUTION OF SLUDGE
- HAACK REWORK MATERIAL TO BE REMOVED
- EXISTING GROUNDWATER MONITORING WELL TO BE ABANDONED

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.

0 60' 120'

SCALE IN FEET

ALTERNATIVE 2A FINAL COVER
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

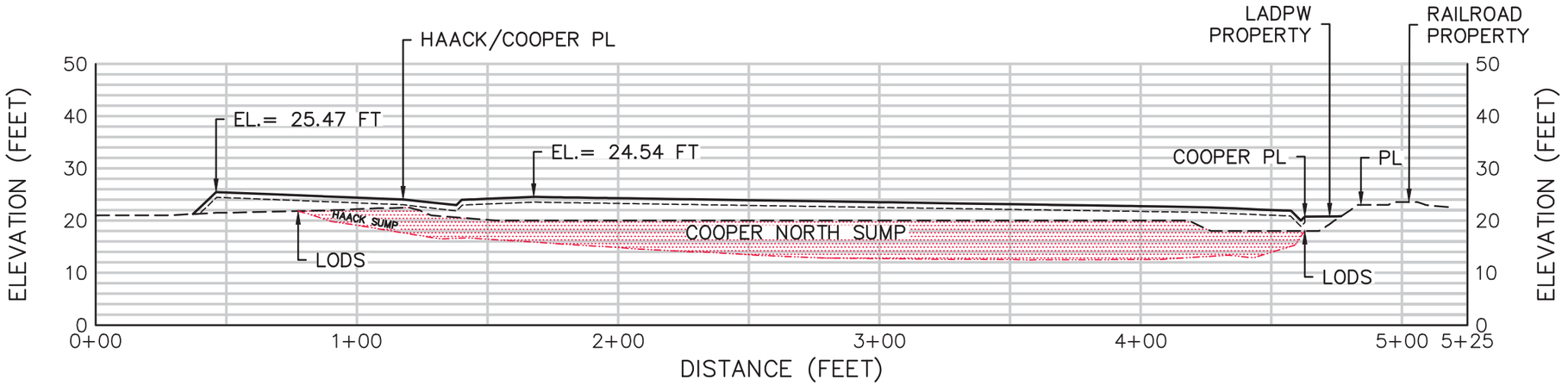
Geosyntec consultants

DATE: NOVEMBER 2012

PROJECT NO. SC0467A

FIGURE 6-2

P:\PRJ\SDCadd\CADD\SC0467A - Gardena Sumps\SC0467A-01-02\Planssets\Current Set\SC0467A-6-1 to 6-4.dwg



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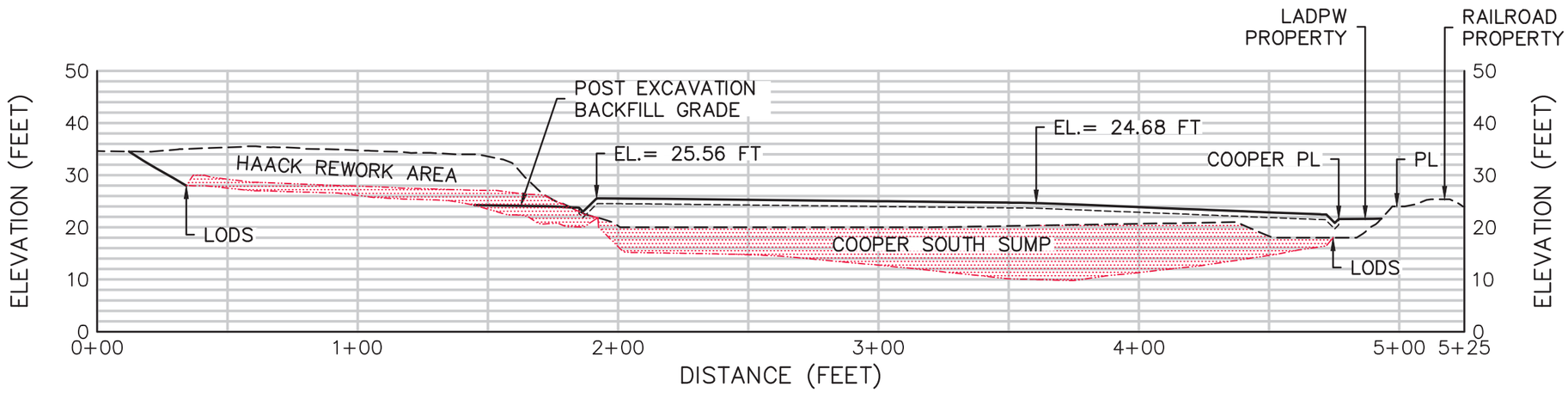

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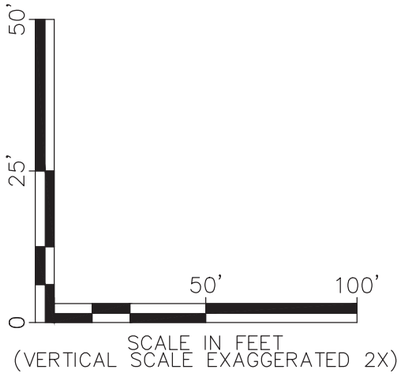


LEGEND

- EXISTING GRADE
- GEOMEMBRANE
- FINAL GRADE
- APPROXIMATE LIMITS OF DETECTED SLUDGE

NOTES:

1. LODS = LIMIT OF DETECTED SLUDGE
2. LADPW = LOS ANGELES DEPARTMENT OF PUBLIC WORKS
3. PL = PROPERTY LINE

ALTERNATIVE 2A EAST–WEST SECTIONS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

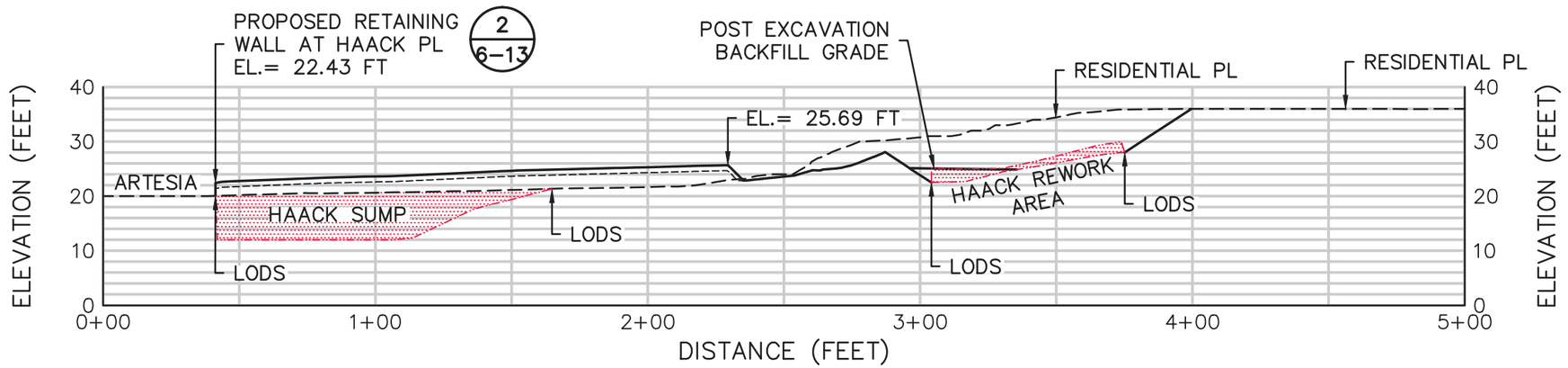
Geosyntec consultants

DATE: NOVEMBER 2012

PROJECT NO. SC0467A

FIGURE 6–3

P:\PRJ\SDCadd\CADD\SC0467A - Gardena Sumps\SC0467A-01-02\Planssets_Current Set\SC0467A-6-1 to 6-4.dwg



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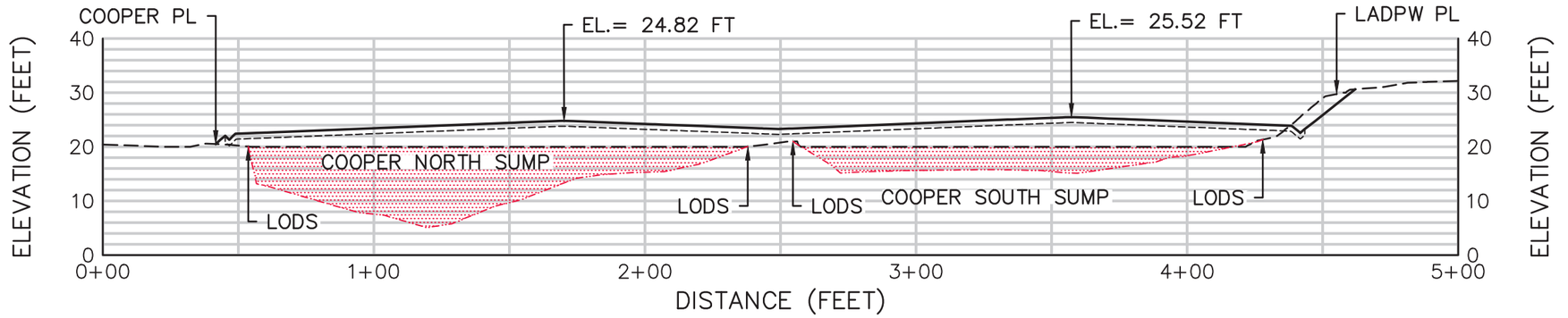

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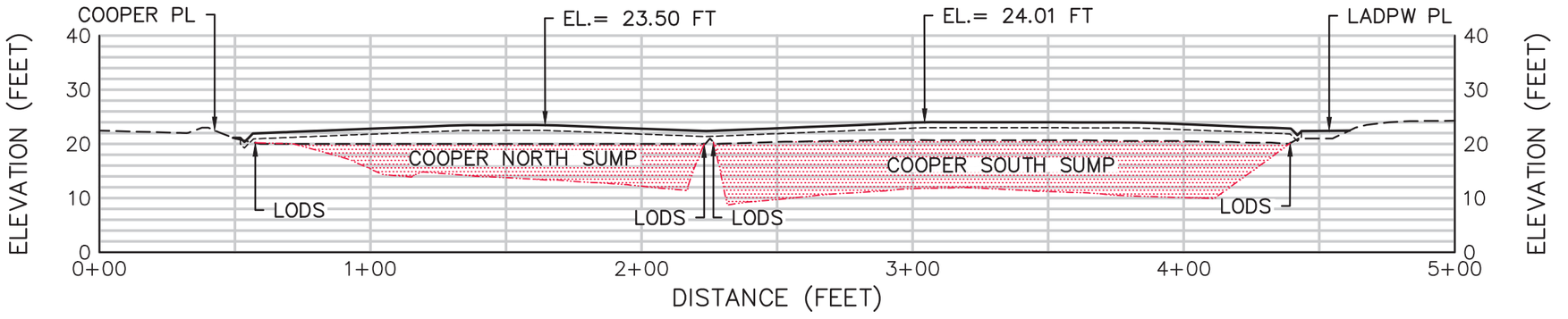

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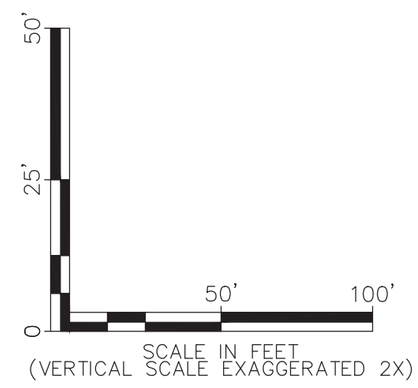


LEGEND

- EXISTING GRADE
- GEOMEMBRANE
- FINAL GRADE
- APPROXIMATE LIMITS OF DETECTED SLUDGE

NOTES:

1. LODS = LIMIT OF DETECTED SLUDGE
2. LADPW = LOS ANGELES DEPARTMENT OF PUBLIC WORKS
3. PL = PROPERTY LINE

ALTERNATIVE 2A NORTH-SOUTH CROSS SECTIONS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

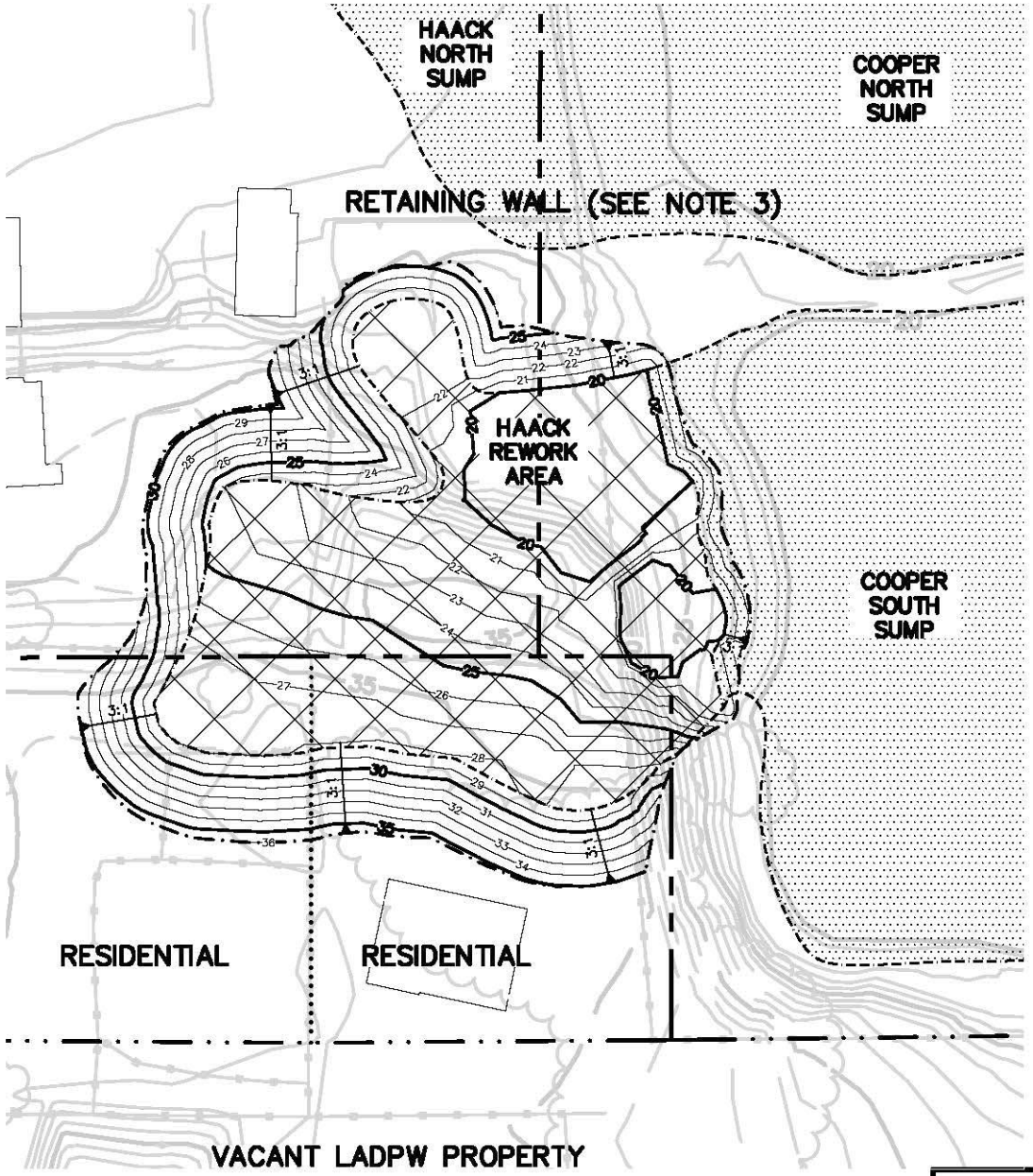
Geosyntec consultants

DATE: NOVEMBER 2012

PROJECT NO. SC0467A

FIGURE 6-4

P:\PRJ\SDCadd\CADD\SC0467A - Gardena Sumps\SC0467A-01-02\Planset_Current Set\SC0467A-20467A-6-1 to 6-4.dwg



LEGEND

- SITE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET)
- EXISTING MINOR CONTOURS (1 FOOT)
- PROPOSED FINAL MAJOR CONTOUR (5 FEET)
- PROPOSED FINAL MINOR CONTOUR (1 FOOT)
- LIMIT OF EXCAVATION
- CHAIN LINK FENCE
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- APPROXIMATE DISTRIBUTION OF SLUDGE
- HAACK REWORK MATERIAL TO BE REMOVED

0 50' 100'

SCALE IN FEET

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING RETAINING WALL TO BE DEMOLISHED PRIOR TO CONSTRUCTION.

HAACK REWORK EXCAVATION PLAN
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

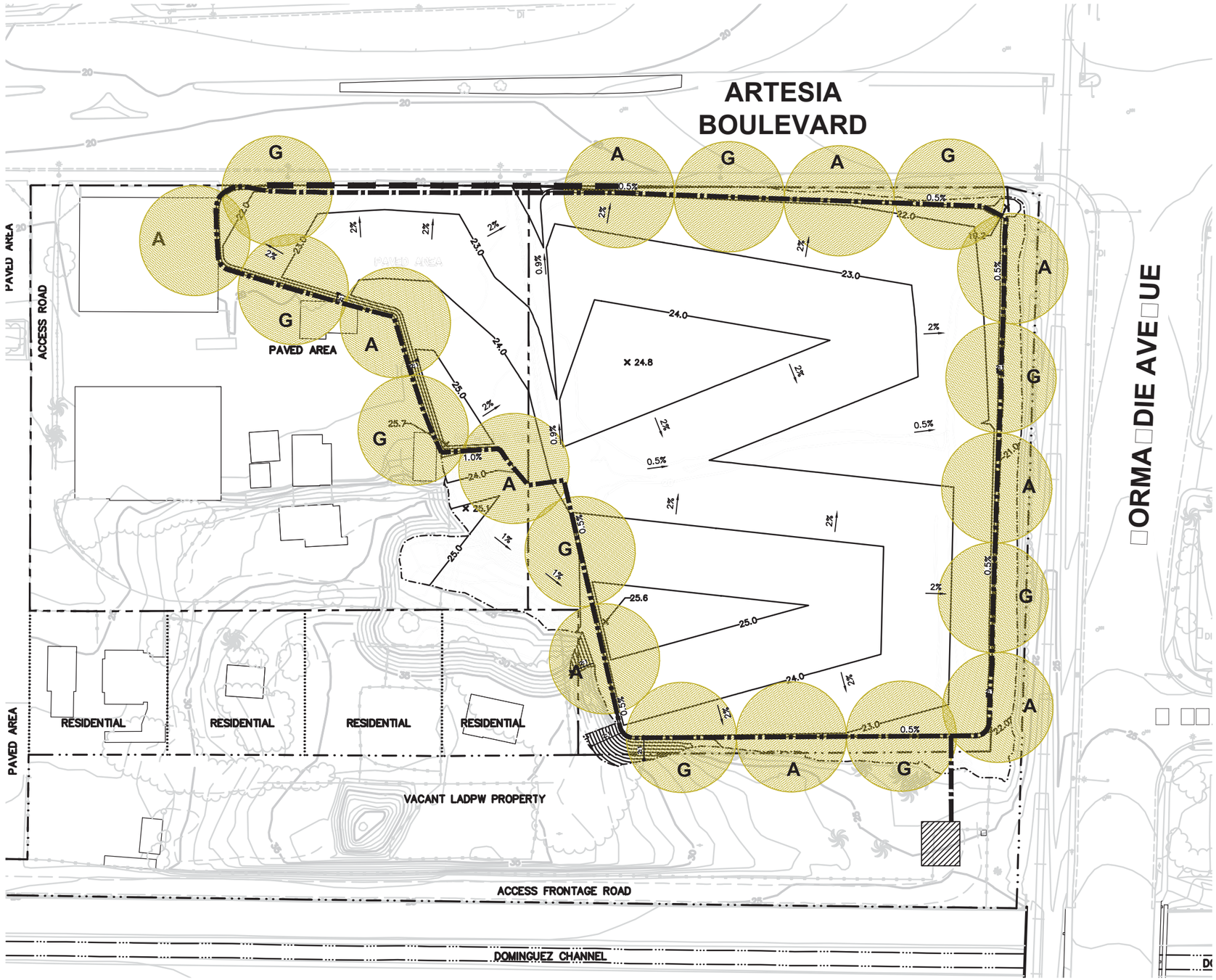
Geosyntec consultants

DATE: NOVEMBER 2012

PROJECT NO. SC0467A

FIGURE 6-5

P:\PRJ\SDCadd\CADD\SC0467A - Gardena Sumps\SC0467A-01-02\Plansets_Current Set\SC0467A-6-5.dwg



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- PROPOSED RETAINING WALL (2 / 6–13)
- CHAIN–LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH

VERTICAL GAS CONTROL WELL RADIUS OF INFLUENCE (WELL AT CENTER OF CIRCLE) (4 / 6–13)

A = AIR INLET WELL

□ = GAS EXTRACTION WELL

VERTICAL GAS COLLECTION PIPE LOCATION

PROPOSED TREATMENT SYSTEM LOCATION

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.

0 80' 160'

SCALE IN FEET

ALTERNATIVE 2A VERTICAL GAS CONTROL LAYOUT PLAN
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

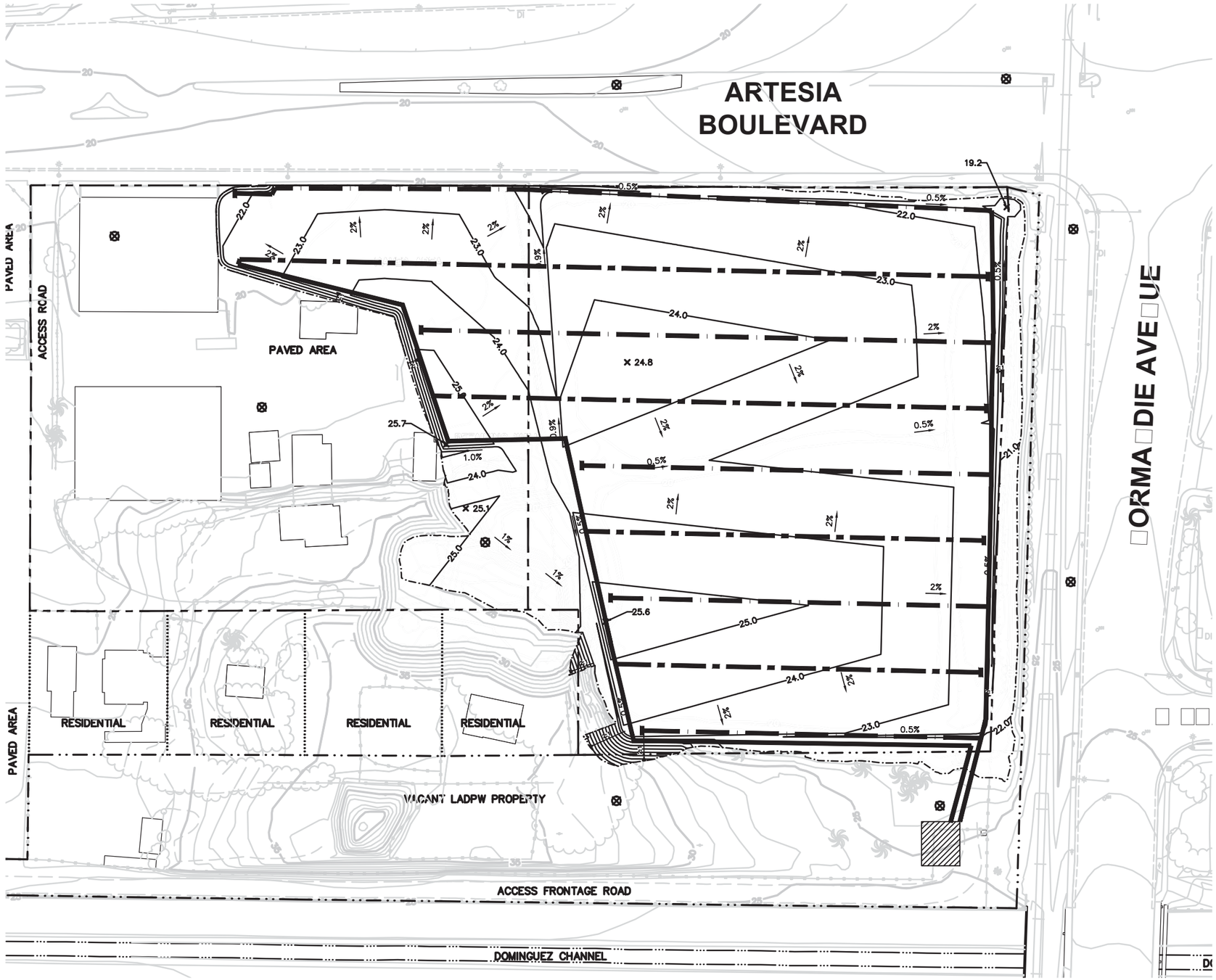
Geosyntec consultants

DATE: NOVEMBER 2012

PROJECT NO. SC0467A

FIGURE 6–6

P:\PRJ\SDCadd\CADD\SC0467A – Gardena Sumps\SC0467A-01-02\Planset_Current Set\SC0467A-6-6.dwg



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- CHAIN–LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- HORIZONTAL GAS COLLECTION GEOSTRIP
- HORIZONTAL AIR INLET GEOSTRIP
- HORIZONTAL GAS COLLECTION / AIR INLET SOLID WALL PIPE LOCATION
- PROPOSED TREATMENT SYSTEM LOCATION
- GAS MONITORING PROBE 5 / 6–13

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.

0 80' 160'

SCALE IN FEET

ALTERNATIVE 2A HORIZONTAL GAS CONTROL SYSTEM
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

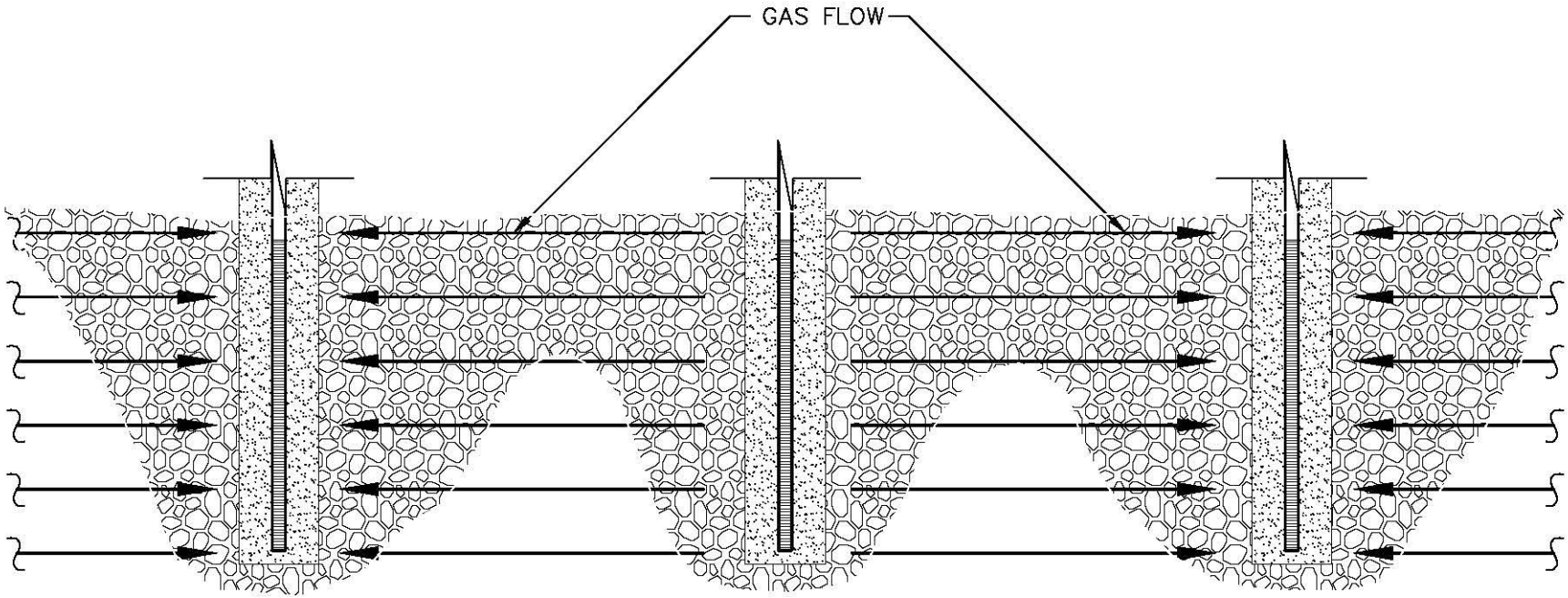
Geosyntec consultants

DATE: NOVEMBER 2012

PROJECT NO. SC0467A

FIGURE 6–7

P:\PRJ\SDCadd\CADD\SC0467A – Gardena Sumps\SC0467A-01-02\Plansets\Current Set\SC0467A-6-7.dwg



NOT TO SCALE

ALTERNATIVE 2A & 3 VERTICAL GAS CONTROL SYSTEM
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2012

PROJECT NO. SC0467A

FIGURE
6-8

P:\PRJ\SDCadd\CADD\SC0467A - Gardena Sumps\SC0467A-01-02\Plansets_Current Set\SC0467A-6-8.dwg

ARTESIA BOULEVARD

NORMANDIE AVENUE

PAVED AREA

ACCESS ROAD

HAACK NORTH SUMP

PAVED AREA

PAVED AREA

COOPER NORTH SUMP

COOPER SOUTH SUMP

HAACK REWORK AREA

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

PAVED AREA

VACANT LADPW PROPERTY

ACCESS FRONTAGE ROAD

DOMINGUEZ CHANNEL

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- 20 EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- AREA OF SUMPS TO BE NEUTRALIZED/ STABILIZED AND CAPPED
- LOCATION OF SHEET PILE SHORING
- CHAIN-LINK FENCE
- WOODEN FENCE
- FENCE
- RAIL ROAD
- BUILDING
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- APPROXIMATE DISTRIBUTION OF SLUDGE
- APPROXIMATE LOCATION OF HAACK REWORK AREA TO BE EXCAVATED AND CONSOLIDATED WITH NEUTRALIZED/ STABILIZED SLUDGE
- APPROXIMATE LOCATION OF EASTERN OVERFLOW TO BE EXCAVATED AND CONSOLIDATED WITH NEUTRALIZED/ STABILIZED SLUDGE

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.

0 80' 160'

SCALE IN FEET

ALTERNATIVE 3 SITE PLAN
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

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FIGURE 6-9

P:\PRJ\SDCadd\CADD\SC0467A - Gardena Sumps\SC0467A-01-02\Planset_Current Set\SC0467A-6-9.dwg

ARTESIA BOULEVARD

HAACK / COOPER PL

PAVED AREA

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

VACANT LADPW PROPERTY

A–A 6–15

1–D 6–15

1–C 6–15

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- AREA OF CONCERN (AFTER INITIAL EARTHWORK)
- EXISTING GRADE MAJOR CONTOURS (1 FOOT, NOTE 3)
- EXISTING GRADE MINOR CONTOURS (1 FOOT, NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- PROPOSED FINAL MINOR CONTOURS (1 FOOT)
- PROPOSED GRADING LIMIT
- CHAIN–LINK FENCE
- WOODEN FENCE
- FENCE
- RAIL ROAD
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- EXISTING GROUNDWATER MONITORING WELL TO BE ABANDONED
- EXISTING GROUNDWATER MONITORING WELL (TO BE PROTECTED IN PLACE)

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.

0 60' 120'

SCALE IN FEET

ALTERNATIVE 3 FINAL COVER
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2012

PROJECT NO. SC0467A

FIGURE 6–10

P:\PRJ\SDCadd\CADD\SC0467A – Gardena Sumps\SC0467A–01–02\Planset_Current Set\SC0467A–6–10.dwg

ARTESIA BOULEVARD

PAVED AREA

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

VACANT LADPW PROPERTY

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- AREA OF CONCERN (AFTER INITIAL EARTHWORK)
- EXISTING GRADE MAJOR CONTOURS (1 FOOT, NOTE 3)
- EXISTING GRADE MINOR CONTOURS (1 FOOT, NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- PROPOSED FINAL MINOR CONTOURS (1 FOOT)
- PROPOSED GRADING LIMIT
- CHAIN–LINK FENCE
- WOODEN FENCE
- FENCE
- RAIL ROAD
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- VERTICAL GAS CONTROL WELL RADIUS OF INFLUENCE (WELL AT CENTER OF CIRCLE) (4 / 6–13)
  - A = AIR INLET WELL
  - G = GAS EXTRACTION WELL
- VERTICAL GAS COLLECTION PIPE LOCATION
- PROPOSED TREATMENT SYSTEM LOCATION

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.

0 60' 120'

SCALE IN FEET

ALTERNATIVE 3 VERTICAL GAS CONTROL LAYOUT PLAN
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2012

PROJECT NO. SC0467A

FIGURE 6–11

P:\PRJ\SDCadd\CADD\SC0467A – Gardena Sumps\SC0467A-01-02\Planset_Current Set\SC0467A-6-11.dwg

ARTESIA BOULEVARD

PAVED AREA

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

VACANT LADPW PROPERTY

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- AREA OF CONCERN (AFTER INITIAL EARTHWORK)
- 20 EXISTING GRADE MAJOR CONTOURS (1 FOOT, NOTE 3)
- EXISTING GRADE MINOR CONTOURS (1 FOOT, NOTE 3)
- 20 PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- PROPOSED FINAL MINOR CONTOURS (1 FOOT)
- PROPOSED GRADING LIMIT
- CHAIN–LINK FENCE
- WOODEN FENCE
- FENCE
- RAIL ROAD
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- HORIZONTAL GAS COLLECTION PERFORATED PIPE LOCATION
- HORIZONTAL AIR INLET PERFORATED PIPE PIPE LOCATION
- HORIZONTAL GAS COLLECTION / AIR INLET SOLID WALL PIPE LOCATION
- PROPOSED TREATMENT SYSTEM LOCATION
- ⊗ GAS MONITORING PROBE (5 / 6–13)

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.

0 60' 120'

SCALE IN FEET

ALTERNATIVE 3 HORIZONTAL GAS CONTROL SYSTEM
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

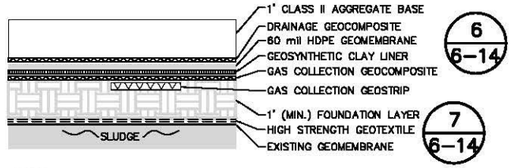
Geosyntec consultants

DATE: NOVEMBER 2012

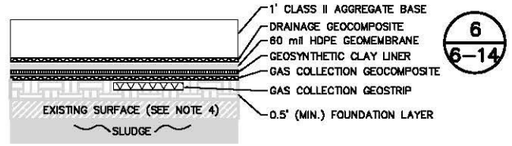
PROJECT NO. SC0467A

FIGURE 6–12

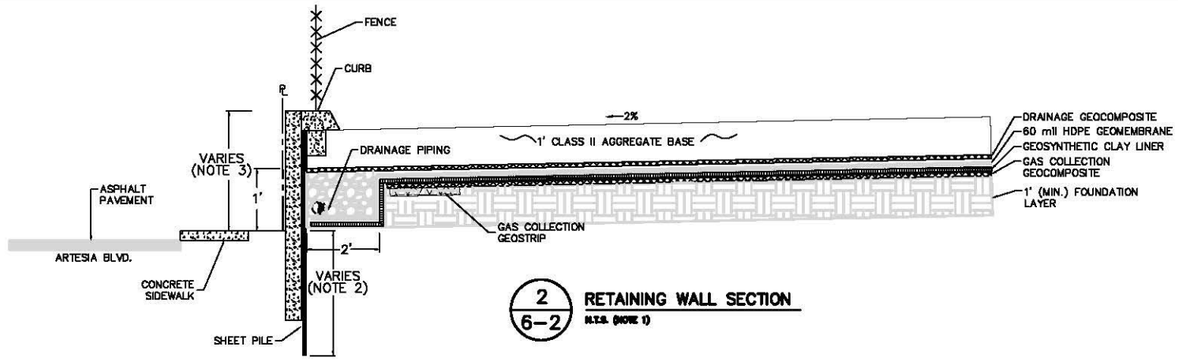
P:\PRJ\SDCadd\CADD\SC0467A – Gardena Sumps\SC0467A–01–02\Planset_Current Set\SC0467A–6–12.dwg



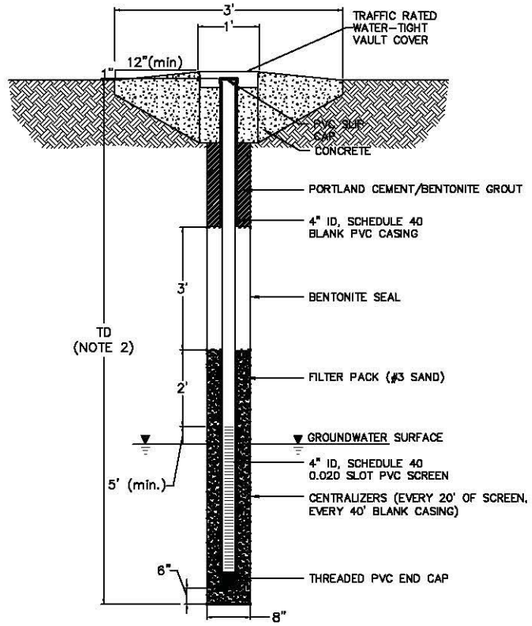
1-A / 6-2 **ALTERNATIVE 2A COOPER SUMP CAP DETAIL**
SCALE = 1" = 4' (NOTE 1)



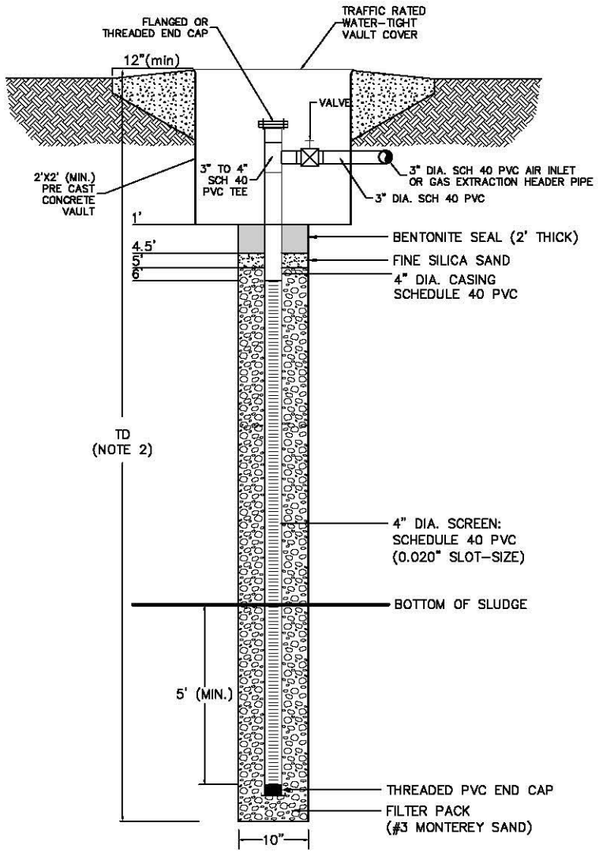
1-B / 6-2 **ALTERNATIVE 2A HAACK SUMP CAP DETAIL**
SCALE = 1" = 4' (NOTE 1)



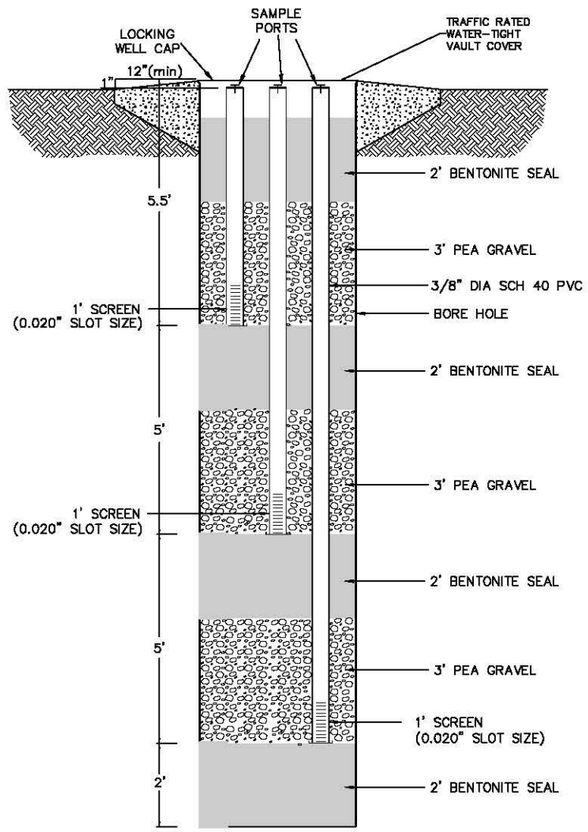
2 / 6-2 **RETAINING WALL SECTION**
N.T.S. (NOTE 1)



3 **DETAIL**
NEW MONITORING WELL
N.T.S.
P:\PRJ\SDCadd\Library\Monitoring_wells\MW_Flush.dwg



4 / 6-6,6-11 **ALTERNATIVE 2 AND 3 CONCEPTUAL**
VERTICAL GAS CONTROL WELL
N.T.S.
P:\PRJ\SDCadd\Library\Gas System\Gas044.dwg



5 / 6-7 **DETAIL**
GAS MONITORING PROBE
N.T.S.
P:\PRJ\SDCadd\Library\Gas System\Gas044.dwg

NOTES:

1. GEOSYNTHETIC THICKNESS EXAGGERATED FOR CLARITY.
2. FINAL CONSTRUCTION DEPTHS BASED ON FIELD CONDITIONS. ALL DEPTHS IN FEET BELOW GROUND SURFACE.
3. FINAL RETAINING WALL HEIGHT DEPENDENT ON FINAL CAP ELEVATIONS. MAXIMUM RETAINING WALL HEIGHT IS 23 FT MSL.
4. EXISTING SURFACE IS DEGRADED ASPHALT OR CONCRETE. SURFACE WILL BE PROTECTED IN PLACE.

ALTERNATIVE 2A & 3 DETAILS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

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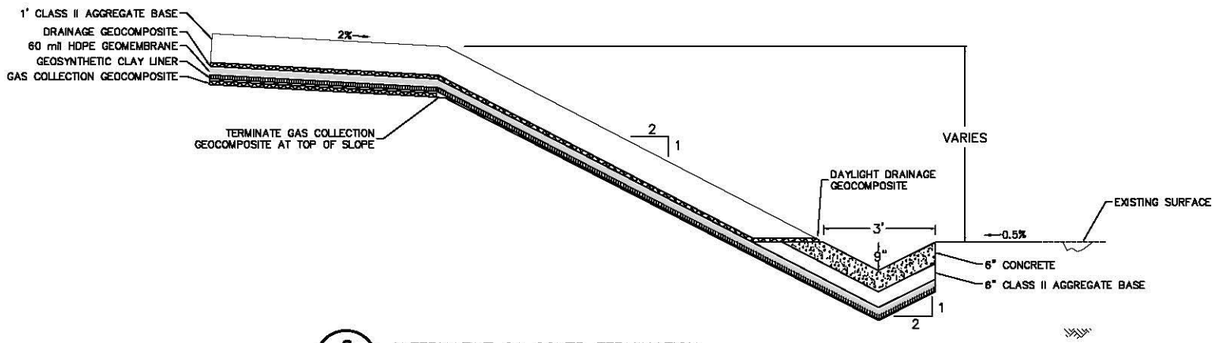
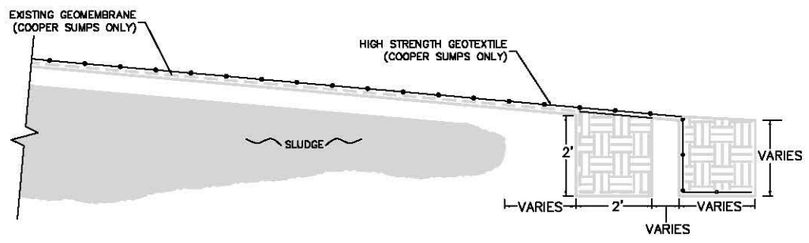
FIGURE
6-13

P:\PRJ\SDCadd\CADD\SC0467A - Gardena Sumps\SC0467A-01-02\Planssets_Current Set\SC0467A-6-14.dwg



6/6-2 **ALTERNATIVE 2A COVER TERMINATION**
SCALE = 1" = 4' (NOTE 1)



7/6-13 **ALTERNATIVE 2A HIGH STRENGTH GEOTEXTILE ANCHOR TRENCH DETAIL**
SCALE = 1" = 4' (NOTE 1)

NOTES:

1. GEOSYNTHETIC THICKNESS EXAGGERATED FOR CLARITY.

ALTERNATIVE 2A DETAILS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2012

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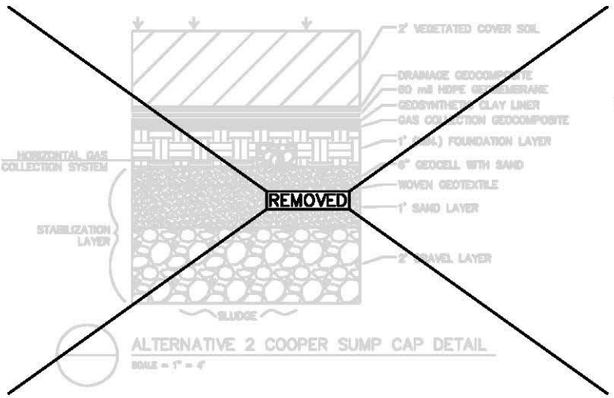
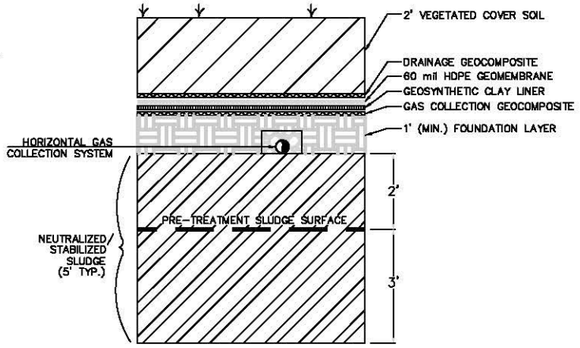
FIGURE 6-14

P:\PRJ\SDCadd\CADD\SC0467A - Gardena Sumps\SC0467A-01-02\Plansets_Current Set\SC0467A-6-14.dwg



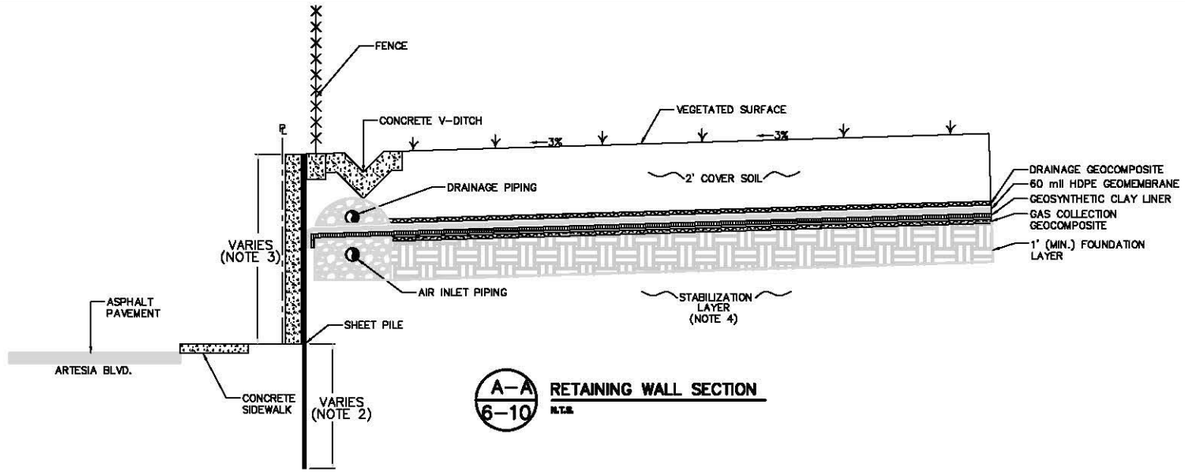
ALTERNATIVE 2 COOPER SUMP CAP DETAIL

SCALE = 1" = 4'



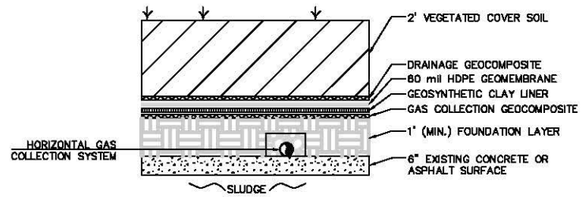
1-C / 6-10 ALTERNATIVE 3 COOPER SUMP CAP DETAIL

SCALE = 1" = 4'



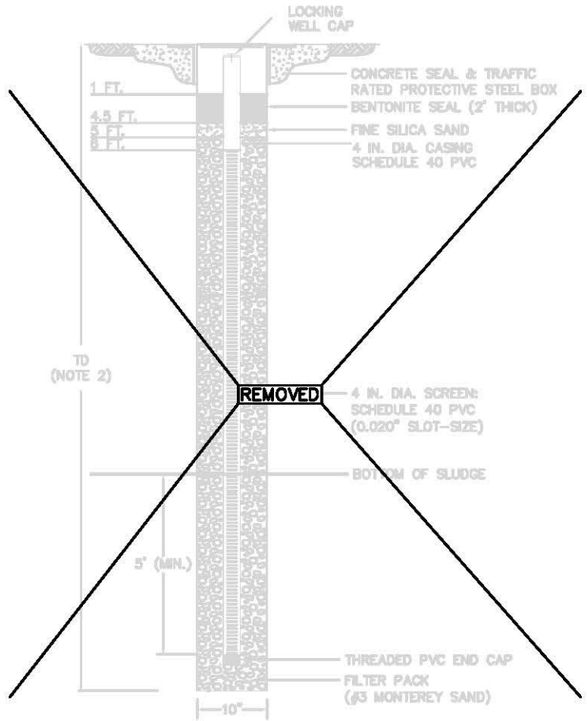
A-A / 6-10 RETAINING WALL SECTION

N.T.S.



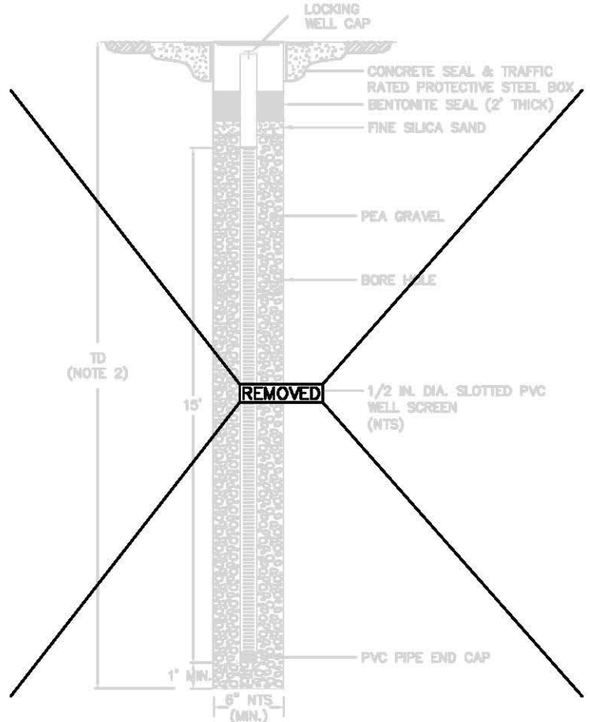
1-D / 6-10 ALTERNATIVE 3 HAACK SUMP CAP DETAIL

SCALE = 1" = 4'



ALTERNATIVE 2 AND 3 CONCEPTUAL VERTICAL GAS CONTROL WELL

N.T.S.



DETAIL GAS MONITORING PROBE

N.T.S.

NOTES:

1. GEOSYNTHETIC THICKNESS EXAGGERATED FOR CLARITY.
2. FINAL CONSTRUCTION DEPTHS BASED ON FIELD CONDITIONS. ALL DEPTHS IN FEET BELOW GROUND SURFACE.
3. FINAL RETAINING WALL HEIGHT DEPENDENT ON FINAL CAP ELEVATIONS.
4. STABILIZATION LAYER VARIES DEPENDING ON PROPERTY LOCATION AND ALTERNATIVE.

ALTERNATIVE 3 DETAILS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2012

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FIGURE 6-15

P:\PRJ\SDCadd\CADD\SC0467A - Gardena Sumps\SC0467A-01-02\Planssets_Current Set\SC0467A-6-15.dwg

ARTESIA BOULEVARD

HPB08 SV10 HPB09 HPB01 HPB02

HAACK NORTH SUMP

CPB29 CPB28 CPB01 CPB02 CPB03

COOPER NORTH SUMP

DPW01 DPW02 DPW03

PAVED AREA

PAVED AREA

CPB06 CPB07 CPB08 CPB05 CPB30

HPB11 CPB10 CPB11R CPB12 DPW04

HPB05 CPB14 CPB15

HPB07 CPB13

HAACK REWORK AREA

COOPER SOUTH SUMP

CPB16 DPW05

RB01

CPB17 CPB18

CPB19 CPB20

RESIDENTIAL RESIDENTIAL RESIDENTIAL

VACANT LADPW PROPERTY

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- PRELIMINARY EXCAVATION MAJOR CONTOURS
- PRELIMINARY EXCAVATION MINOR CONTOURS
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- LOCATION OF SHEET PILE SHORING
- CHAIN–LINK FENCE
- WOODEN FENCE
- FENCE
- RAIL ROAD
- BUILDING
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- APPROXIMATE DISTRIBUTION OF SLUDGE
- APPROXIMATE LOCATION OF HAACK REWORK AREA
- COOPER PROPERTY SOIL/SLUDGE BORINGS
- HAACK PROPERTY SOIL/SLUDGE BORINGS
- LA COUNTY D.P.W. SOIL SAMPLES
- SOIL GAS SAMPLES

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09
2. BORING LOCATIONS PROVIDED BY STANTEC ON 10/21/10.
3. SITE FEATURES ARE APPROXIMATE.
4. DEPTH OF EXCAVATION BASED ON BOTTOM OF SLUDGE AS REPORTED ON BORING LOGS (STANTEC, 2008 AND STANTEC, 2010A)

0 60' 120'

SCALE IN FEET

ALTERNATIVE 4 PROPOSED MINIMUM EXCAVATION DEPTHS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2012

PROJECT NO. SC0467A

FIGURE 6–16

P:\PRJ\SDCadd\CADD\SC0467A – Gardena Sumps\SC0467A-01-02\Plansets_Current Set\SC0467A-6-16.dwg

FIGURES

APPENDIX A

Responses to Comments

Geosyntec consultants

Revised Final Draft FS Report Section No.	Original FS Report Section No.	Addendum Section No.	Comment Date	Comment No.	DTSC Comments	Geosyntec Response
ES; 3.2.6	ES; 3.2.6		3/30/2011	Greg Sweel -7	Remove the speculative statement regarding perched water being related to leaking utilities and note that perched water has also been detected at several areas beneath the site.	The statement regarding perched water being related to leaking utilities has been removed. The Draft FS pages ES-5 and 18 errata sheets are included with Attachment 1.
ES-11; 7.3.3.9; 7.3.4.9; 7.3.5.9; 8.2.10	ES-11; 7.3.3.9; 7.3.4.9; 7.3.5.9; 8.2.10	5.9	6/9/2011	Greg Holmes - 7	p. 49, "Community Acceptance": The U.S. EPA RI/FS guidance states: "The modifying criteria are formally assessed after the public comment period. However, state or community views are considered during the feasibility study to the extent they are known." Since ARC and DTSC have met with the City of Gardena (the City) and now know its views, community views should be addressed in the feasibility study. In the meeting on May 10, 2011 between DTSC, the City of Gardena and ARC, the following was discussed:	The Addendum addresses the “Community Acceptance” concerns of the City of Gardena presented in Comment 7a below.
ES-11; 8.2.10	ES-11; 8.2.10	5.9	6/9/2011	Greg Holmes -3	p. ES-11, "Community Acceptance": This criterion should be addressed at the present time. See specific comment No.7 below.	A general discussion of community acceptance for Alternatives 1, 2, 3, and 4 is discussed in Section 5.9 of the Addendum. The City of Gardena desires to have a commercial structure(s) located at the Site. Alternative 2A has been conceptually designed to minimize the height of the containment cap and provide support for a future parking lot consisting of automobile and light truck traffic on the Cooper property. The removal of sludge from the Haack Rework Area will allow for the construction of a commercial structure on that portion of the Site.
ES-12; 8.3	ES-12; 8.3	6	6/9/2011	Greg Holmes -5	p. ES-12, last sentence: The statement "Alternative 2 would also best accommodate future potential redevelopment of the Site" is not supported. Please provide text to support this statement, or remove it.	The Addendum removes this statement.
ES-8; 6.1.2.5	ES-8; 6.1.2.5	3.3.7	6/9/2011	Greg Holmes -1	p. ES-8, second bullet: A health and safety plan, construction quality assurance plan, and risk management plan are not institutional controls. See EPA 540-F-00-005 for examples of institutional controls. An institutional control that should be included is a land use covenant to place a deed restriction on the site.	Land use restrictions were discussed in Section 6.1.2.5 of the Draft FS and are discussed in Section 3.3.7 of the Addendum. Specific institutional controls for Alternative 2A are zoning restrictions, groundwater use restrictions, land use covenants, and conservation easements in accordance with EPA 540-F-00-005. Appropriate institutional controls are being evaluated and will include a land use covenant.
ES-8; 6.1.2.5	ES-8; 6.1.2.5	3.3.7	6/9/2011	Greg Holmes -2	p. ES-8, third bullet: Same comment as above.	See response to Comment 1. (Greg Holmes -1)
2.4	2.4		3/30/2011	Greg Sweel -15	Replace the word "board" with "broad" in Section 2.4.	This replacement has been made. The Draft FS page 7 errata sheet is included with Attachment 1.
2.5	2.5		3/30/2011	Greg Sweel -3	Include a discussion of the listed beneficial uses for groundwater beneath the site as described in the Regional Water Quality Control Board Basin Plan	The site is located within the West Coast Basin of the Los Angeles Groundwater Basin. Based on the Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties, the West Coast Basin has existing beneficial uses for Municipal and Domestic Supply Wells, Agricultural Supply, Industrial Process Supply, Industrial Service Supply, and Aquaculture (LARWQCB, 1994).
4.4	4.4	2.1	6/6/2011	Efrem Neuwirth -2	Section 4.5: Remedial Action Objectives: HERO recommends modifying the RAO for vapor intrusion risks to include potential health risks from hydrogen sulfide and explosive risks from methane. While the proposed remedies may accomplish this goal, achieving the narrative goal should be explicitly stated. Benzene in soil-gas within one area in the sump was the only chemical in soil gas identified in the HHRA which individually was found in any location to contribute to risks above 1 x 10^{-6} or a hazard of 1.0. However hydrogen sulfide which is the main soil gas health risk was not included in the HHRA. Methane was present at some locations although at relatively low levels. However HERO still recommends that the remedial action as well as the proposed mitigation consider methane to insure that this status does not change in the future.	The Addendum includes a section that addresses the potential health risks of hydrogen sulfide and methane for the FS alternatives.
4.4	4.4	2.1	6/6/2011	Efrem Neuwirth - Conclusions and Recommendations	HERO recommends making modest changes to the remedial action objectives for vapors and gases including modification of the RBC for benzene, adding an RBC for hydrogen sulfide, and monitoring for methane.	The risk-based concentrations were based on reasonable and protective input parameters used in the approved baseline risk assessment for current and future commercial and residential receptors. Therefore, we believe that no further modification is needed. Potential hazards to H_2S and methane from sludge material is addressed as a part of the remedial alternatives discussion in the Addendum to the FS.
4.5	4.5	2.2	10/31/2011	Greg Sweel -1	Include prevention of dermal contact with the low pH sludge, in addition to PAHs, as one of the listed remedial objectives.	Prevention of dermal contact with the low pH sludge will be included with remedial objectives.
4.5	4.5	2.2	11/11/2011	Efrem Neuwirth -1	HERO appreciates that the remedy alternatives address contact with the sludge to deal with the chronic risks from the PAHs and other COPCs, however HERO still recommends that the remedial objectives state that acute risks from direct physical contact should also be addressed by the remedy.	Prevention of dermal contact with the sludge will be included with remedial objectives.
4.5	4.5	2.2	3/30/2011	Greg Sweel -9	Include prevention of dermal contact with low pH sludge on the list of remedial action objectives.	Section 2.2 of the Addendum lists the prevention of dermal contact as one of the remedial objectives.
4.5	4.5	2.2	3/30/2011	Greg Sweel -10	Replace "benzene" with "volatile organic compounds" on the list of remedial action objectives.	The word “benzene” has been replaced with “volatile organic compounds” in Section 2.2 of the Addendum.

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4.5	4.5	2.2	6/6/2011	Efrem Neuwirth -1	Section 4.5: Remedial Action Objectives: HERO recommends an addition to the remedial action objectives for the site which incorporate the numerical RBCs. HERO recommends adding a narrative objective of preventing all future direct contact with the sludge material to prevent potential acute dermal toxicity from the complex PAH mixture and acids in the sludge. The proposed remedies may accomplish this goal; however, achieving this goal should be explicitly stated.	The Risk Based Concentrations (RBCs) are generally incorporated into the remedial action objectives (RAOs) in the discussion of prevention of ingestion, inhalation, and dermal contact with sludge or soil in excess of the 10^{-5} to 10^{-6} cancer risk as represented by arsenic, hexavalent chromium, naphthalene, benzo(a)pyrene equivalence (BaP-eq), dibenz(a,h)anthracene, and VOCs (Section 4.5 of the Draft FS, Section 2.2 of the Addedum). The RBCs are specifically incorporated into the site-specific action levels discussed in Section 4.8.1 of the Draft FS. The Addendum includes a section that addresses the prevention of future direct contact with the sludge.
8		5	5/2/2011	Tizita Bekele -General	Four remedial alternatives including no action are considered for the site. The description of the alternatives is not detailed enough for proper evaluation. The detailed analysis of the alternatives is lacking in demonstrating why the preferred alternative, alternative 2, is superior over the rejected alternatives, specifically alternative 4, excavation and off-site disposal. Although the difference in the estimated cost of alternative 2 and 4 is significant, other factors, such as implementability and compatibility with future land use, should be discussed in detail for the cost/benefit evaluation of each alternative.	A detailed design of the chosen alternative will be presented following the submittal of the Remedial Action Plan, as part of the Remedial Design document. Additional details for the comparative analysis have been added to Section 5 of the Addendum.
6.1.2.2			9/6/2012	Perry Myers -3	The proposed high strength geotextile will be placed above the existing geomembrane which appears to have experienced minor tears and punctures in the past. This could lead to exposure of the high strength geotextile to the low pH sludge. The performance of the existing geomembrane and the high strength geotextile and the expected useful life in contact with the low pH sludge should be evaluated as an aid in choosing a feasible remedy and account for future replacement costs.	ARC, in response to the existing tears and minor punctures within the existing geomembrane, is in the process of overlaying the existing geomembrane with a fabric reinforced 45 mil thick polypropylene ethylene copolymer (PEC) geomembrane designed and manufactured nearly identical to the existing geomembrane. The proposed high-strength geotextile will be manufactured from polypropylene. Polypropylene has been shown to be compatible with low pH environments (SI Geosolutions, 1997). A statement that a polypropylene geotextile will be utilized has been included in the Revised Final Draft FS in Section 6.1.2.2.
6.1.2.2			9/6/2012	Perry Myers -4	In the April 4, 2012 response to DTSC comments from Steven Hariri, it was indicated that the actual design of the parking lot on top of the proposed cap would be deferred to the developer. However, it is our opinion that it would be in order to address any possible traffic or other load limitations/restrictions, based on typical traffic expected in a commercial/retail development, that are related to the cap design in the FS.	The preliminary loading used in the evaluation of the high strength geotextile was the weight of the dozer and "finger fill" soil during construction corresponding to a pressure at the surface of the geotextile of 720 pounds per square foot. This is the design pressure for the selection of geotextile strength needed to support the construction loading. Once the first foot of soil is placed above the geotextile, the bearing capacity is higher (accounting for strength of the soil layer over the geotextile and sludge) and the ability of the cap to support additional surface loads gets better with additional material thickness. Therefore, the traffic loading is expected to not affect the geotextile design. Final design will account for a 200 psf traffic loading on the completed surface.
3.2.1	3.2.1		3/30/2011	Greg Sweel -8	Include the range of pH values detected from the sludge in Section 3.2.1.	The range of pH values has been included in Section 3.2.1. The Draft FS page 8 errata sheet is included with Attachment 1.
					HERO disputes that the input parameters under discussion (site-specific soil properties, including building height) utilized in calculating the risk based concentrations were all agreed to in previous meetings and/or memorandum. HERO refers the reader to the letter/memorandum dated February 12, 2009 (after the referenced phone call) from Kyle Christie representing ARCO to Joseph Cully, DTSC Project Manager. What is agreed to in the response to comment 1 in that memorandum is the use of the US EPA default values for loam (following future GSU approval of that soil type classification) for the HHRA and use of the measured site-specific properties (soil moisture content included) in the uncertainty section. Hero was unable to find any documentation of the review of the soil type, however, HERO will accept the loam classification since the effects on the modeled vapor intrusion risks are likely to be within an acceptable range. However, the soil moisture content offered for use of 0.244 is not well within the expected values for loam material. It is in fact, the upper bound of the range of moisture for that soil type (0.061-0.24 v/v, see Table 10 in the USER'S GUIDE FOR EVALUATING SUBSURFACE VAPOR INTRUSION INTO BUILDINGS, available at http://www.epa.gov/oswer/riskassessment/airmodel/pdf/2004_0222_3phase_users_guide.pdf.	Soil physical property data were collected as part of the original investigation work for the Remedial Investigation for the site. Eight samples were collected from a depth of 5 feet and 15 feet below ground surface (bgs) from 4 locations. This data was summarized and used in the risk assessment. Subsequent to the original data, additional moisture content data was collected in July 2009 to evaluate whether the moisture content of 0.244 is a reasonable assumption to use in the modeling. This data was transmitted to DTSC November 2010 (Stantec, 2010). Moisture content data provided in the Revised Draft Remedial Investigation Addendum was collected at many locations across the site with a total of 32 samples collected at depths up to 10 feet bgs. When reviewing the data from the top 10 feet, the average moisture content by dry weight is 15.2 percent. This value is very similar to and actually slightly higher than the average moisture content used in the risk assessment of 14.9 percent

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4.8.1; Table 4-4	4.8.1; Table 4-4		11/11/2011	Efrem Neuwirth -3	HERO still recommends utilizing the default soil properties for the generic soil type at this time. If site-specific properties including moisture content are to be used in calculating risk based concentrations for soil-gas, then a sufficient amount of samples representative of the soil on-site need to have been collected and analyzed to determine if they are representative of all site soils and do not vary to a significant extent. This is especially true in regards to locations adjacent to sludge where the future monitoring system and buildings will be located, in comparison with soil locations above or below layers of the sludge. HERO is unaware of such an analysis having been performed. Please provide this information with all appropriate documentation so the site-specific properties can be evaluated. HERO also notes that the samples are not applicable to new imported soils in the Haack Rework area. Information will need to be provided to demonstrate that imported soil has the same site-specific physical properties as the pre-existing soil if the risk based concentrations are to be applicable to soil-gas in the proposed Haack removal area. HERO accepts the use of 12-ft ceiling height for this Site in calculating the commercial/industrial risk based concentrations. HERO notes that the increased volume from 12-ft ceiling height has only a minor effect on the risk evaluation.	(0.244 volumetric moisture content). Due to the large number of samples collected across the site the moisture content has been well defined and the value of 0.244 is considered appropriate for use in the modeling. It is acknowledged that information will need to be provided to document that any new import soil brought onto the site is of the same soil type and has similar soil-physical properties as what was assumed in the modeling. This will be addressed through the construction specifications which will require a certain type of soil and gradation.
6.1.2.2		3.3.1	10/31/2011	Greg Sweel -2	Sludge beneath portions of the Haack sump have been observed to daylight through the asphalt surface and beyond the concrete adjacent to the sidewalk along Artesia Boulevard. Portions of the existing asphalt surface have been compromised and these conditions should be addressed in the FS.	ARC has also noticed that sludge daylights through areas of the Haack parking lot asphalt and in one area beneath the edge of the concrete cap over the Haack sump adjacent to the Artesia Boulevard sidewalk. ARC and DTSC personnel also observed, during a December 2011 Site visit, that the integrity of portions of the Haack asphalt was significantly degraded. ARC informed the DTSC that areas of degraded asphalt would be overlain by new asphalt prior to commencing with the installation of the Haack Sump cap foundation layer. A sheet pile wall will be installed adjacent to the sidewalk and Artesia Boulevard along the north side of the Haack sump. This will contain sludge within the Haack sump minimize sludge from daylighting along Artesia Boulevard and the sidewalk. Section 3.3.1 of the FS Addendum is revised as follows: The existing geomembrane surface on the Cooper Property and concrete and asphalt surfaces above the Haack Sump will remain in place and the cap will be installed above these surfaces. New asphalt will be placed above the existing, degraded areas of asphalt surface over the Haack Sump prior to the initiation of cap construction on the Haack property. The geomembrane, asphalt, and concrete surfaces will provide a barrier to minimize worker dermal exposure to sludge contact as well as gas generation and release. Additionally, the concrete and asphalt surfaces will provide strength to the cap on the Haack Sump, eliminating the need for the high-strength geotextile described in Section 3.3.2.
6.1.2.2		3.3.3	10/31/2011	Greg Sweel -8	Confirm that excavation to 20 feet above mean sea level will remove the sludge and sludge impacted materials from the Haack Rework area. Include or provide a plan to collect confirmation samples.	Confirmation sampling to determine the presence of sludge below an elevation of 20 feet mean sea level will be performed following excavation of the Haack Rework area to its planned excavation grade. A Confirmation Sampling Plan will be prepared in the Remedial Action Plan.
6.1.2.2		3.3.4	5/2/2011	Tizita Bekele -1	The potential for release of hydrogen sulfide and sulfur dioxide during the excavation and consolidation of the sludge/soil and sludge material in Haack Rework area and the eastern edge of the sumps should be discussed in detail.	Section 3.3.4 of the Addendum discusses measures to minimize the release of hazardous vapors during excavation of the Haack Rework Area sludge.
6.1.2.2		3.3.1	5/2/2011	Tizita Bekele -4	In addition to displacement, there is a potential for hydrogen sulfide and sulfur dioxide release as the sludge would be disturbed during placement of stabilization material. A detailed assessment of the potential toxic gas releases and mitigation measures to curb the impact should be included.	The preservation of the existing surface materials (asphalt and concrete over the Haack sump and the geomembrane liner over the Cooper sumps) above the three sumps in Alternative 2A (see section 3.3.1 of the Addendum) minimizes disturbance of the sludge and generation of toxic gas releases during placement of the geotextile and foundation layer above the sludge. Vapor control during construction is addressed in Section 3.3.4 of the Addendum.
6.1.2.2	6.1.2.2	3.3.3	6/6/2011	Efrem Neuwirth -4	Following possible removals of sludge, HERO recommends sampling soil-gas for VOCs, hydrogen sulfide and methane to insure that the residual risks are acceptable.	Sludge will be removed from the Haack Rework Area based on visual criteria. There are no plans to perform soil-gas sampling after the removal of the sludge since the source of the VOCs, hydrogen sulfide, and methane will have been removed.
6.1.2.2	6.1.2.2	3.3.3	6/6/2011	Efrem Neuwirth -7	Please describe in greater detail the proposed removal of soil from the HAACK rework area and what if any reworked soil may be left behind. What would be the elevation of the land relative to the adjacent sumps and the homes following the removal? Would there be a need to import fill material? Conceivably, RBCs or future· action objectives for soil gases might need adjusting if the characteristics of the soil are significantly changed.	A detailed description of sludge removal from the Haack Rework Area and land surface elevations is included in the Addendum, Section 3.3.3. It is not anticipated that the soil characteristics will be significantly different as fill material will consist of onsite material and/or fill material meeting a specific grain size distribution and compaction requirements dictated in construction specifications (to be developed during Remedial Design).

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6.1.2.2		3.3.4	6/9/2011	Greg Holmes -General	A proposed new alternative, as discussed below, should include excavation of sludge from the "rework" area and shipment offsite for disposal. This new alternative should also include measures to prevent the release of hazardous vapors.	The Addendum to the Gardena Sumps Draft FS presents Alternative 2A. Alternative 2A was requested by the DTSC during a meeting between the DTSC, the City of Gardena, and ARC on 10 May 2011 and includes a modification of the containment cap alternative presented in the Draft FS. Alternative 2A includes the excavation of sludge from the Haack Rework Area. This sludge will be transported offsite for disposal. Haack Rework soil-sludge material may be placed under the containment cap in the Cooper Sumps portion of the site as part of the foundation soil necessary to achieve drainage design criteria. Reworked soil overburden currently above the sludge may be utilized as part of the foundation layer of the containment cap as described in Section 3.3.3 of the Addendum. Section 3.3.4 of the Addendum discusses measures to minimize the release of hazardous vapors during excavation of the Haack Rework Area sludge.
6.1.2.2		3.3.3	6/9/2011	Greg Holmes -7b	The City and the DTSC representatives requested that the FS consider off-site disposal of impacted soil to be excavated as part of the recommended remedial alternative rather than incorporation of such soil below the cap.	The Addendum addresses offsite disposal of impacted material such as the Haack Rework material (Section 3.3.3); however, the elevation concerns will not be alleviated by offsite disposal of this material. As described in the response to Comment 6, above, the height of the cap presented in Alternatives 2 and 3 is the result of meeting stability and drainage requirements of 22 CCR and 27 CCR. The estimated 6,500 cubic yards (CY) of impacted material is only 17% of the 39,200 CY of soil necessary to create the final cover grades for Alternatives 2 and 3. Alternative 2A will incorporate a thinner cap which will require less fill than Alternative 2. The Haack Rework soil-sludge material may be used as part of Alternative 2A's foundation layer, beneath the low-hydraulic conductivity layer; however, the description of its use and the cost estimates are based on off-site disposal.
					It is stated that the material below Artesia Boulevard and the adjacent sidewalk is considered capped and will be left in place. Given that a permanent cap is proposed as a remedy for the onsite sludge please clarify the basis of the assumption that this material is capped and provide analysis showing that the cover on this material would provide the same level of protection and for the same duration as the proposed onsite cap.	An explanation of the mapped boundaries of sludge as depicted in Figure 2AS and other figures in the December 2010 'Addendum to the August 22, 2008 Revised Draft 2006 Remedial Investigation Report' and Figure 3-2 (clarification sheet 17) of the April 2012 Revised Feasibility Study is required to clarify the statement that the sludge material beneath Artesia Boulevard is capped. In early 2009 the DTSC staff and ARC agreed that future revised maps illustrating the lateral distribution of sludge would address sludge of any thickness or at any depth encountered and exclude mixtures of soil-sludge material. Boring AB-101, drilled within Artesia Boulevard, was located to the north of the location of the northern Haack Sump berm and encountered asphalt, roadbase and constructed fill to 2.8 feet bgs. A sludge layer having an apparent thickness of approximately 0.5 to 0.75 feet was encountered at 5.5 feet bgs and was overlain and underlain by deposits of reworked soil-sludge material, indicating that this sludge layer had also been re-worked and was not a continuation of the Haack Sump. Borings AB-102 and AB-103, drilled near AB-101, encountered asphalt, roadbase and constructed fill to a depth of 6 feet bgs but no sludge material. The 2009 mapping agreement results in the extension of mapped sludge into Artesia Boulevard. However, it is interpreted that the sludge encountered in AB-101 is a large fragment of sludge displaced from the Haack Sump during the significant widening and reconstruction of Artesia Boulevard in the mid-1950s. The occurrence of reworked soil-sludge material (including larger fragments of sludge) with a thickness of approximately 3.75 feet lies beneath a small portion of Artesia Boulevard. This reworked soil-sludge material is capped by approximately 2.75 feet of asphalt, roadbase, and fill material that meets Cal Trans standards for state highway construction. This soil-sludge mixture is contained to the west by approximately 2.5 feet of asphalt and roadbase material underlain by approximately 4.25 feet of reworked clay and silt (boring AB-100) and contained to the north and east by approximately 2.5 feet of asphalt and roadbase material underlain by approximately 3.5 feet of reworked silty sand and sandy silt (borings AB-102 and AB-103). The soil-sludge mixture would be contained to the south by the proposed sheet pile cut-off wall.

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6.1.2.2			9/6/2012	Perry Myers -9		Code of Federal Regulations (CFR) Title 40, Part 264.310 designates the requirements for a hazardous waste landfill cover which includes: provide long-term minimization of migration of liquids through the closed landfill, function with minimum maintenance, promote drainage and minimize erosion or abrasion of the cover; accommodate settling and subsidence so that the integrity is maintained, and have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present. The concrete and asphalt "caps" currently over the sludge deposits have not shown evidence of settlement since their installation. They provide a relatively impermeable surface to minimize infiltration into the sludge deposits. The permeability of the current asphalt is unknown but asphalt with permeabilities as low as 10^{-7} cm/s can be achieved. Furthermore, the City of Gardena maintains the roadway such that the asphalt surface remains in good condition. The area of Artesia Boulevard that overlays the soil-sludge material shows no evidence of differential settlement, even with heavy truck traffic. As part of the institutional controls, the requirement for a low-permeability asphaltic concrete paving will be included when Caltrans repaves the portion of Artesia Blvd covering the sludge material.
6.1.2.2			9/6/2012	Perry Myers -10	Alternative 2A proposes to use the Haack Rework Area material as part of the foundation layer beneath the Haack, Cooper North or Cooper South Sumps or off haul it for disposal. However, about half (2670 CY) is indicated to be sludge and a soil-sludge mixture and would appear to be unsuitable for use as foundation material. The FS should further justify use of the sludge/soil as foundation material.	It is proposed to only use the Haack overburden soil as foundation material. The text has been revised to reflect this.
6.1.2.2			9/6/2012	Perry Myers -11	Figure 3-1 of the FS Addendum depicts the sludge in the area between the Haack and Cooper North Sumps as continuous, requiring the anchor trench for the high strength geotextile to be constructed in the sludge. The FS should discuss how contact with this low pH material affects the performance and life expectancy of the geotextile, whether the proposed anchor trench in this area will need modifying to provide adequate bearing capacity and lateral resistance, and gas mitigation measures that will be necessary due to disturbing the sludge.	The 2009 mapping agreement resulted in the Haack Sump – North Cooper Sump berm being illustrated as a continuous sludge deposit. ARC believes that the Haack and Cooper North Sump are not one contiguous sump at depth. Borings CPB28, CPB29 and CPB30 were drilled to investigate if these two sumps were contiguous. All three of these borings encountered one to two discrete, thin sludge layers (<1.0 feet thick) within the upper 5.0 feet of the ground surface. These discontinuous sludge layers are interbedded with reworked fill which consists of a mixture of silt, brick debris and sludge fragments. ARC's interpretation is that the discontinuous sludge layers represented surficial overflow deposits which were then buried with reworked fill materials as the height of the berm was increased. The December 1941 aerial photograph (Figure C-7 of the 2008 revised draft RI report) and the September 1946 aerial photograph (Figure C-8 of the 2008 revised draft RI report) show the Haack Sump – North Cooper Sump berm where the anchor trench is proposed to be located. The high strength geotextile will not be negatively impacted by small amounts of sludge which may be present within the anchor trench, as described in response to comment No. 6. Material excavated from the anchor trench containing sludge will not be used to backfill the trench and will be used as foundation material beneath the capor disposed of offsite depending on the properties of the material. The cost estimate conservatively assumes the material will be disposed of offsite.
6.1.2.3		3.2.1, 3.2.2, 3.2.3	2/10/2012	Steven Hariri -3	ESPO recommends a minimum of two feet of foundation layer as required by 27CCR§21090(a)(1).	In order to accommodate the City of Gardena's request for a reduced cap height, a minimum 1 foot foundation layer thickness was designed. The 1 foot thickness is a minimum and will generally occur along the perimeter of the cap. The foundation thickness increases with the 2 percent graded slope to a maximum of approximately 3.5 feet. During design of the final cap, an evaluation will be provided which demonstrates that the differential settlement of waste and ultimate land use will not affect the structural integrity of the final cover in accordance with 27CCR§21090(a)(1).
6.1.2.3		3.3.5.4	2/10/2012	Steven Hariri -5	The one foot of base above the geomembrane may not be protective of the geomembrane from heavy construction equipment required for development. Therefore, ESPO recommends a total cover over the cap of a minimum of eighteen inches to two feet comprised of infiltration and erosion layers (27CCR§21140(b) and 40CFR258.60(a)) unless an equivalent is demonstrated. The total cover can include the full structural section of base with asphaltic concrete (AC) or portland concrete cement (PCC) surface layer.	During design of the final cap, the puncture resistance of the geomembrane will be evaluated for construction and longer term loading (as understood at the time of final design). Final design will evaluate the loading conditions (construction and long term), adjacent material particle sizes, and drainage composite nonwoven geotextile mass per unit area to appropriately protect the underlying geomembrane hydraulic barrier. Results of the engineering calculations will be used to prepare technical specifications that may limit the size of construction equipment operating on the aggregate base and prepare minimum requirements for material index properties (e.g. aggregate maximum particle size, minimum mass per unit area of geotextile, etc.).

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6.1.2.3		3.2.1, 3.2.2, 3.2.3	2/10/2012	Steven Hariri -6	ESPO recommends the consideration of other membranes such as linear low-density polyethylene (LLDPE) or polyvinyl chloride (PVC) geomembrane in lieu of HDPE to mitigate future differential settlement and longevity of the geomembrane.	The high density polyethylene (HDPE) liner was primarily selected due to its chemical resistance, particularly with respect to the acidic materials found in the sumps. The basis of this selection was determined during the McColl Superfund design where HDPE geomembrane was tested in contact with the acidic waste (similar to the Gardena Sumps waste) and found to be suitable for the final cover application. Linear Low Density Polyethylene (LLDPE) and Polyvinyl Chloride (PVC) are generally regarded as more flexible than HDPE with significant elongation prior to breaking; however, both are not recommended due to chemical resistance less than that of HDPE. Given past experience with using HDPE geomembranes for final cover hydraulic barriers at the McColl, Del Amo, and Thomas Ranch site remediation projects, HDPE is the desired geomembrane for the Gardena Sumps site.
6.1.2.3		3.3.5.6	3/30/2011	Greg Sweel -2	Describe the current site topography and explain how the proposed remedial option may affect these features	A detailed description of the current site topography is found in Section 5.1.1 of the Addendum to the 22 August 2008 Revised Draft 2006 Remedial Investigation Report (RI Addendum). Site topography is illustrated in Figures 9A, 9AS, 17AS through 17KS of the RI Addendum report. A detailed description of anticipated land surface elevations is included in Alternative 2A of the Addendum.
6.1.2.3		3.3.5	3/30/2011	Greg Sweel -12	Extend the sheet piling around all sump perimeters to prevent lateral spread.	Lateral spread of sludge has been shown to be contained at depth by the existing berms and excavation sidewalls; therefore sheet piles around the sump perimeters are not needed. Additionally, the geosynthetic liner components of the cap will be secured using an anchor trench around the perimeter of the sumps. The anchor trench will further minimize the lateral spread of the sludge as the liner will be anchored two feet deep along the perimeter of the sumps thereby acting as a vertical cut-off barrier at the top of the sludge sumps. The anchor trenches are further discussed in Section 3.3.5 of the FS Addendum. Sheet piles will be utilized at the northern boundary of the Haack and Cooper properties along portions of Artesia Boulevard to provide an above grade retaining wall approximately 3-feet high.. The top of the sheet piles that are exposed above Artesia Boulevard will have a decorative facing.
6.1.2.3		3.3	5/2/2011	Tizita Bekele -3	Adding the stabilization material would displace the sludge that could result in overflow of waste material to the surrounding areas and possibly spread to unimpacted areas in the subsurface. A detailed description of how the stabilization material will be placed, and how overflow and possible subsurface spread of sludge material will-be prevented, should be included.	A detailed description of site preparation, high-strength geotextile installation, and foundation layer placement for Alternative 2A is provided in Section 3.3 of the Addendum. The geotextile and foundation layer will utilize anchor trenches located beyond the perimeter of the sludge to secure them above the sludge. This design will minimize the opportunity for the overflow and spread of the sludge to areas outside of the detected sludge limits.
6.1.2.3	8.3	3.3.5.1	5/2/2011	Tizita Bekele -9	Section 8.3-The basis and assumptions for a 3.5 foot stabilization layer across the sumps should be provided.	The 3.5-foot stabilization layer across the sump is based on preliminary evaluations of necessary stability for construction activities and supporting construction loading. The stabilization material was shown to provide adequate support for similar sludge and low strength soil capping construction projects. The basis and assumptions for Alternative 2A are provided in the Addendum.
6.1.2.3	6.1.2.3	3.3.5.6	6/9/2011	Greg Holmes -6	p. 38, "Erosion Resistance Layer": Please describe the change in topography that would result from construction of this layer, particularly the final elevation above street level in various portions of the cap.	The erosion resistance layer for Alternatives 2 and 3 contributes to 2 feet of the total cover thickness per California Code of Regulation, Title 22 (22 CCR), Section 66264.228(e)(14). The minimum thickness of the cover is 6.5 feet which accounts for the 3.5-foot stabilization layer, 1-foot (minimum) foundation layer, and 2-foot erosion resistance layer. The maximum cover thickness would be approximately 12.5 feet due to increasing the foundation layer to 9.5 feet to create a cover surface with 3 percent (%) slopes. The maximum elevation of the cover for Alternatives 2 and 3 is 35 feet amsl. Artesia Boulevard north of the Haack property has an elevation of approximately 20 feet amsl. Along Artesia Boulevard, the Alternatives 2 and 3 cap elevation varies from approximately 26 feet amsl to 29 feet amsl resulting in a retaining wall height along Artesia Boulevard between 6 and 9 feet high. A discussion concerning the containment cap's topography that will be generated by Alternative 2A is included in the Addendum. A minimum 1-foot foundation layer will be placed on top of a high-strength geotextile. The erosion resistance layer for Alternative 2A will be comprised of 1-foot of Class II aggregate base, in accordance with 22 CCR, Section 66264.228(e)(10). Therefore, the minimum thickness of the cover for Alternative 2A is 2 feet and the maximum thickness would be 4.5 feet to achieve a 2% slope and maintain perimeter drainage. The maximum elevations of the covers for Alternative 2A are 25.7, 24.8, and 25.6 feet amsl on the Haack, Cooper North, and Cooper South sumps, respectively, or approximately 4.5 to 6 ft higher than the Artesia Blvd elevation of 20 ft asml. Along Artesia Boulevard, the cap elevation varies from approximately 20 feet amsl to 22.5 feet amsl. Above the retaining wall, a 0.5 ft curb will be constructed to direct stormwater to the stormwater channels. The cover retaining wall and curb result in a retaining wall height along Artesia Boulevard no greater than 3 feet high.

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6.1.2.3	6.1.2.3	3.3.5.6	6/9/2011	Greg Holmes -7a	The City's representatives expressed their concerns that the recommended remedial alternative would be a "landfill", their concerns over the height of the proposed soil and cap, and the proposed construction of a retaining wall. They indicated that this alternative proposes an incompatible solution to the vision and goal of the community of Gardena which is to move toward future development of the site.	The Addendum presents Alternative 2A which is similar to the cap presented in Alternatives 2 and 3 from the FS, but has been re-engineered to have a lower overall height.
6.1.2.3			9/6/2012	Perry Myers -2	The functioning of the high strength geotextile as presented in the Cover Evaluation Calculation Packages dated February 1, 2012 appears to depend on the placement of a stabilizing berm outside of the sludge footprint prior to placement of intermediate (finger fill) berms. However, the existing sludge footprint would appear to extend to or beyond the property lines along the east and north portions of the site. In addition, sheet piling is proposed along portions of the north property boundary. It appears that the absence of space for placement of a stabilizing layer either beyond the south and north, or east and west margins of the sludge footprint would significantly impact the feasibility/constructability of the proposed cap.	Along the eastern portion of the Site, the high strength geotextile would be anchored within the Los Angeles Department of Public Works (LADPW) property. North of the Haack Sump, geosynthetics would be secured to the sheet pile walls utilizing battens. If necessary, concrete anchors with battens may be utilized in portions of the site with limited access to reduce the size of the geotextile anchors.
6.1.2.3			9/6/2012	Perry Myers -7	The proposed sheet piling along the north margin of the Cooper and Hack Sumps are likely to be in sludge or soil-sludge materials with pH ranging from less than one to more than nine. The FS should discuss the long term effects of the variable pH material on the sheet piling and any effects on the expected life in this setting. An effective life of the sheet piling should be estimated and a cost for replacement included in the cost estimate.	Steel can corrode when exposed to low pH and/or hydrogen sulphide environments. This is a typical environment in the petroleum industry and, as a result, many coatings have been developed to protect the steel from these environments. A coating, such as the Wasser Polyflex 204, will be used on the sheet piles to minimize corrosion of the steel sheet piles. The sheet pile unit price for Alternatives 2 and 3 includes the cost for the protective coating.
6.1.2.3			9/6/2012	Perry Myers -8	The easterly margin of the sludge material appears to coincide with the easterly site property line. This would appear to preclude room for an anchor trench within nonsludge soil materials. Please discuss how the anchor trench along this portion of the site would be configured.	Please see the response to 9/6/12 ESPO comment #2. (Perry Meyers - 2)
6.1.2.3; Table 8-1		3.3.5; Table 4-1	5/2/2011	Tizita Bekele -2	An estimation of the amount of stabilization material for Alternative 2 should be included.	The amount of stabilization material for Alternative 2 was provided in the attached cost estimate tables. The estimated volume was 8,100 CY of gravel, 4,100 CY of sand, and an additional 2,100 CY of sand to be used as geocell fill. The amount of foundation material for Alternative 2A is provided in Section 3.3.5 as well as Table 4-1.
6.1.2.4		3.3.6	2/10/2012	Steven Hariri -9	Please discuss the methods used to prevent fugitive emissions via air inlets or passive vents off gassing into the atmosphere. Furthermore, the proposed vapor probes, passive operation of vertical and horizontal gas extraction system with air inlets to comply with SCAQMD Rule 1150.1 requirements.	The gas control wells will be operated as an active system until it is demonstrated they can be operated passively based on permit limitations on total organic carbon (TOC) concentrations in soil gas and risk-based concentrations developed for Site constituents of concern (COCs). Passive operation will occur if emissions via the air inlet or gas outlet wells are below permit limitations. For additional operational details, please see the response to Comment 5 (3/7/12) received from Greg Holmes.
6.1.2.4	6.1.2.4	3.3.6.3	3/7/2012	Greg Holmes -5	HERO is also concerned about the response to comment #3 because it is not yet clear what the decision-making process will be for determining whether the future vapor mitigation system will be run as active or passive, as well as design issues such as the lateral distance of future buildings to the sumps. As mentioned above, HERO prefers beginning with a more protective risk-based number developed using the default properties for loam. When developing an Operation and Maintenance plan for the future vapor mitigation system, HERO recommends considering other relevant information such as spatial and temporal variability of measurements at monitoring points and the magnitude in concentration changes, instead of a simple comparison with risk-based concentrations, in the decision-making process.	As stated in response 3, the soil-gas risk based concentrations (RBCs) have been re-evaluated with default loam soil properties. The vapor mitigation system will be operated actively for a period of time defined in a future Operations, Maintenance, and Monitoring (OMM) Plan. During initial operation, soil gas data, including constituents extracted and their concentrations, will be collected. The need for active gas collection will be based on the extracted soil gas COC concentrations and associated, calculated health risk goals. If start-up data indicates that COC concentrations are below risk-based trigger concentrations, and therefore, active gas collection is not needed, the system may be converted to a passive system which vents to the atmosphere. Soil gas samples will be collected from the treatment system and perimeter soil gas probes on a regularly basis to evaluate the operation of the system and/or migration of soil gas. Sample results will be compared to risk-based trigger concentrations developed with the OMM Plan for each COC. Development of the risk-based trigger concentrations will assume soil gas will cause outdoor air to become impacted with COCs; however, the outdoor air concentration used to develop the trigger concentration will be low enough to not result in adverse health effects. Based on the assumed conditions at the Site, if soil gas trigger concentrations are not exceeded, outdoor air concentrations will remain below human-health risk based concentrations. If soil gas concentrations are triggered, the gas collection and treatment system may be activated.

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6.1.2.4		3.3.6.3	10/31/2011	Greg Sweel -9	Include the rational for the number and location of the proposed gas probes as depicted on Figure 3-6.	The gas probes are shown on Figure 3-7. A total of nine probes were selected, based on an average distance between probes of 300 ft, to provide multiple locations to detect potential gas migration, if any. The rationale for the location was based on a location outside of the radius of influence of the vertical gas migration control wells and within the property boundary and/or in a location accessible for monitoring, which increased or decreased some distances between the probes. For example, probes were placed within the median of Artesia Boulevard rather than in the street to provide a safer location for monitoring. With further refinement of design, the location and number of probes may change with adjustments to the radius of influence of the vertical gas migration control wells and the locations of buildings and utilities for future site development.
6.1.2.4	6.1.2.4	3.3.6.3	3/30/2011	Greg Sweel -18	Additional gas monitoring probes will be necessary to evaluate radius of influence and effectiveness of the proposed gas control system.	Additional gas monitoring probes have been included with the gas monitoring system. A total of nine multi-level probes are proposed for Alternative 2A.
6.1.2.4		3.3.6.3	6/6/2011	Efrem Neuwirth -5	Following possible consolidation of the sludge, HERO recommends that action objectives be developed for soil-gas to demonstrate that soil-vapor is being contained at acceptable levels. HERO recommends consulting the DTSC Vapor intrusion Mitigation Advisory (VIMA), available at www.dtsc.ca.gov.	As a part of the post-closure plan for the remedy, an operations, maintenance and monitoring plan (OMMP) will be prepared. As a part of the OMMP, monitoring and action objectives will be developed, based on results of the HHRA, to monitor the containment system.
6.1.2.4			9/6/2012	Perry Myers -6	The FS indicates that the existing geomembrane and asphalt surfaces will be left in place over the sumps. However, for the proposed gas collection to be effective, communication with the sludge will be necessary. This would likely require cutting perforations or removal of portions of the geomembrane. The FS should discuss how this would be implemented, ramifications of perforating the existing membrane for installation of the proposed cap and any effects it may have on the performance of the proposed high strength geotextile.	Gas which may be generated and released from the surface of the cap will either travel to the edges of the cap where it will be collected by the vertical gas collection wells or exit through pathways through the existing geomembrane and asphalt surfaces (such as punctures and cracks). It is anticipated that some damage will occur to the existing geomembrane surface during construction which may allow gas to escape and be collected through the horizontal gas collection system. The existing geomembrane is beneficial during initial construction activities to act as a barrier for workers installing the high strength geotextile. The polypropylene high-strength geotextile is compatible with low pH environments; therefore, contact with the sludge will not affect its performance (SI Geosolutions, 1997).
6.1.2.4			9/6/2012	Perry Myers-12	The type of treatment system for the below-cap gas collection system is not specified in section 3.3.6.2 but the cost line item in the associated cost estimates indicates granulated activated carbon (GAC) will be used. GAC may not be appropriate for treatment of high concentrations of hydrogen sulfide and sulfur dioxide gas. An alternative treatment system that includes a thermal component and acid scrubber-to remove these gases should be evaluated and the cost estimate should be adjusted accordingly.	Gas quantity is expected to be very low and, as such, a thermal destruction unit is not appropriate or efficient. The current plan is to use permanganate impregnated granular activated carbon (GAC) (hydrosol) to remove sulfur compounds. Specialized blends of granular activated carbon are designed to treat hydrogen sulfide such as Calgon's Centaur 4x6. The Alternative 2A and 3 granular activated carbon costs account for the increased price of the specialty carbon. Significant quantities of hydrogen sulfide are not anticipated during construction of Alternative 2A or following capping of Alternatives 2A and 3 based on the results of flux chamber testing performed during the Revised Remedial Investigation. During Alternative 3 or 4 neutralization, a thermal oxidizer, or other high concentration, high flow system will be implemented for treatment of vapors.
6.1.2.5		3.3.5.1	2/10/2012	Steven Hariri -4	Please provide the full conceptual pavement structural section and design of the proposed parking lot cap in addition to the one-foot of Class II aggregate base presented in figures.	The traffic loading scenarios are unknown for the developed Site; therefore, a future Site developer will be responsible for the design and construction of the paved surface for the parking lot.
6.1.2.5			2/10/2012	Steven Hariri -11	Please reevaluate the calculations of the high-strength geotextile and anchor trenches with the full structural pavement section weight and overlying vehicles to include H-20 loading.	The final pavement section and loading conditions will be determined by the Site developer (see response to Comment 4). If the proposed capping alternative is selected as the preferred remedial alternative by the DTSC, a detailed design will consider maximum loading conditions for the cap based on the anticipated development of the Site.
6.1.2.5	6.1.2.5		3/7/2012	Greg Holmes -1	Institutional Controls, under the proposed Alternative 2A, disposal of excess sludge to an off-site disposal facility and placement of a cap over remaining sludge without stabilization, should state that a land use covenant (LUC) to place a deed restriction on the Site will be filed with the Los Angeles County Recorder's Office, and annual LUC restriction inspections will be conducted by DTSC to ensure compliance.	Noted. Clarification Sheets 5 and 12 are provided which revise Section 6.1.2.5 of the Draft FS and Section 3.3.7 of the FS Addendum, respectively related to Institutional Controls.
6.1.2.5		3.2	10/31/2011	Greg Sweel -7	Sludge containing materials beneath Artesia Boulevard and the southern sidewalk should be addressed by restricting access from current and/or future utility and/or construction workers.	Future access from current and/or future utility and/or construction workers will be addressed in the Risk Management Plan (RMP). The RMP will describe contaminants remaining onsite, known locations of impacts, contact information, and minimum, recommended personal protective equipment for current and future utility and/or construction workers. Institutional controls will include that the City of Gardena and/or Caltrans provide notice of potential subsurface hazardous materials in the area of Artesia Boulevard where sludge is potentially located when issuing work permits.
6.1.2.6		3.3.8	3/7/2012	Greg Holmes -2	DTSC's geologist notes that the response to the last comment in the Draft FS Response to Comments does not address the request to remove the sentence regarding a "period of 5 years".	The statement regarding a "period of 5 years" has been removed from Section 3.3.8 of the FS Addendum. This section has been included as Clarification Sheet 13.
6.1.2.6	6.1.2.6	3.3.8	10/31/2011	Greg Sweel -4	Include replacement of groundwater monitoring wells following cap construction in the draft FS.	Groundwater monitoring well replacement is discussed in Section 6.1.2.6 in the draft FS and Section 3.3.8 in the FS Addendum presenting Alternative 2A.

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6.1.2.6		3.3.8	10/31/2011	Greg Sweel -6	Recognize that abandonment of monitoring wells MW-01A and MW-01B will eliminate data from upgradient of the site. If these wells are removed, then describe how comparison to background water quality will be determined.	Replacement of groundwater monitoring wells is discussed in Section 3.3.8 of the FS Addendum. The DTSC makes a good observation. Section 3.3.8 of the FS Addendum is revised as follows: Eight of the existing ten groundwater monitoring wells would be properly abandoned prior to commencement of the remedial action. Upgradient wells MW-1A and MW-1B would not be abandoned. During the remedial action activities an appropriate groundwater monitoring network would be agreed upon with input from the DTSC. After the completion of the remedial action, the future groundwater monitoring wells would be installed. Groundwater monitoring would continue to be performed on a semi-annual basis. A typical groundwater monitor well is shown as Detail 3 on Figure 6-9 in the draft FS (Geosyntec, 2011).
6.1.2.6		3.3.8	10/31/2011	Greg Sweel -10	It is not clear why the installation of a groundwater monitoring network is not included as part of the draft FS. Also, future groundwater monitoring would be performed until such time a time as DTSC approves cessation. Remove the sentence regarding a "period of 5 years."	The future development plans of the Site, which is currently unknown, would control where future monitoring wells would be installed. The well locations of the future monitoring well network would be agreed upon in consultation with the DTSC prior to completion of the remedial action. It is anticipated that the new monitoring wells would be installed shortly after completion of the remedial action.
6.1.2.6	6.1.2.6		3/30/2011	Greg Sweel -13	Additional groundwater monitoring wells will be necessary to replace the properly abandoned wells. Section 6.1.2.6 indicates that 6 existing wells would be replaced by only 2 wells.	It is anticipated that current monitoring wells MW-2A, MW-2B, MW-4A, MW-4B, and MW-5A will be abandoned prior to implementation of the remedial action. Future groundwater monitoring wells to replace the abandoned wells will be installed after completion of the remedial action and in consultation with the DTSC. Wells MW-1A and MW-1B will be properly abandoned and not replaced.
6.1.2.6			9/6/2012	Perry Myers-13	Section 3.3.8 , Groundwater Monitoring. Paragraph one states that ten groundwater monitoring wells will be abandoned while the second paragraph states eight wells. The inconsistency should be eliminated.	The Gardena Sumps groundwater network consists of ten wells. Two off-Site wells (MW-1A and MW-1B) are upgradient wells that will not be abandoned. The remaining eight wells (MW-2A, MW-2B, MW-3A, MW-3B, MW-4A, MW-4B, MW-5A and G-4) are located in the footprint of the proposed cap and will be abandoned prior to construction of an engineered cap. Future monitoring wells constructed outside the footprint of the engineered cap will be installed for future groundwater monitoring after completion of the engineered cap.
6.1.2.7		3.4	3/30/2011	Greg Sweel -14	Describe the ability of the Alternative 2 cap to support future potential redevelopment of the site.	Alternative 2 was preliminarily designed to support traffic loads resulting from the construction of a parking lot above the sumps based on the similar design of the Thomas Ranch Site in Corona, California (Geosyntec, 2005). The discussion on future potential redevelopment of the Site is discussed in Section 3.4 of the Addendum.
6.1.2.7		3.4	3/30/2011	Greg Sweel -16	Explain how the placement of a two foot thick vegetated soil cover will facilitate a parking lot on the cap.	The two foot thick vegetated soil cover was incorporated into Alternative 2 per California Code of Regulations Title 27 (27 CCR) Section 21090(a)(3)(A) requiring a minimum 1 foot vegetated soil layer containing no waste, placed above the low-hydraulic-conductivity layer, is capable of sustaining plant growth, and is initially planted. Two feet the erosion resistance layer was proposed to support the installation of shallow conduit piping. A discussion addressing the uppermost cap material to facilitate a parking lot is included in Section 3.4 of the Addendum.
6.1.4			9/6/2012	Perry Myers-15	Section 6.1.4 of the FS states the excavation will extend to depths between .5 and 23.5 feet bgs and references figure 6-8. The descriptions of the sumps included in the FS indicate the thickest area of sludge is in the Cooper North Sump at 17.5 feet. These descriptions appear to be inconsistent and should be reconciled. If there is six feet of overburden on top of the sludge in the Cooper North Sump (to create a depth of 23.5' bgs) this should be noted in the FS and accounted for in the determination of soil volumes for disposal.	The excavation was evaluated at a depth to 23.5 ft bgs due to the lithological information provided for boring HPB09. The deepest reported sludge layer was encountered at a depth of approximately 8 ft bgs; however, tar clasts and hydrocarbon odors were reported to a depth of 23.5 ft bgs in that boring. Excavation in this area has been revised to reflect the 8 ft bgs sludge depth and the quantities for disposal have been updated. Confirmation sampling in this area during excavation may result in removal of additional material not accounted for in the cost estimate.
6.1.4.2			9/6/2012	Perry Myers-16	Section 6.1.4.3 states 52,000 CY (or 49,900 tons) of material will need to be disposed of due to bulking caused by the neutralization process. ESPO tabulated a total of 22,870 CY of sludge with interbedded soil for the four areas to be excavated (sec. 3.2.1). Applying a 25% bulking factor does not equal 52,000 CY. The FS should provide additional detail on how the total for disposal was calculated.	The estimated disposal volume of 52,000 cubic yards (cy) was based on the approximately 33,250 cy of sludge with soil interbeds and 3,750 cy of Haack rework excavation volumes. The sludge volume is increased by 25 percent for admixture bulking and 15 percent for over-excavation contingency. The excavation volume has been revised to 30,895 cy (subject to 25% admixture bulking and 15% overexcavation) and it is assumed the 2,670 cy of Haack Rework area sludge will not require neutralization; therefore, the treated sludge volume for disposal is revised to approximately 45,900 cy (50,500 tons based on a density of 81 pounds per cubic foot [Stantec, 2008]).
7.3.3.2, 7.3.4.2, 7.3.5.2, 8.2.3			9/6/2012	Perry Myers-14	The FS does not adequately consider threats posed by the waste to groundwater quality when developing and evaluating alternatives. Protection of water quality is included in the applicable or relevant and appropriate requirements (ARARs). Sections 3.2.1 and 3.2.6 of the FS indicate that perched groundwater is in contact with the sludge in some areas and past sampling results indicate impacts have occurred. The FS should evaluate all alternatives for compliance with water quality ARARs and should, at a minimum, specifically discuss how alternative 2A will be protective of groundwater.	A discussion of groundwater ARARs has been added to Sections 7.3.3.2, 7.3.4.2, 7.4.5.2, and 8.2.3 of the Revised Draft FS.

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7.3.3.3, 7.3.4.3, 7.3.5.3			9/6/2012	Perry Myers -1	The Site is located in an area of high seismic activity; however seismicity does not appear to have been considered in the remedial alternatives presented. In addition, the area around Artesia Boulevard and the Dominguez Flood Control Channel corridor, including the Site, is within a zone mapped as susceptible to seismic induced liquefaction by the California Geological Survey (CGS). The effects of seismicity on the performance of all remedies under consideration should be included, at least on a preliminary level during remedy evaluation in the FS. In addition, the consequences of remedy failure due to seismic-induced loading as well as mitigation measures required to repair any failures should be considered.	The seismic hazard discussion for each remedy has been included in long-term protection of human health and the environment (Sections 7.3.3.3, 7.3.4.3, 7.3.5.3).
7.3.3.5; 7.3.4.5; 7.3.5.5; 8.2.6	7.3.3.5; 7.3.4.5; 7.3.5.5	4.3.5	5/2/2011	Tizita Bekele -6	Short term effectiveness for all the alternatives considered should include a detailed assessment of possible adverse impacts on workers, community and the environment during remedy implementation, as well as, the mitigation measures that would be applied to minimize adverse impacts. There would be potential releases of toxic gases, VOC emissions, dust, noise, truck traffic, etc. during construction and all potential impacts should be addressed.	Additional details have been incorporated for the evaluation of short-term effectiveness for Alternative 2A in Section 4.3.5 of the Addendum and for each alternative in Section 5.2.6 of the Addendum.
7.3.3.6; 7.3.4.6; 7.3.5.6; 8.2.7	7.3.3.6; 7.3.4.6; 7.3.5.6; 8.2.7	4.3.6; 5.2.7	5/2/2011	Tizita Bekele -8	Section 7.3.3.6-Although the technologies in Alternative 2 are conventional, the site specific conditions are not. Given the urban setting of the project site, being located at the intersection of major streets with the potential releases of toxic gases during implementation, the assessment of the implementability provided in the document is severely inadequate and unacceptable. Safe implementation of the remedy is key in assessing the feasibility of the alternative at this site and sufficient detail should be provided.	Additional details relating to the urban setting of the project have been addressed in Sections 4.3.6 and 5.2.7 of the Addendum.
Figure 4-4; Table 4-4	Figure 4-4; Table 4-4		3/7/2012	Greg Holmes -3	Regarding the response to DTSC's Human and Ecological Risk Office (HERO) comment #3, HERO does not concur with taking an average measurement of the soil properties to use for calculating soil-gas risk based concentrations. The moisture content is highly variable and some of the points were from soil underneath the sludge which may not be representative of the soil between the sumps and future buildings.	The soil-gas risk based concentrations (RBCs) have been re-evaluated with default loam soil properties. The benzene in soil gas concentrations using default loam soil properties are included in the revised Appendix B of the Draft FS (Attachment 3). The following soil vapor locations were in excess of the residential soil gas RBCs for benzene: SV119 at 6 and 10 feet below ground surface (ft bgs), SV127 at 5 ft bgs, SV19 at 5 ft bgs, SV118 at 5 ft bgs, and SV11 at 5 ft bgs. These locations are shown on the revised Figure 4-4 of the Draft FS included as Clarification Sheet 16.
Figure 4-4; Table 4-4	Figure 4-4; Table 4-4		3/7/2012	Greg Holmes -4	Regarding the response to the comment #3, HERO recommends revising the risk-based concentration for benzene using the default properties for loam. When developing risk-based concentrations or action levels for soil-gas for other chemicals of concern which were not included in the Human Health Risk Assessment (for example, sulfide gases), default properties should be utilized.	The RBCs for soil-gas have been revised using the default loam properties, see response to Comment 3. Sulfide gases were evaluated during the risk assessment and subsequent generation of RBCs. Carbon disulfide concentrations were not found to pose a risk in excess of criteria presented in the Human Health Risk Assessment (Geosyntec, 2011). Detections of hydrogen sulfide were only encountered in the sludge; therefore, hydrogen sulfide does not appear to migrate from the sludge.
Figure 6-14	Figure 6-6		3/30/2011	Greg Sweel -20	Portions of the Haack sump are currently paved with degraded asphalt. Removal and replacement of the asphalt with concrete will be required, as depicted on Figure 6-6.	The existing surface of the Haack Sump will be maintained and the cap will be installed above the existing asphalt or concrete material depending on the locations in the sump. Concrete is not a more suitable material for construction of the final cap as both the asphalt and concrete will provide a construction surface and preliminary support during installation of the overlying materials. Furthermore, the existing surfaces minimize the dermal contact and gas inhalation exposure risks to the construction workers during installation of the cap and removing the asphalt to place concrete could expose the workers to unnecessary risk. The revised Figure 6-6 is provided with the errata sheets in Attachment 1.
Figure 6-14	Figure 6-6	Figure 3-9	5/2/2011	Tizita Bekele -13	A multi-level gas monitoring probe with a 1 foot screen length at 5 ft interval across the entire thickness of the waste is recommended. The proposed 15 ft screen is too long to collect discrete samples.	This detail has been revised on Figure 3-9 of the Addendum.
Figure 6-15		Figure 3-10	2/10/2012	Steven Hariri -10	Please address the disposition of the surface drainage of the geocomposite of Detail 6.	Detail 6 illustrates the conceptual layout of the geosynthetics in relation to the slopes and incorrectly shows the drainage geocomposite day-lighting without a perimeter channel. The revised Figures are included as Clarification Sheets 17, 18, and 19.
Figure 6-3 and 6-4		Figure 3-3 and 3-4	5/2/2011	Tizita Bekele -12	Figure 6-6-Cross-section detail for the Normandie Avenue side should be provided.	Cross-sections for Alternative 2A in the Addendum are provided as Figures 3-3 and 3-4.
Figure 6-7; Figure 6-12	Figure 6-4	Figure 3-7	5/2/2011	Tizita Bekele -10	Figure 6-4 -Five gas probes are proposed for monitoring gas migration. It appears that the probes are located within the vertical gas migration control wells area of influence. It is recommended to place additional gas probes between the outside of the vertical wells area of influence and potential receptors, such as the residences and commercial buildings. These additional probes may be necessary to adequately monitor gas migration towards those receptors.	The probes currently shown for Alternatives 2 and 3 are located as close to the sumps as possible for detecting gas migration when the gas control system is not in operation. Additional probes will be included for detecting gas migration when the gas control system is in operation as shown on Figure 3-7 of the Addendum.

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Appendix C	Appendix B		6/6/2011	Efrem Neuwirth -3	HERO does not concur with the use of the measured soil properties in developing soil-gas risk based concentrations as was done for benzene since it is not clear if these values are representative of the whole Site. HERO recommends using the Johnson and Ettinger (J&E) recommended soil:-properties for the generic soil type entered. HERO also does not concur with assuming that a future office will have a vertical height of 12-ft (366 cm). HERO recommends using a more protective 8-ft (244 cm). In addition, the J&E spread sheets provided for a commercial/industrial worker do not follow the exposure parameters (exposure duration, exposure frequency, and averaging time for non-carcinogens) provided in Table 1; HERO recommends correcting the spreadsheets for the above-mentioned exposure parameters.	The DTSC letter to Kyle Christie, dated 30 October 2008, concerning the risk assessment approach included a 24 October 2008 memo from Bryan Eya of HERD (now HERO) to Joe Cully. HERD recommended that the Geological Services Unit (GSU) of DTSC make a determination whether the soil type (loam) are appropriate for use in the vapor intrusion model. GSU required 49 additional soil gradation curves be obtained at the soil vapor sampling depths during the 2009 field activities to verify that site specific soil data would be appropriate for use in the vapor intrusion modeling. Mean particle size distribution was 25 samples silt, 23 samples sand and one sample gravel. Particle percentage of silt and clay >50% occurred in 39 samples while particle percentage of silt and clay <50% occurred in 10 samples. The soil particle characteristics are that of loam. The GSU approved the use of site soil characteristics for the vapor intrusion model because the site soils were characteristic of loam. The site-specific input parameters used in the derivation of RBCs are well within expected values for loam material. The building dimensions for the vapor intrusion modeling were discussed with Bryan Eya and DTSC during a 25 September 2008 teleconference. HERD and DTSC did not object to the use of the building height dimensions for residential (8-feet or 244 centimeters (cm)) and commercial/industrial (12-feet or 366 cm) for current and future buildings. Therefore these building dimension values were used in the approved baseline risk assessment and in the development of risk-based goals for the FS. The J&E spreadsheets were used only for developing a unit modeled indoor air concentration that was then used in separate spreadsheets presented in Attachment A to calculate a risk-based concentration. This approach is consistent with what was done in the baseline risk assessment. Therefore the exposure parameters depicted in the J&E spreadsheet were not used and do not impact the RBC derivation.
Appendix E		Appendix B	5/2/2011	Tizita Bekele -7	Duration of the project should be provided in the short term effectiveness analysis.	The anticipated duration of the project has been added to the Addendum.
N/A			2/10/2012	Steven Hariri -1	Please affix a professional engineer stamp to the final version of the Final Feasibility Study Report, Attachment, and Calculations	The Final Feasibility Study with attachments and, if applicable, calculations, will be stamped by a California professional engineer.
N/A		3	2/10/2012	Steven Hariri -2	ESPO recommends an analysis of the maximum credible earthquake for evaluation of damage to the foundation or structures which control leachate, surface drainage, erosion or gas as required by 23CCR§2547 and 22CCR§66264.228(a)(2)(C)(6).	The cap surface drainage and erosion systems, as well as the gas migration control system, will be evaluated for damage due to the maximum credible earthquake during final design of the cap, if the capping alternative is selected as the preferred remedial alternative by the DTSC. A detailed design will be completed as part of a future Remedial Design submittal.
N/A			10/31/2011	Greg Sweel -5	Please check the last sentence of this response on page 4.	This sentence contained a typo and should read as follows: “The two foot erosion resistance layer was proposed to support the installation of shallow conduit piping”.
N/A			11/11/2011	Efrem Neuwirth -2	HERO accepts the proposal to deal with vapors and gases in the future operations, maintenance and monitoring plan (OMMP; see comment 5).	Acknowledged
N/A			11/11/2011	Efrem Neuwirth -4	HERO finds this approach acceptable for removals of sludge in the Haack rework area due to the unique nature and distribution of the source material.	Acknowledged
N/A			11/11/2011	Efrem Neuwirth -5	HERO acknowledges the response and the future submittal of an OMPP to address action objectives for soil-gases and vapors. However, HERO does not concur with only using the results of the HHRA which does not deal with the explosives risks and acute health risks from a variety of compounds or chronic risks from hydrogen sulfide. As notedin HEROs response to comment 2, HERO accepts dealing with all these issues in the OMPP.	Acknowledged

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N/A			11/11/2011	Efrem Neuwirth - Conclusions and Recommendations	HERO acknowledges the response and the future submittal of an OMPP to address action objectives for soil-gases and vapors. However, HERO does not concur with only using the results of the HHRA which does not deal with the explosives risks and acute health risks from a variety of compounds or chronic risks from hydrogen sulfide. As notedin HEROs response to comment 2, HERO accepts dealing with all these issues in the OMPP.	Acknowledged
N/A			3/30/2011	Greg Sweel -4	Confirm the statement in Section 2.5 that shallow groundwater beneath the site is influenced by the adjacent concrete-lined Dominguez Channel.	A discussion of the influence of the Dominguez Channel (engineered weep holes in the channel) on the flow direction of the shallow (A-horizon) is discussed in Sections 3.10.5 and 5.1.2 of the Addendum to the August 22, 2008 Revised Draft 2006 Remedial Investigation Report and illustrated in Figures 10As and 18S of Appendix D (design drawings of the Dominguez Channel).
N/A			3/30/2011	Greg Sweel -5	Discuss the presence, and identify the location, of nearby groundwater production wells.	The closest active public supply well, the "Dalton Well", is located approximately 1,000 feet northwest of the Site. The Dalton Well is upgradient of the Site and is screened at depths several hundred feet deeper than the screen intervals of the Site monitoring wells. The Dalton Well hydraulic study (Section 3.9 of the Addendum to the August 22, 2008 Revised Draft 2006 Remedial Investigation Report) documented that water production from the Dalton Well does not influence shallow groundwater beneath the Site. The next closest groundwater production well is located approximately 1-mile east of the Site.
N/A			3/30/2011	Greg Sweel -6	Acknowledge and identify which constituents of concern detected in groundwater exceed the maximum contaminant levels (MCLs).	ARC has been performing quarterly groundwater monitoring at the Site for five and a half years (through second quarter 2011). Detections commonly exceeding groundwater MCLs at the Site are: total dissolved solids (TDS) in wells MW-1A, MW-1B, MW-2A, MW-2B, MW-3A, MW-3B, MW-4A, MW-4B, MW-5A, and G-4; chloride in wells MW-1B, MW-2B, MW-3B, MW-4B and G-4; sulfate in wells MW-2B, MW-3B, MW-4A, MW-4B, MW-5A and G-4; and iron in wells MW-2B, MW-3B, MW-4B, MW-5A and G-4. Benzene, beryllium, and nickel were detected in MW-5 at concentrations exceeding their MCL.
N/A			3/30/2011	Greg Sweel -11	Explain the rationale for why the top three feet of sludge in the Cooper North and South sumps was selected for mixing/stabilization/neutralization. Also, include the sludge in the Haack sump in Alternative A3.	The top 3 feet of sludge in the Cooper North and South sumps was selected to create a stabilized "crust" in which to operate equipment and place the overlying cap materials. Three feet was selected to mimic the 3.5-foot stabilization layer identified for Alternative 2. The sludge in the Haack sump was not identified for stabilization because the existing concrete and asphalt surface has shown to be supportive of overlying vehicles and traffic and therefore does not require a stabilized surface for construction.
N/A			3/30/2011	Greg Sweel -19	Explain the need for air inlet wells as part of the gas control system.	Air inlet wells are proposed for the gas control system to facilitate the "curtain" effect of the system as demonstrated on Figure 6-5 in the Draft FS and as shown on Figure 3-8 in the Addendum. The gas control system will not be designed to extract gas from the sludge; rather it will be designed to collect gases migrating laterally from the sludge.
N/A			3/30/2011	Greg Sweel -21	Depict and describe the future use of groundwater monitoring well cluster MW-01A and MW-01B on Figure 6-2.	Figure 6-2 shows the locations of groundwater monitoring wells located at the Site and the conceptual final cover elevations for Site Alternatives 2 and 3. Wells MW-01A and MW-01B are located approximately 470 feet northwest of the northwest corner of the Site. Depicting Wells MW-01A and MW-01B in Figure 6-2 would have decreased the scale to illustrate the conceptual Site final cover elevations and thereby result in a less than useful figure. ARC will request that wells MW-01A and MW-01B be abandoned as the two wells have provided useful information during the remedial investigation but are no longer required to monitor the groundwater at the Site.
N/A			5/2/2011	Tizita Bekele -5	Section 7.3.3.4-The document states that no reduction in waste volume would be realized by alternative 2, but there would be an increase in the waste volume from the addition of the stabilization material. The estimated increase in volume should be discussed along with how the increased volume would alter the topography, aesthetic, and compatibility with future planned land use.	The volume of "waste" will not be increased in Alternatives 2 and 2A since clean fill, sand, and gravel would be imported and used as the stabilization materials above the sludge. Also, see the response to Comments 6 and 7b in the "Response to Comments from Greg Homes, DTSC (9 June 2011)" section above.
N/A			5/2/2011	Tizita Bekele -11	Level of methane gas should be assessed before use of air inlet during gas extraction from the vertical gas control wells.	The air inlet piping will be vented to the atmosphere and used to create a "curtain" to minimize lateral migration and is not anticipated to contain methane quantities any greater than surrounding outdoor air concentrations. Air entering the air inlet piping is anticipated to travel through pore spaces within the soil to the gas extraction system where it will be treated prior to discharging back to the atmosphere.

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N/A			6/6/2011	Efrem Neuwirth -General	Risk based concentrations are calculated for a 1×10^{-5} risk level for commercial/industrial and construction worker receptors, while 1×10^{-6} RBCs are calculated for residents and trespassers. In addition, for arsenic and the carcinogenic polycyclic aromatic hydrocarbons (PAHs), comparisons are also made to the regional background levels which are often used by the DTSC as remedial goals (12 mg/kg and 0.9 mg/kg, respectively). These RBCs are incorporated into the remedial objectives for the site. The large majority of material above the various RBCs are in the sludge including the Haack rework soil. There are also numerous petroleum related VOCs which were measured in the shallow groundwater (12-ft bgs) or in soil-gas proximal to the sludge. Most of these VOCs have low toxicity and low concentrations. It is likely that the large majority of VOCs are trapped in the sludge and only slowly migrate out into the surrounding environmental media making it difficult to accurately evaluate possible vapor intrusion risks. The proposed remedial actions deal with potential uncertainties by removing the sludge material and/or consolidation and capping the material and providing a vapor intrusion mitigation system to insure that what may migrate out of the material in the future does not pose potential health risks.	Comment noted
N/A			6/6/2011	Efrem Neuwirth -6	In the future, HERO recommends using the OEHHA toxicity values for arsenic to determine if clean up levels for various land reuse scenarios may be higher than 12 mg/kg. HERO does not recommend altering the arsenic RBCs for the site since there is only a single location identified on the Site with concentrations greater than 12 mg/kg (42 mg/kg).	Comment noted
N/A	ES-11; 6.1.2.3		6/9/2011	Greg Holmes -4	p. ES-11, "Remedy Selection", third bullet: Please describe "geocell".	A geocell, also referred to as a Cellular Confinement System (CCS), typically consists of high density polyethylene (HDPE) strips expanded to form a honeycomb-like structure filled with sand to stabilize low bearing capacity soils. The three dimensional structure of the geocell reduces the vertical settlement and improves the load-bearing capacity of surfaces such as roadways. The geocell is effective by preventing the lateral movement of fill materials and distributing the loads to a larger area (Geoproducts, 2011).
N/A			6/9/2011	Greg Holmes -7c	ARC was requested by DTSC to prepare a new FS alternative which would include a sufficient level of detail as to be considered implementable and consistent with the future Remedial Action Plan.	The Addendum presents Alternative 2A and includes a conceptual grading plan. Preliminary design calculations were performed to evaluate the stability of the cap and evaluate its effectiveness for a future use as a parking lot. A detailed design will be completed following submittal of the Remedial Action Plan, as part of the Remedial Design submittal.
N/A			6/9/2011	Greg Holmes -7d	The ARC representative indicated that he would speak to Ms. Tizita Bekele, DTSC senior engineer, to identify requirements that would be applicable to the construction of a cap and include the level of detail requested by DTSC in the design of the new remedial alternative.	A meeting with Ms. Tizita Bekele will be held following the submission of this response and Addendum.
N/A			6/9/2011	Greg Holmes -7e	The ARC representative agreed to provide a draft of a new remedial alternative to the City and the DTSC representatives for review prior to finalizing the FS report, and that ARC would submit the revised FS report to DTSC and the City after receiving their comments.	The Addendum with Alternative 2A is enclosed with this Response to Comments.
N/A			9/6/2012	Joseph Cully - 1	For the proposed Alternative 2A, how long will the cap last before it needs to be replaced? What will be cost of replacing this cap?	Studies have shown high-density polyethylene (HDPE) liners lifetimes are at least several hundred years (Rowe and Sangam, 2002). In an EPA-sponsored study conducted by Bonaparte et al. (2002) on the performance of waste containment systems, the overall service life of HDPE geomembranes was estimated to be on the order of 1,000 years. If the cap requires replacement due to unforeseen incidents or catastrophic events, the cost to replace the cap is estimated as approximately $3.45M. This assumes the gas treatment system, vertical gas wells, and sheet piles remain intact after the catastrophic events. This is based off the initial installation costs included with Table 7-1 of the Revised Draft FS.
N/A			9/6/2012	Joseph Cully - 2	Health and Safety Code section 25355.2 requires that responsible parties demonstrate to DTSC and maintain financial assurance to cover the cost of maintaining and replacing the cap. Please address the mechanisms that will be in place to show that the parties will be financially responsible for maintaining, and, should the need arise, removing and replacing the cap in the future.	As referenced in Health and Safety Code section 25355.2, Section 66265.143 of Title 22 provides for five or more financial assurance mechanisms that responsible parties to be named in a possible future Site corrective action consent decree could use to satisfy their financial assurance obligations. At this time it is not known which of these financial assurance mechanisms will be utilized.

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N/A			9/6/2012	Perry Myers/ Recommendations -1	The comments/recommendations presented in this memorandum regarding the remedy alternatives and the associated cost estimates should be adequately addressed.	Noted.
N/A			9/6/2012	Perry Myers/ Recommendations -2	A single document incorporating all revisions, addendums, additional figures and tables should be created and submitted for approval. The current system of original document, addendum, errata and clarification sheets creates confusion and makes a comprehensive review difficult and time consuming.	The Revised Final Draft Feasibility Study has been created which incorporates the Addendums, Clarification Sheets, and Comments received on the Draft Feasibility Study and Feasibility Study Addendum.
N/A			9/6/2012	Perry Myers/ Recommendations -3	The FS should explore transportation options for disposal other than 14 or 16 CY dump trucks. Larger trucks or use of the adjacent rail line should be considered to reduce impacts and costs.	Larger trucks are not recommended due to the small size of the site limiting the truck turning radius and staging areas as well as the difficulting entering/exiting the site onto Artesia Boulevard. Utilizing the adjacent railroad is not feasible due to the limited space availability for construction of a rail spur and the small quantity of rail cars that would be able to be loaded at the site.
N/A			9/6/2012	Perry Myers/ Recommendations -4	The MatCon final surface for Alternative 2A discussed by E&E should be considered. ESPO has had favorable experience with this product and believes it should be considered as a viable alternative for use as the low hydraulic conductivity layer.	The use of MatCon would not limit the height of the cap any further due to the required ground improvements needed to install MatCon as well as provide the strength for the final parking lot.
N/A			9/7/2012	Perry Myers/ Recommendations -5	Consideration should be given to conducting an excavation pilot study at the Site. Goals for the pilot study could include; more accurately assessing gas generation from disturbing the sludge, evaluating whether a tent is necessary or whether products such as Odex andlor Hydroseal can adequately control hydrogen sulphide and sulfur dioxide gases, and mixing techniques for neutralization.	An excavation pilot study is not proposed at this time due to the risks associated with uncontrolled reactions of neutralizing agents and the sludge, exposure of the sludge, and proximity to sensitive receptors. Furthermore, boring logs and test data have indicated the variability of sludge within the sumps; therefore, a small scale pilot study will not be representative of excavation conditions and may lead to a "false sense of security" with inadequate controls, such as lack of vapor system, during full-scale implementation.
N/A		3.3.5	2/10/2012	Steven Hariri -7	ESPO recommends the slopes steeper than a horizontal to vertical ratio of three to one, or having a geosynthetic component (27CCR§21090(a)) be evaluated with slope stability calculations (27CCR§21750(f)(5)).	A detailed design will be completed as part of a Remedial Design submittal if the capping alternative is selected as the preferred remedial alternative by the DTSC. Slope stability evaluations will be performed during design of the final cap.
N/A		3.3.5.6	2/10/2012	Steven Hariri -8	ESPO recommends that the final cover slopes less than three percent (27CCR§21090(6)(b)(1)(A)) be evaluated for storm intensity (27CCR§21090(6)(b)(1)(B)).	Similar to responses to Comments 2 and 7, a detailed design will be completed as part of a Remedial Design submittal if the capping alternative is selected as the preferred remedial alternative by the DTSC. During design of the final cap system, the final cover slopes will be evaluated for the referenced storm intensity.
N/A			10/31/2011	Greg Sweel -3	Provide the evidence cited which has shown that lateral spread of the sludge is contained at depth by the existing berms. The intent of the original comment was not necessarily directed to current conditions, rather to those conditions post cap construction when the weight of the overlying constructed cap and vehicular parking may increase the potential for the lateral spread of sludge.	Outer sump berms that have not had their integrity disrupted after 1945 are the northern North Cooper Sump berm and the southern South Cooper Sump berm. Borings CPB-04, CPB-23, CPB-24, SV-26, SV-124 and SV-126 drilled through the northern North Cooper Sump berm did not reveal the presence of sludge. Borings CPB-19, CPB-20, CPB-21 and CPB-22 drilled through the southern South Cooper Sump berm did not reveal the presence of sludge within the berm although surficial sludge above the berm was noted in borings CPB-19 and CPB-20. The viscosity of the sludge material is such that it does not flow within the soil at the site, as evidenced by the lack of subsurface, non-man-induced, migration of the sludge materials over the 60+ years it has been in place. Additional loading associated with the proposed final cover system is not anticipated to change the physical characteristics of the sludge. Therefore, the proposed cover loading will not create a lateral spreading of the sludge material. Final design of the cover system, to be prepared during the remedial design phase of the project will further evaluate and fine tune the cover system design.
N/A			3/30/2011	Greg Sweel -1	DTSC's Engineering Services Unit should evaluate the analysis of proposed alternatives, treatment options, containment, and engineering controls.	Comment noted
N/A			3/30/2011	Greg Sweel -17	DTSC's Human and Ecological Risk Office should evaluate the proposed target cleanup and action levels.	Comment noted
Table 7-1			9/6/2012	Perry Myers -5	The sludge material is of low shear strength and is likely to undergo both settlement and creep movement under load. In addition, due to the viscous nature of the material and the expected softening during high temperature periods in the summer season the settlement and creep movement could lead to surface expressions of the sludge as has been observed in the past. The FS should discuss the effects of both total and differential settlement on the performance of the cap and their effects on the operations and maintenance (O&M) activities as these have a direct bearing on the efficacy of the remedy and the costs associated with it.	Settlement and creep of the cap is anticipated to be negligible. Settlement is driven by consolidation of soils through deformation of soil particles, relocation or reorientation of soil particles, and expulsion of liquids (water and/or air) from the soil matrix. The tarry sludge material found within is of such a high viscosity that the material does not readily flow into the adjacent soil matrix. Therefore, the sludge material will not exhibit settlement from expolsion of liquids. Furthermore, the solid particles found within the sludge matrix are enveloped in fluid like, high viscosity materials that allow relocation and reorientation of solid particles bu the volume of the overall sludge matrix is not changed significantly. This is evident in the fact that the Haack Sump concrete pavement has not settled over the past 14 years. Concrete cracking is evident, but likely related to durability and shrinkage rather than settlement. Last, previous capping projects like McColl, Del Amo, and Thomas Ranch sites containing similar sludge materials have not indicated significant settlement. Settlement and creep that occurs can be corrected with minor maintenance during the life of the cap. Upon completion of the closure construction, the sludge material will be insulated from direct sunlight and ambient temperature increases; therefore, the softening of the sludge will cease to be a problem once the cap is in place. The costs associated with the creep and settlement maintenance are included with the maintenance costs.

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Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -1	According to the note on the Unit Price page for Mobilization/Demobilization, this cost should be 10% of the total construction cost ($454,491 instead of $297,300). ESPO notes this guidance does not appear to have been used for any of the alternatives. The estimate for Alternative 2 (no longer in consideration) notes the listed cost is 1 0% of the construction subtotal without markup costs which is a hidden row, but the Unit Price page indicates that markups are not applied (factor is= 1). It is not clear what the Mobilization/Demobilization cost is based on. The 10% approach appears valid since the cost of Mobilization/Demobilization should increase as the scope of the project gets larger. This issue should be revisited and the cost estimates or the notes revised as necessary.	The cost estimates have been revised to reflect a mobilization/demobilization of 10 percent for all alternatives.
Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -2	7 acres for clearing and grubbing appears to be an error since the entire Site is 5.6 acres. ESPO notes this item is a minor cost.	The acreage for clearing and grubbing is 7 acres because areas beyond the Cooper and Haack Properties will require clearing and grubbing for laydown, staging, roadways, and office areas.
Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -3	The FS calls for destroying 8 current groundwater monitoring wells, not 3. This change adds $50,000 to the estimate	The cost estimate tables are revised to reflect the destruction of 8 groundwater monitoring wells.
Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -4	The unit cost for the sheet piling appears low. The RACER unit cost for permanent sheet piling was $24.65/SF. See comment 11 for Alternative 4 below.	The unit cost for sheet piles have been revised to approximately $29 per square foot based on preliminary quotes received from vendors and including a protective coating for the Site conditions. The temporary sheet piling price was revised to approximately $25 per square foot based on prelimary quotes, assuming a 1-month rental period, protective coating, and decontamination of the sheets.
Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -5	The FS lists 2,670 CY of sludge/soil and 2,450 CY of soil overburden for the Haack Rework area and uses a density of .9 tons/CY to calculate the weight of the material. The cost estimate appears to assume all of the Haack Rework material is disposed off-site (scenario 3) and lists 4,600 tons for disposal. The unit cost of $80/ton for transportation and disposal appears low.	The cost for disposal has been revised to $120/ton. This is based of a quote received to transport and dispose of the non-hazardous material at the Buttonwillow Facility, a non-RCRA hazardous waste facility.
Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -6	The square footage of high strength geotextile appears to include covering the Haack Sump, which over estimates the amount of material needed by -24,000 SF.	The high strength geotextile will not cover the Haack Sump; the costs have been revised to reflect this.
Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -7	It is not clear if the 3,900 CY quantity listed for fingerfill soil placement in the foundation layer is imported soil or sourced onsite. The only source available onsite is the Haack Rework area and under scenario 3 none of the material would be available. This cost should be re-visited.	The finger fill soil material is assumed to be imported.
Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -8	The treatment system for the gas collection system uses granular activated carbon, which may be inappropriate for the concentrations of hydrogen sulfide expected. A treatment system based on a thermal oxidizer with an acid air scrubber should also be evaluated and associated cost estimate prepared.	Please see the response to comment Perry Myers-12.
Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -9	The FS states vertical gas migration wells will be installed every 20 feet around the perimeter, with the exception of the area along Artesia Boulevard where a sheet piling retaining wall will be installed. Using the supplied figures in the FS, ESPO calculated a total of 71 wells were needed. ESPO agrees with this spacing due to the type of soil. The cost estimate only includes 20 wells for this element of the remedy. The cost estimate should be revised to include 71 wells.	The text has been revised to state vertical gas migration wells will be installed every 80 feet around the perimeter. The costs have not been revised.
Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -10	ESPO included construction of 7 new groundwater monitoring wells in its cost estimate after consulting with Mr. Paul Pongetti, P.G. of the geological services unit, who has previously worked on this Site. The Geosyntec cost estimate includes 3 new wells and should be revised.	The number and location of future groundwater monitoring wells to be installed will be determined in consultation with the DTSC. A minimum of three new wells is likely and this number was used for cost estimation purposes.
Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -11	ESPO notes the unit price to install temporary sheet piling is almost double the cost to install the permanent sheet piling in Alternative 2A. The cost should be reviewed and revised as necessary. See comment 3 for Alternative 2A.	This cost has been revised to approximately $25 per square foot. The costs were previously assumed higher than the permanent costs due to decontamination of the sheet piling and management of the wastes from decontamination.

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Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -12	1tem #13 of the Quantities page of the original cost estimate indicates that 28,556 CY of net clean cut will be generated to make 1% grades. After bulking this volume increases to 37,123 CY. Under Alternative 4 this material is listed as Fill (Place and Grade Excavated Site Soil) and is combined with 4,000 CY of imported fill to backfill the excavated sumps (total of 41 ,200 CY). ESPO could not find a discussion of this 37,123 CY of net clean cut material in the text of the FS nor is excavation and use/disposal of this material included in the cost estimate for Alternative 2A. If this material is an artifact of the original FS that will no longer be generated the cost estimate for Alternative 4 should be revised to include sufficient imported fill to backfill the excavated sumps to the planned grades. If this material will be generated to meet planned grades across the Site, it should be discussed in the text and the cost estimate for Alternative 2A should be revised accordingly.	Grading of the site outside of the sump areas and areas immediately around the sump has been removed from the Feasibility Study. The quantities of imported fill have been revised to reflect the need for increased import to achieve proposed grades.
Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -13	The unit cost for the amendment to neutralize sludge prior to disposal is prohibitively high, $6,000/ton. Based on experience, ESPO believes the quotes of $402/ton for CaOH2 and $198.87/ton for CaC03 from E&E (material + shipping) are more accurate. Based on the quantities included, using these unit costs results in a reduction of $28,172,950 to the cost estimate.	The costs have been revised to reflect recent quotes from manufacturers. It is noted that the price of these materials can be very volatile with ranges quoted from $160 per ton up to $750 per ton (CaOH2) and between $145 and $160 per ton (CaCO3).
Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -14	The 49,900 tons used to calculate disposal costs should be revisited (see comment 16 under Task 1). The unit price of $50/ton for transportation and disposal appears low and needs adjustment unless a written quote supporting this price is provided.	Please see the response to Perry Myer/Cost Estimate Review - 5.
Tables 7-1 through 7-3			9/6/2012	Perry Myers/Cost Estimate Review -15	The long term monitoring costs include groundwater and soil gas monitoring. ESPO believes soil gas monitoring will not be necessary post excavation. Additionally, the a·nalyses needed to monitor groundwater should be fewer than if the waste is left in place since the source has been removed. The total time for monitoring will also likely be less.	The monitoring costs have been revised to reflect 5 years of post-excavation monitoring for Alternative 4.

References:
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April 12, 2013

Mr. Joseph Cully
Hazardous Substance Scientist
Southern California Cleanup Operations Branch
Cypress Office, Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630

Transmittal: **Response to Comments on the Revised Final Draft Feasibility Study Report**
Gardena Sumps Site
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California
DTSC Site No. 400067

Dear Mr. Cully:

Geosyntec Consultants (Geosyntec), on behalf of the Atlantic Richfield Company (ARC), is pleased to provide this response to Department of Toxic Substances Control's (DTSC) comments on the Revised Final Draft Feasibility Study Report (Revised Final Draft FS). These responses were prepared to address the DTSC comments dated 27 December 2013 and 9 January 2013, received 17 January 2013. The DTSC comments are provided below in *italics* with ARC's response following. Errata sheets are provided as attachments as noted in the response.

Response to Comments

ESPO Comments

1. *The Report should include an acronym list after the table of contents.*

Acknowledged. An acronym list has been included after the table of contents (Attachment 1).

2. *Section 2.5 Hydrogeology. The executive summary includes a discussion of the two hydraulic zones within the Bellflower Aquiclude (Zone A and B) which should also be presented in this section. Additionally, this section should discuss the connectivity between these shallow A and B groundwater zones and the underlying water bearing zones that have beneficial uses and the*

potential, or lack thereof, for contaminants of concern (COCs) to migrate vertically and laterally.

Section 2.5 of the text has been revised to address this comment (Attachment 1).

3. *Section 3.2.5.1 Summary of Groundwater Monitoring. The discussion should include the predominant groundwater flow direction, depth to groundwater, and average velocity. Figure 3-3 should include an arrow denoting groundwater flow direction.*

Section 3.2.5.1 of the text has been revised to address this comment. Groundwater flow directions (present and historic) at the Site are illustrated in the quarterly groundwater monitoring reports that can be accessed in Envirostor (http://www.envirostor.dtsc.ca.gov/public/profile_report.asp?global_id=19490135).

4. *Section 3.4.8 Vapor Evolution. ESPO notes the completed Treatability Study provided data regarding gas generation but this data cannot be used to directly calculate volumes or concentrations of gases that might be produced during construction for the purpose of evaluating health risks. ESPO disagrees with Geosyntec's response to comments dated 11/6/12 and believes an excavation pilot study should be conducted at the Site. Goals for the pilot study should include; more accurately assessing gas generation from disturbing the sludge, evaluating whether a tent or shroud is necessary or whether products such as Odex and/or Hydroseal can adequately control hydrogen sulfide and sulfur dioxide gases, and in-situ mixing techniques for neutralization that incorporate a hood.*

A Pilot Study to evaluate the gas generation, mitigation, and mixing techniques is not warranted at this time. Results of the neutralization study were used to qualitatively evaluate the amount of gas generated during sludge neutralization for stabilization or excavation (Alternatives 3 and 4, respectively).

During the Remedial Investigation, surface vapor flux testing was performed on undisturbed and disturbed sludge samples. Results indicated that sludge disturbed by moderate surface agitation released concentrations of sulfur dioxide up to 26,000 $\mu g/m^2$, min^{-1} (STANTEC, 2008). The disturbed sludge vapor flux testing results provide sufficient evidence that the disturbance of sludge results in the release of sulfur dioxide. The Treatability Study results further support the generation of sulfur dioxide and hydrogen sulfide during the sludge neutralization process.

5. *Section 4.6.3 Potential Action-Specific Requirements. The text for the Porter Cologne Water Quality Control Act should also include groundwater.*

Noted, groundwater has been added to the text for the Porter Cologne Water Quality Control Act.

6. *Section 6.1.2.1 Alternative 2A General Overview. Included in this Alternative is repaving an area of Artesia Boulevard, where sludge material is located below the roadway, with low-permeability asphaltic concrete and requiring increased maintenance of this area. The Alternative also includes institutional controls to restrict loading on the proposed cap over the sludge in the sumps. The text should include a discussion of whether the area of Artesia Boulevard that includes sludge material has incurred increased maintenance in the past and whether or not load restrictions for the roadway are necessary.*

The sludge beneath Artesia Boulevard has not detrimentally impacted the roadway, as indicated by the lack of specific pavement repairs above the sludge. Given that the sludge beneath Artesia Boulevard is very thin, is covered by approximately 5 ft of soil and structural pavement section, and that over 50 years of continuous traffic loading have not induced sludge related detriment to the roadway, no load restrictions in addition to those already established by the City and State, will be required.

7. *Section 6.1.2.2 Haack Rework Material Excavation and Disposal. The fourth paragraph appears to have been added to this section in error. It presents a discussion about finger berm construction, which is only proposed for the Cooper sumps.*

Acknowledged, this paragraph was added to this section in error and has been removed (Attachment 1).

8. *Section 6.1.2.2 Vapor Control During Construction. The proposed monitoring and work practices must also consider off-site receptors to avoid unacceptable exposures to the public.*

As described in the Section 6.1.2.2 Vapor Control During Construction, fixed monitoring will be performed around the perimeter of the work area during construction and when the PEL, or a percentage of the PEL, is reached, work activities will pause and/or be altered to minimize impacts to off-site receptors.

9. *Section 6.1.2.3 Capping of the Sumps. ESPO notes the sheet piling and high strength geotextile will be in contact with the sludge and these critical elements of the cap have a finite life. This section should include the life expectancy of the high strength geotextile and the sheet piling so replacement of these features can be scheduled in the Operations and Maintenance Plan, should this Alternative be selected for implementation.*

Sheet piles will be coated to minimize corrosion (i.e. Wasser Polyflex 304) and are expected to have a lifetime in excess of 50 years. The high-strength polypropylene geotextile is not needed after construction of the overlying cover materials; therefore, replacement of the high-strength geotextile will not be included in the Operations and Maintenance Plan.

10. *Section 6.1.2.4 Gas Treatment System. The text should be modified to note the system may be converted to passive operation only with written prior approval from DTSC.*

Acknowledged. The text has been revised to reflect this (Attachment 1).

11. *Section 6.1.2.4 Gas Monitoring System. The first paragraph refers to Figure 3-6 but ESPO could not find this figure in the Report. Please correct the reference.*

The text refers to figure 6-6, the “3-6” is struck out from the previous draft feasibility study and is no longer applicable.

12. *Section 6.1.3.2 Consolidation of Material. Section 3.2.1 states the Haack Rework Area contains 650 cubic yards (CY) of material (without describing the composition of the material, leaving the reader to assume it is sludge only) and 1200 CY of sludge with soil interbeds. Since the description used here is "of a sludge/soil mixture" it would appear the estimate of 1200 CY is appropriate, not 650 CY. Please eliminate the apparent inconsistency and revise the text as necessary.*

The Haack Rework area is estimated to contain 2,670 CY of soil-sludge and 2,450 CY of overburden soil. The text has been revised to reflect this (Attachment 1).

13. *Section 6.1.3.2 Consolidation of Material. The second sentence of the second paragraph is confusing and should be revised to provide a clear summary of the total volume that will be placed above the sumps. The volumes listed for the Haack Rework (assumed to be the sludge with interbedded soils) and Haack Rework overburden are inconsistent with the volumes listed previously in the Report. The sum of the volumes listed here total 5380 CY, not 5120 CY.*

The volumes indicated in the text have been changed to be consistent with the volumes stated in the previous paragraph. The Haack Rework (2,670 CY), Haack Rework overburden (2,450 CY), and eastern overflow (260 CY) will total 5,380 CY (Attachment 1).

14. *Section 6.1.3.4 Capping of the Sumps. It should be clarified that impacted material to be used as foundation soil will be treated, the same as the top three feet of the sumps, to prevent corrosion issues with the materials used to construct the gas control and protective layers of the proposed cap and to help prevent gas and odor generation during construction.*

Impacted material used as foundation soil will consist of soil-like material from the Haack Rework area which will not be treated. The Haack Rework material is degraded and will not be placed in contact with gas collection features. Odor and gas generation will be controlled with odor suppressant equipment.

15. *Section 6.1.3.4 Final Cap Topography. The minimum thickness of the cover was deleted from the second sentence as part of the RTC, but a revised thickness was not inserted. The text should be revised to include the new thickness.*

The revised value of 6 feet is provided in the report and is located directly after the deleted value.

16. *Section 6.1.4 Alternative 4. The text states that active dewatering would be required for the duration of excavation. This statement is incorrect and should be revised. Dewatering will only be necessary where the excavation approaches or is within the water table.*

The text has been clarified to indicate active dewatering would be required to remove perched groundwater and shallow groundwater when excavation and backfill are below the water table, and would be necessary to remove ponded misting agents (Attachment 1).

17. *Section 6.1.4 Alternative 4. Third bullet in the list associated with the first paragraph. The Haack Rework Area contains sludge with interbedded soils that cannot be separated and has been described as distinctly different than the sludge material. The text should be revised.*

The text has been revised to refer to the material excavated from the Haack Rework Area as soil-sludge (Attachment 1).

18. *Section 6.1.4.2 Excavation of Sumps. The first sentence should be revised to clarify whether the depth listed is below ground surface (bgs) or some other reference.*

The depth listed is below ground surface (bgs) and the text has been revised (Attachment 1).

19. *Section 6.1.4.2 Excavation of Sumps. In addition to using an excavator to perform mixing of the sludge with the admixture for neutralization, the use of a drill rig equipped with an auger and hood should be evaluated.*

Use of drill rigs for mixing thick sludge layers is difficult due to the lack of structural support available for the drill rig. Prior to neutralization, the sludge is soft and will not support the drill rig without specific structural elements put into place. Drill rig operation can be staged to work on top of previously neutralized sludge, thereby giving some support; however, the drilling operation will always be at the edge of treatment and highly susceptible to bearing capacity failure. Due to the safety concerns, the use of a drill rig with a hood is not considered further.

20. *Section 7.3 Final Remedial Alternatives- Detailed Analysis. The evaluation of the Alternative is biased towards the preferred alternative throughout this section. The benefits of Alternative 2A are routinely overemphasized while the impacts and negatives are minimized. Conversely for Alternatives 3 and 4, the impacts and negatives are stressed and the benefits (especially long term for Alternative 4) are minimized. The analysis should be redone without bias. Each alternative has major advantages and disadvantages that should be presented in a balanced manner. As written, the Detailed Analysis calls the conclusions of the Report into question.*

The detailed analysis of Alternatives discusses each Alternative with respect to the nine criteria. The benefits and impacts are discussed equally for all Alternatives.

21. *Section 7.3.3.2 Compliance with ARARs. This section should include a more detailed discussion of the potential for contaminated groundwater at the Site to impact other water bearing zones. The included discussion is insufficient. ESPO notes that if it is determined contaminated groundwater in the A Zone can impact deeper zones or the A zone qualifies as a unit with beneficial uses, the rating for this section will change to low. See Comment 2 also.*

Section 7.3.3.2 of the text has been revised to address this comment (Attachment 1).

22. *Section 7 .3.3.3 Long-Term Effectiveness and Permanence. The text in the second paragraph states that high ground shaking is only expected to have minimal effects because a parking lot is planned on the remediated site. However, no data or analysis of high seismic ground shaking effects such as liquefaction, settlement/subsidence, or lateral spreading and any surface expressions of the underlying sludge is included in the Report to justify this statement. While it is*

likely that ground shaking could have minimal effects, a preliminary evaluation of ground shaking effects should be included in the Report to provide a basis supporting any conclusions that are made about ground shaking effects.

A preliminary evaluation of ground shaking was performed for the site and liquefaction was identified as a potential site response. Settlement and subsidence was shown to be minimal due to the thickness of the liquefiable layer and residual material strength. Sand boils would not occur through the sludge due to the low permeability of the sludge and relatively high permeability of the soil around the sumps. Lateral spreading to the south of the engineered cap caused by liquefaction-induced soil displacement at the Dominguez channel was identified as a possibility during the seismic analysis.

23. *Section 7.3.3.3 Long-Term Effectiveness and Permanence. An analysis of what would be necessary to repair a failure in the high strength geotextile should be part of the Report and the results included here. If repairs require removal of the cap above the geotextile this alternative would have low long term effectiveness and could create unacceptable health risks if sludge is exposed during a seismic event. See Comment 22 also.*

The high-strength geotextile provides support during construction of the overlying cover materials at which time the bearing capacity of the sludge is improved. If a failure were to occur in the high-strength geotextile, it would be during construction of the cover, at which time it could be repaired. Following installation of the soil cover system, the high-strength geotextile provides no additional support or necessary function for the cover.

24. *Section 7.3.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment. The Alternative should be rated low for this evaluation. Treatment will not be performed, toxicity is not reduced, and volume is minimally reduced in the least impacted area only. The argument for mobility reduction seems to contradict other sections of the Report. See comment for RTC (Perry Myers 5) below.*

This Alternative is rated moderate because the mobility and volume of the sludge is reduced. The cap will reduce upward and displacement-induced mobility of the sludge. The gas system will further reduce mobility by preventing gas migration, if any. The volume of the sludge onsite will be reduced by relocating the Haack Rework material.

25. *Section 7.3.3.5 Short-Term Effectiveness. The text states cap construction would be performed above the existing surfaces, reducing gas generation. ESPO notes the anchor trench*

for the high strength geotextile runs, in part, between the Cooper North and Haack sumps, creating the potential for disturbing sludge that was shown to generate gases in the Treatability Study. This section should discuss the potential for excavating gas generating sludge material, the required actions to prevent unacceptable exposures, and how this may affect the short term effectiveness and implementability of Alternative 2A.

Gas generation is not anticipated during the construction of the anchor trench. The depth of the anchor trenches (3 feet) is anticipated to be above the sludge reported in the area. Additionally, the sludge which runs between the Cooper North and Haack sumps is similar to the Haack rework material in that it is discontinuous and degraded and therefore gas generated from the disturbance of this sludge in anticipated to be minimal.

26. *Section 7.3.3.6 Site Size. Since implementation of this Alternative requires construction on the Los Angeles Department of Public Works (LADPW) property along the eastern margin of the Site, discussions should be initiated with the LADPW to verify access can be obtained. See comment for RTC (Perry Myers 2) below.*

An access agreement with the LADPW currently exists and is renewed on a periodic basis. Additionally, the presence of sludge on the LADPW property east of the Cooper property may result in the listing of the LADPW as a potential responsible party as previously identified by the DTSC in a 1992 Imminent and Substantial Endangerment Order. It is not believed that the LADPW future actions or use of the property would be adversarial to the implementation of this Alternative.

27. *Section 7.3.4.1 Overall Protection of Human Health and the Environment. ESPO notes that similar to Alternative 2A, Alternative 3 may not adequately address protection of groundwater and that the evaluation of Alternative 3 may need revision depending on the additional information regarding hydrogeology that will be added to the Report. See Comments 2 and 21 also.*

Alternative 3 would not address current impacts to groundwater. This has been included in the discussion in Section 7.3.4.1 (Attachment 1).

28. *Section 7.3.4.3 Long-Term Effectiveness and Permanence. Similar to the evaluation for Alternative 2A, the text should discuss the potential for surface expressions of sludge during a seismic event and the potential health risks should this occur. See comment for RTC (Steven Hariri 2) below and Comment 23 also.*

Preliminary analyses of the site behavior during a seismic event do not indicate the potential for a surface release of sludge.

29. *Section 7.3.5 Alternative 4- Excavation with Offsite Disposal. The individual sections of the Alternative 4 evaluation were not rated low to high as were the evaluations for the other alternatives. The rating should be included for each subsection. ESPO's opinion on the ratings for Alternative 4 is as follows:*

7 .3.5.1 high -moderate

7.3.5.2 high -moderate

7.3.5.3 high -high

7.3.5.4 high –low to moderate

7.3.5.5 low -moderate

7.3.5.6 low -low

7.3.5.7 low –high costs, low ranking

7.3.5.8 moderate to high –not evaluated yet

7.3.5.9 moderate to high (based on statements from the city) –low to high

Noted. The sections have been rated based on the ratings provided in revised Table 8-1. The ratings for Alternative 4 are as follows:

7 .3.5.1 Moderate to high

7.3.5.2 High

7.3.5.3 High

7.3.5.4 Low to moderate

7.3.5.5 Moderate

7.3.5.6 Low

7.3.5.7 High

7.3.5.8 Not assessed yet

7.3.5.9 Moderate to high.

See Attachments 1 [Report Text] and 2 [Table 8-1]for revised rankings.30. *Section 7.3.5.2 Compliance with ARARs. This alternative complies with all ARARS and should be rated high. The statement that implementing this alternative will be impossible to perform in compliance with applicable emissions, disposal, and transportation regulations is not supported by the rest of the Report. Engineering controls can be used to meet emissions, treatment of the sludge will meet disposal requirements, and transportation requirements can be met. All will likely increase costs, perhaps significantly, but this section is to evaluate the alternative's ability to comply with ARARS, no other criteria. See Comment 20 also.*

The text and Table 8-1 have been revised to reflect high compliance of ARARs for Alternative 4 (Attachments 1 [Report Text] and 2 [Table 8-1]).

31. *Section 7.3.5.2 Compliance with ARARs. ESPO does not recall seeing this upgradient source argument previously in the Report. This statement should be removed unless additional information is provided in the Report to justify it.*

The Bellflower Aquiclude groundwater in the vicinity of the Site is naturally degraded as evidence by the Total Dissolved Solids (TDS) concentrations in the A-zone and the TDS and chloride concentrations in the B-zone which exceed the recommended secondary MCL values as documented in the up-gradient, background wells (wells MW-1A and MW-1B). Similar TDS and chloride concentrations also exist in groundwater obtained from the on-Site monitoring wells that are not impacted by waste.

32. *Section 7.3.5.5 Reduction of Toxicity. Mobility. and Volume Through Treatment. This analysis should be done from the perspective of the Site. Toxicity, mobility, and volume would all be significantly reduced and this section should be rated high for this alternative.*

While we agree that the long term toxicity, mobility, and volume would be significantly reduced upon completion of the remedy, the short term toxicity, mobility, and volume during

construction of the remedy actually increases. Alternative 4 would provide moderate reduction of toxicity, mobility, and volume of the sludge or rework material through treatment. This alternative creates a large amount of waste compared to the other alternatives presented and discussed. This larger volume of waste, which will be handled and shipped off site, is taken into consideration for evaluating these criteria. The volume of the sludge would double after admixture and would require disposal off site. Other wastes that would be produced include impacted groundwater, equipment decontamination wastes, and vapor treatment liquid and solid wastes. The mobility of the sludge impacts would be increased during this option as gas is generated during excavation and mixing activities. The mobility of the sludge would be temporarily increased due to trucking to an offsite disposal facility.

33. *Section 7.3.5.5 Short-Term Effectiveness. The fifth sentence should be revised to state " .. acid gases may be generated", not "would". As the Treatability Study was qualitative for construction activities, the assertion that significant quantities of acid gases would be generated is not currently supported by the Report. If additional information supporting this assertion is generated through implementation of an onsite pilot study, or other approved study/source, then the text can remain unchanged. See Comment 4 and Comment* [sic] *and Comment 20.*

The text has been revised to refer to the amount of acid gas produced with Alternative 4 in relative terms to the amount of acid gas that would be produced by the other alternatives presented and discussed (Attachment 1). As previously discussed in the responses to Comments 4 and 20, there is sufficient evidence from the Remedial Investigation Flux Chamber testing, the Treatability Study, and Sites with similar sludge materials, such as McColl, to support the potential for gas generation.

34. *Section 7.3.5.5 Short-Term Effectiveness. The last sentence refers to a cap, which is not part of this Alternative, and should be revised/removed. See comment for RTC (Perry Myers 5) also.*

Noted. The last sentence has been removed from the text (Attachment 1).

35. *Section 8 Comparative Analysis of Alternatives. This entire section, and the associated table(s), should be reviewed and revised as necessary once changes are made to the Report to address all comments made by DTSC on this document. ESPO may have additional comments on Section 8 once it is revised.*

Section 8 is revised to discuss the comparative rankings of the Alternatives.

36. *Section 7.3.5.6 lmplementability. Previous sections describe the sludge properties as soil like and rely on this characterization to design the cap in Alternative 2A and evaluate that alternative's performance during a seismic event. If the sludge is more viscous than previously described, the entire Report should be reviewed and revised as necessary to accurately reflect the material properties of the existing waste.*

The majority of the sludge to be excavated in Alternative 4 is previously undisturbed sludge, which has a less viscous consistency than the degraded soil-sludge material located in the Haack Rework area, eastern overflow, within berms, and within Artesia Blvd. Previously undisturbed sludge is not proposed to be removed in Alternative 2A and Alternative 3.

37. *Appendix A Response to Comments (RTC Summary Table (Perry Myers/Cost Estimate Review 1 0). Given the regulatory agency providing oversight for the cleanup has provided guidance on the number of groundwater monitoring wells likely to be required, using three new wells for cost estimating purposes instead of the recommended number would under estimate the Operations and Maintenance costs for Alternatives 2A and 3 related to long term monitoring. Installation of three new wells is likely acceptable for the Alternative 4 cost estimate due to the included source removal. The cost estimates for Alternatives 2A and 3 should be revised to include installation and monitoring of at least eight new groundwater wells (see comments on the Report from Greg Sweel of DTSC's Geological Services Unit for more detailed guidance). Analysis should include all COCs on a quarterly basis.*

] The addition of five groundwater wells creates a small, uniform, $40,000 construction cost increase to Alternatives 2A and 3 which will not affect the outcome of the relative cost difference of the three Alternatives. Increasing monitoring to quarterly from semi-annually, and the addition of 5 groundwater wells increases the O&M costs for Alternatives 2A and 3 from approximately $1.12M to approximately $3.18M. These costs are believed to be conservatively high for the 30-year period as soil vapor monitoring will likely decrease to semi-annually or annually or eliminated as occurred at sites similar to Gardena Sumps (Thomas Ranch, McColl). Further, groundwater monitoring will likely decrease to semi-annually or annually. While the O&M cost increase is significant, the costs of each alternative compared to one another remains the same, low (Alternative 2A), medium (Alternative 3), and high (Alternative 4). The revised cost tables are provided in Attachment 2.

38. *Appendix A Response to Comments (RTC) Summary Table (Perry Myers/Cost Estimate Review 9). The response to comments indicates Geosyntec is relying on a zone of influence (ZOI) of 40 feet for each of the gas migration wells to control gases generated from the sludge. A detailed discussion should be included in the Report that justifies the ROI and demonstrates the proposed gas collection system is adequate.*

The Zone of Influence (ZOI) is assumed from published, typical values for silty to fine sand. Typical ZOI values for those materials range from 20 ft – 40 ft (Silt) to 60 - 100 ft (fine sand) (Wong, 1997). The material at the site is generally silty sand; therefore, a 40-ft ZOI is appropriate for Feasibility Study-level planning and cost estimating purposes.

39. *Appendix A RTC (Perry Myers 2). The response to comment states that the high strength geotextile will be anchored within the Los Angeles Department of Public Works (LADPW) property along the eastern margin of the site. This may be acceptable as long as unhindered access for both installation and future maintenance is secured and guaranteed. Discussion should be initiated with the LADPW to verify access can be obtained. In addition, costs for concrete anchors and associated battens should be included in the remedy cost estimate.*

An access agreement with the LADPW currently exists and is renewed on a periodic basis. Additionally, the presence of sludge on the LADPW property east of the Cooper property may result in the listing of the LADPW as a potential responsible party as previously identified by the DTSC in a 1992 Imminent and Substantial Endangerment Order. It is not believed that the LADPW future actions or use of the property would be adversarial to the implementation of this Alternative and long term maintenance. The cost for anchor trenches is included in the cost of material under high strength geotextile located in Table 7-1. An additional cost of $15 per linear foot of sheet piling has been included for the battens. (Attachment 2)

40. *Appendix A RTC (Perry Myers 4). The response to comment states that the "final design will account for a 200 psf traffic loading on the completed surface". This level of loading would appear to preclude most light trucks and SUVs which would typically be expected in a retail or office parking lot and raises serious questions about the viability of a parking lot on the remediated site. Please clarify the vehicle size/weight limitations that are likely to be imposed on an onsite parking lot, or the feasibility of construction adjustments needed to accommodate such vehicles.*

We evaluated the cover for H20 loading of 80 psi (11,520 psf) at the cap surface and found it to be acceptable. H20 loading is greater than SUV and light truck loading and therefore inclusive of those loads.

41. *Appendix A RTC (Perry Myers 5). The response to comment states that settlement and creep of the cap is expected to be negligible and that the tarry sludge is of such high viscosity that it will not exhibit settlement from expulsion of liquids. This would appear to contradict the statement in the second paragraph of Section 7.3.3.4 of the Report which states that there is evidence of sludge movement from beneath the cap at the edges of the concrete and asphalt cover on the Haack Sump and Section 7.3.5.6 that states as an area is excavated the sludge would flow to the newly excavated portion of the sump. The observed sludge movement likely will be exacerbated by application of additional load from the proposed cover/cap. In addition, data from the 2008 Treatability Study by Stantec (Appendix B Treatability Study, Section 3.1.3 Moisture, of the current Report) indicates that the sludge has moisture contents varying from 9.8 to 22.3%. Given these moisture content levels in the sludge, it is likely that the sludge will undergo settlement (by expulsion of water) under load.*

Experience with similar sludge materials at the McColl, Del Amo, and Thomas Ranch sites indicates that the surficial sludge materials are highly susceptible to temperature. The surficial sludge materials are warmed by the sun and hotter summer temperatures, making them less viscous and prone to movement. This is seen in the current asphalt and concrete capped areas of the site where the sludge near the surface is warmed and repeated traffic loading compresses the flexible pavement and underlying sludge, thereby allowing it to migrate upwards through cracks in the pavement.

When a thicker final cover, which will provide more thermal insulation from the sun and hotter temperatures, is constructed, the sludge will exhibit more viscous characteristics and be less susceptible to migration. Furthermore, the installation of the cap components (soil, geotextile, geomembrane, etc.) will further impede the movement of the sludge material as the porosity of these cap materials, where the sludge would move, will be much smaller than the current pavement cracks that provide a pathway for sludge to migrate to the surface.

The presence of moisture in a fine grained material, such as the sludge at the site, does not necessarily relate to the ability of the material to compress. Expulsion of water is driven by the microstructure of the sludge and the hydraulic conductivity of the sludge. The microstructure of the sludge provides a certain amount of porosity, which can be reduced with reorientation of the

microstructure. If the microstructure does change and the porosity is reduced, the liquid contents of the porosity will be expelled. Expelled liquids are hindered by the hydraulic conductivity of the adjacent materials and the liquid travel distance to get out of the sludge. In this case, the sludge, which has a very low hydraulic conductivity of 1×10^{-8} cm/sec, will limit the expulsion of the liquid.

These factors have been exhibited by similar sludge materials found at the McColl, Del Amo, and Thomas Ranch sites. Six years of settlement monitoring of the Thomas Ranch site Pond 2, which contains 15 feet of low viscosity and soft sludge material, indicates that a maximum settlement of 6.84 inches has occurred in the middle of Pond 2. This settlement occurred within the first three years after completion of construction and is attributed to the large aggregate, with large open pores, that was placed over the sludge during construction. The sludge migrated into the aggregate pores allowing the final cover to settle slightly. This settlement has now ceased, indicating that liquid expulsion driven compression of the sludge is not occurring.

42. *Appendix A RTC (Steven Hariri 2). While it is appropriate to complete a detailed evaluation of damage to the cap surface drainage and erosion systems, as well as the gas migration control system, during the remedial design phase, it would be prudent to perform a preliminary evaluation at the feasibility study stage to provide data and information for use in remedy selection. We would strongly suggest a preliminary evaluation of seismic induced liquefaction, lateral spreading, subsidence, and other effects be considered at this stage.*

A preliminary evaluation of ground shaking was performed for the site and liquefaction was identified as a potential site response. Settlement and subsidence was shown to be minimal due to the thickness of the liquefiable layer and residual material strength. Sand boils would not occur through the sludge due to the low permeability of the sludge and relatively high permeability of the soil around the sumps. Lateral spreading to the south of the engineered cap caused by the liquefaction-induced soil displacement at the Dominguez channel was identified as a possibility during the seismic analysis.

<u>Efrem Neuwirth Comments</u>

1. *HERO appreciates the changes which were made to the soil-vapor risk based concentrations (Table 4-4) for benzene based upon modeling utilizing the default soil physical properties for loam (in Appendix C) rather than the previously utilized site specific properties. HERO also appreciates that the response to comments indicated that possible future fill material will not be*

more permissive to soil-vapor migration than those used in the modeling for evaluating vapor intrusion risks.

Despite the aforementioned changes, the response to comments still argues that the site specific moisture content is reasonable. However in HEROs opinion, it is not appropriate to use an average value from across the site for modeling vapor migration when there is considerable variability as was the case in the data collected for the moisture content (% weight). In addition, the bulk soil density was not measured in the majority of the samples, such that the volumetric water content cannot be determined.

Acknowledged.

Greg Sweel Comments

1. *Appendix A (Response to Comments)*

I generally concur with the RTCs and the proposed revisions and defer to the Engineering and Special Projects Office (ESPO) regarding concerns related to areas of their expertise.

There are a few RTCs which need some additional clarification. Specifically, page 7 of 15 (Greg Sweel – 9) mentions that the location and number of proposed soil gas probes may change. I would recommend that any changes in number and location be made after consultation and agreement with DTSC. Also, there remains conflict between several RTCs (Greg Sweel – 6, Greg Sweel – 13, Greg Sweel – 21, and Perry Myers – 13) regarding the number of groundwater monitoring wells which are proposed for abandonment.

Noted. The exact locations and number of proposed soil gas probes will be decided in consultation with the DTSC.

2. *Section 3.3 (Fate and Transport)*

Some areas of sludge may be in direct contact with groundwater resulting in ongoing contamination. The subject document should integrate removal of the source areas and protection of groundwater resources as a remedial alternative.

The document evaluates the feasibility of removing the sludge and the potential source of localized groundwater impacts in Alternative 4. Groundwater impacts which may be attributed to

the sludge are localized and not impacting offsite areas as evidence by the lack of downgradient impacts; therefore, the incorporation of institutional controls preventing the use of onsite groundwater as well as notification of excavation and other activities where groundwater may be encountered, are sufficient for protection with Alternatives 2A and 3.

3. *Section 6.1.2.6 (Groundwater Monitoring)*

We note that Tables 7-1 through 7-3 only estimate costs for the installation of three (3) replacement groundwater monitoring wells. These tables should be revised to include at least eight (8) new wells (4 well clusters each consisting of a Zone A and a B completion). Also, Figure 6-13 should include a schematic for deep (Zone B) monitoring wells along with shallow (Zone A) wells.

The addition of five groundwater wells creates a small, uniform, $40,000 construction cost increase to Alternatives 2A and 3 which does not affect the outcome of the relative cost difference of the three Alternatives. Increasing monitoring to quarterly from semi-annually, and the addition of 5 groundwater wells increases the O&M costs for Alternatives 2A and 3 from approximately $1.12M to approximately $3.18M. These costs are believed to be conservatively high for the 30-year period as soil vapor monitoring will likely decrease to semi-annually, annually, or eliminated altogether as occurred at sites similar to Gardena Sumps (Thomas Ranch, McColl). Further, it groundwater monitoring will likely decrease to semi-annually or annually. While the O&M cost increase is significant, the costs of each alternative to one another remains the same, low (Alternative 2A), medium (Alternative 3), and high (Alternative 4). The revised cost tables are provided in Attachment 2.

The typical well shown in Figure 6-13 is provided for demonstration purposes only and is not intended to serve as construction guidance for future onsite wells. Additional wells and their schematics, if necessary, will be included in the RAP and subsequent design reports.

4. *Section 7.3.5.2 (Compliance with ARARs)*

The newly added text mentions that groundwater beneath the site has been impacted from upgradient sources. We believe this statement is not accurate and should be removed.

The Bellflower Aquiclude groundwater in the vicinity of the Site is naturally degrade as evidence by the Total Dissolved Solids (TDS) concentrations in the A-zone and the TDS and chloride concentrations in the B-zone which exceed the recommended secondary MCL values as documented

in the up-gradient, background wells (wells MW-1A and MW-1B). Similar TDS and chloride concentrations also exist in groundwater obtained from the on-Site monitoring wells that are not impacted by waste. Impacted was a poor choice of words, degraded should have been used in place of impacted.

If you have questions or require additional information about the enclosed report, please contact Mr. Kyle Christie with ARC at 714-670-5303.

Sincerely,

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References:

Wong, Jimmy, et. al., 1997.Design of Remediation Systems, Table 5.3.

Attachments:

1 – Updated Revised Final Draft Feasibility Study Report Text

2 – Updated Revised Final Draft Feasibility Study Report Tables 7-1, 7-2, and 8-1

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REVISED FINAL DRAFT FEASIBILITY STUDY

GARDENA SUMPS

Prepared by

Geosyntec consultants

engineers | scientists | innovators

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~~February 2011~~

~~November 2012~~

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LIST OF ACRONYMS (RTC, 1/9/2013)

amsl	above mean sea level
APA	Air pathway analysis
API	American Petroleum Institute
ARAR	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
$CaCO_3$	calcium carbonate
CalDWR	California Department of Water Resources
CalEPA	California Environmental Protection Agency
Cal-OSHA	California Occupational Safety and Health
CaO	calcium oxide
$Ca(OH)_2$	calcium hydroxide, hydrated lime
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHHSLs	California Human Health Screening Levels
cm/s	centimeters per second
COC	chemicals of concern
COPC	constituents of potential concern
cP	centipoises
CQA	Construction Quality Assurance
CY	cubic yard
DRO	diesel range organics
DTSC	Department of Toxic Substances Control
EEI	Ecology and Environmental, Inc.
FS	Feasibility Study
ft	feet
ft bgs	feet below ground surface
GAC	Granular Activated Carbon
GCL	geosynthetic clay liner
GRA	general response action

GRO	gasoline range organics
H_2S	hydrogen sulfide
HASP	Health and Safety Plan
HDPE	high-density polyethylene
HHRA	human health risk assessment
in	inch
LACDPW	Los Angeles County Department of Public Works
LADPW	Los Angeles Department of Public Works
LUCs	land use covenants
MCL	maximum contaminant level
NPDES	National Pollution Discharge Elimination System
O&M	operation and maintenance
OMM	Operations, Maintenance, and Monitoring
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PEL	permissible exposure limit
ppmv	parts per million by volume
PVC	polyvinyl chloride
QC	quality control
RAOs	Remedial Action Objectives
RAP	Remedial Action Phase
RBC	risk-based concentration/value
RI	Remedial Investigation
RL	Reporting Limit
RMP	Risk Management Plan
ROD	Record of Decision
RTC	response to comments
RWQCB	Regional Water Quality Control Board
SCAQMD	South Coast Air Quality Management District
SCBA	Self-Contained Breathing Apparatus
SO_2	sulfur dioxide

SPLP	synthetic precipitation leaching procedure
SSAL	site-specific action levels
SVOC	semi-volatile organic compound
SWPPP	Stormwater Pollution Prevention Plan
TBC	to be considered
TCLP	toxic characteristic leaching procedure
THE	total extractable hydrocarbon
USEPA	United States Environmental Protection Agency
VFH	volatile fuel hydrocarbons
VOC	volatile organic compounds
w/w	mass concentration

EXECUTIVE SUMMARY

This Revised Final Draft (RTC, 11/6/12) Feasibility Study (FS) Report was prepared for the Gardena Sumps Site (Site) in Gardena, California. This FS Report was prepared for submittal to the California Environmental Protection Agency (CalEPA), Department of Toxic Substances Control (DTSC) in accordance with the California Health and Safety Code. The FS Report is a requirement of Consent Decree CV04-7882-AHM (JTLx), (Consent Decree). This Revised Final Draft FS incorporates the comments and requests made by the DTSC on the original draft FS dated February 2011 and the Draft Feasibility Study Addendum – Alternative 2A (Addendum). Revisions to the original Draft FS resulting from the Addendum and comments are shown as either strike out (deletions) or underline (additions) with the corresponding comment package date at the end. (RTC, 11/6/12)

Background

The Site is located in the southwest corner of the Artesia Boulevard and Normandie Avenue intersection in the City of Gardena, Los Angeles County, California. Generally, the area surrounding the Site is bordered to the south by the Los Angeles County Department of Public Works (LACDPW) Dominguez Flood Channel, to the east by the Southern Pacific Railroad right-of-way, to the west by the western Haack property line, and to the north by Artesia Boulevard, although a small portion of Artesia Boulevard is included within the Site. Commercial and residential properties are currently located to the north, east, and west of the Site (Stantec, 2008).

The site was developed as a clay mine during the 1920s by the Moneta Brick Company. Clay mining resulted excavations that were ~~in what are known as the Haack, Cooper South, and Cooper North sumps and Haack Rework Area~~ reportedly used for sludge disposal beginning in approximately ~~at the Site. These sumps were reportedly used for sludge disposal beginning in March~~ (RTC, 11/6/12) 1940. By September 1946, the Haack, Cooper South and Cooper North Sumps had been ~~and two Cooper sumps were~~ (RTC, 11/6/12) filled with sludge, and vegetation had reclaimed ~~the small pit and~~ (RTC, 11/6/12) the Haack Rework Area (Stantec, 2008).

By December 1951, the western portion of the Haack Sump had been covered with dirt and was converted into a parking lot. On October 1, 1952, the northern-most strip of the Site ~~Haack~~ (RTC, 11/6/12) property was sold to the State of California for a highway easement. By early 1956, Artesia Boulevard (Highway 91) had been constructed, with the southern portion of the roadway encroaching into the Haack Sump northern berm. By January 1958, the Dominguez Channel had been reconstructed and extended eastward south of the Site (Stantec, 2008).

By November 1962, the bluff on the Haack Property (RTC, 11/6/12) had been excavated to expand the Haack ~~paved~~(RTC, 11/6/12) parking lot, although the eastern portion of the Haack property contained sludge ~~remained a vegetated area~~ (RTC, 11/6/12) immediately west of the Cooper North Sump. The Haack Rework Area appeared altered and may have received soil cover from excavation activities that occurred immediately north of the Haack Rework Area. The future Cooper property was unchanged even after it was sold to Thomas Cooper in December 1977 (Stantec, 2008).

Currently, the two Cooper sumps are capped by a geosynthetic material that was installed by OHM Corporation (OHM) in July 1993 as part of the DTSC's environmental program at the Site. The Haack Sump has been covered by asphalt and a concrete slab. Currently the Haack property is leased to various tenants who operate small businesses, including a U-Haul rental agency, a metal fabricating, sand blasting and painting company, and an auto body repair shop. Three buildings and numerous small trailer-type storage structures are present on the Haack property (Stantec 2008).

Geology and Hydrogeology

The Site is located in the Los Angeles Coastal Plain and is underlain by a thick sequence of marine and continental sediments that were deposited in a broad synclinal depression generally referred to as the Los Angeles Basin. The Los Angeles Basin is bisected by the northwest trending Newport-Inglewood uplift, which divides the Coastal Plain into two smaller synclinal troughs. The Site is located in the West Coast Basin, which constitutes the southwest portion of the Los Angeles Basin (Stantec, 2008).

The Site is located near the junction of the Torrance Plain and the Dominguez Erosion Gap. The Torrance Plain runs west of and parallel to the hills of the Newport-Inglewood uplift from the Ballona Gap southeast to the Dominguez Gap. The Plain is a broad featureless area only slightly dissected locally by the Dominguez Creek (Dominguez Channel) (Stantec, 2008).

According to boring logs in the Ecology and Environmental, Inc. (EEI) (1986), Metcalf and Eddy (1992), CalEPA (1994) and URS (1994) reports, sediments underlying the Site, to the maximum explored depth of 92 feet below ground surface (ft bgs), consist primarily of a mixture of clays and silts with interbeds of sand (Stantec, 2008).

The Site is underlain by the Bellflower Aquiclude at the ground surface, and beneath that, the Gardena and/or Gage Aquifers of the Lakewood Formation within the larger, West Coast Groundwater Basin. Regionally, the Bellflower Aquiclude contains interfingered zones of permeable and less permeable sediments with modest to relatively high hydraulic conductivity. Little beneficial use is made of water in these

shallow, discontinuous hydraulic zones because well yields tend to be low and water quality generally poor (CalDWR, 1961).

Immediately beneath the site, there are two hydraulic zones within the Bellflower Aquiclude: Zone A (upper) and Zone B (lower), which are approximately 15 to 25 and 75 to 80 ft bgs, respectively. Site groundwater monitoring wells are screened within these two zones (Stantec, 2008). Presently the shallow groundwater beneath the Site is influenced by the concrete lined Dominguez Channel and flows southward (Stantec, 2010c).

Beneath the Lakewood Formation are the Lynwood and the Silverado Aquifers, which are capable of storing or conveying groundwater in significant quantities and constitute major sources of groundwater in the West Coast Groundwater Basin. While these aquifers are designated as primary and secondary sources of domestic water supply, neither the Gardena nor Gage Aquifers are currently pumped for domestic use (Stantec, 2008).

The area surrounding the Site is urbanized, with surface waters that drain via storm drains into the Dominguez Channel. The upstream portion of the modern day Dominguez Channel originates several miles west-northwest of the Site, and it drains surface water to the southeast where it discharges to the Cerritos Channel of the Los Angeles Harbor. Historically, the Dominguez Channel flowed along a natural channel bed located approximately several hundred feet west and north of the Site, where it flowed eastward into Laguna Dominguez. Surface water at the Site generally drains towards the north and east following site topography, and is intercepted by a flood control storm drain located at the northeast corner of the Site adjacent to the intersection of Artesia Boulevard and Normandie Avenue (Stantec, 2008).

Contaminant Distribution

During the 2006, 2008, and 2009 Remedial Investigation (RI) activities, Stantec collected subsurface soil, sludge, surface water, groundwater, perched groundwater, soil gas, and soil vapor flux samples to identify the nature and extent of contamination. Results of the sampling activities are summarized in the following paragraphs.

Sludge

The Cooper North and South Sumps have a maximum thickness of 17.5 ft and 13.5 ft, respectively, while the Haack Sump varies in thickness from 0.5 to 3 ft to depths up to 14.6 ft bgs. Based on analytical results, attenuation of sludge was typically 1 to 7.5 ft below the bottom of the sludge (Stantec, 2008). The sludge volumes in the sumps are

6,700 cubic yards (cy), 7,000 cy, and 2,250 cy in the Cooper South, Cooper North, and Haack Sumps, respectively (Stantec, 2010c).

The Haack rework area consists of deposited sludge, soil, and debris in discontinuous and mixed layers beneath a soil cover with thickness varying from less than 1 foot to 10 feet. Stantec calculated approximately 650 cy of material is in the Haack Rework Area (Stantec, 2010c).

Constituents identified in the sludge included volatile fuel hydrocarbons (VFHs), total extractable hydrocarbons (TEHs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons (PAHs), Title 22 metals, mercury, and hexavalent chromium.

Surface Water

Surface water samples were collected upstream and downstream of the Site from the Dominguez Channel in 2006 and 2008. Analytical data from surface water samples indicated elevated concentrations of gasoline range organics (GRO) and VOC analytes in contrast to the non-detections for those analytes in groundwater monitored at the Site. Based on the organic chemical parameters, the Site is not impacting surface water quality in the channel.

Soil Gas

The soil gas investigation activities evaluated the subsurface concentrations of VOCs, hydrogen sulfide, and methane at various locations across the Site for use in the baseline human health risk assessment (HHRA). Constituent concentrations reported above the detection limit for targeted VOCs include benzene, toluene, ethylbenzene, m-,p-,o-xylenes, 1,3,5-trimethylbenzene, and Freon 113. Methane and hydrogen sulfide were also detected in samples collected during the 2006 RI activities.

Soil Vapor Flux

Air pathway analysis (APA) was performed on ambient air samples, exposed disturbed and undisturbed sludge on the Cooper property, soil on both the Cooper and Haack properties, and asphalt and concrete slab-covered soil on the Haack property. Results of the APA indicated methane and select VOCs were present in ambient air likely due to industrial activities on the Haack property and sludge on the Cooper property. The undisturbed sludge had low to moderate emissions, while the disturbed condition can be generally characterized as having moderate to high area source emissions. Odor analyses confirmed the potential for sulfuric compounds from disturbed sludge to create nuisance odors to people in the area or downwind of the disturbed sludge. The infiltration analysis in locations above cracks and seams in the asphalt and concrete

indicated that the individual compound emissions are greatly affected by the surface coverings and slab.

Groundwater

The *First Quarter 2010 Groundwater Monitoring Report* identified nine of ten groundwater monitoring wells as having no detectable concentrations of GRO, VOCs, or PAHs above the Reporting Limit (RL). Samples from MW-05A had detections of GRO and VOCs above the RL. SVOCs were reported in wells MW-01A, MW-01B, and MW-02A. Generally, groundwater samples from onsite wells have a pH ranging between 4.5 and 8.0. Metals detected in samples collected from the groundwater wells included barium, arsenic, cobalt, copper, nickel, and zinc.

Perched Groundwater

~~Perched groundwater in the Haack Sump area is suspected to be the result of leaking utilities.~~ (RTC, 9/29/11) Perched groundwater has been detected at several locations beneath the Site. Total metals detected above primary and/or secondary MCLs included: antimony, arsenic, beryllium, cadmium, chromium, copper, nickel, selenium, and zinc. Dissolved metals above primary and/or secondary MCLs included: nickel and zinc. Benzene was detected in a perched groundwater sample below the MCL, and some SVOCs were detected above the detection limit but below the RL.

Treatability Study

A treatability study was conducted by Stantec to define and evaluate the physical and chemical characteristics of the sludge and evaluate neutralization/stabilization options. Acidity, wet density, moisture, viscosity, softening point, and leaching were evaluated on untreated sludge samples. Different reagent mixes were tested with the sludge to evaluate their neutralization/stabilization ability. Thermal treatment and asphaltic recycling were also evaluated during the treatability study.

The treatability study indicated the following:

- The acidity of the sludge ranged from 6.1 to 20.8 percent by weight;
- The densities for the samples ranged from 63 lb/ft^3 to 79 lb/ft^3;
- The average moisture of the sludge ranged from 9.8 to 22.3 percent on a wet basis;
- The sludge is highly viscous, ranging from 1.7×10^6 to 2.5×10^6 centipoises (cP) at a reference temperature of 140ºF;

- The softening point of the sludge varied from 158ºF for samples collected from the Cooper property to over 210 ºF for samples collected from the Haack Rework area;
- A mixture of 50 percent hydrated lime ($Ca(OH)_2$) and 50 percent calcium carbonate fines ($CaCO_3$) with the addition of 10 percent water and 50 percent soil by weight effectively solidifies the sludge, fixates lead, and neutralizes acid gases such as hydrogen sulfide (H_2S) and sulfur dioxide (SO_2);
- Disrupting or heating the sludge will result in the release of H_2S and SO_2 gases, but the release of VOCs from the sludge should be minimal unless the sludge is heated;
- The SPLP extracts for untreated sludge contained detectable lead, but lead was below the detection limits in SPLP extracts for treated sludge;
- The permeability of the untreated sludge was less than $1x10^{-8}$ cm/sec due to the monolithic, asphaltic properties of the untreated sludge, but the permeability of the material increased to $9x10^{-3}$ cm/sec after treatment;
- The sludge has a high BTU value of 13,000 BTUs/lb, but the high sulfur content of the sludge (7 percent sulfur) would make incineration or use of the sludge as a fuel prohibitively expensive due to sulfur-removal and vapor treatment requirements; and
- Testing for asphaltic qualities of the sludge indicates that it will be unsuitable for use as recycled asphalt for road construction or roofing since it has no ductility, high viscosity, and high solids content.

Feasibility Study Process

The Feasibility Study (FS) process is specified by the USEPA. The purpose of the FS process is to provide sufficient information on potential remedial options so that informative treatment decisions can be made. The FS process consists of developing remedial alternatives, screening those alternatives, and then performing a detailed analysis of the most applicable alternatives. The steps to this process include:

- Developing Remedial Action Objectives (RAOs) based on the results of the RI, HHRA, and future site use;
- Identifying and selecting applicable remedial technologies for soil based on effectiveness, implementability, and cost;
- Developing alternatives from the retained remedial technologies that satisfy the RAOs;

- Screening the alternatives and performing a detailed analysis of each of the final alternatives; and
- Performing a comparative analysis of the final alternatives sufficient to provide the information necessary to select an appropriate remedy for the site.

Remedial Action Objectives and Cleanup Criteria

RAOs are goals specific to various media and apply to those media that have been identified as posing an unacceptable risk based on the HHRA work performed for the Site. The RAOs for onsite soils, soil gas, and groundwater are:

- Prevent ingestion/direct contact with sludge and/or soil having 10^{-5} to 10^{-6} excess cancer risk from carcinogenic constituents as represented by arsenic, hexavalent chromium, naphthalene, and the BaP-eq concentration;
- Prevent dermal contact with shallow groundwater having 10^{-5} excess cancer risk from carcinogenic polycyclic aromatic hydrocarbons (PAHs) as represented by dibenz(a,h)anthracene;
- Prevent dermal contact with low pH, PAH containing sludge (RTC, 2/10/12);
- ~~Prevent inhalation of benzene posing excess cancer risk levels of 10^{-5} to 10^{-6}~~ (RTC, 9/29/11);
- Prevent inhalation of volatile organic compounds (VOCs), as represented by benzene, posing excess cancer risk levels of 10^{-5} to 10^{-6} (RTC, 9/29/11); and
- Prevent explosive risks associated with methane. (RTC, 9/29/11)

Applicable Remedial Technologies

Potentially applicable technologies for soil remediation were screened based on effectiveness, implementability, and cost. The remedial technologies determined to be most applicable to the Site are:

- No action;
- Institutional controls;
- Treatment:
    - Stabilization/neutralization
- Containment;
- Excavation and removal for offsite disposal; and
- Engineered controls:
    - Vapor and gas control systems; and

- Groundwater monitoring.

Other technologies identified but eliminated from further consideration are:

- Treatment:
  - Thermal treatment and
  - Sludge recycling

These technologies were eliminated primarily due to their ineffectiveness as identified during the treatability study.

Development of Remedial Alternatives

Four alternatives were developed from the retained remedial technologies:

- Alternative (A) 1 – No action: This consists of no remedial actions or institutional controls to address soils above target cleanup levels;
- ~~A 2 – Capping with selective excavation: This alternative consists of excavating the Haack Rework area and a portion of sludge overflow along the eastern Cooper sump and consolidating the materials above the Cooper North and South Sumps. A cap consisting of a stabilization layer, foundation layer, low-hydraulic conductivity layer, and erosion resistance layer would be constructed above the sumps. A gas control and monitoring system would be installed beneath the cap and around the sumps, and groundwater monitoring would remain ongoing. Institutional controls consisting of a Health and Safety Plan (HASP), Construction Quality Assurance (CQA) Plan, and Risk Management Plan (RMP) would be implemented.~~ (RTC, 9/29/11)
- A 2A – Capping with selective excavation: This alternative consists of excavating the Haack Rework area and disposing of the sludge (RTC, 11/6/12) material offsite. A cap consisting of a high strength geotextile, foundation layer, low-hydraulic conductivity layer, and erosion resistance layer would be constructed above the sumps. A gas control and monitoring system would be installed beneath the cap and around the sumps, and groundwater monitoring would remain ongoing. Institutional controls consisting of a Health and Safety Plan (HASP), land use covenants (LUCs), Construction Quality Assurance (CQA) Plan, and Risk Management Plan (RMP) would be implemented. (RTC, 9/29/11)
- A 3 – Capping with selective excavation and stabilization/neutralization: This alternative includes mixing the top three feet of sludge in the Cooper North and South Sumps with reagent to stabilize/neutralize the sludge. The Haack Rework area and a portion of sludge overflow along the eastern Cooper sump would be

mixed with the stabilized/neutralized material. A cap consisting of a foundation layer, low-hydraulic conductivity layer, and erosion resistance layer would be constructed above the Cooper North and South and Haack Sumps. A gas control and monitoring system would be installed beneath the cap and around the sumps, and groundwater monitoring would remain ongoing. Institutional controls consisting of a Health and Safety Plan (HASP), Construction Quality Assurance (CQA) Plan, and Risk Management Plan (RMP) would be implemented.

- A 4 – Excavation with offsite disposal: This alternative includes excavation of sludge with disposal offsite. The sludge would be mixed with the neutralizing agent and loaded into trucks for disposal offsite. Major components of this alternative include concrete and asphalt removal, excavation and mixing of sludge, transportation to the disposal facility, confirmation sampling, sump backfill, and groundwater monitoring.

Detailed Analysis of Alternatives

The CERCLA guidance document explains the nine criteria that are used to evaluate each remedial alternative [USEPA, 1988]. The first two criteria are categorized as threshold criteria that a selected remedy must meet:

- Overall Protection of Human Health and the Environment; and
- Compliance with ARARs.

The following seven criteria are “balancing” criteria. They represent the primary criteria upon which the detailed analysis is based and that are used to distinguish among alternatives that meet the threshold requirements above:

- Long-term Effectiveness and Permanence;
- Reduction of Toxicity, Mobility, and Volume Through Treatment;
- Short-term Effectiveness;
- Implementability;
- Cost;
- State Acceptance; and
- Community Acceptance.

State and community acceptance are evaluated following public comment on the FS Report.

Overall Protection of Human Health and the Environment

Alternative 1, No Action, does not provide adequate protection of human health and the environment. No further assessment or comparison with this alternative is provided. Alternative ~~2~~ 2A (RTC, 9/29/11) would perform better than Alternative 3. While Alternative 3 stabilizes/neutralizes a portion of the sludge, the mixing of the reagent releases potentially hazardous amounts of hydrogen sulfide and sulfuric acid gas. Alternative 4 would provide very good protection of human health and the environment with the removal of the impacted materials; however, because of the risks associated with hazardous gas generation during excavation and transportation of the material, the overall protection is deemed moderate.

Compliance with ARARs

Alternative ~~2~~ 2A (RTC, 9/29/11) would perform better with respect to ARARs due to the reduction of gas emissions when compared to Alternatives 3 and 4.

Long-term Effectiveness and Permanence

Alternative 3 is ranked higher than ~~2~~ 2A (RTC, 9/29/11) with respect to long-term effectiveness and permanence. Both alternatives would be effective and permanent over the long-term with maintenance; however, because Alternative 3 neutralizes a portion of the sludge, the treatment is likely more permanent. Alternative 4 provides the greatest long-term effectiveness and permanence since the sludge is removed from the site and disposed offsite.

Reduction of Toxicity, Mobility, and Volume Through Treatment

Alternative 3 would slightly reduce toxicity and mobility through partial in-situ treatment of the source zone; however, toxicity would increase as acid gases are released during mixing of the sludge for treatment. Alternatives ~~2~~ 2A (RTC, 9/29/11) and 3 would reduce mobility of the sludge by limiting infiltration and wind erosion. Alternative 4 would reduce the mobility of the sludge after offsite disposal since the disposal landfill would be equipped with a liner system to collect leachate; however, transport of the material would temporarily increase the potential mobility.

Short-term Effectiveness

Alternative ~~2~~ 2A (RTC, 9/29/11) would perform the best with respect to short-term effectiveness. Unlike Alternatives 3 and 4, Alternative ~~2~~ 2A (RTC, 9/29/11) does not significantly disturb the sludge, thereby minimizing the release of acid gas. Both Alternatives ~~2~~ 2A (RTC, 9/29/11) and 3 incorporate a cap into the final design which would provide an immediate reduction in risk due to inhalation, dermal exposure, and

ingestion. Alternative 4 would provide a reduction in risk after the sludge was transported offsite; however, risk is temporarily increased in the short-term during sludge disturbance and transport.

Implementability

Alternatives 3 and 4 pose significant implementation issues due to the gas generation during mixing and excavation of the sludge. Gas control and treatment would be necessary during mixing and excavation of the sludge. Construction of a tent to contain the gases would be difficult to perform due to low bearing capacity of the sludge and the area the tent would need to span (minimum of the Cooper North sump). Gases captured by the tent would need treatment prior to discharge.

Alternative ~~2~~ 2A (RTC, 9/29/11) is relatively easy to implement. A stabilization layer on the Cooper sumps would be placed first to provide a surface in which to install the foundation and gas collection, barrier, and cover layers. Disturbance of the sludge would be limited to the eastern overflow and Haack Rework Area, which are significantly degraded and would release significantly less acid gas than the sludge in the Haack and Cooper Sumps (Appendix A, Stantec, 2008). The materials necessary for construction are available and do not require admixtures or special equipment.

All Alternatives are difficult to implement due to the Site's urban setting, size, and proximity to sensitive receptors; however, the design of Alternative 2A limits the effects of these challenges on construction. The urban setting with high traffic flows will be impacted with the significant truck traffic entering and exiting the site with imported soil and exported waste. Alternative 2A limits the traffic by only exporting Haack Rework material and importing minimal soil for backfill and foundation. The size of the Site is limited due to the extent of the sumps leaving little space available for storage, staging, and construction activities. Alternative 2A is not as affected by the space limitations because neutralization materials will not be required, and as such, storage area for these materials is not required for this Alternative. (RTC, 9/29/11)

Alternatives 3 and 4 pose significant implementation issues due to the gas generation during mixing and excavation of the sludge and the potential impacts to neighboring sensitive receptors. Limiting work to night-time only would not reduce the risks to near-by businesses which operate 24-hours a day. Implementation of Alternative 2A has fewer engineering and health and safety complications since the sludge is not fully disturbed, thus limiting the release of hazardous gas. (RTC, 9/29/11)

While Alternative 2A has implementation challenges due to the Site size and location, the design of the Alternative 2A cap results in the most implementable remedial alternative. (RTC, 9/29/11)

Cost

Alternative ~~2~~ 2A (RTC, 9/29/11) has the lowest capital cost of approximately ~~$5,206,314~~ $5,774,550 ~~with Alternatives 3 and 4 having comparable capital costs of $35,402,274 and $54,067,350, respectively~~. (RTC, 11/6/12) Alternative 3 has a capital cost highly dependent on neutralization admixture costs ranging from $11,144,880 to $12,566,880. Similarly to Alternative 3, Alternative 4 has a cost highly dependent on the admixture price ranging from a low of $26,217,950 to a high of $28,991,650. (RTC, 11/6/12)Alternatives ~~2~~ 2A (RTC, 9/29/11) and 3 have identical net present value O&M costs of approximately ~~$1,563,800~~ $2,822,100.00 (RTC, 11/6/12). Alternative 4 has the lowest net present value O&M cost of approximately ~~$620,500~~ $113,200 (RTC, 11/6/12). Alternative 2A has the lowest combined remedial cost. (RTC, 9/29/11)

State Acceptance

In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the ROD is being prepared.

Community Acceptance

In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the ROD is being prepared. During the May 10, 2011 meeting between the DTSC and the City, the City expressed concerns regarding the appearance of the former Alternative 2 being similar to a "landfill," and the height of the cap being too high. The City expressed the desire that the final remedial Alternative be consistent with the vision and goal of future development for the Site. (RTC, 9/29/11)

Alternative 2A provides a reduced cap thickness, and accounts for future use as a parking lot subgrade consistent with the City's vision for commercial development. Alternative 3 proposes a cap sloping upward to a maximum elevation of 35 ft amsl, which makes parking lot construction more difficult above the high grades and slopes of the Site. Alternative 4 proposes the Site is excavated and filled. Alternative 4 best incorporates the City's vision for commercial development; however, given the implementation, short-term effectiveness, and cost challenges, Alternative 2A provides the best compromise to meet the City's development vision. (RTC, 9/29/11)

Remedy Selection

~~Based on the comparative analysis of the remedial alternatives, the alternative that meets the RAOs and ranks the highest is Alternative 2,capping with selective excavation. The elements of Alternative 2 are:~~ (RTC, 9/29/11)

- ~~Prepare a construction Health and Safety Plan and Construction Quality Assurance Plan;~~ (RTC, 9/29/11)
- ~~Place a 3.5-foot stabilization layer across the Cooper North and South sumps consisting of gravel, sand, and geocell;~~ (RTC, 9/29/11)
- ~~Excavate the Haack Rework area, segregating the overburden soil from the sludge/soil mixture;~~ (RTC, 9/29/11)
- ~~Install retaining wall (sheet pile) along northern perimeter (Artesia Blvd);~~ (RTC, 9/29/11)
- ~~Place the Haack Rework material and other site soils as the foundation layer above the stabilization layer with horizontal gas collection pipes embedded. The foundation layer would increase in thickness and would be graded such that the final surface would drain at 3 percent to the cap perimeters;~~ (RTC, 9/29/11)
- ~~Install vertical gas migration control wells;~~ (RTC, 9/29/11)
- ~~Install geosynthetic layers consisting of, from bottom to top, a gas collection geocomposite, GCL, 60-mil HDPE geomembrane, and drainage geocomposite;~~ (RTC, 9/29/11)
- ~~Place 2 feet of cover soil above the geosynthetics;~~ (RTC, 9/29/11)
- ~~Install groundwater monitoring wells;~~ (RTC, 9/29/11)
- ~~Operate the below-cap gas collection system and the perimeter vertical gas migration control well system as active systems for a period of at least 2 weeks. Following the start-up period, operate the below-cap gas collection system and vertical gas migration control well system passively. During passive operation, monitor the performance of the proposed alternative remedial measure with a system of perimeter gas migration sentry wells outside the limit of the perimeter vertical gas migration control wells. If the monitoring data indicate significant gas migration from the waste, convert the system to active gas control and, if required, include gas treatment;~~ (RTC, 9/29/11)
- ~~Prepare a Risk Management Plan;~~ (RTC, 9/29/11)
- ~~Perform semi-annual groundwater monitoring; and~~(RTC, 9/29/11)

- ~~Complete a formal review of remediation effectiveness after five years.~~ (RTC, 9/29/11)

~~This remedial alternative effectively mitigates the risk from ingestion, inhalation, and dermal contact with onsite soils for both future non-residential and residential occupants of buildings on site, and future landscapers and utility workers. This alternative also effectively mitigates the risk from dermal contact with site groundwater through the cap and institutional controls including the Health and Safety Plan and Risk Management Plan.~~ (RTC, 9/29/11)

~~Alternative 2 readily meets the criteria of overall protection of human health and the environment and satisfies ARARs. When evaluated against the balancing criteria, Alternative 2 provides short-term effectiveness as well as long-term effectiveness and permanence. It is readily implementable and presents an effective balance of cost against the other criteria. Alternative 2 also would best accommodate future potential redevelopment of the Site.~~ (RTC, 9/29/11)

Based on the comparative analysis of the remedial alternatives, the alternative that meets the RAOs and ranks the highest is Alternative 2A, capping with selective excavation. The elements of Alternative 2A are: (RTC, 9/29/11)

- Prepare a construction HASP and CQA Plan;
- Prepare a Risk Management Plan;
- High-strength geotextile installation;
- Select excavation of impacted material;
- Containment of sludge along Artesia Boulevard;
- Capping of sludge;
- Installation of gas control and monitoring system;
- Institutional controls;
- Perform semi-annual groundwater monitoring; and
- Complete a formal review of cap effectiveness after five years. (RTC, 9/29/11)

This remedial alternative effectively mitigates the risk from ingestion, inhalation, and dermal contact with onsite soils for future non-residential occupants of buildings onsite, and future landscapers and utility workers. This alternative also effectively mitigates the risk from dermal contact with Site groundwater through the cap and institutional controls including the Health and Safety Plan and Risk Management Plan. (RTC, 9/29/11)

Alternative 2A readily meets the criteria of overall protection of human health and the environment and satisfies ARARs. When evaluated against the balancing criteria, Alternative 2A provides short-term effectiveness as well as long-term effectiveness and permanence. It is implementable and presents an effective balance of cost against the other criteria. Alternative 2A could also accommodate future potential redevelopment of the Site as a parking lot to support a commercial operation. (RTC, 9/29/11)

1. INTRODUCTION

1.1 Terms of Reference

This document presents the Revised Final Draft (RTC, 11/6/12) Feasibility Study (Revised Final Draft FS) Report for the Gardena Sumps Site (Site) in Gardena, California. The FS Report is a requirement of Consent Decree CV04-7882-AHM (JTLx), (Consent Decree). The original draft (RTC, 11/6/12) FS Report (Draft FS) was prepared for submittal to the California Environmental Protection Agency (CalEPA), Department of Toxic Substances Control (DTSC) in accordance with the California Health and Safety Code on 11 February 2011. After submittal of the Draft FS, the following timeline of correspondence and revisions occurred:

- A meeting with the DTSC and City of Gardena on 2 May 2011 and receipt of comments from the DTSC 6 June 2011 and 9 June 2011.

- Responses to comments including the Draft Feasibility Study Addendum – Alternative 2A (FS Addendum) were prepared by Geosyntec Consultants, Inc. (Geosyntec) and submitted to the DTSC on 29 September 2011.

- Comments on the FS Addendum were received from the DTSC on 31 October 2011 and 11 November 2011.

- Calculations supporting the preliminary cap design were requested by the DTSC 28 January 2012. The calculations were subsequently transmitted to the DTSC on 1 February 2012.

- A letter in response to DTSC comments received 31 October 2011 and 11 November 2011 was issued by Geosyntec on 7 February 2012.

- Additional DTSC comments on the Addendum and 10 February 2012 response to comments package were received on 7 March 2012 and 30 March 2012.

- A response to comments package was submitted to DTSC by Geosyntec on 4 April 2012 as the Revised Draft Feasibility Study (Revised FS) which included clarification sheets for the Draft FS and FS Addendum.

- Comments were received from the DTSC on the Draft FS, comment responses, and Revised FS on 6 September 2012. (RTC, 11/6/12)

This document represents the Revised Final Draft FS following a recommendation in the 6 September 2012 comment package to revise the documents to form one, comprehensive Feasibility Study. This package addresses the comments and concerns

which were presented in the letters received from DTSC. This draft represents revisions to the original, Draft FS with the changes identified in the following manner:

- Text deleted from the report is ~~struck-out~~ with the corresponding comments package date at the end (RTC, [Date]).
- Text added to the report is underlined with the corresponding comments package date at the end (RTC, [Date]).
- Text removed from a revised text section is ~~struck-out and underlined~~ with the corresponding comments package date at the end (RTC, [Date]).
- Text added to a revised text section is double underlined with the corresponding comments package date at the end (RTC, [Date]).

A summary table of all comments received from the DTSC and their responses is included as Appendix A.

This report was prepared by Ms. Rebecca Flynn, P.E., of Geosyntec and reviewed by Mr. Gregory Corcoran, P.E., both of Geosyntec, in accordance with Geosyntec's peer review policy.

1.2 Description of Feasibility Study Process

The Remedial Investigation (RI) for the Site comprises three separate reports: the *Revised Draft Remedial Investigation Report* (Stantec, 2008); the *Draft Memorandum – Data Gap Analysis* (Stantec, 2010a); *Draft Human Health Risk Assessment* (HHRA) (Geosyntec, 2010); and the *Addendum to the August 22, 2008 Revised Draft 2006 Remedial Investigation Report* (Stantec, 2010c). This FS Report includes the following information and evaluations in general accordance with *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA, 1988):

- Background information on the Site, including a summary of investigative and remedial work performed to date;
- Future use of the Site, future risk exposure pathways, and receptors that may be at risk;
- Remedial Action Objectives (RAOs) and cleanup criteria;
- Identification of remedial technologies that potentially can be employed to remediate the Site contaminants;
- Screening of the remedial technologies to identify those that can realistically remediate or isolate wastes at the Site;

- Development of a range of potential remedial technologies to address impacted soil, soil gas, and groundwater, and remedial alternatives, which are combinations of remedial technologies that can address impacted media at the Site;
- Screening of the remedial alternatives to identify those that can realistically address conditions at the Site;
- Analysis of remedial alternatives using United States Environmental Protection Agency (USEPA) criteria; and
- Comparative analysis of remedial alternatives that will result in identification of the preferred remedial alternative for the Site.

1.3 Organization

This document is organized into the following sections:

- Section 2 – "Site Background," describes the history and physical characteristics of the Site, including hydrogeology;
- Section 3 – "Remedial Investigation Summary," summarizes the results of the remedial investigation;
- Section 4 – "Remedial Action Objectives and Cleanup Criteria," summarizes the findings of the draft HHRA and identifies the potential future use of the Site, future risk exposure pathways, and potential receptors that may be at risk. The RAOs also are identified, along with cleanup criteria selected to achieve those objectives;
- Section 5 – "Identification and Screening of Technologies," identifies potential remedial technologies. The remedial technologies are then screened based on their effectiveness, implementability, and cost to address human health risks and ecological risks associated with these media;
- Section 6 – "Development of Remedial Alternatives," uses the retained technologies from Section 5 to compile remedial alternatives that address a range of potential response actions and technical approaches for the Site. Remedial alternatives are further screened, evaluated and ranked in terms of effectiveness, implementability, and cost to identify the final set of remedial alternatives for detailed analysis;
- Section 7 – "Detailed Analysis of Alternatives," presents a nine-criteria analysis of the final set of remedial alternatives;
- Section 8 – "Comparative Analysis of Alternatives," uses the nine-criteria analysis results to compare the alternatives to assess which alternative

provides the best balance of the nine criteria, and is, therefore, the recommended alternative; and

- Section 9 – "References," presents the FS Report references.

Tables, figures, and appendices are included at the end of this FS Report.

2. SITE BACKGROUND

2.1 General

This section includes the following background information on the Site:

- Site location and description;
- Site history;
- Geology; and
- Hydrogeology

The information presented in this section generally has been excerpted from the *Revised Draft RI* (Stantec, 2008).

2.2 Site Location and Description

The Site is located in the southwest corner of the Artesia Boulevard and Normandie Avenue intersection in the City of Gardena, Los Angeles County, California (Figure1-1). Generally, the area surrounding Site is bordered to the south by the Los Angeles County Department of Public Works (LACDPW) Dominguez Flood Channel, to the east by the Southern Pacific Railroad right-of-way, to the west by the western Haack property line, and to the north by Artesia Boulevard, although a small portion of Artesia Boulevard is included within the Site. Commercial and residential properties are currently located to the north, east, and west of the Site (Figure 1-2) (Stantec, 2008). For the purpose of this report, the Site is comprised of the Cooper, Haack, and four (4) residential properties as shown on Figure 1-2.

The Site is greater than 5.6 acres of mixed-use development and primarily consists of two properties, the Cooper property and the Haack property. The Cooper property is approximately 3.0 acres, approximately 90 percent of which is comprised of two large sumps (referred to as the "Cooper North" and "Cooper South" sumps) containing primarily petroleum refining wastes. The Haack property is approximately 2.6 acres, contains one modified sump (referred to as the "Haack sump") and the "Haack Rework Area", which is a reworked and mixed sludge/soil area south of the Haack sump. The Haack Rework Area encroaches onto the extreme northern portions of the two easternmost residential lots. In this FS Report, the wastes in the sumps will be referred to as "sludge" for ease of reference. This FS Report will address the three sumps and the Haack Rework Area, constituting the areas of concern (Figure 1-2) (Stantec, 2008).

2.3 Site History

The *Revised Draft RI* documents the site history and presents historic aerial photographs. The following section summarizes the site history and evaluation of the photographs presented by Stantec (Stantec, 2008).

Early topographic maps show that the eastern (Cooper property area) and southern (southern Haack and residential areas) portions of the Site were elevated, which suggests that some amount of clay material could have been extracted from excavations into the elevated bluff.

During the 1920's, the Moneta Brick Company leased the Site. By 1928 the area of the two Cooper sumps had been excavated to a lower surface elevation than the current LACDPW land to the south and most of the Haack and residential properties. The railroad tracks east of the Cooper property were elevated above the land surface of the current Cooper property, and clay mining at the Cooper property had been completed by this time. Clay mining operations were occurring on the northern Haack property in 1928 and 1929. By 1929 the southern portion of the Haack property (present Haack Rework Area) had an elevated scoured slope. This elevated area sloped eastward towards the land surface of the current southern Cooper property. Boring logs from RB-2 and RB-3 indicate that fill material (including brick and concrete debris and glass) extended to elevations of approximately 8 feet above mean sea level (amsl) (depths of 17 to 20 feet below the scoured slope surface) in portions of the Haack Rework Area. An aerial photograph from May 1938 documents that creation of the disposal sumps at the Site had not yet begun. Denys Goddard purchased the land consisting of the current Haack, Cooper, and residential properties in May 1939.

Newspaper reports indicate that sludge disposal had commenced by March 1940. The Haack Sump, Cooper South Sump, and the Haack Rework Area had been constructed and contained sludge by March 1941. The Cooper North Sump had not yet been constructed. By early December 1941 the eastern and northern berms of the Cooper North Sump had been constructed and initiation of sludge disposal into this sump had commenced. Sludge deposition at the Site had occurred at the Haack Sump, the Haack Rework Area, a small pit between these two locations (constructed after March 1941), and the Cooper South Sump by this time.

By September 1946, the Haack and two Cooper sumps were filled with sludge, and vegetation had reclaimed the small pit and the Haack Rework Area. Some excavation of soil had occurred into the bluffs west and south of the western portion of the Haack Sump, but there had been no further development of the Haack and Cooper properties. Denys Goddard sold the future Haack and Cooper property parcels to Wendell and

Golda Hopkins in March 1947, but maintained ownership of the residential lots. The Hopkins' sold their property to S&L Manufacturing in January 1948.

By December 1951, the western portion of the Haack Sump had been covered with dirt and was converted to a parking lot. The eastern portion of the Haack Sump does not appear to have been altered. A significant portion of the bluff south and southwest of the Haack Sump had been excavated. This excavation activity removed the small sludge pit that was located between the Haack Sump and the Haack Rework Area. Two structures had been constructed in the northwestern portion of the Haack property. The Haack Rework Area remained vegetated and the two easternmost residential lots (on the Goddard property) had structures on them.

On October 1, 1952, S&L Manufacturing sold the northern-most strip of their property to the State of California for a highway easement. By early 1956, Artesia Blvd (Highway 91) had been constructed with the southern portion of the roadway encroaching into the Haack Sump northern berm.

By January 1958, the Dominguez Channel had been reconstructed and extended eastward south of the Site. A third structure (the "administrative building") had been constructed on the Haack property at the southern edge of the parking lot. The Cooper property had not significantly changed since 1951. The two westernmost residential lots had structures on them by this time. In May 1958, S&L Manufacturing sold the current Haack and Cooper properties to Charles Warfel. Warfel then sold the current Cooper property to William Ward in January 1959 and the Haack property to Clarence and Genevieve Haack in May 1960. In late 1960, the City of Gardena annexed the area of the Site from the County of Los Angeles.

By November 1962 significant changes had occurred at the Haack property. The bluff immediately south of the "administrative building" had been excavated back to the present day cut-bank (located west of boring HPB11). This excavation expanded the parking lot south of the "administrative building." The parking lot on the Haack property appeared to have been paved, although the eastern portion of the Haack property remains a vegetated area immediately west of the Cooper North Sump. The Haack Rework Area appeared altered and may have received soil cover from the excavation activities that occurred immediately north of the Haack Rework Area. The future Cooper property was unchanged. William Ward sold his property to Thomas Cooper in December 1977.

The two Cooper sumps currently are capped by a geosynthetic material that was installed by OHM Corporation (OHM) in July 1993 as part of the DTSC's environmental program at the Site. The Haack Sump has been covered by asphalt and a concrete slab. Currently the Haack property is leased to various tenants who operate

small businesses, including a U-Haul rental agency, a metal fabricating, sand blasting and painting company, and an auto body repair shop. Three buildings and numerous small trailer-type storage structures are present on the Haack property.

2.4 Geology

The following discussion is based on California Department of Water Resources (CalDWR) Bulletin No. 104, Planned Utilization of the Ground-water Basins of the Coastal Plain of Los Angeles County, Appendix A — Ground Water Geology, dated June 1961, reprinted April 1988 (CalDWR, 1961) and discussions contained in reports from previous investigations (CalEPA 1994, URS 1994, and Stantec, 2008).

The Site is located in the Los Angeles Coastal Plain and is underlain by a thick sequence of marine and continental sediments that were deposited in a ~~board~~ broad (RTC, 9/29/11) synclinal depression. This depression is generally referred to as the Los Angeles Basin. The Los Angeles Basin is bisected by the northwest trending Newport-Inglewood uplift, which divides the Coastal Plain into two smaller synclinal troughs. The Site is located in the West Coast Basin, which constitutes the southwest portion of the Los Angeles Basin.

The Site is located near the junction of the Torrance Plain and the Dominguez Erosion Gap. The Torrance Plain runs west of and parallel to the hills of the Newport-Inglewood uplift from the Ballona Gap southeast to the Dominguez Gap. The Plain is a broad featureless area only slightly dissected locally by the Dominguez Creek (Dominguez Channel).

According to boring logs in the Ecology and Environmental, Inc. (EEI) (1986), Metcalf and Eddy (1992), CalEPA (1994) and URS (1994) reports, sediments underlying the Site, to the maximum explored depth of 92 feet below ground surface (bgs), consist primarily of a mixture of clays and silts with interbeds of sand. Copies of the available boring logs from these previous studies are provided in Appendix F and summarized in Table 13 of the *Revised Draft RI* (Stantec, 2008). This stratigraphy correlates in general with the observed conditions in borings completed in conjunction with the *Revised Draft RI* (Stantec 2008), which reached a maximum depth of 100 feet bgs.

2.5 Hydrogeology

The following discussion is based on CalDWR *Bulletin No. 104, Planned Utilization of the Ground-water Basins of the Coastal Plain of Los Angeles County, Appendix A - Ground Water Geology*, dated June 1961, reprinted April 1988 (CalDWR, 1961) and discussions contained in reports from previous investigations (CalEPA 1994, URS 1994, Stantec, 2008).

The Site is located in what is known as the West Coast Groundwater Basin. The West Coast Groundwater Basin has existing beneficial uses for municipal and domestic supply wells, agricultural supply, industrial process supply, industrial service supply, and aquaculture (LARWQCB, 1994). (RTC, 9/29/11) This basin is hydraulically isolated from other, larger groundwater basins in the Coastal Plain by the regional Newport-Inglewood Fault. The Site is underlain by Holocene and late-Pleistocene Age alluvial and marine deposits, which include the Bellflower Aquiclude at the ground surface, and the Gardena and/or Gage Aquifers of the Lakewood Formation beneath the aquiclude. Major underlying aquifers (beneath the Lakewood Formation) are the Lynwood and the Silverado Aquifers of the San Pedro Formation.

The uppermost defined unit within the basin, and the unit that the Site is located within, is the Bellflower Aquiclude. Regionally, the Bellflower Aquiclude contains interfingered zones of permeable and less permeable sediments. The zones with modest to relatively high hydraulic conductivity consist of fine to coarse sand with gravel and silty sand. These coarser grained sediments vary in thickness from 10 to 60 feet and are not laterally continuous. However, in some areas, these permeable zones can contain significant amounts of water. Little beneficial use is made of water in these shallow, discontinuous hydraulic zones because well yields tend to be low and water quality generally poor (CalDWR, 1961).

The Gardena/Gage, Silverado, and Lynwood Aquifers are all capable of storing or conveying groundwater in significant quantities and constitute major sources of groundwater in the West Coast Groundwater Basin. The Lynwood and Silverado Aquifers are primary sources for domestic water supply, while the Gardena and Gage Aquifers are a secondary domestic water supply source. Neither the Gardena nor Gage Aquifers are currently pumped for domestic use. The intervening finer-grained aquitards have not been named. These aquitards, including those that separate the Gardena and Gage Aquifers from the Lynwood Aquifer and the Lynwood Aquifer from the Silverado Aquifer, are discontinuous in nature and absent in some areas.

Immediately beneath the Site, there are two hydraulic groundwater zones within the Bellflower Aquiclude: Zone A (upper) and Zone B (lower), which are approximately 15 to 25 and 75 to 80 ft bgs, respectively. Site groundwater monitoring wells are screened within these two zones. General groundwater chemistry analyses were performed at the Site to evaluate if a hydraulic interconnection exists between Zone A and Zone B due to the existence of a downward vertical gradient between the two zones. The groundwater chemistry analysis indicated that the two zones are characterized by different groundwater geochemistry. The concrete lined Dominguez Channel influences the flow direction of the shallow Zone A groundwater southward while the deeper Zone B groundwater has a flow direction to the east – southeast. Groundwater monitoring at the

Site over the past seven years indicates that COCs are not migrating vertically or laterally over any significant distance from the locations of the waste material. (RTC, 1/9/2013)

The area surrounding the Site is urbanized, with surface waters that drain via storm drains into the Dominguez Channel. The Dominguez Channel is a concrete-lined flood-control structure immediately south of the Site. The upstream portion of the modern day Dominguez Channel originates several miles west-northwest of the Site, and it drains surface water to the southeast where it discharges to the Cerritos Channel of the Los Angeles Harbor. Surface water at the Site generally drains towards the north and east following site topography, and is intercepted by a flood control storm drain located at the northeast corner of the Site adjacent to the intersection of Artesia Boulevard and Normandie Avenue.

Historically, the Dominguez Channel flowed along a natural channel bed located approximately several hundred feet west and north of the Site where it flowed eastward into Laguna Dominguez. Presently the shallow groundwater beneath the Site is influenced by the concrete lined Dominguez Channel and flows southward.

3. REMEDIAL INVESTIGATION SUMMARY

3.1 General

The nature and extent of hydrocarbon and metal impacts at and surrounding the Site have been evaluated through several investigation programs conducted since 1982. Sludge, soil, surface water, groundwater, and soil vapor have been investigated. The following sections provide a summary of findings for each of these media. Details of the investigations and findings can be found in the *Revised Draft RI* (Stantec, 2008) and the *Addendum to the Revised Draft RI* (Stantec, 2010c).

3.2 Nature and Extent of Contamination

3.2.1 Soil/Sludge

As part of the RI investigation, Stantec collected over 300 subsurface soil and sludge samples from beneath and surrounding the sumps and rework area to delineate the vertical and horizontal extents of continuous (nonreworked) sludge and sludge-induced impacts to the adjacent soil (Figure 3-1). The samples were analyzed for organic and inorganic constituents. In addition, pH was measured to determine the effects of the sludge on the soil pH near the sumps and adjacent berms. Organic constituents analyzed were: volatile fuel hydrocarbons (VFHs), total extractable hydrocarbons (TEHs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and polynuclear aromatic hydrocarbons (PAHs). Inorganic constituents analyzed were: Title 22 metals, mercury, and hexavalent chromium.

Sludge constituents are as follows (Stantec, 2008):

- **VFH and TEH**: Heavier hydrocarbon compounds predominate in the sludge.
- **VOCs**: Most commonly detected include ethylbenzene, p-isopropyltoluene, naphthalene, toluene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and m-, o-, p-xylene compounds.
- **Non-PAH SVOCs**: Not typically detected in sludge samples due to the dilution factor necessary to analyze the sludge samples.
- **PAHs**: The most predominant PAH compounds include benzo(a)-pyrene, benzo(b)-fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene.
- **Title 22 Metals**: Background, offsite soil, onsite non-reworked soil, and sludge samples were collected during the RI. Antimony, barium, cadmium, vanadium, and zinc were all reportedly lower in the sludge when compared with background soil, while lead and molybdenum were higher in the sludge when compared to background soil. Arsenic and thallium concentrations were

similar in the sludge and background soil while copper had a wider range (higher and lower) of concentrations in sludge compared to background soil. During the 2006 RI field investigation, arsenic was detected in background soil on the LADPW property at 82 milligrams per kilogram (mg/kg). Sampling was performed during the subsequent 2009 RI field investigation at this location and immediate vicinity and resulted in arsenic concentrations of less than 5.5 mg/kg; therefore, the 82 mg/kg concentration could not be confirmed (Stantec, 2010a). Isolated areas on the Haack property had significantly higher concentrations of antimony, arsenic, chromium, copper, molybdenum, nickel, and zinc than typically found at the Site (Stantec, 2010c).

- **Chromium VI**: Analytical results for hexavalent chromium and total chromium in sludge ranged from <0.026 to 0.73 mg/kg and 0.55 to 4.7mg/kg, respectively. Analytical results for hexavalent chromium and total chromium in background soil ranged from <0.026 to 1.3 mg/kg and 6.0 to 28 mg/kg, respectively. One background 2006 soil sample was suspect for hexavalent chromium, having hexavalent chromium and total chromium values of 100 mg/kg and 33 mg/kg respectively (Stantec, 2008; Geosyntec, 2010). Subsequent resampling of this location resulted in hexavalent chromium and total chromium values of <1.0 mg/kg and 17 mg/kg respectively; therefore, the 2006 hexavalent chromium test result of 100 mg/kg is suspect (Geosyntec, 2010).
- **pH**: ~~The pH of the sludge samples averaged 2.22~~ <u>The pH of the sludge samples ranged from 0.39 to 9.05</u> (RTC, 9/29/11) while pH of the background soil averaged 6.57 (Stantec, 2008). The 2009 RI activities included an assessment of pH in soil adjacent to the sludge. Results of testing indicate pH ranges from 5.2 to 10.3 in soil adjacent to the sludge (Stantec, 2010a).

During the RI, four areas of sludge disposal were investigated: the Cooper South Sump, the Cooper North Sump, the Haack Sump, and the Haack Rework Area. The delineation of nonreworked sludge is shown on Figure 1-2 and illustrates the lateral extent of congruent sludge having any thickness. Below is a summary of the results of the delineation (Stantec, 2008):

- **Cooper South Sump**: The Cooper South Sump has an identified maximum thickness of 13.5 feet. Figure 10A of the *Revised Draft RI* (Stantec, 2008) illustrates the general vertical profile of this sump. Vertical attenuation of sludge impacts in soil typically ranged from 1.5 to 3 feet beneath the sludge; lateral impacts of sludge in soil is negligible. Approximately 6,700 cubic yards (CY) of sludge was calculated by Stantec to be in the Cooper South Sump (Stantec, 2010c). Approximately 8,000 CY of sludge containing soil

interbeds was calculated by Stantec to be in the Cooper South Sump (Stantec, 2008).

- **Cooper North Sump**: The Cooper North Sump has an identified maximum thickness of 17.5 feet. Figure 10A of the *Revised Draft RI* (Stantec, 2008) illustrates the general vertical profile of this sump. Vertical attenuation of sludge impacts in soil typically ranged from 5 to 7.5 feet beneath the sludge, with the exception of one boring where chrysene was detected up to 11 feet beneath the sludge. Some TEH and PAH constituents were detected approximately 6 feet laterally from this sump in depths up to 15 feet bgs indicating some lateral migration in soil to the north; however, other borings indicated lateral impacts of sludge in soil is negligible. Stantec calculated approximately 7,000 CY of sludge is in the Cooper North Sump (Stantec, 2010c). Approximately 9,300 CY of sludge containing soil interbeds was calculated by Stantec to be in the Cooper North Sump (Stantec, 2008).
- **Haack Sump**: The Haack sump consists of several discontinuous layers of sludge varying in thickness from 0.5 to 3.0 feet to a depth up to 14.6 feet bgs. Boring logs indicated the western and central areas of the sump had been reworked, possibly during site development in the late 1940's. Figure 10B of the *Revised Draft RI* (Stantec 2008) illustrates the general vertical profile of this sump. Stantec calculated approximately 2,250 CY of sludge is in the Haack Sump (Stantec, 2010c). Approximately 2,900 CY of sludge containing soil interbeds was calculated by Stantec to be in the Haack Sump (Stantec, 2008).
- **Haack Rework Area**: The Haack rework area consists of deposited sludge, soil, and debris in discontinuous and mixed layers beneath a soil cover with thickness varying from less than 1 foot to 10 feet. The thickness of sludge in the western portion of the Haack Rework Area is thinner and occurs at a higher elevation than at the eastern edge of the Haack Rework Area. Figures 10E and 10F of the *Revised Draft RI* (Stantec, 2008) illustrate the general vertical profile of this area. Stantec calculated approximately 650 CY of material is in the Haack Rework Area (Stantec, 2010c). Approximately 1,200 CY of sludge containing soil interbeds was calculated by Stantec to be in Haack Rework Area (Stantec, 2008).

Delineation borings were conducted at several specific areas of the Site. The results of the sampling are provided in the *Revised Draft RI* (Stantec, 2008) and summarized below:

- **Eastern LACDPW Easement**: Borings were performed to determine if sludge had migrated offsite onto the LACDPW property east of the Cooper property. The 2006 delineation borings encountered sludge within 6 inches

bgs in all five delineation borings (Stantec, 2008). Subsequent delineation borings were performed in 2009 east of the 2006 delineation borings which delineated the extent of the continuous sludge shown on Figure 1-2 (borings DPW116 through DPW121 and GWP102) (Stantec, 2010a).

- **East-Central Haack Property (Former Drum Storage Area)**: Sampling of the former drum storage area on the Haack property was performed in 2006 to determine if metal concentrations in soil were elevated when compared to background soil concentrations. Elevated lead concentrations were detected at a depth of 1.5 feet in all four borings, but lead concentrations were in the range of background at a depth of 5 feet. Elevated concentrations of antimony, arsenic, copper, and molybdenum were detected in one boring at a depth of 1.5 feet. One hexavalent chromium concentration above background was detected at 5 feet bgs.
- **Sludge Surface Samples**: Sludge surface samples were collected to determine if analytical interference resulted in high arsenic, antimony, and thallium concentrations during the 1982 investigation. With the exception of the low level of antimony detected in one boring, antimony, arsenic, and thallium were not detected in the samples; therefore, it suggests the 1982 data is not valid.
- **Sump Perimeter**: Borings were performed around the perimeters of the sumps to assess the lateral extent of continuous sludge during both the 2006 and 2009 RI activities. Continuous sludge is a sludge-only deposit and excludes soil mixed with sludge. The results of the step-out borings indicate the extent of the continuous sludge, which is illustrated on Figure 1-2.
- **Offsite Adjacent Residential Properties**: Borings were advanced in the residential properties in the southern portion of the site during the 2006 and 2009 RI activities to investigate the presence of sludge. The results of these borings indicate that the extent of the sludge has been delineated as illustrated on Figure 1-2.

3.2.2 Surface Water

Surface water samples were collected upstream and downstream of the Site from the Dominguez Channel in 2006 and 2008. During both sampling events, the samples had gasoline range organics (GRO) concentrations of 58 µg/L and 50 µg/L in 2006 and 2008, respectively. No SVOCs were observed. Two VOCs, tetrachlorothene and trichloroethene, were observed during both events; upstream samples had higher concentrations of both VOCs than the downstream samples. Barium was found in surface water at concentrations approximately double what was detected in the soil and

sludge samples. Copper, lead, and vanadium were detected at levels below background for the Site (Stantec, 2008).

Analytical data from surface water samples collected from the inner channel of the Dominguez Channel indicated elevated concentrations of GRO and VOC analytes in contrast to the non-detections for those analytes in groundwater monitored at the Site. Based on the organic chemical parameters, the Site is not impacting surface water quality in the channel. Overall, the observed concentrations of metals in surface water adjacent to the Site support the same conclusion, that the Site groundwater conditions are not impacting surface water quality. Both upstream and downstream surface water samples have at least twice the concentration of antimony, molybdenum, nickel, barium, lead, and copper compared to shallow groundwater at the southern boundary of the Site (Stantec, 2010b).

3.2.3 Soil Gas

The soil gas investigation activities evaluated the subsurface concentrations of VOCs, hydrogen sulfide, and methane at various locations across the Site for use in the baseline HHRA. Soil gas samples were collected in the locations indicated on Figure 3-2. Constituent concentrations reported above the detection limit for targeted VOCs include benzene, toluene, ethylbenzene, m-,p-,o-xylenes, 1,3,5-trimethylbenzene, and Freon 113. Concentrations ranged from non-detect to 2.2 µg/L-vapor (toluene) (Stantec, 2008).

During the 2006 RI activities, benzene concentrations in the soil gas samples ranged from non-detect to 0.3 µg/L-vapor by Method 8260B and from non-detect to 0.260 µg/L-vapor by Method TO-15. Hydrogen sulfide concentrations in the soil vapor samples ranged from non-detect to 5.1 parts per million by volume (ppmv) except for one sample location with results of greater than 50 ppmv. Methane concentrations in the soil gas samples ranged from non-detect to 220 ppmv (Stantec, 2008).

During the 2009 RI activities, additional samples were collected from 22 semi-permanent direct-push soil gas probes. Samples collected near the Haack administrative building showed no VOCs greater than California Human Health Screening Levels (CHHSLs). On the residential properties, benzene from the sample collected from the former corral was the only constituent reported higher than the specific constituent CHHSL value. The results elsewhere at the Site during the 2009 RI activities generally confirmed the results of the 2006 RI (Stantec, 2010a).

3.2.4 Soil Vapor Flux

An Air Pathway Analysis (APA) was performed during the 2006 investigation to evaluate the exposure pathway of outdoor inhalation of vapors. The surfaces evaluated included:

- exposed, undisturbed sludge on the Cooper property;
- exposed, disturbed sludge on the Cooper property;
- soil on both the Cooper and Haack properties; and
- asphalt and concrete-slab covered soil on the Haack property.

The results of the APA are provided in the *Revised Draft RI* (Stantec, 2008) and are summarized below:

- **Ambient Air**: Methane and select VOCs were reported above the quality control (QC) criteria and/or reporting limit in the four ambient air samples collected. Detected methane levels are typical of global, outdoor, ambient air. Detections of VOCs on the Haack property are most likely related to industrial activities on the property and not from undisturbed surface emissions from the nearby sumps. The VOCs detected on the Cooper property may be related to the presence of sludge in the sumps.
- **Undisturbed**: Twenty (20) open (undisturbed) soil flux samples of 61 collected were reported to have specific compounds above the QC criteria and/or reporting limit. The undisturbed sludge had low to moderate emissions and, in general, more compounds were detected at Cooper property locations than Haack property locations. Higher emissions and more detectable compounds were detected at Cooper Sump locations overlying sludge.
- **Disturbed**: All nine (9) disturbed flux samples collected were reported to have specific compounds above the QC criteria and/or reporting limit. The disturbed condition can be generally characterized as having moderate to high area source emissions as compared to the undisturbed sludge condition. In addition, more compounds were detected in the emissions from the disturbed sludge condition than from the undisturbed sludge condition. Odor analyses confirmed the potential for sulfuric compounds from disturbed sludge to create nuisance odors to people in the area or downwind of the disturbed sludge.
- **Infiltration**: Specific compounds were detected above the QC criteria and/or reporting limit for each of the infiltration flux samples. The flux chamber was used to test the air emissions through seams and cracks in the concrete and asphalt. Compounds having the maximum detections represent a different mixture of sulfur and hydrocarbon compounds as detected in the undisturbed

sludge condition, indicating that the individual compound emissions are greatly affected by the surface coverings and slab.

3.2.5 Groundwater

3.2.5.1 Summary of Groundwater Monitoring

Well clusters MW-01A/B, MW-02A/B, and MW-03A/B were periodically sampled from 1994 through 2002. Analytical results of these samples supported the findings of earlier investigators, with trace amounts of volatile organic compounds (VOCs) detected in 1994 samples immediately after installation, and no VOC detections in the next ten years of sampling. Detections in 1994 were likely the result of cross-contamination during well installation (Stantec, 2008).

Groundwater samples obtained on February 28, 2002, contained detectable concentrations of antimony, lead, and thallium that were above the maximum concentration level (MCL), as defined in Title 22 CCR §64431. With a very few exceptions, prior to the 2002 sampling event, analytes tested in groundwater samples were either not detected or found below the laboratory reporting limit. Quarterly groundwater monitoring and sampling of MW-01A/B, MW-02A/B, MW-03A/B, and G-4 was agreed to as part of a Consent Decree entered into between DTSC and Atlantic Richfield Company, which became effective November 4, 2004 (§VIIC, paragraph 2, lines 2-3). Wells MW-4A, MW-4B and MW-5A have been installed during Atlantic Richfield Company's RI investigation of the Site.

The following summary is abstracted from the *First Quarter 2010 Groundwater Monitoring Report* (Stantec, 2010b):

The depth to Site groundwater in the A-zone ranges between 10.5 and 18 feet below the ground surface. The groundwater in the A-zone flows southward with an approximate velocity of 0.04 feet per day. The depth to Site groundwater in the B-zone ranges between 15.5 and 22 feet below the ground surface. The groundwater in the B-zone flows east-southeast with an approximate velocity of 0.18 feet per day. (RTC, 1/9/2013)

Nine of the ten groundwater monitoring wells showed no detectable concentrations of GRO, VOCs, or PAHs above the RL during the first quarter 2010 sampling event. Samples from the recently installed MW-05A well indicated a GRO detection of 390 µg/L. VOCs detected above the reporting limit in well MW-05A included benzene (0.73 µg/L), naphthalene (3.4 µg/L), m-,p-xylenes (1.5 µg/L), 1,2,4-trimethylbenzene (2.8 µg/L), and 1,3,5-trimethylbenzene (23 µg/L). Total xylene levels in MW-05A were 1.7 µg/L.

Wells with SVOCs detected included well MW-01A with acenaphthylene (5.6 µg/L), bis(2-ethylhexyl)phthalate (3.2 J[1] µg/L; detected below the reporting limit), and naphthalene (3.2 J µg/L; detected below the reporting limit); MW-01B had bis(2-ethylhexyl)phthalate (3.9 µg/L); MW-02A had acenaphthylene (2.1 µg/L), bis(2-ethylhexyl)phthalate (10 µg/L), 2-methylphenol 2.3 µg/L, naphthalene (2.6 µg/L), and phenol (1.2 µg/L); and MW-02B had acenaphthylene (0.75 µg/L).

The groundwater pH levels have remained relatively constant since project sampling began in the first quarter of 2006. The anomalously high pH levels reported during the 1994 and 2002 sampling events have not been observed recently. Generally, groundwater samples from onsite wells (with the exception of MW-5A) have a pH ranging between 6.0 and 8.0. Recently installed well MW-05A has had groundwater pH readings ranging from 4.5 to 5.8.

For each groundwater sampling event since the year 2000, both dissolved (starting in 2006) and non-dissolved phase barium have been detected above the RL in all wells. The highest concentration of barium continues to be detected up-gradient and off site in well MW-01B.

During the second quarter 2010 sampling event, reportable trace amounts of arsenic were detected in both non-dissolved phase (total metals) in wells MW-01A, MW-02A, MW-02B, MW-03A, MW-05A, and G-4 and in the dissolved phase in wells MW-02A, MW-02B, MW-03A, and MW-05A. Well MW-04B showed the highest levels of arsenic in both dissolved and non-dissolved phases (4.4 and 4.4 µg/L, respectively).

Well MW-05A had elevated non-dissolved levels of cobalt (140 µg/L), copper (62 µg/L), nickel (190 µg/L), and zinc (3,800 µg/L) (total metals), and elevated dissolved levels of cobalt (190 µg/L), copper (74 µg/L), nickel (240 µg/L), and zinc (4,400 µg/L) compared to the other site monitoring wells.

3.2.5.2 Summary of Hydropunch Sampling

During the 2009 RI activities, additional groundwater assessment was performed using hydropunch sampling. Groundwater samples were collected in the A and B horizons, respectively to test for VOCs, SVOCs, PAHs, metals, and pH. No VOCs, SVOCs, or PAHs were detected above MCLs. Dissolved metal concentrations of beryllium, cadmium, and nickel were reported in one sample (GWP-100) from the A horizon. pH ranged from 6.74 to 7.44 in the A horizon with the exception of a 4.74 pH value from GWP-100. pH was not measured in the B horizon (Stantec, 2010a).

[1] J = Analyte was detected between the method detection limit and reporting limit; reported value is estimated.

3.2.6 Perched Groundwater

Ten temporary groundwater wells were installed during the 2009 RI activities to investigate suspected perched groundwater. The results of the investigation are discussed in the *Data Gaps Memorandum* (Stantec, 2010a). In summary, benzene was detected at 1.6 µg/L, and some SVOCs were detected above the detection limit but below the reporting limit (J-flag). Lab pH ranged from 3.82 to 6.93, and PAHs were not detected in concentrations greater than 5 µg/L. Total metals above primary and/or secondary MCLs included: antimony, arsenic, beryllium, cadmium, chromium, copper, nickel, selenium, and zinc. Dissolved metals above primary and/or secondary MCLs included: nickel and zinc. ~~Perched groundwater in the Haack Sump area is suspected to be the result of leaking utilities.~~ (RTC, 9/29/11)

3.3 Fate and Transport

Based on the results from previous investigations and the extensive field work performed as part of the *Revised Draft RI* (Stantec, 2008), the current Conceptual Site Model (CSM) suggests that:

- The undisturbed sludge at the Site does not pose a threat to surface water and does not pose a threat to shallow (A-horizon) or deeper (B-horizon) groundwater quality throughout much of the Site. Shallow groundwater is impacted (lower pH, total & dissolved metals) south of the Haack sump; however, these impacts are not detected in samples collected downgradient of the sumps. (RTC, 1/9/2013)
- The undisturbed sludge at the Site does not pose a substantive threat to the air quality in the immediate vicinity of the Site. However, isolation of the sludge from temperature fluctuations above approximately 100 degrees would further minimize this potential impact; and
- The undisturbed sludge does not pose a threat to further contamination of soil surrounding the sludge by leaching of constituents of potential concern (COPCs) from the sludge (Stantec, 2008).

The transport mechanisms identified during the HHRA are discussed further in Section 4.2 but in summary are: wind erosion and dust, volatilization to indoor and ambient air, and leaching to groundwater.

3.4 Treatability Studies Conducted

3.4.1 General

A treatability study was conducted by Stantec to define and evaluate the physical and chemical characteristics of the sludge and evaluate neutralization/stabilization options. The following sections summarize the results of the treatability study found in Appendix J of the *Revised Draft RI* (Stantec, 2008) and included as Appendix B of this Revised Final Draft FS.

3.4.2 Acidity

The testing showed that the acidity of the sludge ranged from 6.1 to 20.8 percent by weight. The Cooper South Sump had the highest acidity, with an average value of 19 percent by weight (Stantec, 2008).

3.4.3 Wet Density

Wet densities of the sludge samples were determined from samples collected using a Fann Model 140 mud balance. The densities for the samples ranged from 63 lb/ft^3 to 79 lb/ft^3. The average density of the sludge collected from the Cooper North Sump was 65.7 lb/ft^3, and the average density of the sludge from the Cooper South Sump was denser at 72.8 lb/ft^3. The sludge collected in the Haack Rework Area had an average density of 74.9 lb/ft^3 (Stantec, 2008).

3.4.4 Moisture

The average moisture of the sludge ranged from 9.8 to 22.3 percent on a wet basis. The moisture of the soil below the sludge sumps ranged from 12.1 to 25.6 percent on a wet basis. The soil below the Cooper North Sump was noted to have higher moisture content (24.2 percent) when compared to the soil below the Haack Rework Area, which averaged 14 and 16.9 percent moisture, respectively (Stantec, 2008).

3.4.5 Viscosity

The viscosities of sludge samples were tested at different temperatures to determine material viscosity as a function of temperature. This data was plotted as semi-log graphs to generate trend lines for modeling the viscosity as a function of temperature in accordance with ASTM Method D 2493. The sludge is highly viscous, ranging from 1.7×10^6 to 2.5×10^6 centipoises (cP) at a reference temperature of 140ºF. The results of the testing show that the sludge in the Cooper North Sump had a slightly lower viscosity than the sludge in the Cooper South Sump. The sludge in the Cooper North Sump had an average viscosity of 1.7×10^6 cP at 140ºF while the viscosity of sludge in

the Cooper South Sump averaged 2.5 $\times 10^6$ cP at 140ºF. Sludge collected from the Haack property in the Haack Rework Area was heated to 220ºF, but it was still too viscous to test for viscosity, thus indicating the sludge may contain other solids from disruption during development activities in that area (Stantec, 2008).

3.4.6 Softening Point

The softening point of the sludge was evaluated by the softening point test defined in ASTM Method D36. The results of the testing show that the softening point of the sludge samples from the Cooper property ranged from 158ºF to 185ºF. The sludge in the Cooper North Sump had a slightly lower softening point than the sludge in the Cooper South Sump. The sludge in the Cooper North Sump had an average softening point of 159ºF while the average softening point for the sludge in the Cooper South Sump was 180ºF. The softening point of the sludge collected in the Haack Rework Area was greater than 210ºF (Stantec, 2008).

3.4.7 Neutralization and Stabilization Testing

Five different reagent mixes were tested with the sludge to evaluate their neutralization/stabilization ability. The five mixes included: calcium oxide (CaO), 50/50 (w/w) mix of CaO and calcium carbonate ($CaCO_3$), calcium hydroxide ($Ca(OH)_2$), a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$, and Portland cement (Stantec, 2008).

Testing indicated that the sludge can be neutralized by treatment using 25 percent treatment reagent addition by weight where the treatment reagent is comprised of 50 percent hydrated lime ($Ca(OH)_2$) and 50 percent $CaCO_3$ fines. Approximately 10 percent water addition was also required to help activate the lime and carbonate reactions. The addition of 50 percent soil by weight during this mixing will also effectively solidify the waste so it is no longer susceptible to viscoelastic deformation. This treatment also effectively fixates lead, as demonstrated through long-term leaching tests, and neutralizes acid gases such as hydrogen sulfide (H_2S) and sulfur dioxide (SO_2) (Stantec, 2008).

3.4.8 Vapor Evolution

Stantec also evaluated the potential rates of off-gas evolution during full-scale mixing operations as a function of temperature. Headspace analyses were performed on the sludge samples at temperatures of 60ºF, 100ºF, 140ºF, 180ºF, and 212ºF (Stantec, 2008).

3.4.8.1 VOC and TPH Headspace Results

The analyses indicated no benzene was emitted from the sludge samples at temperatures ranging from 60 to 212ºF. Toluene was not detected at 60ºF; however, detected concentrations increased as temperature increased. Similarly, ethylbenzene and xylenes were near detection limits at 60ºF, and detected concentrations increased as temperatures increased. Detected concentrations of toluene, ethylbenzene, and xylenes did not exceed the Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) (Stantec, 2008).

Total petroleum hydrocarbons (TPH) was monitored in the vapor headspace as a function of temperature, where TPH represents the total concentration of VOCs detected for GRO and diesel range organics (DRO). Initial concentrations of TPH in the vapor headspace were below 12.5 ppmv in the Cooper North and Cooper South Sump samples at 60ºF. However, TPH concentrations increased exponentially with increasing temperature. At 212ºF, the concentrations of TPH in the vapor headspace of samples from the Cooper North and Cooper South Sump were 259 ppmv and 223 ppmv, respectively. These data indicate that TPH (as petroleum distillates) will not present a health and safety issue with respect to construction work since the concentrations are less than the OSHA PEL of 500 ppmv for petroleum distillates (Stantec, 2008).

Samples collected from the Haack Rework Area did not have detectable concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) and TPH, with the exception of toluene and xylenes. These compounds were only detected when temperatures were increased to 212ºF. TPH was below detection limits at 60ºF, and detected concentrations rose to a maximum at 212ºF (Stantec, 2008).

3.4.8.2 H_2S and SO_2 Headspace Results

H_2S and SO_2 were monitored in the headspace of sludge samples at various temperatures. The results showed that these sulfurous gases were readily emitted from disturbed and heated sludge samples in the Cooper North and Cooper South Sumps. The vapor concentrations of SO_2 in equilibrium with sludge samples from both sumps exceeded 150 ppmv at 60ºF. The vapor concentration of H_2S was 408 ppmv for the Cooper North Sump and 471 ppmv for the Cooper South Sump at 60ºF, but at higher temperatures it exceeded 500 ppmv for both sumps. These data show that H_2S and SO_2 will both be present at an exposure risk to workers and the community if the sludge is disturbed for neutralization and stabilization treatment, as the OSHA PELs for H_2S and SO_2 are 10 ppmv and 2 ppmv, respectively (Stantec, 2008).

The sludge samples collected from the Haack Rework Area had substantially lower concentrations of H_2S and SO_2 in the vapor headspace. The vapor concentrations of SO_2 in equilibrium with sludge samples ranged from 8 to 71 ppmv. The vapor concentration of H_2S ranged from 2 to 50 ppmv. These data show that H_2S and SO_2 emissions from sludge on the Haack property could present an exposure risk to workers and the community if the sludge is disturbed for neutralization and stabilization (Stantec, 2008).

3.4.9 Metal and Organic Mobilization

Treated and untreated composite samples of sludge from the Cooper North and Cooper South Sumps were analyzed for total RCRA metals, VOCs, SVOCs, and PAHs and for analyses of leachable RCRA metals and organics by both the toxic characteristic leaching procedure (TCLP) and synthetic precipitation leaching procedure (SPLP) (Stantec, 2008).

3.4.9.1 Untreated Sludge Leaching

Analyses showed that the composite sludge sample contained 22.4 mg/kg lead and 1.2 mg/kg barium. The TCLP extract contained 0.24 mg/L lead and 0.06 mg/L barium, thus indicating that the sludge would not be characterized as a hazardous waste under the definitions and exclusions given in 40 CFR Part 21 for lead or barium, even in a final TCLP extract of pH 3.97. The SPLP extract contained 0.31 mg/L lead and less than 0.01 mg/L barium at a final SPLP extract pH of 2.15. This indicates that the SPLP will be more likely to produce leaching effects in laboratory analyses than the TCLP (Stantec, 2008).

The analyses for total SVOCs, PAHs and VOCs identified the following constituents in the sludge:

- Benzo(a)anthracene 70,000 µg/kg;
- Chrysene 160,000 µg/kg;
- 2-Methylnaphthalene 30,000 µg/kg;
- Phenanthrene 200,000 µg/kg;
- Pyrene 60,000 µg/kg;
- Ethylbenzene 200 µg/kg;
- Toluene 400 µg/kg;
- Xylenes 1,000 µg/kg;
- 2-Methylnapthalene 1,900 µg/kg;

- 1,2,4-Trimethylbenezene 700 µg/kg;
- 1,3,5-Trimethylbenzene 500 µg/kg; and
- 1,2,3-Trimethylbenzene 1,100 µg/kg.

Despite the presence of these compounds within the sludge itself, no PAHs or SVOCs were identified in the SPLP extract for the untreated sludge above the detection limit of 5 µg/L. This indicates that the SVOCs and PAHs within the sludge are largely immobile. Toluene was detected in the SPLP extract of the untreated sludge at 7 µg/L, and 1,2,3-trimethylbenzere was detected in the SPLP extract at 1 µg/L (Stantec, 2008).

Analysis of the sludge for TPH as GRO and DRO showed that the sludge contained 70 mg/kg GRO and 39,000 DRO. This shows that only 3.9 percent of the sludge is comprised of organics in the C6 to C28 hydrocarbon range, thus showing that the majority of organics in the sludge have a very high molecular weight in excess of 400 (Stantec, 2008).

3.4.9.2 Treated Sludge Leaching

Samples of composite sludge treated with a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$ at dosage rates of 22, 24, 26, and 28 percent reagent by weight with respect to the original mass of untreated sludge were subjected to SPLP testing. The results showed that the treatment produced non-detectable concentrations of RCRA metals and SVOCs in each of the SPLP extracts, with the exception of barium which was detected at 0.01 mg/L. This shows that the treatment reduced the concentration of leachable lead by the SPLP to less than 0.03 mg/L (Stantec, 2008).

3.4.10 Long-Term Leaching Analysis

A long-term leaching test was performed on a composite sludge sample from the Cooper North and Cooper South Sumps that was treated at a dosage of 25 percent of the 50/50 (w/w) $Ca(OH)_2$ and $CaCO_3$ reagent mix. The sample was subjected to the SPLP extraction procedure daily, with new extract water being added to the sample after each SPLP extraction to evaluate the long-term leaching effects after multiple extractions. The leachate from every other extraction was filtered and sent for analyses of PNAs, RCRA metals, and VOCs. The extracts were also tested in the laboratory for pH and alkalinity (Stantec, 2008).

Testing indicated lead did not leach from the sludge even after ten sequential SPLP extractions, indicative that treatment of the sludge with $Ca(OH)_2$ and $CaCO_3$ provides long-term stability for lead. Trace concentrations of barium, ethylbenzene, toluene and xylenes leached from the treated sludge, but the concentrations were well below the primary drinking water standards. Additionally, trace concentrations of

trimethylbenzene isomers, 2-methylnapthalene, and acetone leached from the treated sludge, but there are no primary or secondary drinking water standards for these compounds. Minimal alkalinity was removed from the sludge during the ten sequential extractions, thus indicating that many more extractions could have been performed while still maintaining alkaline stability in the treated material (Stantec, 2008).

3.4.11 Permeability

Composite samples of untreated and treated sludge from the Cooper North and Cooper South Sumps were tested for permeability by modified American Society for Testing and Materials (ASTM) D5084, Method C. The treated samples consisted of composite sludge samples treated with 15 percent calcium hydroxide and 15 percent $CaCO_3$ fines by weight. Stantec reported that the untreated sludge exhibited permeability less than $1x10^{-8}$ centimeters per second (cm/s), while the treated sludge exhibited permeability of approximately $9x10^{-3}$ cm/s (Stantec, 2008).

3.4.12 Evaluation of Soil Additive

Four composite samples of sludge were treated with 25 percent reagent comprised of a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$. Prior to adding the reagent, the samples were amended with 0, 25, 50, and 75 percent soil, by weight (Stantec, 2008).

The testing showed that the addition of soil to the neutralized sludge improved the density of the treated material and maintained high strength. Because the sludge at the Site is so viscous, it was difficult to assess how the soil additive worked as a stabilization material for bituminous stabilization at ambient temperatures. Therefore, samples of neutralized sludge treated with 0, 25, 50, and 75 percent soil were compacted into cores using a Harvard compaction apparatus, and the cores were placed into a convection oven at 220ºF to test the stability of the sludge. The testing showed that the neutralized samples containing no soil exhibited viscoelastic flow at 220ºF. The samples containing 25 percent soil exhibited minor viscoelastic properties, and the samples containing 50 and 75 percent soil by weight exhibited no viscoelastic properties. These test results show that the addition of 50 percent soil to neutralized sludge by weight converts the sludge into a stable solid material, even at elevated temperatures that exceed the softening point of the sludge (Stantec, 2008).

3.4.13 Evaluation of Thermal Treatment

Although the sludge was found to contain approximately 4 percent diesel-range organics, the majority of hydrocarbon in the sludge was comprised of very large chain hydrocarbons having a molecular weight greater than 400. When the sludge was tested for BTU value, it was found to have a very high heating value of 13,000 BTUs per pound. This confirms that the sludge is comprised primarily of organics. However, the

sludge also had an elevated sulfur content of approximately 7 percent. This high sulfur content suggests that incineration or fuel combustion of the sludge is not a viable treatment alternative due to the large amount of SO_2 gas that would be emitted during combustion. Stantec has estimated over 1,800 cubic feet (280 pounds) of SO_2 gas could be emitted for each ton of sludge incinerated or combusted. Sitewide, the total mass of SO_2 generated by thermal treatment of the sludge would exceed 2,600 tons (Stantec, 2008).

3.4.14 Evaluation of Moisture/Density Relationship for Treated Sludge

Four samples of sludge treated with 25 percent of a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$ were tested for moisture/density relationship to determine optimal dry density and moisture content for compaction after treatment. Testing was performed on a sample without soil amendment and on three samples amended with 25, 50, and 75 percent soil by weight with respect to the initial weight of untreated sludge (Stantec, 2008).

The test results showed that the neutralized sludge without soil amendment had a very low maximum dry density of 52.3 lb/ft^3 and high optimum moisture content of 46.7 percent. When the neutralized sludge was amended with 25 percent soil, the maximum dry density increased to 64.1 lb/ft^3 and the optimum moisture content decreased to a more reasonable value of 29.5 percent. The neutralized sludge sample amended with 50 percent soil had a maximum dry density of 68.8 lb/ft^3 and an optimum moisture content of 25.7 percent, and the sample amended with 75 percent soil had a maximum dry density of 71.6 lb/ft^3 and an optimum moisture content of 24.4 percent. Based on Table 13, stabilized sludge amended with 12 percent $CaCO_3$ and 12 percent $Ca(OH)_2$ has a density of 81 lb/ft^3 (RTC, 11/6/12) (Stantec, 2008).

3.4.15 Testing for Asphaltic Qualities

Testing of the sludge indicated that it will have low marketability as recycled asphalt, even when neutralized, for the following reasons:

- The sludge is a brittle, glass-like material with little to no ductility;
- The viscosity of the sludge is too high for use as asphalt cement in road construction;
- The sludge contains a high concentration of impurities and suspended solids which causes it to fail to meet the test for asphalt solubility for both asphalt cement and roofing asphalt;
- The sludge has a negative American Petroleum Institute (API) gravity;

- The softening point falls into acceptable ranges for a Type II roofing asphalt, but the sludge fails to meet most of the remaining specifications for Type II roofing asphalt; and
- Penetration values for the sludge were too low for use as asphalt cement but meet the specifications for Type IV roofing asphalt.

Although the sludge shares the softening point specifications for Type II roofing asphalt and the penetration specifications for Type IV roofing asphalt, it fails to meet the ductility requirements for either of these asphalt grades. The brittle nature of the material gives it undesirable properties because the material is easily cracked and sheared, thus making it unsuitable for roofing or pavement construction applications (Stantec, 2008).

Section VII.C. of the Consent Decree requires the evaluation of the proposal of Mr. Thomas Cooper for recycling the sludge as one of the alternatives in the FS. The Cooper Sumps sludge, in a non-neutralized state, releases significant quantities of H_2S and SO_2 gas when disturbed. The release of these gases from the sludge as well as the physical characteristics of the sludge, makes the sludge unacceptable for recycled asphalt application. The sludge recycling alternative is not evaluated further in this FS.

4. REMEDIAL ACTION OBJECTIVES AND CLEANUP CRITERIA

4.1 General

This section describes the development of remedial action objectives (RAOs) and target cleanup levels for the Site. The development of RAOs is required by RI/FS guidance as part of the FS. The process of developing the RAOs depends upon the assessment of risk to identified receptors at the Site and in the Site vicinity. A discussion of the risk assessment (RA) at the Site follows.

4.2 Chemicals of Potential Concern

The chemicals of potential concern (COPCs) for the Site were developed and discussed in the hazard identification section of the *Draft Human Health Risk Assessment* (HHRA) (Geosyntec, 2010). USEPA guidance states that the list of chemicals should include all chemicals that were:

- Positively detected in at least one sample;
- Detected above levels of the same chemicals found in associated blank samples;
- Tentatively identified, but may be associated with the Site based on historical information;
- Transformation products of detected chemicals; and
- Detected above naturally occurring levels (background).

During the RA, those contaminants posing a potential risk to receptors at the Site were identified as COPCs and can be found in Table 4-1 for soil, soil gas, and groundwater.

4.3 Human Health Risk Assessment

4.3.1 Approach

The draft HHRA included an evaluation of health risks to potentially exposed receptor populations consisting of: commercial/industrial workers, construction workers, hypothetical future residents, and trespassers. Potential exposures were evaluated for these populations assuming existing physical site conditions (without the existence of the protective caps on the Cooper and Haack properties and prior to any future remediation efforts at the Site). In addition, a current residential scenario has been included for the immediate adjacent offsite residential area (Geosyntec, 2010).

Future development of the Site and the immediate adjacent offsite residential area would be commercial as designated in the City of Gardena's report titled *Artesia*

Corridor Specific Plan (TPC, 2006). To conservatively evaluate the potential risks under an unrestricted land use scenario, a more conservative hypothetical future residential scenario was included in the HHRA to evaluate potential risks under an unrestricted land use scenario. Additionally, the conservative construction worker, shallow groundwater to outdoor vapor inhalation and dermal contact scenario was evaluated to represent groundwater in an open excavation (Geosyntec, 2010).

To evaluate the spatial distribution of risk driving chemicals, two types of comparison criteria were developed for each chemical identified in the risk characterization: (1) those based on background; and (2) risk-based values (RBCs) or target risk concentrations which are based on each receptor group and assuming site-specific soil characteristics and a target risk goal. For worker exposures (commercial/industrial and construction worker) a target risk goal of 1 in 100,000 (1×10^{-5}) was used. For residential and trespasser scenarios a 1 in 1,000,000 (1×10^{-6}) target risk goal was used. For those chemicals in which the risk-based concentrations are below background, the background concentration is used as the comparison criteria. This is the case for arsenic and residential and commercial/industrial worker scenarios, and benzo(a)pyrene toxicity equivalent (BaP-eq) for the residential scenarios (Geosyntec, 2010).

4.3.2 Results

The results of the HHRA indicate that exposures to onsite soils may potentially exceed target risk goals for all potential receptor scenarios evaluated: commercial/industrial worker, construction worker, hypothetical future onsite/current offsite resident, and trespasser. The primary contributors to the risk estimates were arsenic, hexavalent chromium, naphthalene, and predominantly the carcinogenic PAHs as represented by the BaP-eq concentration. The majority of locations where concentrations of these chemicals were elevated occurred within areas of known sludge material which are currently covered by the existing geomembrane cap, soil, concrete, and/or asphalt (Geosyntec, 2010).

4.4 Chemicals of Concern

Following completion of the HHRA, primary risk driving chemicals were identified from the list of COPCs (see Section 4.2) as chemicals of concern (COCs). These chemicals were identified as primary risk drivers because they are the most ubiquitous chemicals throughout the Site and because they are co-located with a majority of the COPCs (i.e., the risk associated with the COCs would encompass the COPCs). Based on the HHRA, the primary COCs at the Site are:

- **Soil**: arsenic, hexavalent chromium, naphthalene, and the BaP-eq
- **Air**: benzene, hydrogen sulfide

- **Groundwater**: dibenz(a,h)anthracene

These COCs are present in the Cooper and Haack Sumps as well as in the Haack rework area. Methane has been detected at low concentrations around the site but was not identified as a COC based on the HHRA. Due to the potential explosive risk associate with methane, it has been included with as a Remedial Action Objective. (RTC, 9/29/11)

4.5 Remedial Action Objectives

RAOs are goals specific to various media and apply to those media that have been identified as posing an unacceptable risk based on the HHRA work performed for the Site. The RAOs for onsite soils, soil gas, and groundwater are:

- Prevent ingestion/direct contact with sludge and/or soil having 10^{-5} to 10^{-6} excess cancer risk from carcinogenic constituents as represented by arsenic, hexavalent chromium, naphthalene, and the BaP-eq concentration;
- Prevent dermal contact with shallow groundwater having 10^{-5} excess cancer risk from carcinogenic polycyclic aromatic hydrocarbons (PAHs) as represented by dibenz(a,h)anthracene;
- Prevent dermal contact with low pH, PAH containing sludge (RTC, 2/10/12);
- ~~Prevent inhalation of benzene posing excess cancer risk levels of 10^{-5} to 10^{-6}~~ (RTC, 9/29/11);
- Prevent inhalation of volatile organic compounds (VOCs), as represented by benzene, posing excess cancer risk levels of 10^{-5} to 10^{-6}(RTC, 9/29/11); and
- Prevent explosive risks associated with methane. (RTC, 9/29/11)

4.6 Applicable or Relevant and Appropriate Requirements

The Applicable or Relevant and Appropriate Requirements (ARARs), as defined by 40 CFR 300.5, presented in this section were identified for the remedial actions presented in this document to comply with Federal environmental law or more stringent standards promulgated under State environmental law. Federal and State environmental laws are evaluated to determine if they are either applicable or relevant and appropriate.

"To Be Considered" (TBC) criteria have also been identified to cover Federal and State nonpromulgated standards, policies, or guidance documents and local requirements for constituents which do not have developed preliminary remedial goals or ARARs.

The ARARs are divided up into the following three categories according to the type of CERCLA action they govern: chemical-specific, location-specific, and action-specific requirements. ARARs and TBC criteria are presented in Table 4-2.

4.6.1 Potential Chemical-Specific Requirements

At the Site, chemical-specific requirements include RCRA provisions defining hazardous waste, maximum contaminant levels (MCLs) derived from the Safe Drinking Water Act, and primary and secondary national standards for ambient air quality. The Draft HHRA identifies the site-specific, risk-based cleanup levels (Geosyntec, 2010).

4.6.2 Potential Location-Specific Requirements

No location-specific ARARS were identified since the Site is not located in any sensitive or protected area.

4.6.3 Potential Action-Specific Requirements

The potential action-specific requirements for the Site include:

- **Porter-Cologne Water Quality Control Act**: Set on a case by case basis by the Regional Water Quality Control Board (RWQCB), water emission standards are applied to waste water, groundwater, (RTC, 1/9/2013) and stormwater runoff from the Site.
- **South Coast Air Quality Management District (SCAQMD)**: Emissions of gases, particulate matter, and fugitive dust are set by the SCAQMD and may apply if they are part of the State Implementation Plan pursuant to the Clean Air Act.
- **National Pollution Discharge Elimination System (NPDES)**: Requires the elimination of most non-stormwater discharges, Stormwater Pollution Prevention Plan (SWPPP) preparation, and stormwater discharge monitoring.
- California Civil Code and California Health and Safety Code governing land use restrictions.
- DTSC hazardous constituent regulations as outlined in 22 CCR Division 4.5.

4.7 Future Site Use

The Site is currently used for residential and commercial/industrial applications. The DTSC has requested the following three future land use scenarios be evaluated for the Site:

- Current land use will continue; residential properties would remain and Cooper and Haack areas would remain commercial/industrial;
- Use the Site for residential only; and
- Use the Site for commercial/industrial only.

As a conservative approach to meet the DTSC request, the residential cleanup goals will be used, which are the most stringent.

The City of Gardena has developed the City of Gardena Master Plan (TPC, 2006) which indicates the Site would be developed in the future as commercial property with a mix of commercial buildings and parking. To accommodate this development plan and constraints of the Site, ARC requested the remedial design be compatible with a parking lot or open space end use incorporating curbs, gutters, light poles, and utilities.

4.8 Target Cleanup Levels

The target cleanup levels for the Site were developed with consideration given to the following factors:

- Hypothetical future use scenario;
- Remedial action objectives; and
- Potential site health risk.

The cleanup levels shown in Tables 4-3, 4-4, and 4-5 were developed for each of the COCs identified in Section 4.3. Cleanup criteria either are numeric goals to be achieved through remediation or are non-numeric, performance-based criteria. The cleanup levels shown in Tables 4-3, 4-4, and 4-5 will be used subsequently in this FS Report to guide the selection and screening of remedial technologies and the development and detailed analysis of remedial alternatives. A discussion of the development of cleanup criteria follows.

4.8.1 Site-Specific Action Levels

Soil cleanup criteria are based on the derivation of risk-based concentrations (RBCs) for site COCs. RBCs were developed for each chemical identified as a COC or "risk driver" in the risk characterization of the HHRA (Geosyntec, 2010) based on each receptor group and assuming site-specific soil characteristics as presented in Appendix C. (RTC, 4/4/12) RBCs were derived for arsenic, BaP-eq, hexavalent chromium, benzene, and naphthalene in soil (Table 4-3); benzene in soil gas (Table 4-4); and dibenz(a,h)anthracene in groundwater (Table 4-5). The derivation of these concentrations is provided in Appendix B. RBCs are presented for both cancer and noncancer effects; cancer effects generally produce lower RBCs. The selected site-specific action levels (SSALs), considering background concentrations, are presented in the last column for each receptor group.

For arsenic in soil, the DTSC screening level of 12 mg/kg, which is considered background for southern California sites (Cal-EPA DTSC, 2007), was used as the SSAL for residential receptors.

For BaP-eq in soil, a concentration of 0.9 mg/kg, considered representative of background PAH concentrations in southern California soils, was used as the SSAL for residential receptors.

5. IDENTIFICATION AND SCREENING OF TECHNOLOGIES

5.1 Introduction

General response actions (GRAs) describe remedial actions that would address RAOs and achieve cleanup criteria for hypothetical future receptors that may be exposed to soil, soil gas, and groundwater contaminants. This section provides a discussion of GRAs and also provides identification of potential remedial technology types and specific technologies. A screening analysis was conducted to reduce the number of potentially applicable technologies to those that were determined to be potentially able to achieve the RAO for the COCs.

5.2 General Response Actions

Specific GRAs identified for onsite impacts include the following:

- No action;
- Remediate or remove soils that present potential ingestion and/or dermal contact risk;
- Containment;
- Reduce concentrations of COCs that present a potential inhalation risk;
- Gas monitoring and treatment;
- Monitor groundwater; and
- Implement institutional controls to restrict access to sludge and to control and manage risk associated with future mixed-use redevelopment.

5.3 Technology Identification and Screening

In accordance with USEPA guidance, potential remedial technology types and specific technologies that can be used to implement the GRAs were identified and then screened to assess their effectiveness, implementability, and cost. This section provides a screening of technologies to identify those that will be combined into remedial alternatives in Section 6 of this FS Report. The following technologies have been identified for remediation and are listed in Table 5-1:

- No action;
- Institutional controls;
- Treatment:
    - Stabilization/neutralization

    - Thermal treatment and
    - Sludge recycling
- Containment;
- Excavation and removal for offsite disposal; and
- Engineered controls:
    - Vapor and gas control systems; and
    - Groundwater monitoring.

In accordance with US EPA Feasibility Study guidance, Table 5-1 presents the screening of each technology based on its relative effectiveness, implementability, and cost. This screening provides the rationale behind the decision to retain or eliminate each technology type. Therefore, based on the screening, the following technology types were retained for further evaluation:

- No action (as required by USEPA guidance);
- Institutional controls;
- Treatment:
    - Stabilization/neutralization
- Containment;
- Excavation; and
- Engineering Controls:
    - Gas control systems; and
    - Groundwater Monitoring.

A summary of technologies retained is presented in Table 5-2. Each retained technology will be integrated into one or more remedial alternatives, described in Section 6.

6. DEVELOPMENT OF REMEDIAL ALTERNATIVES

In this section, remedial alternatives for the Site are assembled from those technologies that remain after the initial screening in Section 5. Each remedial alternative includes a remedial approach that accommodates the hypothetical future use scenario described in Section 4 and assumes that Site features are removed prior to remedy implementation. Each remedial alternative listed in Table 6-1 is designed to address each impacted media at the Site.

6.1 Remedial Alternatives

Table 6-1 presents the four remedial alternatives that were retained for evaluation:

- Alternative (A) 1 – No action;
- ~~A 2 – Capping with selective excavation~~ (RTC, 9/29/11)~~;~~
- A 2A – Capping with selective excavation (RTC, 9/29/11);
- A 3 – Capping with selective excavation and stabilization/neutralization; and
- A 4 – Excavation with offsite disposal.

Alternatives ~~2~~ 2A (RTC, 9/29/11) and 3 include institutional controls, gas control and monitoring, and groundwater monitoring. All four alternatives are described below.

Alternatives ~~2~~ 2A (RTC, 9/29/11) through 4 are depicted on Figures 6-1 through 6-16. Details shown are conceptual for estimating and comparison purposes only, and do not represent the results of full engineering design and analysis.

6.1.1 Alternative 1 – No Action

This alternative consists of performing no work now or in the future to attempt to mitigate an existing condition. The current geomembrane cover would remain and no deed restrictions would be placed on the property.

For No Action to be considered an acceptable alternative, the concentrations of COCs would have to be below RAOs. This alternative would provide no exposure pathway reductions. There would be no controls to prevent future site development or site access. Groundwater contamination would not be known since monitoring would not be performed. Future site development would be hindered due to the instability of the sludge material. The No Action Alternative is required by USEPA FS guidance.

~~6.1.2 Alternative 2 – Capping with Selective Excavation~~

~~Alternative 2 includes the following major elements:~~ (RTC, 9/29/11)

- ~~Existing surface removal;~~
- ~~Consolidation and capping of impacted material;~~
- ~~Capping of sludge;~~
- ~~Installation of gas control and monitoring system;~~
- ~~Institutional controls; and~~
- ~~Groundwater monitoring.~~

~~This alternative is depicted on Figures 6-1 and 6-2. The cap surface shown in Figure 6-2 is for comparative purposes in this Feasibility Study only and does not represent the final cap surface. Each component is discussed further in the following sections.~~ (RTC, 9/29/11)

~~*6.1.2.1 Existing Surface Removal*~~

~~A geomembrane is currently above the Cooper North and South Sumps. Prior to initiating consolidation activities, the existing geomembrane will be cut to allow sludge to permeate through and prevent the potential for gas build up. The geomembrane will remain in place and Haack Rework and Eastern Overflow material would be consolidated above it.~~ (RTC, 9/29/11)

~~*6.1.2.2 Consolidation of Material*~~

~~In general, the sludge is contained in the three sumps: Cooper North and South, and Haack. As previously discussed in Section 3.2.1, approximately 650 CY of a sludge/soil mixture is located outside of the sumps in the Haack Rework area. To excavate the sludge/soil mixture, approximately 3,550 CY of overburden will need to be excavated. Additionally, along the eastern property line, a thin layer of sludge exists which appears to be the result of spillage or overflow from the sumps. Also, as shown on Figure 6-1, some sludge material is outside of the Site boundary beneath the sidewalk and Artesia Blvd. This sludge material is considered to be already capped with asphalt, concrete, and a minimum of 18 inches of sand and/or silty sand above the first detected sludge deposits (Stantec, 2010a).~~ (RTC, 9/29/11)

~~The Haack Rework and eastern overflow areas would be consolidated into one of the three sumps prior to capping, and used as fill beneath the cap low-hydraulic conductivity layer (to be discussed in Section 6.1.2.2). Approximately 4,460 CY of Haack Rework (650 CY), Haack Rework overburden (3,550 CY), and eastern overflow (260 CY) are anticipated to be placed above the sumps.~~ (RTC, 9/29/11)

~~Following visual excavation of material from the Haack Rework and eastern overflow, confirmation sampling would be performed to confirm the material was removed.~~

~~Confirmation sample results would be compared to cleanup goals. Where testing indicates concentrations in excess of cleanup goals, additional material would be removed and consolidated above the sumps. Haack Rework and eastern overflow excavations will be backfilled using soils obtained from unimpacted areas of the site.~~ (RTC, 9/29/11)

~~*6.1.2.3 Capping of the Sumps*~~

~~The Cooper North and South and Haack Sumps would remain in place. Human health and the environment would be protected through use of a cap which would act as a barrier to prevent both dermal contact and gas exposure. The proposed, conceptual Haack and Cooper cap grades are shown on Figure 6-2. This preliminary cap design is in accordance with California Code of Regulations Title 22 (22 CCR) §66264.228. The grades show on Figure 6-2 incorporate minimum slopes to maintain cover integrity in the event of settling and/or subsidence per 22 CCR §66264.228(a)(2)(C)(4). The final design of the cap may have flatter slopes if analyses are performed to show ponding will be prevented. In accordance with 22 CCR, the cap consists of a foundation layer, low-hydraulic conductivity, and erosion-resistance layer. The Alternative 2 cap is illustrated on Figure 6-6, in Detail 1-A, and would consist of the following layers:~~ (RTC, 9/29/11)

~~*Stabilization Layer*~~

~~The stabilization layer is intended for use over the sludge material in the Cooper North and South sumps (Detail 1-A, Figure 6-6). The Haack Sump is currently overlaid by a 6-inch reinforced concrete pad which would act as the stabilization layer (Detail 1-C, Figure 6-6). Prior to placement of the stabilization layer over the Cooper Sumps, the geomembrane material will be cut to allow sludge to seep through and mix with the gravel layer. The stabilization layer on the Cooper North and South sumps will consist of, from bottom to top, 2 feet of gravel, 1 foot of sand, high-strength woven geotextile, and a 6-inch geocell filled with sand. The bottom gravel layer placed above the cut geomembrane is intended to partially sink into the sludge material to provide stabilization during construction of the overlying materials. The high-strength woven geotextile would provide separation reinforcement and, along with the geocell reinforcement, would "bridge" the soft sludge areas and provide the strength needed to support the cap.~~ (RTC, 9/29/11)

~~*Foundation and Gas Collection Layers*~~

~~The foundation soil and gas collection layers would be placed above the stabilization layers and consist of, from bottom to top, minimum 1 foot of foundation soil, gas collection piping, and a gas collection geocomposite. The minimum 1 ft foundation and gas collection layer will support the low-hydraulic conductivity layer and erosion~~

resistance layer in accordance 22 CCR §66264.228(e)(4). The foundation soil would consist of onsite, impacted soil and Haack Rework material where available. Impacted foundation layer material would be supplemented with soil material obtained from unimpacted areas of the site. Horizontal gas collection pipes surrounded by gas collection aggregate would be embedded in the foundation layer. Nonwoven geotextile would surround the aggregate to prevent clogging of the aggregate due to fines intrusion. (RTC, 9/29/11)

Low-Hydraulic Conductivity Layer

The low-hydraulic conductivity layer would be placed above the foundation and gas collection layers and would consist of a geosynthetic clay liner (GCL) and a 60-mil high density polyethylene (HDPE) geomembrane. In accordance with 22 CCR §66264.228(e)(5), the low-hydraulic conductivity layer would reduce the downward migration of precipitation and the upward migration of sludge and gas. (RTC, 9/29/11)

Erosion Resistance Layer

The erosion resistance layer is comprised of a drainage geocomposite and 2 feet of vegetated cover soil. In accordance with 22 CCR §66264.228(e)(10). the drainage geocomposite would prevent hydrostatic head buildup and drain precipitation that has infiltrated the overlying vegetated cover soil toward the outside of the cap and perimeter drainage channels while the vegetative cover soil will be resistant to foreseeable erosion effects by wind scour, raindrop impact, and runoff. (RTC, 9/29/11)

Along the northern property boundary, limited space is available to allow for grading to install the cap system. As a result, sheet piles would be installed to allow for the vertical rise of the cap without altering Artesia Boulevard or the railroad property. Furthermore, the installation of sheet piles would prevent lateral migration of the sludge material from beneath the cap due to the new weight of the cap. The sheet piles would be installed to an average depth of 20 feet bgs and extend between 4 and 10 feet from the ground surface to accommodate the cap. (RTC, 9/29/11)

6.1.2.4 Gas Control and Monitoring System

The gas control system would be comprised of perimeter vertical gas migration control wells and a below-cap horizontal gas collection system. The proposed layouts of the vertical and horizontal gas collection systems are shown on Figures 6-3 and 6-4, respectively. (RTC, 9/29/11)

Vertical Gas Migration Control Wells

The system of gas migration control wells is designed to be a passive system that, as a contingency, can be converted readily to an active system. The system will operate

~~actively for a period of 2 weeks following remedial action at the site. Based on the concentrations of constituents detected during the 2-week startup period, the system will remain active or switch to passive operation with the option for active control in the future. The decision to make the system active again would be based upon future gas monitoring at the Site.~~ (RTC, 9/29/11)

~~As a passive system, the wells are designed to intercept gases that may migrate laterally from the sumps; the gases are then vented to the atmosphere or to a treatment system. Barometric pumping would help "flush" the wells. As an active system, alternate wells would serve as air inlet and gas extraction wells. In this way, a "curtain" of air would be created that would intercept gases that may potentially migrate from the sumps as depicted on Figure 6-5. The extracted gases would then be vented to the atmosphere or to a treatment system. The wells would be installed to the approximately 2 ft above the groundwater "A" horizon.~~ (RTC, 9/29/11)

~~*Below-Cap Horizontal Gas Collection System*~~

~~A horizontal gas collection system would be placed within the foundation layer of the cap, as discussed above. Similar to the vertical gas migration control wells around the perimeter of the cap, the gas collection system is designed to initially operate as an active system, during a start-up period of approximately two weeks. The system would then be operated as a passive system, but is designed as a contingent measure to be readily converted to active. As a passive system, it would be vented to the atmosphere and rely on barometric pumping to flush the system. The decision to make the system active would be based upon post-remediation gas monitoring at the Site.~~ (RTC, 9/29/11)

~~The design of the gas collection system incorporates two separate gas collection pipes near the perimeter of the cap. A gas transport pathway between the gas collection pipes is established by the geocomposite component of the cap. As a passive system, gas entering the geocomposite would transmit to either of the gas collection pipes and would vent to the atmosphere or gas treatment system. As an active system, one of the pipes would be an air inlet pipe and the other pipe would be an extraction pipe. A flow of air and gas from the air inlet pipe to the extraction pipe would be created across the width of the caps and would remove gas that may accumulate below the barrier component of the cap.~~ (RTC, 9/29/11)

~~*Gas Monitoring System*~~

~~Gas migration sentry probes would be placed near the perimeter of the cap. The proposed locations of the probes are shown on Figure 6-4. The sentry probes are designed to be outside of the vertical gas migration control wells. Regular monitoring of gas concentrations at the probe locations would be performed before, during, and after system operation. The decision to convert the gas collection systems to an active~~

~~system would be partially based upon the results of the sentry probe monitoring activities, and threshold contaminant concentrations developed in the Operations, Maintenance, and Monitoring (OM&M) Plan.~~ (RTC, 9/29/11)

~~*6.1.2.5 Institutional Controls*~~

~~The anticipated institutional controls for the Site would prohibit sensitive land uses (i.e., single family residence, hospitals, schools, or child care centers), specify new building construction (i.e., first floor non-residential, upper floor residential, and inclusion of gas control system), and prohibit onsite groundwater extraction for municipal (i.e., drinking water purposes), industrial, and agricultural (i.e., irrigation) use. Furthermore, a Health and Safety Plan (HASP) and Construction Quality Assurance (CQA) Plan would be required to establish minimum health and safety protocol during construction, and provide documentation of proper excavation, cap, and gas control system construction. A Risk Management Plan (RMP) would be developed for the Site to reduce the risk of future construction worker exposure to groundwater if the Site is developed. The RMP would discuss the hazards at the site, minimum PPE requirements, and notification requirements. Land use covenants (LUCs) to place deed restrictions on the site will be filled with the Los Angeles County Recorder's Office and annual LUC restriction inspections will be conducted by DTSC to ensure compliance (RTC, 4/4/12)~~ (RTC, 9/29/11)

~~*6.1.2.6 Groundwater Monitoring*~~

~~Groundwater monitoring would continue to be performed on a semi-annual basis for a period of 5 years after the remedial controls have been implemented. During construction, three sets of wells would be destroyed to accommodate construction of the cap. Following construction, two wells would be installed to represent the upgradient and downgradient conditions with the remaining well network.~~ (RTC, 9/29/11)

6.1.2 Alternative 2A – Capping with Selective Excavation

Alternative 2A replaced Alternative 2 in the Draft FS dated February 2011. Alternative 2A is consistent with the former Alternative 2 in that capping and selective excavation of the sludge in the Haack Rework area are evaluated. However, the evaluated cap proposed in Alternative 2A is significantly lower in overall height than the cap of former Alternative 2. Additionally, different disposal scenarios for the Haack Rework material are proposed in Alternative 2A. The lower profile cap and different Haack Rework material disposal alternative presented in this Final Revised Draft FS is in response to comments received from the City of Gardena during the 10 May 2011 meeting. (RTC, 9/29/11)

6.1.2.1 General Overview

The Site is generally divided into three areas: the Cooper North and South Sumps on the Cooper Property, the Haack Sump and the Haack Rework Area located primarily within the Haack property, four residential properties, land owned by Los Angeles County and a small area of land beneath the Artesia Boulevard right-of-way. Because these areas of the Site are divided among different property owners, the properties may not all be available for remedial construction at one time. The following sections describe, in general, the proposed Alternative 2A approach for each area. Section ~~3.3~~ 6.1.2.2 (RTC, 11/6/12) describes the remedial implementation approach for the entire Site in greater detail. (RTC, 9/29/11)

As described ~~in the Draft FS (Geosyntec, 2011),~~ previously (RTC, 11/6/12), the sludge material beneath the Artesia Boulevard South sidewalk and Artesia Boulevard are below road base material and asphalt or sidewalk concrete. The concrete and asphalt surface prevent ingestion and direct contact with the sludge as well as reduce its mobility by containing the sludge. (RTC, 11/6/12) This sludge material is considered to be already capped; however, institutional controls will include a requirement for repaving the area with "low-permeability asphaltic concrete" and increased maintenance of the asphalt surface in this area. ~~and therefore was not addressed in the Draft FS and will not addressed in Alternative 2A.~~ (RTC, 11/6/12)

Future access from current and/or future utility and/or construction workers will be addressed in the Risk Management Plan (RMP). The RMP will describe contaminants remaining onsite, known locations of impacts, contact information, and minimum, recommended personal protective equipment for current and future utility and/or construction workers. Institutional controls will include requirements (RTC, 11/6/12) that the City of Gardena and/or Caltrans provide notice of potential subsurface hazardous materials in the area of Artesia Boulevard where sludge is potentially located, prior to (RTC, 11/6/12) issuing work permits. (RTC, 2/10/12) Institutional controls will also include requirements related to Site development and cap loading restrictions. (RTC, 11/6/12)

Cooper North and South Sumps

The existing geomembrane will remain in place with the cap installed above. The geomembrane will provide a construction surface and preliminary support during installation of the overlying materials. Furthermore, the existing surfaces minimize the dermal contact and gas inhalation exposure risks to the construction workers during installation of the cap. (RTC, 11/6/12)

The sludge in the Cooper North and South Sumps will be capped, from bottom to top, with the following materials: (1) high-strength geotextile; (2) between 1 and 4.5 feet (ft) of foundation layer material; (3) a horizontal gas collection system: gas collection geostrips and gas collection geocomposite; (4) geosynthetic clay liner (GCL); (5) high-density polyethylene (HDPE) geomembrane; (6) drainage geocomposite; and (7) 12-inches (in.) of Class II aggregate base. (RTC, 9/29/11)

Haack Sump

The existing asphalt and concrete will remain in place with the cap installed above. The asphalt and concrete will provide a construction surface and preliminary support during installation of the overlying materials. Furthermore, the existing surfaces minimize the dermal contact and gas inhalation exposure risks to the construction workers during installation of the cap. (RTC, 9/29/11) In areas where sludge has migrated to the surface, asphalt repair will be performed prior to installation of the cap. (RTC, 11/6/12)

The sludge in the Haack Sump will be capped, from bottom to top, with the following materials: (1) between 0.5 and 4.5 ft of foundation layer material; (2) a horizontal gas collection system made up of gas collection geostrips and gas collection geocomposite; (3) geosynthetic clay liner (GCL); (4) HDPE geomembrane; (5) drainage geocomposite; and (6) 12 in. of Class II aggregate base. (RTC, 9/29/11)

Haack Rework Area

The Haack Rework area is composed of soil-sludge material and soil overburden. The Haack Rework overburden material will be disposed of as foundation material beneath the Cooper North and/or South sumps cap. ~~These materials will be removed and relocated or disposed of in three possible scenarios or a combination of the following three scenarios: (1) beneath the Cooper North and/or South Sumps cap as foundation layer material; (2) beneath the Haack Sump cap as foundation layer material; and (3) offsite disposal.~~ (RTC, 11/6/12) Approximately 2,670 CY of Haack Rework soil-sludge material and 2,450 CY Haack Rework overburden are anticipated to be relocated during construction activities. Disposal of the Haack Rework material will be dependent on the material properties of the soil-sludge and (RTC, 11/6/12) ~~property~~ availability of staging areas within the property (RTC, 11/6/12) during construction, as described in greater detail in Section ~~3.3.3~~ 6.1.2.2. (RTC, 11/6/12)

6.1.2.2 Detailed Alternative 2A Components

Alternative 2A includes the following major elements:

- Existing surface preservation;
- High-strength geotextile installation;

- Select excavation of impacted material (Haack Rework material);
- Containment of sludge along Artesia Boulevard;
- Installation of gas control and monitoring system;
- Capping of the sumps;
- Institutional controls; and
- Groundwater monitoring.

The approximate area of Alternative 2A is depicted on Figures ~~3-1~~ 6-1 and ~~3-2~~ 6-2. (RTC, 11/6/12) The construction and cap components are discussed further in the following sections.

Existing Surface Preservation

The existing geomembrane surface on the Cooper Property and concrete and asphalt surfaces above the Haack Sump will remain in place and the cap will be installed above these surfaces. New asphalt will be placed above the existing, degraded areas of asphalt surface over the Haack Sump prior to the initiation of cap construction on the Haack property. (RTC, 2/10/12) The geomembrane, asphalt, and concrete surfaces will provide a barrier to minimize worker dermal exposure to sludge contact as well as gas generation and release. Additionally, the concrete and asphalt surfaces will provide strength to the cap on the Haack Sump, eliminating the need for the high-strength geotextile described ~~in Section 3.3.2.~~ below. (RTC, 11/6/12)

High-Strength Geotextile Installation

A polypropylene (RTC, 11/6/12) high-strength geotextile will be placed above the existing geomembrane surface in the Cooper North and South sump areas; no polypropylene (RTC, 11/6/12) high-strength geotextile is proposed above the Haack sump area. The geotextile will be used to provide reinforcement during installation of the foundation soil to support both the weight of the soil and construction equipment. The polypropylene (RTC, 11/6/12) high-strength geotextile will be anchored around the perimeter of the two Cooper sumps with an anchor trench and/or secured to sheet piling along Artesia Boulevard. The minimum tensile strength and anchorage of the high-strength geotextile have been evaluated and are included in Appendix D. (RTC, 2/1/12) A typical anchor trench is shown as Detail 7 on Figure ~~3-10~~ 6-14.

Haack Rework Material Excavation and Disposal

The Haack Rework area is comprised of approximately 2,670 CY of sludge and a soil-sludge mixture beneath approximately 2,450 CY of soil overburden; therefore, a total of approximately 5,120 CY of material is anticipated to be relocated during construction activities. Haack rework material excavation will be performed using standard

construction equipment. Odor suppressant equipment (foaming units) will be present during excavation to control odors and gas emissions, if necessary. South Coast Air Quality Management District (AQMD) Rule 1166 and applicable California Occupational Safety and Health (Cal-OSHA) exposure limits will be followed during excavation and handling of the Haack Rework material.

As previously described, the Haack Rework soil-sludge material will be removed and disposed of offsite ~~relocated by three possible scenarios: (1) beneath the Cooper North and/or South Sumps cap; (2) beneath the Haack Sump cap; and/or (3) offsite disposal.~~ (RTC, 11/6/12) The Haack Rework area overburden soil will be used as foundation material beneath the Cooper or Haack Sumps caps.

~~Scenarios 1 and 2 are dependent on the phasing of the construction. For example, if all parcels are available for cap construction at one time, the Haack Rework soil-sludge material can be placed within the Cooper North and South cap; however, if only the Haack Sump and Residential Properties are available for cap construction, the Haack Rework soil-sludge material will be placed within the Haack Sump cap. Material will only be placed as foundation material if it meets the requirements for engineered fill as defined in the future construction specifications.~~ (RTC, 11/6/12) ~~In Scenarios 1 and 2, the Haack Rework soil-sludge mixture material would be excavated and placed as foundation material above the high strength geotextile or 6-inch reinforced concrete or asphalt on the Cooper North and South Sumps or Haack Sump, respectively. The material would be used as foundation material to support the overlying geosynthetics and erosion resistant layer, provide fill to generate the minimum grades for drainage, and support the gas collection strip composite (geostrip), gas collection piping, and gas collection geocomposite.~~ (RTC, 11/6/12)

~~The construction schedule for Scenarios 1 and 2 is estimated to require approximately 14 days to relocate the material from the Haack Rework area to the sump(s).~~ (RTC, 11/6/12)

The Haack Rework soil-sludge material would be excavated and disposed of at a commercial, non-RCRA hazardous landfill (assumed to be the Buttonwillow Facility). Assuming all 2,670 CY of soil-sludge material is disposed of offsite and assuming 16 CY capacity end-dump trucks are used, approximately 164 truckloads would be necessary to transport the material an estimated 150 miles one-way to the Buttonwillow Facility. An estimated 18 trucks[2] per day could be loaded and transported to the Buttonwillow Facility, resulting in approximately 10 days of hauling from the Site

[2] Assumptions: (1) 3 trucks are loaded per hour between 7 am and 1 pm, such that trucks can get to the disposal facility prior to closing

(Appendix E [RTC, 9/29/11]). ~~Scenario 3 has been included in the cost estimation, Table 3-1, and detailed and comparative analyses, Sections 4 and 5, respectively. A potential cost savings of $314,500 may be achieved if Scenarios 1 or 2 are implemented.~~(RTC, 11/6/12)

~~Initial finger berm construction as described in Section 3.3.5.1 6.1.2.3 (RTC 11/6/12) is estimated to require 8 days, assuming approximately 500 CY per day of material can be relocated. After the initial lift is placed, an additional 9 days would be required to place the additional 9,100 CY of foundation material, assuming an increased placement efficiency of 1,000 CY per day. The increase in efficiency after the initial lift is due to the less selective and restrictive nature of the placement after the working surface becomes more supportive. A preliminary schedule is provided in Appendix E. (RTC, 9/29/11)~~ (RTC, 1/9/2013)

The Haack Rework area will be excavated no deeper than an elevation of approximately 20 ft above mean sea level (amsl) as shown on Figure ~~3-5~~ 6-5. (RTC, 11/6/12) Following excavation of material from the Haack Rework area using visual means to guide the limits of the excavation, confirmation sampling to determine the absence of sludge and (RTC, 2/10/12) COCs at 5 ft intervals to a depth of 10 ft below the planned excavation grade (RTC, 2/10/12) would be performed to confirm the material was removed. Confirmation sample results will be compared to risk-based cleanup goals ~~provided in the Draft FS~~ described in Section 4.8. (RTC, 11/6/12) Where testing indicates concentrations in excess of cleanup goals, additional material would be excavated, hauled, disposed of offsite or reused as foundation material, and additional confirmation testing would be performed.

Upon completion of excavation, confirmation sampling, and receipt of test results indicating that the samples are below risk-based cleanup goals, the area will be backfilled with clean on- or off-site soil and graded to drain. The slope from the southern residential properties resulting from the excavation of the Haack Rework area will be contoured to a 3 ft horizontal to 1 ft vertical (3H:1V) grade while portions of the excavations lower than the surrounding land will be backfilled and graded to drain (Figures ~~3-1~~ 6-1 and ~~3-2~~ 6-2). (RTC, 11/6/12)

Vapor Control During Construction

Health and safety controls will be implemented during construction, specifically during ~~including~~ (RTC, 11/6/12) the excavation of the Haack Rework material. The Treatability Study performed by Stantec (Stantec, 2007) indicated the Haack Rework soil-sludge material is significantly degraded; however, detectable concentrations of hydrogen sulfide and sulfur dioxide are still produced when the sludge material is disturbed. Therefore, during construction activities, vapor suppressing foams can be

used and workers will be provided health and safety monitoring devices such as hydrogen sulfide and sulfur dioxide indicator badges. The badges alert workers when the permissible exposure limit (PEL, 10 parts per million [ppm] and 2 ppm for hydrogen sulfide and sulfur dioxide, respectively) is nearing so the worker can exit the work area or change practices. Additionally, fixed monitoring will be performed around the perimeter of the Site to alert workers when the PEL is detected so work activities can pause and/or be altered to prevent additional releases.

At the completion of excavation activities each day, a vapor suppressing foam or soil cover will be used to cover the exposed excavation and stockpiles to minimize ~~prevent additional~~ (RTC, 11/6/12) release of vapors.

6.1.2.3 Capping of the Sumps

The proposed, conceptual Haack and Cooper cap grades of Alternative 2A are shown on Figure ~~3-1~~ 6-2 with cross sections shown on Figures 6-3 and 6-4. (RTC, 11/6/12) This preliminary cap design is in accordance with 22 CCR §66264.228. In accordance with 22 CCR, the cap consists of a foundation layer, low-hydraulic conductivity layer, and erosion-resistance layer. The Alternative 2A cap is illustrated on Figure ~~3-9~~ 6-13 (RTC, 11/6/12), in Details 1-A and 1-B, and would consist of the layers described below.

Foundation and Gas Collection Layers

The foundation soil and gas collection layers would be placed above the high-strength geotextile and asphalt and concrete for the Cooper and Haack Sumps, respectively, and consist of, from bottom to top, minimum 1 ft of foundation soil, gas collection geostrips, and a gas collection geocomposite. The minimum 1 ft foundation and gas collection layer will support the low-hydraulic conductivity layer and erosion resistance layer in accordance with 22 CCR §66264.228(e)(4). The foundation soil would consist of ~~Haack Rework soil-sludge material,~~ (RTC, 11/6/12) Haack Rework overburden soil, on-site soils and/or imported fill material. Approximately 13,000 CY of foundation material will be required for the Cooper Sumps and Haack Sump. (RTC, 9/29/11)

The foundation material would initially be placed using the "finger fill soil placement technique," which incorporates the use of parallel, narrow berms over the polypropylene (RTC, 11/6/12) high-strength geotextile. Approximately 3,900 CY of material would be placed using the "finger fill soil placement technique." The initial, 1-ft berms will then gradually be expanded across the sumps until the entire sump surface is covered with one foot of foundation soil. (RTC, 9/29/11)

During finger fill placement of soil above the polypropylene (RTC, 11/6/12) high-strength geotextile, movement of the sludge will be minimized and contained by the existing berms and the anchor trenches securing the polypropylene (RTC, 11/6/12) high

strength geotextile and existing geomembrane. (RTC, 9/29/11) Where available space onsite limits traditional anchor trenches, the high-strength geotextile may be secured with concrete anchors or attached to sheet piles with battens. (RTC, 11/6/12)

After the initial 1-ft placement of soil across the sump, an additional 9,100 CY of foundation soil will be placed in lifts until final foundation grades are met (1 ft below the final cover grades shown on Figures ~~3-1~~ 6-1 and ~~3-2~~ 6-2). (RTC, 11/6/12) The slopes will be a minimum of 2 percent (%) to reduce impacts on drainage due to settlement of the foundation material and/or sludge. (RTC, 9/29/11)

Rows of gas collection geostrips will be placed at the surface of the foundation layer. The geostrips are 6 to 12 in. wide and consist of a geosynthetic filter fabric surrounding a molded polyethylene core (US Fabrics, 2011a). The molded polyethylene core provides a pathway for the gas to travel, while the filter fabric prevents soil intrusion and clogging. A polyethylene core and polypropylene geotextile, which are more resistant to acidic environments, will be required in the technical specifications. (RTC, 11/6/12) The gas collection geocomposite will be placed above the geostrip rows and the foundation layer (Details 1-A and 1-B, Figure ~~3-9~~ 6-13). (RTC, 11/6/12) The gas collection and control system is described in greater detail (RTC, 9/29/11) ~~in Section 3.3.6~~ below. (RTC, 11/6/12)

Low-Hydraulic Conductivity Layer

The low-hydraulic conductivity layer would be placed above the foundation soil and gas collection geostrips and geocomposite and would consist of a geosynthetic clay liner (GCL) overlain by a 60-mil HDPE geomembrane (Details 1-A and 1-B, Figure ~~3-9~~ 6-13). (RTC, 11/6/12) In accordance with 22 CCR §66264.228(e)(5), the low-hydraulic conductivity layer would reduce the downward migration of precipitation and the upward migration of gas. The low-hydraulic conductivity layers would be secured within an anchor trench around the perimeter of the sumps as described below. (RTC, 9/29/11)

Anchor Trenches

The existing geomembrane (located above the two Cooper Sumps), the high strength geotextile, and the low-hydraulic conductivity layer (60-mil HDPE geomembrane overlying a GCL) are or will be anchored above the sumps using separate anchor trenches. The existing geomembrane is secured above the sumps using a 2 ft by 2 ft anchor trench (OHM, 1994). These anchor trenches act similarly to shallow, vertical barriers by minimizing the opportunity for lateral "overspilling" of surface sludge. Lateral migration of the sludge at depth has not been shown to occur through the soil based on soil borings outside the immediate areas of the sumps. (RTC, 9/29/11)

The high strength woven geotextile will be secured in a separate 2 ft by 2 ft anchor trench located outside the limits of the Cooper Sumps. (RTC, 9/29/11)

The GCL and HDPE geomembrane will be secured by an additional anchor trench around the perimeter of the Haack and Cooper Sumps. The anchor trench will vary in configuration depending on the termination condition. On the eastern, southern, and portions of the northern and western perimeters, the anchor trench will consist of a vee-trench filled with concrete to form a surface water drainage ditch (Detail 6 on Figure ~~3-10~~ 6-14). (RTC, 11/6/12) On portions of the northern and western perimeters, the anchor trench will consist of a 1 ft deep by 2 ft wide anchor trench (RTC, 9/29/11) (Detail 7 on Figure ~~3-10~~ 6-14). (RTC, 11/6/12) Where sheet piles are located on the northern edge of the site, the geosynthetic materials will be secured to the sheet piles using battens. (RTC, 11/6/12)

Erosion Resistance Layer

The erosion resistance layer is comprised of a drainage geocomposite overlain by 1 ft of Class II aggregate base, in accordance with 22 CCR §66264.228(e)(10). The drainage geocomposite minimizes hydrostatic head buildup above the hydraulic barrier and provides a means to drain precipitation that has infiltrated the overlying Class II aggregate base toward the outside of the cap and perimeter drainage channels. The Class II aggregate base will be resistant to foreseeable erosion effects caused by wind-scour, raindrop impact, and runoff prior to site development. (RTC, 9/29/11)

Sheet Pile Cut-Off Wall

Along a portion of the northern Site boundary, limited space is available to allow for grading to install the cap system. As a result, sheet piles would be installed to allow for the vertical rise of the cap without altering the Artesia Boulevard right-of-way. The sheet piles would be installed to a maximum depth of 18 feet bgs, consistent with the deepest known sludge in the Cooper North and Haack Sumps, and extend upwards to approximately 3 feet from the ground surface to accommodate the cap. The sheet piles would be coated to minimize corrosion of the steel due to the low pH and high hydrogen sulfide environment. (RTC, 11/6/12) A decorative exterior wall will cover the exposed portion of the sheet piles along Artesia Boulevard. (RTC, 9/29/11) The sheet pile cut-off wall will provide a barrier between the Haack sump sludge and Artesia Blvd and its adjacent sidewalk. (RTC, 2/10/12)

Final Cap Topography

The final cap surface is shown on Figures ~~3-1~~ 6-1 and ~~3-2~~ 6-2. (RTC, 11/6/12) Cross sections of the final cap topography are provided on Figures ~~3-3~~ 6-3 and ~~3-4~~ 6-4. (RTC, 11/6/12) Drainage channels are shown on the exterior of the sumps to the north, south, east, and west as well as bisecting the Cooper North and South sumps. The channels

drain with a 0.5% slope to the northeast and northwest corners of the Cooper North and Haack sumps, respectively. The cap slopes up from the drainage channels with a minimum 2% slope to a maximum elevation of 25.7, 24.8, and 25.6 ft amsl on the Haack, Cooper North, and Cooper South sumps, respectively. Along Artesia Boulevard, the approximate height of the cap will be 22 to 23 ft amsl which includes the maximum 3 ft wall to support the final cover and an additional 6-inch curb to direct stormwater runoff to the perimeter drainage channels. The Haack Rework area will be backfilled and graded to drain as shown on Figures ~~3-1~~ 6-1 and ~~3-2~~ (RTC, 9/29/11) 6-2. (RTC, 11/6/12)

6.1.2.4 Gas Control and Monitoring System

The gas control system would be comprised of perimeter vertical gas migration control wells and a below-cap horizontal gas collection system. The proposed layouts of the vertical and horizontal gas collection systems are shown on Figures ~~3-6~~ 6-6 and ~~3-7~~ 6-7 (RTC, 11/6/12), respectively. (RTC, 9/29/11)

Vertical Gas Migration Wells

The system of gas migration control wells is designed to be a passive system that, as a contingency, can be converted readily to an active system. The system will operate actively for a period of two weeks following completion of the remedial action construction at the Site. Based on the concentrations of constituents detected during the two-week startup period, the system will remain active or switch to passive operation with the option for active control in the future. The system may be converted to passive operation with written prior approval from the DTSC. (RTC, 1/9/2013) The decision to make the system active again would be based upon future gas monitoring at the Site. (RTC, 9/29/11)

A series of alternating air inlet and gas extraction piping would be placed approximately every ~~20~~ 80 ft (RTC, 11/6/12) along the perimeter of the cap, except where sheet piles are installed as shown on Figure 3-6. The wells would be installed to approximately 2 ft above the groundwater "A" horizon ("A" horizon approximate elevation between 5.85 and 11.55 ft msl [Stantec, 2011]). The air inlet and gas extracting wells act to create a "curtain" of air surrounding the sumps, minimizing the horizontal migration of gas without extracting gas from the sludge. (RTC, 9/29/11)

During active gas extraction, a vacuum will be applied to the gas extraction wells, thus extracting gases from these wells, which will be conveyed to a treatment system for treatment prior to discharge to the atmosphere. The location of the system is shown on Figures ~~3-6~~ 6-6 and ~~3-7~~ 6-7. (RTC, 11/6/12) The vacuum pressure in the gas extraction wells imparts a vacuum on the soils surrounding each gas extraction well. With the air inlet wells equally spaced between the gas extraction wells, the air inlet forces a "short-

circuiting" of the flow into the gas extraction wells. The "short circuiting" effect creates a preferential flow path between the air inlet and gas extraction wells, thereby allowing the system to "sweep" or "flush" gases migrating from the sludge material laterally without extracting gases from within the sludge (RTC, 9/29/11) (Figure ~~3-8~~ 6-8). (RTC, 11/6/12)

During passive gas extraction, subsurface gas movement is non-existent or very small, allowing barometric pumping and diffusion to vent subsurface gases from the vertical gas migration control wells. (RTC, 9/29/11)

Below-Cap Horizontal Gas Collection System

A horizontal gas collection system (utilizing geostrips) would be placed within the foundation layer of the cap, as discussed above. ~~in Section 3.3.5.1.~~ (RTC, 11/6/12) Similar to the vertical gas migration control wells around the perimeter of the cap, the horizontal gas collection system is designed to initially operate as an active system, during a start-up period of two weeks. The system would then be operated as a passive system, but is designed as a contingent measure to be readily converted to active, if necessary. As a passive system, it would be vented to the atmosphere and rely on barometric pumping and diffusion to vent subsurface gases from the system. The decision to make the system active would be based upon post-cap construction gas monitoring at the Site (RTC, 9/29/11) as described in *Gas Treatment System*, below. (RTC, 11/6/12)

The design of the gas collection system incorporates gas collection geostrips and air inlet geostrips, both connected to separate gas collection and air inlet piping. Piping is connected to the treatment compound where actively extracted gases can be treated prior to discharge to the atmosphere and fresh air can be pulled into the system through the air inlet piping. Gases fluxing out of the sludge and vertically rising to the base of the hydraulic barrier component of the cap will be collected in the continuous gas collection geocomposite layer. Parallel geostrips will allow collected gases to be "flushed" or "swept" from the gas extraction geocomposite to the gas extraction geostrips by allowing fresh air into the air inlet geostrips. Geostrips will convey the collected gases to the gas extraction piping and the treatment compound. (RTC, 9/29/11)

*Gas Treatment System (*RTC, 11/6/12)

The gas extracted from the control system would be treated using specialized granular activated carbon (GAC). Specialized Granular Activated Carbon (GAC) products have been manufactured to include hydrogen sulfide and sulfur dioxide oxidation. Specifically, Calgon Carbon has a number of specialized GAC products for hydrogen sulfide and sulfur dioxide environments. (RTC, 11/6/12)

The gas system will be operated actively for a period of time defined in a future Operations, Maintenance, and Monitoring (OMM) Plan. During initial operation, soil gas data, including constituents extracted and their concentrations, will be collected. The need for active gas collection will be based on the extracted soil gas COC concentrations and associated, calculated health risk goals. If start-up data indicates that COC concentrations are below risk-based trigger concentrations, and therefore, active gas collection is not needed, the system may be converted to a passive system which vents to the atmosphere or is turned off with no venting. (RTC, 4/4/12)

Soil gas samples will be collected from the treatment system and perimeter soil gas probes on a regularly basis to evaluate the operation of the system and/or migration of soil gas. Sample results will be compared to risk-based trigger concentrations developed with the OMM Plan for each COC. Development of the risk-based trigger concentrations will assume soil gas will cause outdoor air to become impacted with COCs; however, the outdoor air concentration used to develop the trigger concentration will be low enough to not result in adverse health effects. Based on the assumed conditions at the Site, if soil gas trigger concentrations are not exceeded, outdoor air concentrations will remain below human-health risk based concentrations. If soil gas concentrations are triggered, the gas collection and treatment system may be activated. (RTC, 4/4/12)

Gas Monitoring System

Multi-level gas migration probes would be placed outside of the perimeter of the cap. The proposed locations of the nine probes are shown on Figure 3-6. The probes are designed to be outside of the vertical gas migration control wells. (RTC, 9/29/11)

The gas probes are shown on Figure ~~3-7~~ 6-7. (RTC, 11/6/12) A total of nine probes were selected based on the average distance between probes of 300 ft to provide multiple locations to detect potential gas migration, if any. (RTC, 2/10/12) Each monitoring location will consist of three nested probes with 1 ft screen lengths at 5 ft intervals for discrete sample collection.(RTC, 9/29/11) The rationale for the location was based on a location outside of the radius of influence of the vertical gas migration control wells and within the property boundary and/or in a location accessible for monitoring which increased or decreased some distances between the probes. For example, probes were placed within the median of Artesia Boulevard rather than in the street to provide a safer location for monitoring. With further refinement of design, the location and number of probes may change with adjustments to the radius of influence of the vertical gas migration control wells and the locations of buildings and utilities for future site development. (RTC, 2/10/12)

Regular monitoring of gas concentrations at the probe locations would be performed before, during, and after system operation. The decision to convert the gas collection systems to an active system would be partially based upon the results of the probe monitoring activities and threshold contaminant concentrations developed in the Operations, Maintenance, and Monitoring (OMM) Plan (RTC, 2/10/12) as described in the *Gas Treatment System* section, above. (RTC, 11/6/12)

6.1.2.5 Institutional Controls

The anticipated institutional controls for the Site would consist of governmental controls, such as zoning and building permit restrictions, proprietary controls that restrict property use, and informational controls. Governmental controls would restrict the zoning of the Site to commercial (as identified in the Artesia Corridor Specific Plan) and prohibit sensitive land uses (i.e., residential, hospitals, schools, or child-care centers), specify building construction requirements (i.e., inclusion of gas control system beneath new structures). Environmental land use restrictions may also be applicable. Proprietary controls would place use restrictions on the Site properties. Restrictions would include future land use, the prevention of excavation or drilling within certain areas of the Site (i.e., within the capped areas), (RTC, 9/29/11) controlled traffic loads over the caps (RTC, 11/6/12), prohibit onsite groundwater extraction for municipal and domestic use (i.e., drinking water purposes), industrial, and agricultural (i.e., irrigation) use, future building location restrictions, provide for potential easements (i.e., for O&M activities) and conveyance of proprietary control restrictions to future property owners (i.e., restrictions "run with the land"). Informational controls would include deed notices on the Site property titles and ensure inclusion of the Site on a California registry of contaminated sites. (RTC, 9/29/11) Land use covenants (LUCs) to place deed restrictions on the site will be filed with the Los Angeles County Recorder's Office and annual LUC restriction inspections will be conducted by DTSC to ensure compliance. (RTC, 4/4/12) The asphalt cap above the sludge within Artesia Boulevard will have increased maintenance to repair cracking and normal wear that increase the permeability. (RTC, 11/6/12)

Furthermore, a Health and Safety Plan (HASP) and Construction Quality Assurance (CQA) Plan would be required to establish minimum health and safety protocol during construction, and provide documentation of proper excavation, cap, and gas control system construction. A Risk Management Plan (RMP) would be developed for the Site to reduce the risk of future construction worker exposure to groundwater if the Site is developed. The RMP would discuss the hazards at the Site, minimum PPE requirements, and notification requirements. (RTC, 9/29/11)

6.1.2.6 Groundwater Monitoring

~~The existing ten groundwater monitoring wells would be properly abandoned prior to commencement of the remedial action. During the remedial action activities an appropriate groundwater monitoring network would be agreed upon with input from the DTSC. After the completion of the remedial action, the future groundwater monitoring wells would be installed. Groundwater monitoring would continue to be performed on a semi-annual basis for a period of 5 years (RTC, 2/7/12)after the remedial controls have been implemented. A typical groundwater monitor well is shown as Detail 3 on Figure 6-9 in the Draft FS (Geosyntec,2011).~~ (RTC, 4/4/12)

Eight of the existing ten groundwater monitoring wells would be properly abandoned prior to commencement of the remedial action. Upgradient wells MW-1A and MW-1B would not be abandoned. (RTC, 4/4/12) During the remedial action activities, an appropriate groundwater monitoring network would be agreed upon with input from the DTSC. After the completion of the remedial action, the future groundwater monitoring wells would be installed. Groundwater monitoring would continue to be performed on a semi-annual basis. A typical groundwater monitor well is shown as Detail 3 on Figure ~~6-9 in the draft FS (Geosyntec, 2011)~~ 6-13.(RTC, 11/6/12)

The future development plans of the Site, which are currently unknown, would control where future monitoring wells would be installed. The well locations of the future monitoring well network would be agreed upon in consultation with the DTSC prior to completion of the remedial action. It is anticipated that the new monitoring wells would be installed shortly after completion of the remedial action. (RTC, 4/4/12)

6.1.2.7 Future Site Development

Following completion of the cap construction, the resulting Site conditions will facilitate the construction of a parking lot and an ingress/egress road to accommodate future commercial development at the Site. The 12-in. thick Class II aggregate base will provide a working surface for construction equipment used for parking lot construction, prevent the accumulation of free water within or below the pavement structure, and affect the rate of load distribution on the cap (Caltrans, 2008). Final landscape development designed in conjunction with the future parking lot above the cap will require the use of above grade planters to prevent biological intrusion into the cap. (RTC, 9/29/11)

The grades and final elevation of the cap have been reduced to allow for a flatter surface on which to construct a parking lot and be a less prominent feature along Artesia Boulevard. As described in Section ~~3.3.5~~ 6.1.2.3 (RTC, 11/6/12), the maximum elevation of the cap will be 25.7 ft amsl and the slopes will vary between 2H:1V and 2

percent. During commercial development of the Site, the slopes of the parking lot can be further reduced by adding fill above the lower portions of the cap, provided drainage from the geocomposite is maintained. Selective fill would allow for a flatter surface and ramp features to facilitate car movement. (RTC, 9/29/11) The cap has been shown to support construction loads at the surface (Appendix D). During final design of the cap, traffic load restrictions will be developed and incorporated into the institutional controls. (RTC, 11/6/12)

6.1.3 Alternative 3 – Capping with Selective Excavation and Stabilization/ Neutralization

Alternative 3 includes the following major elements (Figures ~~6-2~~ 6-9 and ~~6-7~~ 6-10): (RTC, 11/6/12)

- Existing surface removal;
- Consolidation of material;
- Stabilization/neutralization of the current upper 3 feet of sludge in the Cooper Sumps;
- Capping of sludge remaining onsite;
- Installation of gas control and monitoring system;
- Institutional controls; and
- Groundwater monitoring.

Some of these elements were discussed in Section 6.1.2; therefore, ~~the existing surface removal (Section 6.1.2.1), the consolidation of material (Section 6.1.2.2),~~ (RTC, 11/6/12) the installation of the gas control and monitoring system (Section 6.1.2.4), institutional controls (Section 6.1.2.5), and groundwater monitoring (Section 6.1.2.6) will not be repeated herein. Existing surface removal, the consolidation of material, ~~surface covering material removal,~~ (RTC, 11/6/12) sludge stabilization/neutralization, and capping are discussed further in the following sections.

6.1.3.1 Existing Surface Removal

A geomembrane is currently above the Cooper North and South Sumps. Prior to initiating neutralization and stabilization activities, the existing geomembrane will be removed to permit access to the sludge. The reinforced concrete and asphalt covers above the Haack Sump will remain in place. (RTC, 11/6/12)

6.1.3.2 Consolidation of Material

In general, the sludge is contained in the three sumps: Cooper North and South, and Haack. As previously discussed in Section 3.2.1, approximately ~~650~~2,670 (RTC, 1/9/2013) CY of a sludge/soil mixture is located outside of the sumps in the Haack Rework area. To excavate the sludge/soil mixture, approximately ~~3,550~~ 2,450 (RTC, 1/9/2013) CY of overburden will need to be excavated. Additionally, along the eastern property line, a thin layer of sludge exists which appears to be the result of spillage or overflow from the sumps. (RTC, 11/6/12)

The Haack Rework and eastern overflow areas would be consolidated into one of the three sumps prior to capping, and used as fill beneath the cap low-hydraulic conductivity layer (to be discussed in Section 6.1.3.4). Approximately ~~5,120~~5,470 CY (RTC, 1/9/2013) of Haack Rework ~~(2,670 CY)~~(2,670 CY) (RTC, 1/9/2013), Haack Rework overburden ~~(2,450 CY)~~(2,450 CY) (RTC, 1/9/2013), and eastern overflow (260 CY) are anticipated to be placed above the sumps. (RTC, 11/6/12)

Following visual excavation of material from the Haack Rework and eastern overflow, confirmation sampling would be performed to confirm the material was removed. Confirmation sample results would be compared to cleanup goals. Where testing indicates concentrations in excess of cleanup goals, additional material would be removed and consolidated above the sumps. Haack Rework and eastern overflow excavations will be backfilled using soils obtained from unimpacted areas of the site. (RTC, 11/6/12)

6.1.3.3 Stabilization/Neutralization of Cooper North and South Sludge

Stabilization/neutralization of the sludge material would be performed to the top 3 feet of the sludge to solidify the sludge for support of the proposed overlying cap. From the treatability studies performed by Stantec, it was determined that the addition of a 50/50 weight for weight (w/w) mix of calcium hydroxide ($Ca(OH)_2$) and calcium carbonate ($CaCO_3$) at a dosage rate of 20 to 30 percent reagent to sludge mix and 10 percent water neutralizes the sludge material. The addition of 50 percent soil (by weight) to this mix would effectively solidify the waste such that it is no longer susceptible to viscoelastic deformation (Stantec, 2008).

In-situ mixing would be performed through use of an excavator. The sludge on the edges of the sump would be mixed first to establish a foundation for equipment to move inward. Mixing would be performed to the minimum depth to support equipment, which is estimated at 3 feet. Due to the difficulty segregating the sludge and interbedded soil layers, it is assumed both the sludge and soil materials within the top 3 feet would be mixed as sludge. Therefore, the sludge volume used to calculate the

reagent volume was the 2008 sludge volume in the top 3 feet, or 13,500 CY (Stantec, 2008).

Mixing with the reagents and soil (RTC, 11/6/12) would cause bulking of the materials. According to the Treatability Study performed by Stantec, the sumps are expected to bulk 69 percent, based on the mix design specified (Appendix A, Stantec, 2008). Therefore, the bulked materials are anticipated to increase the height of the sumps by approximately 2 feet, resulting in a total treated sludge thickness of approximately 5 feet.

Respirators (or if warranted by conditions, more stringent personal protective equipment such as Self-Contained Breathing Apparatus [SCBA]), engineering controls (potentially tenting over the excavation), and air monitoring may be required to address potential emissions of sulfurous gases from the sludge generated during mixing (Stantec, 2008).

6.1.3.4 Capping of the Sumps

Similar to Alternative 2A, the Alternative 3 cap would consist of foundation, gas collection, barrier, drainage, and protective layers covering the Cooper North and South, and Haack sumps contiguously within the Site boundary; however, the gas collection layer, erosion protection layer, and sheet piling proposed for Alternative 3 are different than Alternative 2A, as described below. As discussed in Section 6.1.2.1, (RTC, 11/6/12) the portion of the Haack sump outside of the Site boundary beneath the sidewalk and Artesia Blvd. is considered to be already capped in this Alternative (Stantec, 2010a). The proposed final grades are shown on Figure ~~6-2~~ 6-10. (RTC, 11/6/12) The Alternative 3 cap is depicted on Figure ~~6-6~~ 6-15 in Details 1-C and 1-D. (RTC, 11/6/12)

Foundation and Gas Collection Layers

The foundation soil and gas collection layers would be placed above the stabilized sludge layer and consist of, from bottom to top, minimum 1 foot of foundation soil, gas collection piping, and a gas collection geocomposite. The minimum 1 ft foundation and gas collection layer will support the low-hydraulic conductivity layer and erosion resistance layer in accordance 22 CCR §66264.228(e)(4). The foundation soil would consist of onsite, impacted soil and Haack Rework material where available. Impacted foundation layer material would be supplemented with soil material imported from offsite. Horizontal gas collection pipes surrounded by gas collection aggregate would be embedded in the foundation layer. Nonwoven geotextile would surround the aggregate to prevent clogging of the aggregate due to fines intrusion. The foundation layer would be graded with 3 percent slopes to accommodate drainage. (RTC, 11/6/12)

Low-Hydraulic Conductivity Layer

The low-hydraulic conductivity layer would be placed above the foundation and gas collection layers and would consist of a geosynthetic clay liner (GCL) and a 60-mil high density polyethylene (HDPE) geomembrane. In accordance with 22 CCR §66264.228(e)(5), the low-hydraulic conductivity layer would reduce the downward migration of precipitation and the upward migration of sludge and gas. (RTC, 11/6/12)

Erosion Resistance Layer

The erosion resistance layer is comprised of a drainage geocomposite and 2 feet of vegetated cover soil. In accordance with 22 CCR §66264.228(e)(10), the drainage geocomposite would prevent hydrostatic head buildup and drain precipitation that has infiltrated the overlying vegetated cover soil toward the outside of the cap and perimeter drainage channels while the vegetative cover soil will be resistant to foreseeable erosion effects by wind-scour, raindrop impact, and runoff. (RTC, 11/6/12)

Along the northern property boundary, limited space is available to allow for grading to install the cap system. As a result, sheet piles would be installed to allow for the vertical rise of the cap without altering Artesia Boulevard or the railroad property. The sheet piles would be installed to an average depth of 18 feet bgs and extend between 4 and 10 feet from the ground surface to accommodate the cap. (RTC, 11/6/12)

Final Cap Topography

The final cover grades are shown on Figure 6-10. The minimum thickness of the cover is ~~6.5~~ 6(RTC, 11/6/12) feet which accounts for the ~~3.5~~ 3-foot stabilization layer (with bulking, 3 ft sludge layer increases to a total thickness of 5 feet) (RTC, 11/6/12), 1-foot (minimum) foundation layer, and 2-foot erosion resistance layer. The maximum cover thickness would be approximately 12.5 feet due to increasing the foundation layer to 9.5 feet to create a cover surface with 3 percent (%) slopes. (RTC, 9/29/11)

The maximum elevation of the cover for Alternative 3 is 35 feet amsl. Artesia Boulevard north of the Haack property has an elevation of approximately 20 feet amsl. Along Artesia Boulevard, the Alternative 3 cap elevation varies from approximately 26 feet amsl to 29 feet amsl resulting in a retaining wall height along Artesia Boulevard between 4 and 10 feet high. (RTC, 9/29/11)

Gas Monitoring System

The gas control and monitoring system is shown on Figures 6-11 and 6-12. The design of the Alternative 3 system is the same Alternative 2A; however, Alternative 3 will incorporate 3-inch solid and perforated polyvinyl chloride (PVC) pipes rather than

geostrips. Pipes are proposed for Alternative 3 because the thicker foundation layer can accommodate the pipes and filter material. (RTC, 11/6/12)

6.1.3.5 Future Site Development

The resulting Site conditions following cap construction will facilitate an open-space end use; however, use as a parking lot may be difficult due to steep slopes around the cap edges. The maximum height of the cap is approximately 34.5 ft amsl or approximately 14.5 ft above the surrounding area (Figure 6-10). Areas around the site are available for future development such as the residential properties to the south. (RTC, 11/6/12)

6.1.4 Alternative 4 – Excavation with Offsite Disposal

Excavation and offsite disposal of the sludge would involve excavating the sludge materials to depths between 0.5 and ~~23.5~~ 17.5(RTC, 11/6/12) feet bgs (Figure ~~6-8~~ 6-16 [RTC, 11/6/12]). Shoring would be required in areas to support the sump walls in locations shown on Figure ~~6-8~~ 6-16, (RTC, 11/6/12) at a minimum. ~~Active dewatering for the duration of excavation would be required to remove perched water and groundwater from the excavation.~~ Active dewatering would be required to remove perched groundwater and shallow groundwater when excavation and backfill are below the water table. Additionally, dewatering would be necessary to remove ponded misting agents. (RTC 1/9/2013) Respirators (or if warranted by conditions, more stringent personal protective equipment such as Self-Contained Breathing Apparatus [SCBA]), engineering controls (potentially tenting over the excavation), and air monitoring may be required to address potential emissions of sulfurous gases from the sludge generated during excavation (Stantec, 2008). Alternative 4 includes the following major elements:

- Concrete and asphalt removal;
- Excavation of sludge material from the (RTC, 11/6/12) Cooper North and South and Haack Sumps;
- Excavation of soil-sludge material from the (RTC, 1/9/2013) (RTC, 11/6/12) Haack Rework Area;
- Transportation to a disposal facility;
- Confirmation sampling;
- Backfill of sumps; and
- Groundwater monitoring.

Groundwater monitoring was discussed in Section ~~6.1.2.5~~ 6.1.2.6, (RTC, 11/6/12) and will not be repeated herein. Surface covering material removal, sludge

stabilization/neutralization, and capping are discussed further in the following sections. These elements are discussed further in the following sections.

6.1.4.1 Concrete and Asphalt Removal

In order to access the Haack sump, the existing 6-inch reinforced concrete slab and 8-inch asphalt pavement would need to be removed. Since the underside of the concrete slab is in contact with the sludge material, after the concrete is demolished, it would be stockpiled onsite to allow for characterization sampling. Representative concrete samples should be collected and analyzed for metals, PAHs, and VOCs. Concrete found to contain metals, PAHs, or metals at concentrations exceeding hazardous waste classification thresholds would require disposal at an offsite hazardous waste facility. If materials are found to be nonhazardous, they may be recycled or disposed of at a nonhazardous facility.

6.1.4.2 Excavation of Sumps

The sumps would be excavated to the maximum depth of sludge as reported during the RI. Based on the boring logs, sludge depth varies between 0.5 ~~foot~~ and ~~23.5~~ 17.5 (RTC, 11/6/12) ~~feet~~ft bgs (RTC, 1/9/2013) (Figure ~~6-8~~ 6-16 [RTC, 11/6/12]) (Stantec, 2008). Where significant overburden is present, such as on the Haack Sump, the overburden may be stockpiled separately, sampled, and used as backfill if testing indicates concentrations of constituents are below cleanup objectives. Using an excavator, sludge and interbedded soil would be mixed with the $Ca(H)_2/CaCO_3$ reagent and loaded directly into trucks for transport to the disposal facility. Due to the difficulty segregating the sludge and interbedded soil layers, it is assumed both the sludge and soil materials would be excavated and managed as sludge. Because of the acid gas generation during mixing, a tent would be necessary around the excavator and working surface to capture and treat the gas during mixing. As discussed in Section ~~6.1.3.2~~ 6.1.3.3 (RTC, 11/6/12), the addition of the reagent would result in bulking of the material. With only the addition of the reagent, it is anticipated bulking of the sludge would be approximately 25% and assuming 15% over-excavation, resulting in a total disposal volume of approximately ~~52,000~~ 45,923 CY or ~~49,900~~ 50,200 (RTC, 11/6/12) tons (based on a bulk density assumption of 81 lb/cy [Stantec, 2008]). It is assumed that the sludge containing 25% admixture will be acceptable as-is for disposal at a landfill permitted to accept non-RCRA hazardous waste such as the Buttonwillow Facility.

During excavation below the groundwater table or within the perched water zones, some dewatering may be necessary. The area where this is most likely is in the Haack Sump near the northern border of the Site. In this region, groundwater entering the excavation would be pumped to a tank where it would be sampled prior to disposal.

6.1.4.3 Excavation of Haack Rework Area

The Haack Rework area would be excavated without the addition of the reagent. Based on the Treatability Study, the rework material is significantly degraded indicating stabilization/neutralization is likely not necessary. Furthermore, the Treatability Study demonstrated that significant quantities of gas are not likely to be produced when the Haack Rework material is disturbed; therefore, a tent system with gas treatment is not necessary (Stantec, 2008).

The Haack Rework overburden would be excavated and stockpiled separately. Similar to the Haack overburden, the overburden material would be sampled and used as backfill if testing indicates concentrations of constituents are below cleanup objectives. Using an excavator, the Haack Rework sludge material would be loaded directly into trucks for transport to the disposal facility.

6.1.4.4 Confirmation Sampling

Following excavation of the sumps and Rework area, confirmation samples would be collected and analyzed for the COCs. Where confirmation sampling indicates ~~impacted~~ sludge (RTC, 11/6/12) material remains, additional material would be excavated in the area represented by the confirmation sample. When confirmation sampling indicates ~~impacted~~ sludge (RTC, 11/6/12) material has been removed, the removal would be considered complete and backfill would be initiated.

6.1.4.5 Backfill of Sumps

Following removal completion, the sumps would be backfilled with ~~onsite material outside of the impacted areas where available.~~ (RTC, 11/6/12) non-impacted, imported soil ~~would be placed if additional material is required~~. (RTC, 11/6/12) The sumps would be backfilled to pre-excavation grades.

6.1.4.6 Transportation to Disposal Facility

The neutralized sludge material would be transported to the Button Willow Facility ~~a disposal facility~~ (RTC, 11/6/12) in covered trucks. This disposal facility was selected because it accepts non-RCRA hazardous wastes containing petroleum. (RTC, 11/6/12) The total volume estimated for disposal includes the sludge volume with interbedded soil calculated by Stantec in 2008, 0.5 foot over-excavation at the base of the sumps, and reagent volume for a total disposal volume of ~~49,900~~ 45,923 CY and the total disposal weight of 50,200 tons. (RTC, 11/6/12) Based on testing performed by Stantec during the treatability study, the neutralized sludge would be disposed at a non-hazardous facility (Appendix ~~A~~ B [RTC, 11/6/12], Stantec, 2008); however, due to avoid potential future disposal liability (RTC, 11/6/12), a non-RCRA hazardous waste

facility, the Buttonwillow Facility, was selected for this Alternative analysis. (RTC, 11/6/12)

7. DETAILED ANALYSIS OF ALTERNATIVES

7.1 General

This section includes a detailed analysis of the final remedial alternatives for the Site. An overview of the nine criteria used for the detailed analysis is presented below.

7.2 Detailed Analysis Criteria

The CERCLA guidance document explains the nine criteria that are used to evaluate each remedial alternative [USEPA, 1988]. The first two criteria relate directly to findings that must be made in the Record of Decision (ROD) for the Site. These are categorized as threshold criteria that a selected remedy must meet.

1. **Overall Protection of Human Health and the Environment** – This criterion requires evaluation of how the alternative achieves and maintains protection of human health and the environment. The overall assessment of protectiveness draws on the assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. Evaluation of the overall protectiveness of an alternative focuses on whether an alternative achieves adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineered controls or institutional controls. This evaluation also considers whether an alternative poses any unacceptable short-term or cross-media impacts.
2. **Compliance with ARARs** – This criterion requires an evaluation of how the alternative complies with identified ARARs and applicable advisories or guidance that are "to be considered." ARARs are generally categorized as action-specific, location-specific, or chemical-specific Federal or state-promulgated requirements. A list of potential Federal and state action-specific, location-specific, or chemical-specific ARARs have been identified for the Site and are included in Table 4-2.

The following seven criteria are "balancing" criteria. They represent the primary criteria upon which the detailed analysis is based and that are used to distinguish among alternatives that meet the threshold requirements above. The alternative that strikes the best balance among these seven criteria and that meets the threshold criteria generally is the preferred alternative.

3. **Long-term Effectiveness and Permanence** – Requires evaluation of the long-term effectiveness of the remedial alternative in maintaining protection

of human health and the environment following implementation of the alternative.

4. **Reduction of Toxicity, Mobility, and Volume Through Treatment** – The assessment against this criterion evaluates the anticipated performance of the treatment technologies that the alternative comprises, and assesses their ability to reduce the toxicity, mobility and volume of contaminated materials through the use of treatment.
5. **Short-term Effectiveness** – Requires an assessment of the protection of human health and the environment during construction and implementation of the remedial alternative until RAOs are met. The following factors are addressed as appropriate for each alternative: protection of the community during remedial actions; protection of workers during remedial actions; environmental impacts; and time until remedial response objectives are achieved.
6. **Implementability** – This criterion requires an assessment of the technical and administrative feasibility of an alternative, including the availability of required services and materials to execute the alternative. How each alternative is impacted by the property ownership (i.e., one, large, single property or seven individual properties) will also be discussed.
7. **Cost –** Requires evaluation of the anticipated capital costs and operation and maintenance (O&M) costs of an alternative. For this FS Report, O&M costs are presented in ~~2011~~ 2012 (RTC, 11/6/12) dollars using a ~~7~~ 2 (RTC, 11/6/12) percent discount rate per EPA Guidance (EPA, 2000).
8. **State Acceptance** – Allows for consideration of preferences or apparent concerns by the State of California Department of Toxic Substances Control (DTSC).
9. **Community Acceptance** – Allows for consideration of the community's preferences or concerns regarding remedial alternatives. DTSC formally considers the community's preferences or concerns after this FS Report and proposed plan are prepared.

7.3 Final Remedial Alternatives – Detailed Analysis

7.3.1 General

This section includes the detailed analysis of the four final remedial alternatives presented in Section 6.1 and in Table 6-1. Each alternative is analyzed separately according to the nine criteria listed above. The common elements of the final remedial alternatives are not evaluated as they are the same for each alternative.

7.3.2 Final Remedial Alternative 1– No Action

7.3.2.1 Overall Protection of Human Health and the Environment

The no action alternative does not effectively mitigate potential future risks associated with the ingestion, inhalation, or direct contact of Site soils or soil gas. It does not provide any means for source zone mass removal or containment and would not be protective of human health under the hypothetical future scenario use. Because the no action alternative does not meet the threshold requirement of providing overall protection of human health and the environment, no further analysis of this alternative is performed.

~~7.3.3 Final Remedial Alternative 2 – Capping with Selective Excavation~~

~~*7.3.3.1 Overall Protection of Human Health and the Environment*~~

~~Capping with selective excavation would provide moderate to high overall protection of human health and the environment. The exposure routes for receptors as identified in the HHRA are dermal contact with sludge, ingestion of sludge, and inhalation of soil gas. Selective excavation and consolidation within the sumps would remove the eastern overflow and Haack Rework area with the associated gas risks. The sumps would be capped reducing the risk associated with dermal contact and ingestion. Additionally, a gas control and monitoring system would be installed beneath the cap to control gas which may be generated by the sludge. High overall protection is not achieved with the method due to the source remaining onsite.~~ (RTC, 9/29/11)

~~*7.3.3.2 Compliance with ARARs*~~

~~ARARs potentially applicable to Site remedial actions are shown in Table 4-2. Precautions would be required to ensure that short-term community and worker exposures to dust, noise, truck traffic, and VOC emissions are limited to acceptable levels during soil excavation and handling, per ambient air quality health standards.~~ (RTC, 9/29/11)

~~*7.3.3.3 Long-Term Effectiveness and Permanence*~~

~~The permanent cap with the below-cap and perimeter passive gas control system provides long-term effectiveness. To maintain the long-term integrity of the cap and related remedial measure components, maintenance and monitoring would be provided. If gas monitoring indicates concentrations in excess of acceptable values, the below-cap and perimeter vertical gas migration control wells can be made active, which adds to long-term effectiveness in controlling the migration of gas to the environment.~~ (RTC, 9/29/11)

~~*7.3.3.4 Reduction in Toxicity, Mobility, or Volume Through Treatment*~~

~~The cap design would include a gas collection system that can be connected to a treatment system during start-up and continued use, if necessary, based upon start-up monitoring results. If the gases are treated, some reduction in toxicity would be realized. The cap and Site drainage improvements would provide a reduction in mobility of the waste as infiltration of water would be mitigated. No reduction in waste volume would be realized with the remedial measure~~. (RTC, 9/29/11)

~~Gas transport at the Site occurs as a result of diffusion; therefore, the rate of lateral migration of gas constituents is very low. If necessary, the perimeter vertical gas migration control wells can be activated to collect potentially migrating gases and/or remove in-place gases from subsurface soils. The collected gas can be treated if necessary, which results in reduction of the toxicity of the waste~~. (RTC, 9/29/11)

~~*7.3.3.5 Short-Term Effectiveness*~~

~~The cap construction would provide immediate short-term effectiveness since worker risk is low and impacts on environment are minor (grading operations). Liquid infiltration, gas migration, and physical contact would be controlled upon cap placement. Because the disturbance to the sludge would be limited, hazardous gas generation would be minimal.~~ (RTC, 9/29/11)

~~*7.3.3.6 Implementability*~~

~~Technical implementation of Alternative 2 is relatively easy. The alternative uses conventional construction technologies~~. (RTC, 9/29/11)

~~*7.3.3.7 Cost*~~

~~The estimated capital cost of Alternative 2 is $5,206,314. The estimated net present value of operating and maintenance costs is $1,563,800. Therefore, the total present value cost of Alternative 2 is $6,770,114. Table 7-1 presents a cost breakdown of Alternative 2.~~ (RTC, 9/29/11)

~~*7.3.3.8 State Acceptance*~~

~~State acceptance of Alternative 2 will be assessed during the public comment period.~~ (RTC, 9/29/11)

~~*7.3.3.9 Community Acceptance*~~

~~Community acceptance of Alternative 2 will be assessed during the public comment period~~. (RTC, 9/29/11)

7.3.3 Alternative 2A – Capping with Selective Excavation

7.3.3.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is moderate to high with this remedial alternative. The exposure routes for receptors as identified in the HHRA are dermal contact with sludge, ingestion of sludge, and inhalation of soil gas. Selective excavation would remove the Haack Rework area sludge material that is associated with potential gas risks. The sludge in the three sumps would be capped, reducing the risk associated with dermal contact and ingestion. Additionally, a gas control and monitoring system would be installed beneath the cap to control gas which may be generated by the sludge. High overall protection is not achieved with this method due to the source remaining onsite. (RTC, 9/29/11)

7.3.3.2 Compliance with ARARs

Compliance with ARARS is ~~high~~ moderated (RTC, 1/9/13) with this remedial alternative. ARARs potentially applicable to Site remedial actions are provided in Table 4-2. Precautions would be required to ensure that short-term community and worker exposures to dust, noise, truck traffic, and VOC emissions are limited to acceptable levels during soil excavation and handling, per AQMD standards.(RTC, 9/29/11) This remedial alternative is compliant with the Groundwater ARARs by implementing institutional controls limiting onsite extraction of groundwater. Groundwater data has indicated that the sumps are not contributing to offsite impacts; therefore, institutional controls limiting onsite extraction are sufficient for groundwater ARAR compliance. (RTC, 11/6/12)

At some locations of the Site groundwater in the A-zone may encounter the waste material where excavations are the deepest. Waste impacted groundwater has been documented at Well MW-5A which is located immediately down gradient of the Haack Sump. Where these impacts occur the groundwater is characterized by a lower pH, occurrence of gasoline range hydrocarbons, the occurrence of some volatile organic compounds in the low ppb range, elevated concentrations of some metals and modifications to its inorganic groundwater chemistry. However these impacts are attenuated over a short lateral distance down-gradient of the waste as documented in wells MW-3A and MW-4A which are located within or downgradient of the Site's sumps. Impacts to deeper water bearing zones have not been confirmed as the groundwater impacts observed in Well MW-5A are not observed in the B-zone monitoring wells at the Site and the geochemistry of the two water bearing zones are noticeably different suggesting limited hydraulic communication. (RTC, 1/9/13)

The Bellflower Aquiclude groundwater in the vicinity of the Site is naturally degrade as evidence by the Total Dissolved Solids (TDS) concentrations in the A-zone and the TDS and chloride concentrations in the B-zone which exceed the recommended secondary MCL values as documented in the up-gradient, background wells (wells MW-1A and MW-1B). During development of the Site's existing monitoring wells prior to reinstituting the groundwater monitoring program in 2006, some wells were pumped dry and development operations were halted to allow for recharge. This observation suggests that the two hydraulic zones immediately beneath the Site have limited yield that cannot be sustained over time. The naturally degraded groundwater quality and limited yield of the Bellflower Aquiclude at the Site indicates that human use of the groundwater beneath the Site is not likely. (RTC, 1/9/13)

The California Regional Boards are required to assure that the beneficial uses of municipal and domestic supply are designated for protection wherever those uses are presently being attained. This ARAR requirement may not be applicable to the Site because the groundwater upgradient of the Site is naturally degraded and the beneficial uses requirement is not presently being attained . Institutional controls preventing onsite extraction or use of groundwater should be sufficient for groundwater ARAR compliance. (RTC, 1/9/13)

7.3.3.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence is moderate to high for this remedial alternative. The permanent cap with the below-cap and perimeter passive gas control system provides long-term effectiveness. To maintain the long-term integrity of the cap and related remedial measure components, maintenance and monitoring would be provided. If the Site is developed, the parking lot surface above the cap should be maintained by the future property owner(s) to prevent cracking and/or ponding of surface water. If gas monitoring indicates concentrations in excess of acceptable values, the below-cap and perimeter vertical gas migration control wells can be made active, which adds to long-term effectiveness in controlling the migration of gas to the environment. (RTC, 9/29/11)

Based on its location, the Site is potentially at risk for high ground shaking and liquefaction during an earthquake. High ground shaking would minimally affect this alternative because its planned future use is a parking lot. Liquefaction may result in differential settlement of the cap; however, the differential settlement can be corrected with maintenance of the cap. High ground shaking would minimally affect this alternative because its planned future use is a parking lot; however, veneer stability may be compromised. Damage due to a loss of veneer stability may be repaired with maintenance. (RTC, 11/6/12)

High long-term effectiveness and permanence is not achieved with this method due to maintenance requirements. (RTC, 9/29/11)

7.3.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction in toxicity, mobility, or volume through treatment is moderate ~~to high~~ (RTC 1/9/13) with this remedial alternative. The cap design would include a gas collection system that can be connected to a treatment system during start-up and continued use, if necessary, based upon start-up monitoring results. If the gases are treated, some reduction in toxicity would be realized. The cap and site drainage improvements would provide a reduction in mobility of the waste as infiltration of water would be mitigated. (RTC, 9/29/11) ~~No reduction in waste volume would be realized with this remedial measure~~. Waste volume would be reduced with the removal of the Haack Rework material; however, the sludge contained in the Cooper and Haack sumps would not be reduced. (RTC, 1/9/13)

Mobility of the sludge would be reduced with this Alternative. On the Haack Sump, there is evidence of sludge movement from beneath the cap at the edges of the concrete and asphalt cover. The installation of low-hydraulic conductivity layer, associated anchor trench, along with existing soil containment, will minimize the lateral migration of sludge. (RTC, 9/29/11)

Gas transport at the Site occurs as a result of diffusion; therefore, the rate of lateral migration of gas constituents is very low. If necessary, the perimeter vertical gas migration control wells can be activated to collect potentially migrating gases and/or remove in-place gases from subsurface soils. The collected gas can be treated if necessary, which results in reduction of the toxicity of the waste. (RTC, 9/29/11)

7.3.3.5 Short-Term Effectiveness

The short-term effectiveness of Alternative 2A is moderate to high. Cap construction would be performed above the existing surfaces on the Cooper and Haack sumps reducing gas generation, gas migration, and dermal contact risks from the exposed sludge. The Cooper sumps currently have an exposed geomembrane covering the sludge which minimizes dermal contact and gas migration. The high-strength geotextile will be installed above the existing geomembrane in a manner that minimizes damage to the existing liner surface (e.g., hand placement). Prior to the installation of the high-strength geotextile, only limited foot traffic will be permitted above the sumps. (RTC, 9/29/11)

The existing concrete and asphalt surfaces will be maintained above the Haack Sump. The geosynthetic cap components (geostrips, gas extraction geocomposite, GCL, HDPE geomembrane, and drainage geocomposite) will be installed directly above the foundation soil overlying the concrete and asphalt surfaces and anchored outside of the

perimeter of the sumps as identified in the RI, between the Cooper North and Haack Sumps (RTC, 1/9/2013), or to the sheetpile along Artesia Boulevard. The sludge between the Cooper North and Haack Sumps is discontinuous and degraded, and occurs deeper than the proposed anchor trench depth of 3 ft bgs, as identified in the RI. Therefore gas generation due to the construction of the anchor trench between the Cooper North and Haack Sumps is anticipated to be minimal to non-existent. (RTC, 1/9/2013) By maintaining the current concrete and asphalt surfaces, the dermal contact and gas migration risks are minimized during construction. (RTC, 9/29/11)

The short-term effectiveness of Alternative 2A is not high due to the excavation and offsite transport of the Haack Rework material. If the Haack Rework soil material were used as fill beneath the cap, a reduced construction time is achievable as less imported material would be needed. Additionally, there would be a reduced risk of exposure to the public during transport to the final disposal facility. (RTC, 9/29/11)

The cap construction would provide immediate short-term effectiveness since worker risk is low and impacts on environment are minor (grading operations). Liquid infiltration, gas migration, and physical contact would remain controlled due to limited disturbance of the existing surfaces. Because the disturbance to the sludge would be limited, hazardous gas generation would be minimal. (RTC, 9/29/11)

The duration of Alternative 2A, not including preliminary startup of the gas control system, is estimated at approximately 129 calendar days. The estimated construction breakdown schedule is provided in Appendix A. (RTC, 9/29/11)

7.3.3.6 Implementability

Technical implementation of Alternative 2A is relatively easy; however, construction implementation due to the urban setting of the Site, as well as Site size constraints and property owner agreements, create implementation challenges as discussed below. (RTC, 9/29/11)

Urban Setting

Due to the urban setting of the Site, traffic and close proximity to sensitive receptors affect the implementability of Alternative 2A. Traffic will increase the length of time to haul impacted material to an offsite disposal facility and the time to import material such as fill for the foundation layer. Alternative work hours may be proposed to reduce the effects of traffic on construction activities. Close proximity to sensitive receptors concerns are mitigated by leaving the existing surfaces on the sumps in place and by providing continuous monitoring during excavation of the Haack Rework area. The technologies for continuous monitoring are readily available and can easily be deployed at the Site during construction. (RTC, 9/29/11)

Site Size

The majority of the Cooper property contains sludge within the North and South sumps, while approximately one quarter of the Haack property contains the Haack Sump. Of the Haack property not containing the sump, approximately half is sloped and elevated leaving the one quarter available for construction staging and storage. As a result, easements and/or leases may be necessary on the southern Los Angeles Department of Public Works (LADPW) property to provide additional space and additional site ingress/egress. Furthermore, due to the eastern sludge boundary corresponding to the Cooper property boundary, the eastern drainage channel and anchor trench will be located within the LADPW property and will require fill to be placed to maintain and control drainage of that parcel. Additional agreements with the LADPW will be required in order to construct the cap. (RTC, 9/29/11)

By leaving the existing surfaces in place, material may be staged above the Haack Sump while construction is occurring on the Cooper Sumps. Additionally, the reduced fill needed for Alternative 2A requires less imported material and material stockpiling. The lower ground pressure equipment which will be used to place the fill above the high strength geotextile is generally smaller than traditional equipment, thereby requiring less storage space than larger, heavier equipment. As a result, while Alternative 2A has implementation challenges due to the Site size and location, the design of the Alternative 2A cap reduces the effect of the challenges. (RTC, 9/29/11)

7.3.3.7 Cost

The estimated capital cost of Alternative 2A is ~~$4,544,913 $5,774,550,.(RTC, 11/6/12)~~ $5,844,150. (RTC, 1/9/13) However, a cost savings of approximately $314,500 may be achieved by using the Haack Rework soil-sludge material onsite as foundation soil. (RTC, 11/6/12) The estimated net present value of operation and maintenance costs is ~~$1,563,800~~ ~~$2,822,100. (RTC, 11/6/12)~~ $4,882,500 (RTC, 1/9/2013). Therefore, the total present value cost of Alternative 2A is ~~$6,108,713 $8,596,650. (RTC, 11/6/12)~~ $10,726,650. (RTC, 1/9/13) Table 7-1 presents a cost breakdown of Alternative 2A. (RTC, 9/29/11)

7.3.3.8 State Acceptance

State acceptance of Alternative 2A will be assessed during the public comment period. (RTC, 9/29/11)

7.3.3.9 Community Acceptance

During the May 10, 2011 meeting between the DTSC and City of Gardena (City), the City expressed concerns regarding the appearance of Alternative 2 (since removed

[RTC, 9/29/11]) being similar to a "landfill," and the height of the cap being too high. The City expressed the desire that the final remedial alternative be consistent with the vision and goal of future development for the Site. (RTC, 9/29/11)

Alternative 2A is a lower cap option for the Site. The maximum height of the cap is approximately 25.5 ft amsl near the center of the Site. This elevation is approximately 5.5 ft higher than Artesia Boulevard north of the Haack Property. Immediately adjacent to Artesia Boulevard, the maximum height of the cap and associated retaining wall is 23 ft amsl, or 3 ft higher than Artesia Boulevard. The elevation of the cap on the Cooper Property is similar to the elevation of the railroad grade immediately east of the Cooper Property. The final cap surface will consist of Class II aggregate base to support construction of a parking lot consistent with the future commercial development of the Site. Additionally, the cap structure has been designed to support loading associated with traffic and parking. Lower areas of the cap such as drainage channels may be filled to provide a more level surface on which to construct a future parking lot, provided the functionality of the cap is not compromised. (RTC, 9/29/11)

7.3.4 Alternative 3 – Capping with Neutralization/Stabilization and Selective Excavation

7.3.4.1 Overall Protection of Human Health and the Environment

Capping of the partially stabilized/neutralized sludge, combined with selective excavation, would provide moderate ~~to high~~ (RTC 1/9/13) overall protection of human health and the environment. The exposure routes for receptors as identified in the HHRA are dermal contact with sludge, ingestion of sludge, and inhalation of soil gas. Neutralization/stabilization of the sludge would further improve the pH, neutralize acid gases, fixate lead, and provide long-term strength (Stantec, 2008). This Alternative is not ranked higher because (RTC, 1/9/13) the neutralization/stabilization process would require substantial mixing of the sludges, releasing hazardous gases and odors, thereby requiring a tent and gas treatment system to control gas emissions during construction. Selective excavation and consolidation within the sumps would remove the eastern overflow and Haack Rework area with the associated gas risks. Further, this Alternative does not address localized groundwater impacts at the Site (RTC, 1/9/13). The sumps would be capped, reducing the risk associated with dermal contact and ingestion. Additionally, a gas control and monitoring system would be installed beneath the cap to control gas which may be generated by the sludge.

7.3.4.2 Compliance With ARARs

ARARs potentially applicable to Site remedial actions are shown in Table 4-2. Alternative 3 would provide moderate compliance with ARARs. (RTC, 1/9/2013).

Precautions would be required to ensure that short-term community and worker exposures to dust, noise, truck traffic, and VOC emissions are limited to acceptable levels during soil mixing and handling, per ambient air quality health standards.

This remedial alternative is compliant with the Groundwater ARARs by implementing institutional controls limiting onsite extraction of groundwater. Groundwater data has indicated that the sumps are not contributing to offsite impacts; therefore, institutional controls limiting onsite extraction are sufficient for groundwater ARAR compliance. (RTC, 11/6/12) This Alternative does not remediate the groundwater; therefore, this Alternative is not given a "high" ARAR compliance rating. (RTC, 1/9/13)

7.3.4.3 Long-Term Effectiveness and Permanence

The permanent cap with stabilization/neutralization and the below-cap and perimeter passive gas control system provide moderate to high (RTC, 11/6/12) long-term effectiveness. Routine maintenance and monitoring would be provided and would positively contribute to the long-term effectiveness of the remedial measure. If gas monitoring indicates impacts in excess of acceptable values, the below-cap and perimeter vertical gas migration control wells can be made active, which adds to long-term effectiveness in controlling the migration of gas to the environment.

Based on its location, the Site is potentially at risk for high ground shaking and liquefaction during an earthquake. High ground shaking would minimally affect this alternative because its planned future use is open space; however, veneer stability may be compromised. Damage due to a loss of veneer stability may be repaired with maintenance. Liquefaction may result in differential settlement of the cap; however, the differential settlement can be corrected with maintenance of the cap. (RTC, 11/6/12)

7.3.4.4 Reduction of Toxicity, Mobility, and Volume Through Treatment

The toxicity of the sludge would be reduced through stabilization/neutralization by improving the pH, neutralizing acid gases, fixating lead, and providing long-term strength (Stantec, 2008). The cap design would include a gas collection system that can be connected to a treatment system during start-up and continued use, if necessary, based upon start-up monitoring results. If the gases are treated, some reduction in toxicity would be realized. The cap and Site drainage improvements would provide a reduction in mobility of the waste as infiltration of water would be mitigated; hence, migration of liquids from waste would be reduced. An increase in waste volume through bulking would be realized with the remedial measure.

Gas transport at the Site occurs as a result of diffusion; therefore, the rate of lateral migration of gas constituents is very low. If necessary, the perimeter vertical gas migration control wells can be activated to collect potentially migrating gases and/or

remove in-place gases from subsurface soils. The collected gas can be treated if necessary, which results in reduction of the toxicity of the waste.

7.3.4.5 Short-Term Effectiveness

Stabilization/neutralization would require the mixing of the top 3 feet of sludge with $Ca(OH)_2/CaCO_3$. In order to mix the top 3 feet of sludge, the existing cover on the Cooper Sumps would require removal, temporarily increasing the risks associated with the sumps and decreasing the effectiveness of this Alternative. During the exposed period, stormwater could come into contact with the sludge, increasing the volume of materials requiring treatment. While fencing around the Site would be continuously maintained to prevent trespasser entry, animals, such as birds, may enter the Site and either become entrapped in the sludge or potential spread sludge to off-site areas. Additionally, during sludge mixing, ~~As a result,~~ (RTC, 11/6/12)significant quantities of acid gases would be released. Therefore, there may be an increased, short-term risk during mixing activities which would require mitigation through treatment of the acidic gases. The cap construction would provide short-term effectiveness as liquid infiltration, gas migration, and physical contact would be controlled upon cap placement.

7.3.4.6 Implementability

Alternative 3 may be difficult to implement due to the mixing of $Ca(OH)_2/CaCO_3$ compounded with the urban setting of the Site and the Site size. (RTC, 11/6/12) During mixing operations, significant quantities of acid gases would be released which would require treatment. Uncontrolled reactions have been known to occur when neutralizing acid sludges which require constant supervision to prevent the uncontrolled release of hydrogen sulfide gas. (RTC, 11/6/12) A tent would be necessary to contain the gases for treatment prior to discharge to the atmosphere. Due to the size of the sumps, a tent large enough to span the sumps to locations where stable foundations can be achieved may be difficult or impossible to engineer or construct. Similarly to Alternative 2A, the urban setting of the Site increases the impacts the construction would have on area traffic and the proximity to sensitive receptors. Business operations near the Site operate 24-hours a day meaning limiting mixing activities to night-time work only would still affect the public. Significant quantities of neutralizing material as well as soil would need to be imported and stored at the Site; the importing of material could significantly impact traffic as large trucks are forced to enter the Site off Artesia Blvd. Storage at the Site is limited due to the sumps and topography with staging, office, and storage areas limited to the eastern portion of the Haack Property. Stormwater controls or treatment systems, such as retention basins, would be limited by the amount of space at the site. (RTC, 11/6/12)

7.3.4.7 Cost

The estimated capital cost of Alternative 3 ~~is~~ ranges between ~~$11,144,880~~ $11,219,880(1/9/13) and ~~$35,402,274~~ ~~$12,566,880~~ $12,646,280 (1/9/13). This range is due to the variable cost of neutralization admixture, $CaCO_3$ and $CaOH_2$. The costs are highly variable based where the material is sourced from, shipping costs, and construction activities. The high cost variability adds to the low cost rating of this Alternative due to the uncertainty of prices during construction. (RTC, 11/6/12) The estimated net present value of operating and maintenance costs assuming quarterly groundwater and soil vapor probe monitoring for 30 years (RTC, 1/9/2013) is ~~$1,563,800~~ ~~$2,822,100. (RTC, 11/6/12)~~ $4,882,500 (RTC, 1/9/2013). Therefore, the total present value cost of Alternative 3 ~~is $36,966,074~~ ranges from ~~$13,996,980 to $15,388,980. (RTC, 11/6/12)~~ $16,102,380 to $17,528,780 (RTC, 1/9/13). Table 7-2 presents a cost breakdown of Alternative 3.

7.3.4.8 State Acceptance

State acceptance of Alternative 3 will be assessed during the public comment period.

7.3.4.9 Community Acceptance

As discussed in Section 7.3.3.9, the City of Gardena expressed concerns regarding the appearance of Alternative 3 and the desire for a final remedial alternative to be consistent with future development plans. As a result, Alternative 3 has low community acceptance. ~~Community acceptance of Alternative 3 will be assessed during the public comment period.~~ (RTC, 11/6/12)

7.3.5 Alternative 4 – Excavation with Offsite Disposal

7.3.5.1 Overall Protection of Human Health and the Environment

Alternative 4 would provide moderate to high (RTC, 1/9/2013) protection of human and health and the environment by removing the sludge and rework material from the Site. The risk to human health through dermal contact, inhalation, or ingestion would be eliminated because the sludge and rework material would be removed and disposed of offsite. During construction activities and transport of the material, risk to human health and the environment would be increased as significant quantities of acid gases would be released when the sludge is disturbed. Furthermore, there is an increased risk to human health during transport of the material as it would require hauling to a facility where transport would potentially expose many more individuals to the sludge than if it were to remain onsite.

7.3.5.2 Compliance With ARARs

ARARs potentially applicable to Site remedial actions are shown in Table 4-2. Alternative 4 would provide high compliance with ARARs. (RTC, 1/9/2013) ~~Excavation and offsite disposal of sludge can be difficult or impossible to perform in compliance with applicable emissions, disposal, and transportation regulations.~~ (RTC, 1/9/2013) Precautions would be required to ensure that short-term community and worker exposures to dust, noise, truck traffic, and VOC emissions are limited to acceptable levels during soil excavation and handling, per ambient air quality health standards. Poor groundwater quality (as documented in MW-05A immediately adjacent) may be improved as the suspected sludge source is removed. (RTC, 11/6/12)

7.3.5.3 Long-Term Effectiveness and Permanence

Alternative 4 would provide high long-term effectiveness and permanence ~~is effective and permanent~~ (RTC, 1/9/2013) since the impacted material would be removed from the Site.

7.3.5.4 Reduction of Toxicity, Mobility, and Volume Through Treatment

Alternative 4 would provide low to moderate reduction of toxicity, mobility, and volume of the sludge or rework material through treatment. This alternative creates a large amount of waste compared to the other alternatives presented and discussed. This waste should be taken into consideration for evaluating these criteria. (RTC, 1/9/2013) Alternative 4 will ~~not~~ (RTC, 1/9/2013) reduce the toxicity ~~or volume~~ (RTC, 1/9/2013) of the sludge or rework material. The mobility of the sludge would be temporarily increased due to transportation of the sludge, then (RTC, 1/9/2013) reduced since it would be disposed of in an appropriate facility with a bottom liner system. The migration of sludge constituents is further reduced by the admixture prior to transport which was shown to reduce leaching and gas generation during the Treatability Study (Appendix A, Stantec, 2008). The volume of the sludge would double following admixture. Other wastes that would be produced during treatment include impacted groundwater, vapor treatment associated liquid and solid wastes, and decontamination wastes. Taking these wastes into consideration, Alternative 4 would provide low to moderate reduction of toxicity, mobility, and volume of sludge and associated wastes through treatment. (RTC, 1/9/2013)

7.3.5.5 Short-Term Effectiveness

Alternative 4 would provide moderate short-term effectiveness ~~is effective in the short term~~ (RTC, 1/9/2013) by removing the sludge and rework material from the Site; however, in order to neutralize the sludge for off-site disposal, risks associated with the sludge are temporarily increased. Neutralization of the sludge requires deep mixing of

the sludge with $Ca(OH)_2/CaCO_3$. In order to mix the sludge, the existing sump covers would require removal, temporarily increasing the risks associated with the sumps and decreasing the effectiveness of this Alternative. During the exposed period, stormwater could come into contact with the sludge, increasing the volume of materials requiring treatment. While fencing around the Site would be continuously maintained to prevent trespasser entry, animals, such as birds, may enter the Site and either become entrapped in the sludge or potentially spread sludge to off-site areas. Additionally, during sludge mixing, ~~significant~~ large quantities of acid gases, when compared to the other alternatives presented and discussed, (RTC, 1/9/2013) would be released. Therefore, there may be an increased, short-term risk during mixing activities which would require mitigation through treatment of the acidic gases. ~~The cap construction would provide short-term effectiveness as liquid infiltration, gas migration, and physical contact would be controlled upon cap placement. (RTC, 11/6/12~~) (RTC, 1/9/2013)

7.3.5.6 Implementability

Implementability ~~Implementation~~ of Alternative 4 would be low~~challenged~~ (RTC, 1/9/2013) due to the sludge depth, site proximity to sensitive receptors, site size, (RTC, 11/6/12) and site access issues. The majority of the sludge to be excavated is previously undisturbed sludge, which has a less viscous consistency than the degraded soil-sludge material that is proposed to be removed in Alternative 2A and Alternative 3. (RTC, 1/9/2013) As an area is excavated, sludge would flow to the newly excavated portion of the sump. The depth of the excavation would be between 0.5 and ~~23.5~~ 17.5 (RTC, 11/6/12) ~~feet~~ ft bgs (RTC, 1/9/13), depending on the sump, and due to the size of the Site there would not be enough room to slope the sides of the excavation. Therefore, shoring would be required, which would limit the ability to "chase" impacted materials laterally during excavation and obtain side wall conformance samples. Shoring may be used, but due to the discontinuity of sludge material, during mixing of the reagent and sludge, acid gas containment and treatment would be necessary. A tent would be necessary to contain the gases for treatment prior to discharge to the atmosphere. Due to the size of the sumps, a tent large enough to span the sumps to locations where stable foundations may be achieved would be difficult to implement. An equipment hood may provide the necessary containment; however, the working area is limited by the size of the hood.

Similarly to Alternatives 2A and 3, the urban setting of the Site increases the impacts the construction would have on area traffic and the proximity to sensitive receptors. Business operations near the Site operate 24-hours a day meaning limiting mixing activities to night-time work only would still affect the public. Significant quantities of neutralizing material as well as soil would need to be imported and stored at the Site; the importing of material could significantly impact traffic as large trucks are forced to enter the Site off Artesia Blvd. Storage at the Site is limited due to the sumps and

topography with staging, office, and storage areas limited to the eastern portion of the Haack Property. Stormwater controls or treatment systems, such as retention basins, would be limited by the amount of space at the site. (RTC, 11/6/12)

7.3.5.7 Cost

The estimated capital cost of Alternative 4 is high compared to the alternatives presented and discussed, and (RTC, 1/9/2013) ~~is $54,067,350~~ ranges between $26,217,950 and $28,991,650. The costs are highly variable based where the admixture material is sourced from, shipping costs, and construction activities. The high cost variability adds to the low cost rating of this Alternative due to the uncertainty of prices during construction. (RTC, 11/6/12) The estimated net present value of groundwater monitoring costs is ~~$620,500~~ $113,200. (RTC, 11/6/12) Therefore, the total present value cost of Alternative 4 is ~~$54,687,850~~ between $26,331,150 and $29,104850. (RTC, 11/6/12) Table 7-3 presents a cost breakdown of Alternative 4.

7.3.5.8 State Acceptance

State acceptance of Alternative 4 will be assessed during the public comment period.

7.3.5.9 Community Acceptance

~~Community acceptance of Alternative 4 will be assessed during the public comment period.~~ (RTC 9/29/11) During the 10 May 2011 meeting with the DTSC and City of Gardena, the City felt Alternative 4 best achieved their future development goals (RTC, 11/6/12); therefore, this Alternative receives a moderate to high ranking for community acceptance (1/9/2013).

8. COMPARATIVE ANALYSIS OF ALTERNATIVES

8.1 General

In this section, the final remedial alternatives are compared by using the detailed analysis criteria. The purpose of this comparative analysis is to identify the relative advantages and disadvantages of each final remedial alternative and to provide a basis for identifying the preferred remedial alternative.

8.2 Final Remedial Alternatives

8.2.1 General

In Table 8-1, each final remedial alternative is assigned a ranking for each detailed analysis criterion. These rankings range from "low" to "high" and are accompanied by a numeric ranking from 1 to 5 (Note 3, below). At the conclusion of the comparative analysis, the preferred remedial alternative is identified.

8.2.2 Overall Protection of Human Health and the Environment

~~Alternative 1, No Action, does not provide adequate protection of human health and the environment. No further assessment or comparison with this alternative is provided. Alternative 2 would perform better than Alternative 3. While Alternative 3 stabilizes/neutralizes a portion of the sludge, the mixing of the reagent releases hazardous amounts of hydrogen sulfide and sulfuric acid gas. Alternative 4 would provide very good protection of human health and the environment with the removal of the impacted materials; however, because of the risks associated with hazardous gas generation during excavation and transportation of the material, the overall protection is deemed moderate~~. (RTC, 9/29/11)

Alternative 1, No Action, does not provide adequate protection of human health and the environment. No further assessment or comparison with this alternative is provided. Alternative 2A performs better than Alternatives 3 and 4 due to disturbance of only the degraded Haack Rework sludge material. As demonstrated in the Treatability Study and Surface Flux Testing (RTC, 1/9/13) (Stantec, 2007), disturbing the non-degraded sludge results in the generation of significant quantities of hydrogen sulfide and sulfur dioxide. Significant mechanical disturbance of the non-degraded sludge occurs in Alternatives 3 and 4. Both Alternatives 2A and 3 would leave the majority of the sludge onsite, which reduces their overall protection of human health and the environment; however,

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(3) A numeric ranking of "1" is lowest, or worst; "5" is highest, or best. With respect to cost, "1" is most expensive; "5" is least expensive.

Alternative 4 excavates the sludge from the Site and transports the sludge along public streets and highways en route to final disposal at the Buttonwillow Facility. During transport, the public may become potentially exposed to the sludge due to traffic accidents resulting in a sludge release or gas release from the truck. The same transport risks are not anticipated with transport of the Haack Rework soil-sludge material as proposed in Alternative 2A due to the degraded nature of this sludge and the significantly reduced volume of sludge to be transported. (RTC, 9/29/11)

8.2.3 Compliance With ARARs

~~Alternative 2 would perform better with respect to ARARs due to the reduction of gas emissions when compared to Alternatives 3 and 4.~~ (RTC, 9/29/11)

~~Alternative 2A would perform with respect to ARARs due to the minimal gas emissions, reduced truck traffic, and lack of sludge exposed to air and possible stormwater when compared to Alternatives 3 and 4. (RTC, 9/29/11)~~ (RTC, 1/9/13)

Alternative 4 would perform the best with respect to ARARs due to the removal of the sludge and source for potential onsite groundwater impacts. All Alternatives perform well with respect to ARAR compliance; however, Alternatives 2A and 3 are ranked lower because a potential source for onsite groundwater impacts remains in place. (RTC, 1/9/13)

8.2.4 Long-Term Effectiveness and Permanence

~~Alternative 3 is ranked higher than Alternative 2 with respect to long-term effectiveness and permanence. Both alternatives would be effective and permanent over the long-term with maintenance; however, because Alternative 3 neutralizes the sludge, the treatment is likely more permanent. Alternative 4 provides the greatest long-term effectiveness and permanence since the sludge is removed from the site and disposed of offsite.~~ (RTC, 9/29/11)

Alternative 4 is ranked the highest for long-term effectiveness and permanence because the sludge is removed from the site and disposed of offsite. (RTC, 1/9/13) Alternative 3 is ranked higher than Alternative 2A with respect to long-term effectiveness and permanence. Both alternatives would be effective and permanent over the long term with maintenance; however, because Alternative 3 neutralizes some of (RTC, 11/6/12) the sludge, the treatment is likely more permanent. (RTC, 9/29/11)

Based on its location, the Site is at risk for high ground shaking and liquefaction during an earthquake regardless of the remedial alternative. High ground shaking would minimally affect Alternatives 2A and 3 because of their planned future use as a parking lot or open space, respectively. High ground shaking on Alternatives 2A and 3 slopes

may result in veneer failure and liquefaction may result in differential settlement of the cap. Both the veneer failure and differential settlement can be corrected with maintenance of the cap. (RTC, 11/6/12) Alternative 4 provides the greatest long-term effectiveness and permanence since the sludge is removed from the site and disposed of offsite. (RTC, 9/29/11)

8.2.5 Reduction of Toxicity, Mobility, and Volume through Treatment

~~Alternative 3 would slightly reduce toxicity and mobility through partial in-situ treatment of the source zone; however, toxicity would increase as acid gases are released during mixing of the sludge for treatment. Alternatives 2 and 3 would reduce mobility of the sludge by limiting infiltration and wind erosion. Alternative 4 would reduce the mobility of the sludge after offsite disposal since the disposal landfill would be equipped with a liner system to collect leachate; however, transport of the material would temporarily increase the potential mobility.~~ (RTC, 9/29/11)

Alternatives 2A and 3 would reduce mobility of the sludge by limiting infiltration and wind erosion. Alternative 3 would slightly reduce toxicity and mobility through partial in-situ treatment of the source zone; however, toxicity would increase as gases are released during mixing of the sludge for treatment. The volume of material within the sumps would increase due to bulking during neutralization and increase the cap height by a minimum of 3 ft. In Alternative 3, the net toxic material (non-stabilized sludge) would be reduced. The volume of sludge material in the sumps would remain the same with Alternative 2A. Treatment of sludge with Alternative 4 would double the volume of waste material to be disposed of as well as generate more waste from decontamination water, spent vapor treatment carbon, and ponded dust and emissions control liquid. (RTC, 1/9/13) Alternative 4 would reduce the mobility of the sludge after offsite disposal since the disposal landfill would be equipped with a liner system to collect leachate; however, transport of the material would temporarily increase the potential mobility. (RTC, 9/29/11)

8.2.6 Short-Term Effectiveness

~~Alternative 2 would perform the best with respect to short-term effectiveness. Unlike Alternatives 3 and 4, Alternative 2 does not significantly disturb the sludge thereby minimizing the release of acid gas. Both Alternatives 2 and 3 incorporate a cap into the final design which would provide an immediate reduction in risk due to inhalation, dermal exposure, and ingestion. Alternative 4 would provide a reduction in risk after the sludge was transported offsite; however, risk is temporarily increased in the short-term during sludge disturbance and transport.~~ (RTC, 9/29/11)

Alternative 2A would perform the best with respect to short-term effectiveness. Unlike Alternatives 3 and 4, Alternative 2A does not significantly disturb the sludge, thereby minimizing the release of gas. The existing surfaces, which have been shown to reduce the migration of gas, will remain in place during construction resulting in limited sludge disturbance and therefore, gas generation. Alternatives 2A and 3 incorporate a cap into the final design which would provide a reduction in risk due to inhalation, dermal exposure, and ingestion. (RTC, 9/29/11)

Alternatives 3 and 4 significantly disturb the sludge, which has been demonstrated to generate significant quantities of hydrogen sulfide and sulfur dioxide gas requiring tenting and gas control systems during mixing and excavation operations. The gas control system, incorporating a tent, blower, and treatment system, would significantly increase the amount of time to remediate the Site due to the limited operating space within the enclosed facility. Additionally, waste materials from the treatment system components, such as a scrubber, could generate additional waste, which could increase the total volume of hazardous materials at the Site. (RTC, 11/6/12) The length of time would be increased due to the use of smaller equipment as well as down time during treatment system maintenance. (RTC, 9/29/11)

Alternative 4 would provide a reduction in risk after the sludge was transported offsite; however, risk is temporarily increased in the short-term during sludge disturbance and transport. Given that the weight of material estimated for offsite disposal is approximately ~~49,900 tons and a typical end dump truck capacity is 14 tons, approximately 3,565 truck loads are anticipated for Alternative 4~~ 45,900 CY and a typical end dump truck capacity is 16 CY(RTC, 11/6/12, approximately ~~3,565~~ 2,870 (RTC, 11/6/12 truck loads are anticipated for Alternative 4. Smaller, 16 CY trucks are proposed for Site work due to the limited space available onsite for staging and operating larger trucks (RTC, 11/6/12) Additionally, using the estimated 20 trucks per day discussed in Section ~~3.3.3~~ 6.1.2.2, trucks (RTC, 11/6/12) transport of the sludge would require a minimum of ~~179~~ 160 (RTC, 11/6/12) days for transport, which does not include additional delays due to limitations from tenting and gas control during excavation. (RTC, 9/29/11)

Due to the nature of the sludge disposal within the sumps, Alternative 4 would require the excavated sumps to be exposed for periods of time during confirmation sampling. Temporary backfill of sludge in the interim would generate the potential for non-impacted material to become impacted through contact, thereby increasing the amount of material excavated and the time to remediate. (RTC, 9/29/11)

The durations of the Alternatives are estimated at 129, 235, and 301 calendar days for Alternatives 2A, 3, and 4, respectively. The construction duration of Alternative 2A is approximately half of Alternative 3 and 4 times less than Alternative 4, meaning the

potential exposure time of sludge hazards to workers is significantly reduced. Additionally, the construction impacts on the community including truck traffic and visual distractions are significantly reduced with Alternative 2A. The estimated construction schedules are provided in Appendix ~~A~~ (RTC, 9/29/11) E.(RTC, 11/6/12)

8.2.7 Implementability

~~Alternatives 3 and 4 pose significant implementation issues due to the gas generation during mixing and excavation of the sludge. Gas control and treatment would be necessary during mixing and excavation of the sludge. Construction of a tent to contain the gases would be difficult to perform due to low bearing capacity of the sludge and the area the tent would need to span (minimum of the Cooper North sump). Gases captured by the tent would need treatment prior to discharge. (RTC, 9/29/11)~~

~~Alternative 2 is relatively easy to implement. A stabilization layer on the Cooper sumps would be placed first to provide a surface in which to install the foundation and gas collection, barrier, and cover layers. Disturbance of the sludge would be limited to the eastern overflow and Haack Rework, which are significantly degraded and would release significantly less acid gas than the sludge in the Haack and Cooper Sumps (Appendix A, Stantec, 2008). The materials necessary for construction are available and do not require admixtures or special equipment.~~ (RTC, 9/29/11)

All Alternatives are difficult to implement due to the site location and size; however, the design of Alternative 2A limits the effects of these challenges on construction. These challenges are discussed in further detail below: (RTC, 9/29/11)

Urban Setting

Due to the urban setting of the Site, traffic and close-proximity to sensitive receptors affect the implementability of all Alternatives. Traffic will increase the length of time to haul impacted material to an offsite disposal facility and the time to import construction materials such as fill. (RTC, 9/29/11)

Alterative 2A requires the least amount of imported and exported material, thus reducing overall truck traffic on Artesia Boulevard. Both Alternatives 3 and 4 require significant truck traffic to import stabilization material as well as, in the case of Alternative 4, export sludge offsite. As discussed previously in Section 6.1.4.2, 3,565 truck loads are estimated for transport of excavated sludge to an offsite facility, which could negatively affect the traffic flows in the vicinity of the Site. (RTC, 9/29/11)

Site Size

The majority of the Cooper property contains sludge in the North and South sumps, while approximately one quarter of the Haack property contains the Haack Sump. The

portion of the Haack property not containing the sump is split into a sloped and elevated portion and a flatter portion that could be available for construction staging and material storage. Furthermore, easements and/or leases may be necessary on the Los Angeles Department of Public Works (LADPW) property for grading and fill placement to provide for surface water flow and collection, as well as providing additional space and additional site ingress/egress. (RTC, 9/29/11)

Alternatives 3 and 4 require stockpiling of stabilization material; therefore, the time for stabilization is directly proportional to how much material is available onsite to mix. If only limited quantities of material are available onsite due to storage area constraints, the length of time to implement Alternatives 3 and 4 will increase. (RTC, 9/29/11)

Site Proximity to Sensitive Receptors

Alternatives 3 and 4 pose significant implementation issues due to the gas generation during mixing and excavation of the sludge and the potential impacts to neighboring sensitive receptors. Gas control and treatment would be necessary during mixing and excavation of the sludge. Construction of a tent to contain the gases would be difficult to perform due to low bearing capacity of the sludge and the area the tent would need to span (minimum of the Cooper North sump). Gases captured by the tent would need treatment prior to discharge. In addition, the size of the tent and treatment system would further reduce the space available on the Site to stage construction including equipment storage, stockpiling of fill material, and construction facilities. (RTC, 9/29/11)

Implementation of Alternative 2A has fewer engineering and health and safety complications. By maintaining the existing surfaces, gas generation from the sumps would be minimized and continuous monitoring with readily available vapor suppression equipment will provide a means to minimize potential effects of gas generation during excavation in the Haack Rework area. In addition, Alternative 2A requires less imported material and material stockpiling, thus reducing the effects of traffic and the reduced Site size on construction. As a result, while Alternative 2A has implementation challenges due to the Site size and location, the design of the Alternative 2A cap reduces the effect of the challenges. (RTC, 9/29/11)

8.2.8 Cost

~~Alternative 2 has the lowest capital of approximately $5,206,314 and O&M cost, with Alternatives 3 and 4 having comparable capital costs of $35,402,274 and $54,067,350, respectively. Alternatives 2 and 3 have identical net present value O&M costs of approximately $1,563,800. Alternative 4 has the lowest net present value O&M cost of approximately $620,500. Alternative 2 has the lowest combined remedial cost.~~ (RTC, 9/29/11)

Alternative 2A has the lowest capital cost of approximately ~~$4.5~~ $5.8 million, with Alternatives 3 and 4 having ~~having comparable~~ low-range capital costs of approximately ~~$35.4~~ $11.1 million and ~~$54.1~~ $26.2 million, respectively and high-range costs of approximately $12.6 and $29.1 million. (RTC, 11/6/12) Alternatives 2A and 3 have identical net present value O&M costs of approximately ~~$1.6~~ $2.8 million. (RTC, 11/6/12) Alternative 4 has the lowest net present value O&M cost of approximately ~~$0.6 million~~ $113,200. Alternative 2A has the lowest combined remedial cost and is not dependent on the highly variable neutralization admixture cost which may vary from as low as $300/ton to as high as $750/ton or more. (RTC, 11/6/12)

8.2.9 State Acceptance

In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the ROD is being prepared.

8.2.10 Community Acceptance

~~In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the ROD is being prepared.~~ (RTC, 9/29/11)

During the May 10, 2011 meeting between the DTSC and the City, the City expressed concerns regarding the appearance of the former (RTC, 11/6/12) Alternative 2 being similar to a "landfill," and the height of the cap being too high. The City expressed the desire that the final remedial Alternative be consistent with the vision and goal of future development for the Site. (RTC, 9/29/11)

Alternative 2A provides a reduced cap thickness, and accounts for future use as a parking lot subgrade consistent with the City's vision for commercial development. Alternative 3 proposes a cap sloping upward to a maximum elevation of 35 ft amsl, which makes parking lot construction more difficult above the high grades and slopes of the Site. Alternative 4 proposes the Site is excavated and filled. Alternative 4 best incorporates the City's vision for commercial development; however, given the potential health risks associated with implementation, short-term effectiveness, and cost challenges, Alternative 2A provides the best compromise to meet the City's development vision. (RTC, 9/29/11)

8.3 Preferred Remedial Alternative

~~Based on the comparative analysis of the remedial alternatives, the alternative that meets the RAOs and ranks the highest is Alternative 2, capping with selective excavation. The elements of Alternative 2 are~~: (RTC, 9/29/11)

- ~~Prepare a construction Health and Safety Plan and Construction Quality Assurance Plan;~~ (RTC, 9/29/11)
- ~~Place a 3.5-foot stabilization layer across the Cooper North and South sumps consisting of gravel, sand, and geocell; (RTC, 9/29/11)~~
- ~~Excavate the Haack Rework area, segregating the overburden soil from the sludge/soil mixture;~~ (RTC, 9/29/11)
- ~~Install retaining wall (sheet pile) along northern perimeter (Artesia Blvd);~~ (RTC, 9/29/11)
- ~~Place the Haack Rework material and other site soils as the foundation layer above the stabilization layer with horizontal gas collection pipes embedded. The foundation layer would increase in thickness and would be graded such that the final surface would drain at 3 percent to the cap perimeters;~~ (RTC, 9/29/11)
- ~~Install vertical gas migration control wells;~~ (RTC, 9/29/11)
- ~~Install geosynthetic layers consisting of, from bottom to top, a gas collection geocomposite, GCL, 60-mil HDPE geomembrane, and drainage geocomposite~~; (RTC, 9/29/11)
- ~~Place 2 feet of cover soil above the geosynthetics;~~ (RTC, 9/29/11)
- ~~Install groundwater monitoring wells;~~ (RTC, 9/29/11)
- ~~Operate the below-cap gas collection system and the perimeter vertical gas migration control well system as active systems for a period of at least 2 weeks. Following the start-up period, operate the below-cap gas collection system and vertical gas migration control well system passively. During passive operation, monitor the performance of the proposed alternative remedial measure with a system of perimeter gas migration sentry wells outside the limit of the perimeter vertical gas migration control wells. If the monitoring data indicate significant gas migration from the waste, convert the system to active gas control and, if required, include gas treatment;~~ (RTC, 9/29/11)
- ~~Prepare a Risk Management Plan;~~ (RTC, 9/29/11)
- ~~Perform semi-annual groundwater monitoring; and~~ (RTC, 9/29/11)
- ~~Complete a formal review of remediation effectiveness after five years.~~ (RTC, 9/29/11)

~~This remedial alternative effectively mitigates the risk from ingestion, inhalation, and dermal contact with onsite soils for both future non-residential and residential occupants of buildings on site, and future landscapers and utility workers. This alternative also~~

~~effectively mitigates the risk from dermal contact with site groundwater through the cap and institutional controls including the Health and Safety Plan and Risk Management Plan.~~ (RTC, 9/29/11)

~~Alternative 2 readily meets the criteria of overall protection of human health and the environment and satisfies ARARs. When evaluated against the balancing criteria, Alternative 2 provides short-term effectiveness as well as long-term effectiveness and permanence. It is readily implementable and presents an effective balance of cost against the other criteria. Alternative 2 also would accommodate future potential redevelopment of the Site~~. (RTC, 9/29/11)

~~Figures 6-2 through 6-7 demonstrate the conceptual design of Alternative 2 and are for the purposes of evaluating costs in this Feasibility Study. The overall height of the cap may be reduced by alternatives such as flatter final cap slopes and a narrower stabilization layer which will be evaluated and presented in the Remedial Action Plan (RAP). The final design for Alternative 2 will be presented in the RAP~~. (RTC, 9/29/11)

Based on the comparative analysis of the remedial alternatives, the alternative that meets the RAOs and ranks the highest is Alternative 2A, capping with selective excavation. The elements of Alternative 2A are (RTC, 9/29/11):

- Prepare a construction HASP and CQA Plan;
- Prepare a Risk Management Plan;
- High-strength geotextile installation;
- Select excavation of impacted material;
- Containment of sludge along Artesia Boulevard;
- Capping of sludge;
- Installation of gas control and monitoring system;
- Institutional controls;
- Perform semi-annual groundwater monitoring; and
- Complete a formal review of cap effectiveness after five years. (RTC, 9/29/11)

This remedial alternative effectively mitigates the risk from ingestion, inhalation, and dermal contact with onsite soils for future non-residential occupants of buildings onsite, and future landscapers and utility workers. This alternative also effectively mitigates the risk from dermal contact with Site groundwater through the cap and institutional controls including the Health and Safety Plan and Risk Management Plan. (RTC, 9/29/11)

Alternative 2A readily meets the criteria of overall protection of human health and the environment and satisfies ARARs. When evaluated against the balancing criteria, Alternative 2A provides short-term effectiveness as well as long-term effectiveness and permanence. It is implementable and presents an effective balance of cost against the other criteria. Alternative 2A also would accommodate future potential redevelopment of the Site. (RTC, 9/29/11)

Figures ~~3-1~~ 6-1 through ~~3-10~~ 6-8, 6-13, and 6-15 (RTC, 11/6/12) demonstrate the conceptual design of Alternative 2A and were prepared for the purposes of evaluating costs in this Addendum. The design for Alternative 2A will be presented in the Remedial Action Plan. (RTC, 9/29/11)

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Attachment 2

TABLE 7-1
ALTERNATIVE 2A COST ESTIMATE
Gardena Sumps, Gardena, California

Geosyntec consultants

	Unit	Unit Price	Quantity	Amount
Institutional Controls				
Deed Restrictions	EA	$ 25,000.00	1	$ 25,000.00
Site Preparation				
Mobilization/Demobilization	LS	$ 372,700.00	1	$ 372,700.00
Security	Month	$ 20,000.00	5	$ 100,000.00
Construction Facilities	Month	$ 10,000.00	5	$ 50,000.00
Health and Safety	Month	$ 35,000.00	5	$ 175,000.00
Air Monitoing	Month	$ 48,000.00	5	$ 240,000.00
Temporary Fencing and Signage	LS	$ 10,000.00	1	$ 10,000.00
Surveying (Baseline and As-Built)	LS	$ 75,000.00	1	$ 75,000.00
Temporary Traffic Control	LS	$ 20,000.00	1	$ 20,000.00
Clearing and Grubbing	ACRE	$ 2,000.00	7	$ 14,000.00
Groundwater Monitoring Well Destruction	EA	$ 4,000.00	8	$ 32,000.00
Containment				
Install sheet piles	SF	$ 30.00	5,100	$ 153,000.00
Overhead Electrical Relocation	EA	$ 50,000.00	2	$ 100,000.00
Retaining wall façade	SF	$ 9.00	675	$ 6,075.00
Batten Anchors (RTC, 1/9/2013)	LF	$ 20.00	225	$ 4,500.00
Earthworks				
Clean Excavation	CY	$ 7.00	2,450	$ 17,150.00
Clean Fill (Import, place, Compact)	CY	$ 40.00	1,500	$ 60,000.00
Haack Rework Disposal				
Impacted Excavation	CY	$ 20.00	2,670	$ 53,400.00
Haul and Dispose of Waste at Non-RCRA Hazardous Facility	TON	$ 120.00	4,600	$ 552,000.00
Cap				
High Strength Geotextile				
Material (Import and place)	SF	$ 5.00	102,978	$ 514,890.00
Foundation Layer Installation				
Fingerfill Soil Placement	CY	$ 50.00	3,900	$ 195,000.00
Fill (Import, Place, and Grade Soil)	CY	$ 40.00	9,100	$ 364,000.00
Geosynthetics				
Furnish and Install Gas Geocomposite	SF	$ 0.72	169,005	$ 121,684.00
Furnish and Install Geosynthetic Clay Liner	SF	$ 0.75	169,005	$ 126,754.00
Furnish and Install 60-mil HDPE Geomembrane	SF	$ 0.62	169,005	$ 104,783.00
Furnish and Install Drainage Geocomposite	SF	$ 0.72	169,005	$ 121,684.00
Cover Soil				
Fill (Import, Place, and Grade 1 ft Class II Aggregate Base)	CY	$ 35.00	6,444	$ 225,556.00
Horizontal Gas Collection System				
Furnish and Install Strip Composite	LF	$ 3.00	3,288	$ 9,864.00
Furnish and Install Outlet Pipe	LF	$ 10.00	1,480	$ 14,800.00
Import and Place Gravel	CY	$ 40.00	20	$ 800.00
Furnish and Install Blower (0.5 hp, 50 scfm)	EA	$ 10,000.00	1	$ 10,000.00
Furnish and Install Granular Activated Carbon	EA	$ 22,000.00	1	$ 22,000.00
Vertical Gas Probes				
Probe Drilling	LF	$ 20.00	180	$ 3,600.00
Furnish and Install Pipe (3 - 3/8" ϕ Perforated PVC)	LF	$ 10.00	180	$ 1,800.00
Import and Place Gravel	CY	$ 40.00	3	$ 120.00
Perimeter Vertical Gas Migration Control System				
Well Drilling	LF	$ 20.00	380	$ 7,600.00
Furnish and Install Air Inlet Header Pipe (4" ϕ HDPE)	LF	$ 10.00	1,770	$ 17,700.00
Furnish and Install Air Outlet Header Pipe (4" ϕ HDPE)	LF	$ 10.00	1,770	$ 17,700.00

TABLE 7-1
ALTERNATIVE 2A COST ESTIMATE
Gardena Sumps, Gardena, California

Geosyntec consultants

	Unit	Unit Price	Quantity	Amount
Furnish and Install 4" ϕ perforated HDPE Vertical Gas Migration Control Pipes	LF	$ 10.00	380	$ 3,800.00
Import and Place Gravel	CY	$ 40.00	10	$ 400.00
Furnish and Install Blower (15 hp, 400 scfm)	EA	$ 30,000.00	1	$ 30,000.00
Concrete Pad	EA	$ 5,000.00	1	$ 5,000.00
Fencing	EA	$ 2,000.00	1	$ 2,000.00
Electrical/Connection And Switch Gear	EA	$ 22,000.00	1	$ 22,000.00
Other Construction Costs				
Groundwater Monitoring Wells (RTC, 1/9/2013)	EA	$ 8,000.00	8	$ 64,000.00
Revegetation	SY	$ 1.00	32,390	$ 32,390.00
Other Direct Costs				
Contingency (20%)	LS	$ 894,500.00	1	$ 894,500.00
Project Management (5%)	LS	$ 223,700.00	1	$ 223,700.00
Engineering Design (8%)	LS	$ 357,800.00	1	$ 357,800.00
Construction Management (6%)	LS	$ 268,400.00	1	$ 268,400.00
Construction Costs Subtotal:				**$ 5,844,150.00**
Operations and Maintenance Costs				(RTC, 1/9/2013)
Blower, Granular Activated Carbon	LS	$1,612,600.00	1	$ 1,612,600.00
Annual Inspection	LS	$ 44,800.00	1	$ 44,800.00
Groundwater and Vapor Sampling & Analysis (Quarterly) (RTC, 1/9/2013)	LS	$3,180,300.00	1	$ 3,180,300.00
Miscellaneous Cap Maintenance	LS	$ 44,800.00	1	$ 44,800.00
Operation and Maintenance Costs Subtotal:				**$ 4,882,500.00**
				(RTC, 1/9/2013)
			Total:	**$ 10,726,650.00**
				(RTC, 1/9/2013)

TABLE 7-2
ALTERNATIVE 3 COST ESTIMATE
Gardena Sumps, Gardena, California

Geosyntec consultants

	Unit	Unit Price (Low)	Unit Price (High)	Quantity	Amount (Low)	Amount (High)
Institutional Controls						
Deed Restrictions	EA	$ 25,000.00	$ 25,000.00	1	$ 25,000.00	$ 25,000.00
Site Preparation						
Mobilization/Demobilization	EA	$ 733,800.00	$ 827,100.00	1	$ 733,800.00	$ 827,100.00
Security	Month	$ 20,000.00	$ 20,000.00	8	$ 160,000.00	$ 160,000.00
Construction Facilities	Month	$ 10,000.00	$ 10,000.00	8	$ 80,000.00	$ 80,000.00
Health and Safety	Month	$ 35,000.00	$ 35,000.00	8	$ 280,000.00	$ 280,000.00
Air Monitoring	Month	$ 48,000.00	$ 48,000.00	8	$ 384,000.00	$ 384,000.00
Temporary Fencing and Signage	LS	$ 10,000.00	$ 10,000.00	1	$ 10,000.00	$ 10,000.00
Surveying (Baseline and As-Built)	LS	$ 75,000.00	$ 75,000.00	1	$ 75,000.00	$ 75,000.00
Temporary Traffic Control	LS	$ 20,000.00	$ 20,000.00	1	$ 20,000.00	$ 20,000.00
Admixture Mobilization/Demobilization	EA	$ 175,000.00	$ 175,000.00	1	$ 175,000.00	$ 175,000.00
Clearing and Grubbing	ACRE	$ 2,000.00	$ 2,000.00	7	$ 14,000.00	$ 14,000.00
Existing Geomembrane Cutting	SF	$ 0.05	$ 0.05	103,000	$ 5,150.00	$ 5,150.00
Groundwater Monitoring Well Destruction	EA	$ 4,000.00	$ 4,000.00	8	$ 32,000.00	$ 32,000.00
Containment						
Install sheet piles	SF	$ 30.00	$ 30.00	13,800	$ 414,000.00	$ 414,000.00
Overhead Electrical Relocation	EA	$ 50,000.00	$ 50,000.00	2	$ 100,000.00	$ 100,000.00
Retaining wall façade	SF	$ 9.00	$ 9.00	4,400	$ 39,600.00	$ 39,600.00
Batten Anchors (RTC, 1/9/2013)	LF	$ 15.00	$ 20.00	600	$ 9,000.00	$ 12,000.00
Earthworks						
Clean Excavation	CY	$ 7.00	$ 7.00	300	$ 2,100.00	$ 2,100.00
Impacted Excavation	CY	$ 20.00	$ 20.00	5,800	$ 116,000.00	$ 116,000.00
Stabilization/Neutralization						
Stabilization Mobilization	LS	$ 175,000.00	$ 175,000.00	1	$ 175,000.00	$ 175,000.00
CaOH2/CaCO3 Stabilizer	TON	$ 300.00	$ 600.00	3,100	$ 930,000.00	$ 1,860,000.00
Soil for Stabilization	CY	$ 40.00	$ 40.00	3,400	$ 136,000.00	$ 136,000.00
Deep Soil Mixing with Hood	CY	$ 60.00	$ 60.00	11,400	$ 684,000.00	$ 684,000.00
Vapor Control Tent with Air Handling and Treatment System	LS	$ 1,100,000.00	$ 1,100,000.00	1	$ 1,100,000.00	$ 1,100,000.00
Vapor Treatment System	DAY	$ 1,000.00	$ 1,000.00	70	$ 70,000.00	$ 70,000.00
Cap						
Foundation Soil						
Fill (Import, place, grade, compact, moisture condition)	CY	$ 40.00	$ 40.00	20,100	$ 804,000.00	$ 804,000.00
Fill (Place and Grade Excavated Site Sludge/Soil Mix)	CY	$ 10.00	$ 10.00	5,800	$ 58,000.00	$ 58,000.00
Geosynthetics						
Furnish and Install Woven Geotextile	SF	$ 2.00	$ 2.00	103,000	$ 206,000.00	$ 206,000.00
Furnish and Install Gas Geocomposite	SF	$ 0.72	$ 0.72	169,000	$ 121,680.00	$ 121,680.00
Furnish and Install Geosynthetic Clay Liner	SF	$ 0.75	$ 0.75	169,000	$ 126,750.00	$ 126,750.00
Furnish and Install 60-mil HDPE Geomembrane	SF	$ 0.62	$ 0.62	169,000	$ 104,780.00	$ 104,780.00
Furnish and Install Drainage Geocomposite	SF	$ 0.72	$ 0.72	169,000	$ 121,680.00	$ 121,680.00
Cover Soil						
Fill (Import, Place, and Grade 2 ft Cover Soil)	CY	$ 40.00	$ 40.00	11,800	$ 472,000.00	$ 472,000.00
Horizontal Gas Collection System						
Furnish and Install Perforated Pipes	LF	$ 13.00	$ 13.00	3,300	$ 42,900.00	$ 42,900.00
Furnish and Install Outlet Pipe	LF	$ 10.00	$ 10.00	900	$ 9,000.00	$ 9,000.00
Import and Place Gravel	CY	$ 40.00	$ 40.00	100	$ 4,000.00	$ 4,000.00
Furnish and Install Blower (0.5 hp, 50 scfm)	EA	$ 10,000.00	$ 10,000.00	1	$ 10,000.00	$ 10,000.00
Furnish and Install Granular Activated Carbon	EA	$ 22,000.00	$ 22,000.00	1	$ 22,000.00	$ 22,000.00
Vertical Gas Probes						
Probe Drilling	LF	$ 20.00	$ 20.00	80	$ 1,600.00	$ 1,600.00
Furnish and Install Pipe (4" ϕ Perforated PVC)	LF	$ 10.00	$ 10.00	80	$ 800.00	$ 800.00
Import and Place Gravel	CY	$ 40.00	$ 40.00	2	$ 80.00	$ 80.00
Perimter Vertical Gas Migration Control System						
Well Drilling	LF	$ 20.00	$ 20.00	300	$ 6,000.00	$ 6,000.00
Furnish and Install Air Inlet Header Pipe (4" ϕ HDPE)	LF	$ 10.00	$ 10.00	1,300	$ 13,000.00	$ 13,000.00
Furnish and Install Air Outlet Header Pipe (4" ϕ HDPE)	LF	$ 10.00	$ 10.00	1,300	$ 13,000.00	$ 13,000.00
Furnish and Install 4" ϕ perforated HDPE Vertical Gas Migration Control Pipes	LF	$ 10.00	$ 10.00	300	$ 3,000.00	$ 3,000.00
Import and Place Gravel	CY	$ 40.00	$ 40.00	9	$ 360.00	$ 360.00
Furnish and Install Blower (15 hp, 400 scfm)	EA	$ 30,000.00	$ 30,000.00	1	$ 30,000.00	$ 30,000.00
Furnish and Install Granular Activated Carbon	EA	$ 22,000.00	$ 22,000.00	1	$ 22,000.00	$ 22,000.00
Other Construction Costs						
Groundwater Monitoring Wells (RTC, 1/9/2013)	EA	$ 8,000.00	$ 8,000.00	8	$ 64,000.00	$ 64,000.00
Revegetation	SY	$ 1.00	$ 1.00	32,400	$ 32,400.00	$ 32,400.00
Stormwater Channel	SF	$ 2.00	$ 2.00	6,500	$ 13,000.00	$ 13,000.00
Other Direct Costs						
Contingency (20%)	LS	$ 1,614,400.00	$ 1,819,600.00	1	$ 1,614,400.00	$ 1,819,600.00
Project Management (5%)	LS	$ 403,600.00	$ 454,900.00	1	$ 403,600.00	$ 454,900.00
Engineering Design (8%)	LS	$ 645,800.00	$ 727,900.00	1	$ 645,800.00	$ 727,900.00
Construction Management (6%)	LS	$ 484,400.00	$ 545,900.00	1	$ 484,400.00	$ 545,900.00

TABLE 7-2
ALTERNATIVE 3 COST ESTIMATE
Gardena Sumps, Gardena, California

Geosyntec consultants

	Unit	Unit Price (Low)	Unit Price (High)	Quantity	Amount (Low)	Amount (High)
Construction Costs Subtotal:					**$ 11,219,880.00**	**$ 12,646,280.00**
Operations and Maintenance Costs						(RTC, 1/9/2013)
Blower, Granular Activated Carbon	LS	$ 1,612,600.00	$ 1,612,600.00	1	$ 1,612,600.00	$ 1,612,600.00
Annual Inspection	LS	$ 44,800.00	$ 44,800.00	1	$ 44,800.00	$ 44,800.00
Groundwater and Vapor Sampling & Analysis (Quarterly) (RTC, 1/9/2013)	LS	$ 3,180,300.00	$ 3,180,300.00	1	$ 3,180,300.00	$ 3,180,300.00
Miscellaneous Cap Maintenance	LS	$ 44,800.00	$ 44,800.00	1	$ 44,800.00	$ 44,800.00
Operation and Maintenance Costs Subtotal:					**$ 4,882,500.00**	**$ 4,882,500.00**
						(RTC, 1/9/2013)
				Total:	**$ 16,102,380.00**	**$ 17,528,780.00**
						(RTC, 1/9/2013)

TABLE 8-1
COMPARATIVE ANALYSIS OF ALTERNATIVES
Gardena Sumps, Gardena, California

Geosyntec consultants

Alternative	Description	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-term effectiveness and permanence	Reduction of toxicity, mobility, or volume	Short-term effectiveness	Implementability	Cost	Total
Alternative 1	Score:	1	1	1	1	2	5	5	16
	No Action: no ongoing maintenance of geomembrane, asphalt, or concrete covers or fencing.	Low: Current geomembrane cover provides limited protection of human health and the environment. Asphalt and concrete caps provide protection of human health and the environment. Without on-going maintenance of caps which is not included with the alternative, protection of human health and the environment is limited.	Low: Does not provide compliance with ARARs.	Low: Caps are not effective over long-term without on-going maintenance.	Low: Toxicity, mobility, and/or volume are not reduced with this option.	Low to moderate: The caps and fenced conditions provide some short-term effectiveness as contact with the sludge is reduced through the clean cover (Haack Rework), geomembrane (Cooper Sumps), and concrete (Haack Sump).	High: Easy to implement	Low: No associated cost	
~~Alternative 2~~	~~Score:~~	~~4~~	~~5~~	~~4~~	~~3~~	~~5~~	~~4~~	~~3~~	~~28~~
	~~Capping with selective excavation: Excavated Haack Rework and consolidated beneath composite cap system above sumps.~~	~~Moderate to high: Exposure routes would be eliminated through capping; however, source would remain onsite.~~	~~High: complies with ARARS.~~	~~Moderate to high: With maintenance, will provide long-term protection.~~	~~Moderate: Reduces mobility of sludge by limited infiltration and wind erosion. Gas treatment will reduce the toxicity of the waste. Volume will not be reduced.~~	~~High: Immediate short-term effectiveness with little gas generation.~~	~~Moderate to high: Technical implementation is relatively easy.~~	~~Moderate~~	
Alternative 2A (RTC, 9/29/11)	Score:	4	~~5~~ 3 (RTC, 1/9/13)	4	3	5	4	3	26
	Capping with selective excavation: Excavate Haack Rework and dispose offsite (RTC, 9/29/11)	Moderate to high: Exposure routes would be eliminated through capping; however, source would remain onsite. (RTC, 9/29/11) Gas would not be generated during implementation of this Alternative. (RTC 1/9/13)	~~High: complies with ARARS. (RTC, 9/29/11)~~ Moderate: complies with ARARS but requires additional monitoring and treatment to do so.(RTC, 1/9/13)	Moderate to high: With maintenance, will provide long-term protection. (RTC, 9/29/11)	Moderate: Reduces mobility of sludge by limited surface water infiltration and wind erosion. Gas treatment will reduce the toxicity of the waste. Onsite volume will be reduced. (RTC, 9/29/11)	High: Immediate short-term effectiveness with little gas generation. (RTC, 9/29/11)	Moderate to high: Technical implementation is relatively easy. (RTC, 9/29/11)	Moderate (RTC, 9/29/11)	
Alternative 3	Score:	~~4~~ 3 (RTC, 1/9/13)	3	4	3	2	1	2	18
	Capping with partial stabilization/neutralization and selective excavation: Partially stabilize/neutralize sludge, excavate Haack Rework and consolidate beneath composite cap system above sumps.	Moderate ~~to high~~ (RTC, 1/9/13): Exposure routes would be eliminated through capping; however, source would remain onsite and gas generation would be high during mixing and stabilization (RTC, 1/9/13)	Moderate: complies with ARARS but requires additional monitoring and treatment to do so.	Moderate to high: With maintenance, will provide long-term protection, some sludge is neutralizaed reducing long-term concerns with untreated sludge remaining.	Moderate: Reduces mobility of sludge by neutralization, limited infiltration and wind erosion. Gas treatment and partial neutralization will reduce the toxicity of the waste. Overall volume will increase but toxicity will be reduced.	Low to moderate: Mixing of materials will release significant quantities of gas; however cap will provide immediate short-term effectiveness.	Low: Difficult to implement due to gas generation and mixing	Moderate to high: Costs associated with partial neutralization/stabilization and gas treatment	
Alternative 4	Score:	~~3~~ 4 (RTC, 1/9/13)	~~3~~ 5 (RTC, 1/9/13)	5	2	3	1	1	21
	Excavate impacted materials and dispose with off-site.	~~Moderate~~ Moderate to High (RTC, 1/9/13):Sludge and rework material would be disposed of offsite eliminating the exposure routes; however, excavation and transport of material temporarily increases risk with gas generation and public exposure.	~~Moderate: complies with ARARS but requires additional monitoring and treatment to do so.~~ High: Complies with ARARS (RTC, 1/9/13)	High: Very effective as material is removed from the Site.	Low to moderate: ~~The toxicity and/or volume are not reduced; however, the mobility is reduced.~~ The toxicity is reduced but volume is doubled. Mobility is significantly increased when material is exposed, excavated, and hauled on public roads for final disposal. (RTC, 1/9/13)	Moderate: Removal will result in immediate effectiveness; however, excavation will generate significant gas and transport will expose public to hazards.	Low: Difficult to implement due to material properties and gas generation	High: Costs associated with partial neutralization/stabilization, gas treatment, transport, and disposal	

Notes:
ARARs - Applicable or Relevant and Appropriate Requirements
State Acceptance and Community Acceptance criteria will be assessed during comment periods and are not presented in this table.
Ranking - A numeric ranking of "1" is lowest, or worst; "5" is highest, or best. With respect to cost, "1" is most expensive; "5" is lease expensive

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12 November 2013

Mr. Joseph Cully
Hazardous Substance Scientist
Southern California Cleanup Operations Branch
Cypress Office, Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630

Transmittal: **Response to Comments on the Revised Final Draft Feasibility Study Report**
Gardena Sumps Site
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California
DTSC Site No. 400067

Dear Mr. Cully:

Geosyntec Consultants (Geosyntec), on behalf of the Atlantic Richfield Company (ARC), is pleased to provide this response to Department of Toxic Substances Control's (DTSC) comments on the Revised Final Draft Feasibility Study Report (Revised Final Draft FS). These responses were prepared to address the DTSC comments dated 23 May 2013 and received 3 October 2013. The DTSC comments are provided below in *italics* with ARC's response following. The updated text of the Revised Final Draft Feasibility Study Report is provided as Attachment 1.

COMMENTS

1. No further comment.

2. No further comment.

3. No further comment.

4. ESPO still believes there is significant value in conducting an excavation pilot study before the final remedy is selected, as the volume and concentrations of hydrogen sulfide and sulfur dioxide generated by various construction activities has major implications for each of the

alternatives reviewed. Alternative 2A relies on not disturbing sludge, thereby not generating gases, to prevent unacceptable exposures during construction. If some of the assumptions underlying Alternative 2A are found to be in error, unacceptable volumes of gases could be generated quickly. The contingency plan that will be required for the implementation phase will have to account for this possibility and include measures to contain gases and protect the public. The more uncertainty there is with gas generation and effective containment measures the more conservative the contingency plan must be, possibly including personnel and equipment kept onsite for immediate response should monitoring action levels be exceeded (see HERO response to DTSC 1/9/13 comment 8). Testing of different containment/mitigation measures would be part of the pilot study. Alternatives 3 and 4 assume gases will be generated, and therefore contain additional measures not included in Alternative 2A, but would also benefit from a pilot study.

A discussion of a gas contingency plan has been included in the Alternative 2A Haack Rework Excavation description. The initial excavation of the Haack Rework area would provide the same information that would be generated from a pilot study. During initial excavation, odor suppressants and PPE would be present, as identified in the Contingency Plan. Continued excavation would be modified as necessary based on gas generation experienced during initial excavation.

5. No further comment.

6. The response to comment states that over 50 years of traffic loading have not induced sludge related detriment to the roadway as indicated by the lack of specific pavement repairs above the sludge. Please provide the rationale for requiring low permeability asphaltic concrete in the roadway.

The low permeability asphaltic concrete is included in response to a comment posed by ESPO in September 2012. The comment, which related specifically to the off-site sludge beneath the adjacent roadway pavement, was "Given that a permanent cap is proposed as a remedy for the onsite sludge please clarify the basis of the assumption that this material is capped and provide analysis showing that the cover on this material would provide the same level of protection and for the same duration as the proposed onsite cap." (Geosyntec, 2013, Appendix A) A low-permeability asphalt could be incorporated into the Institutional Control requirements to provide similar protection as the onsite cap. Current asphalt paving may remain in place until the next scheduled pavement maintenance.

7. No further comment.

8. ESPO will defer to HERO as their comment on the response adequately expresses our continued concerns.

Noted.

9. It appears that with a six-foot thick cover, the high strength geotextile would only be needed during construction. This is acceptable provided a minimum cover thickness to support future parking lot loads (H20 loading is indicated) is maintained. We could not find much information on the Wasser Polyflex 304 product suggested for use in sheet pile corrosion protection. Please include information on this product indicating its corrosion protection performance and expected life in a low pH environment such as exists at Gardena Sumps (this information may be appended to the document). (Gathungu)

The six-foot thick cover is part of Alternative 3 while the high-strength geotextile is included for Alternative 2A. Alternative 2A will support H-20 loading as demonstrated in the calculation package included in Attachment 2. Information on the Wasser Polyflex 304 is included as Attachment 3.

10. No further comment.

11. No further comment.

12. No further comment.

13.The individual volumes in the second paragraph total 5,380 CY (as stated in the RTC), not 5,470. The text should be corrected.

The text has been revised to reflect 5,380 CY.

14. The response is satisfactory with respect to corrosion and gas generation but may be difficult to implement. The text should be revised to indicate the placement of the Haack material in the sumps will be tracked (and documented) and procedures/requirements will be implemented during construction to ensure the material is not placed in areas where the gas collection system will be constructed. If Alternative 3 is chosen as the preferred remedy, details of the tracking and other construction requirements will need to be submitted to DTSC for approval/concurrence.

Section 6.1.3.2 has been revised to include a statement that Haack Rework and overflow material placement above the sumps will be tracked and documented to demonstrate the material is not in contact with the gas collection layer.

15. No further comment.

16. No further comment.

17. No further comment.

18. No further comment.

19. No further comment.

20. No further comment.

21. No further comment.

22. The text states that a preliminary evaluation of ground shaking was performed and liquefaction was identified as a potential site response. The text further states that settlement and subsidence was shown to be minimal. Please include a numerical value, or range, for the calculated settlement and subsidence. The text states that sand boils would not occur through the sludge due to the low permeability of the sludge and relatively high permeability of the soil around the sumps. However, the critical condition would be occurrence of "sludge boils" rather than sand boils. Please discuss the potential for "sludge boils" to occur. The text further states that lateral spreading to the south of the engineered cap caused by liquefaction-induced soil displacement at the Dominguez Channel was identified as a possibility. Please discuss any measures that should be taken to address this condition and include costs of implementing these measures in the cost estimates. (Gathungu)

Based on recommendations in Idriss and Boulanger (2008), typical liquefaction-induced volumetric strain (or settlement) is on the order of 5% or less. Conservatively assuming the upper bound of anticipated strain and a liquefiable layer thickness ranging from approximately 15 to 23 feet, calculated liquefaction-induced settlement is on the order of 9 to 14 inches. Based on a review of available subsurface explorations, the presence of potentially liquefiable material at depth at the site is relatively uniform and differential settlement resulting from liquefaction is expected to be significantly less than total liquefaction induced settlement. Based on a review of

the liquefiable zone thickness in individual cone penetration test (CPT) borings and the distance between the borings, differential settlement will result in post-settlement grades less than 2 percent; however, reverse grades resulting in ponding are unlikely at the Site.

Development of sand boils occurs when water flows upward to relieve excess pore pressures developed at depth during rapid loading conditions. Sand boils are most likely to develop in liquefied areas where inhomogeneity in soil type and permeability are present (e.g, low permeability confining layers promote buildup of excess pore pressures which may be locally relieved through an isolated higher permeability zone). The low permeability and low viscosity of the Cooper Sumps sludge at the Site (permeability of less than 1.0×10^{-8} cm/sec, viscosity approximately 20,000 poise at 60F [Stantec, 2008]) reduces the potential for development of sludge boils within the waste footprint. Potential pore pressure buildup in the liquefiable zone beneath the sludge would likely be relieved through the higher permeability zones outside of the sludge footprint rather than through the low permeability sludge. Based on the viscous nature of the sludge material (similar to a tar) at the Site, the potential for liquefaction of the sludge material at the site is considered low.

While lateral spreading to the south toward the Dominguez Channel was identified as a possibility for the site, the likelihood of this affecting the integrity of the engineered cap is considered low due to the distance between the cap and the north side of the channel and the geometric limitations of the Dominquez Channel to accommodate soil movement. Mitigation of impacts due to potential lateral spreading will be evaluated during overall site development as its potential effect on the caps is minor relative to the effect on buildings developed near the channel.

23. No further comment.

24. ESPO disagrees with the response and believes reduction of toxicity, mobility, or volume through treatment should be rated low, as originally stated. ESPO notes this issue is minor in the overall context of the feasibility study and can be revisited at a later time if necessary.

Noted. The ranking remains as moderate due to the removal of the Haack Rework and reduced mobility of the sludge and soil gas.

25. ESPO could not find a figure that provides the location of the high-strength geotextile anchor trench. Please provide a figure (similar to 6-2) that depicts the high-strength geotextile anchor trench location in detail sufficient to allow us to evaluate its elevation above the sludge on

Section A of Figure 6-3, or inform us which existing figure contains this information, so we may complete our review. Also, the response states an anchor trench depth of three feet while section 6.1.2.3 states this anchor trench will be two-foot by two-foot. Please clarify and revise the response or report as necessary.

The high strength geotextile anchor trench is a minimum of 2 feet deep and is shown on Detail 7 on Figure 6-14.

26. No further comment.

27. No further comment.

28. The text states that preliminary analyses of the site during a seismic event do not indicate the potential of surface release of sludge. Please expand this response to indicate the seismic parameters (magnitude, fault system, acceleration, etc.) used in the analyses. (Gathungu)

To develop seismic parameters for the site, Geosyntec performed a probabilistic seismic hazard analysis (PSHA) using the 2008 beta version of the United States Geological Survey (USGS) software and fault parameter database. An average shear wave velocity for the upper 30 meters of soil of 520 meters per second was used based on a review of subsurface explorations presented in the Revised Draft Remedial Investigation (Stantec, 2008). The PSHA for a 10 percent probably of exceedance in 50 years (475-year return period) indicated a peak ground acceleration of 0.34g representing a modal magnitude 7.4 event. The PSHA used does not identify a single fault that will cause a seismic event at the site, but rather incorporates all of the potential seismic sources that could contribute to ground shaking at the site.

29. The restatement of ESPO's original comment has errors in the rankings for the individual sections that should be corrected for clarity.

Noted. The ranking should have been:

7 .3.5.1 high

7.3.5.2 high

7.3.5.3 high

7.3.5.4 high

7.3.5.5 low

7.3.5.6 low

7.3.5.7 low

7.3.5.8 moderate to high

7.3.5.9 moderate to high (based on statements from the city)

30. No further comment.

31. No further comment.

32. ESPO still believes a rating of high is appropriate for this section. The revised text in section 7.3.5.4 states the volume of the sludge would double following admixture. Per section 6.1.4.2, bulking of the sludge due to addition of the reagent is expected to be 25 percent, not 100 percent. The text in section 7.3.5.4 should be revised to be consistent with section 6.1.4.2. The increased volume will result in additional disposal costs but overall the site will see a reduction in volume from this alternative. The revisions to the text regarding a temporary increase in mobility are more appropriate for section 7.3.5.5, and have already been made, and should be deleted from this section.

The volume of waste would increase by a minimum of 25 percent due to the admixture addition; an additional 15 percent over-excavation is anticipated during sludge and admixture removal. A ranking of moderate has been given to this Alternative due to the additional waste streams that would be created during implementation. During implementation, air treatment systems would be necessary for treatment of vapors being generated during neutralization and waste handling. The air treatment systems would incorporate a scrubber system which would routinely require change-outs resulting in an additional waste material requiring disposal. Further, odor suppression systems typically include spray-applied foams, which will add a minor amount to the waste disposal volume. During excavation, groundwater would be encountered. Groundwater would be removed from the excavation and disposed of in accordance with applicable regulations. Further, soil and sludge below the groundwater surface would need to be dewatered onsite to remove excess liquid before hauling and disposing of the material at a landfill; the water removed from the soil and sludge would require solidification or collection and treatment before disposal. As a result, more waste is generated with Alternative 4 from: waste bulking, air

scrubber systems, odor suppressants, and groundwater dewatering. We have updated the text in Sections 7.3.5.4 and 8.2.5 to reflect an anticipated 25% to 40% increase in waste volumes.

33. No further comment.

34. No further comment.

35. No further comment.

36. The response refers to "degraded soil-sludge" material and "previously undisturbed sludge". This would appear to imply that degradation of sludge/soil-sludge materials has occurred. While sludge materials may have been mixed with soil in some areas, it is not clear that degradation of the sludge-soil has occurred. In addition, Alternative 3 involves stabilization of the upper three feet of sludge beneath the existing temporary cover/membrane which likely is previously undisturbed, and therefore would generate gas similar to excavation in Alternative 4. (Gathungu)

The Haack Rework Area contains both sludge and mixtures of sludge-soil material. Physical testing of the sludge from the North Cooper Sump, South Cooper Sump and Haack Rework Area was performed during the treatability testing of the sludge material as part of the Remedial Investigation. The sludge samples from the Haack Rework Area were shown to be previously disturbed and thus degraded as evidenced by their higher moisture content, lower acidity and greater viscosity than the sludge samples from the two Cooper Sumps. Further evidence of this degradation was shown by the vapor evolution tests where the sulphur dioxide and hydrogen sulfide gas emitted from agitated Haack Rework Area sludge was reduced by more than 95% compared to emissions from agitated Cooper Sumps sludge. Neutralization and stabilization of the sludge presented in Alternative 3 would generate significant quantities of hydrogen sulfide and sulfur dioxide gas.

37. No further comment.

38. ESPO believes the estimate of 40 feet for the zone of influence is optimistic but has no further comments regarding this issue for the feasibility study.

Noted.

39. No further comment.

40.The text states that the cover was evaluated for H20 loading of 80 psi at the cap surface and found to be acceptable. The load capacity of the cover is dependent on cover thickness. We note that the proposed minimum cover thickness is on the order of two feet for Alternative 2A. Please include the minimum cover thickness used in the evaluation as well as the applicable factor of safety. In addition, if the total cover thickness required to support the indicated loading will require a parking lot structural pavement section thicker than would otherwise be required, the report should indicate the minimum structural pavement section that will be required along with the feasibility of final cover/pavement grade elevations that may be required. (Gathungu)

The calculation package that demonstrates the cover can support H20 loading is included as Attachment 2.

41. Given the level of settlement experienced at other sites (Del Amo, McColl, and Thomas Ranch) with similar materials, the text should include an estimate of the expected settlement at the Gardena Sumps site and discuss expected effects on the proposed cap and the proposed parking Jot pavements. The associated repair/maintenance costs should be included in the cost estimates. (Gathungu)

The settlement at the Thomas Ranch Site was a maximum of 6.84 inches in the middle of Pond 2 as provided in the Response to Comments dated 12 April 2013 (Geosyntec, 2013). This settlement was the result of porous gravel layer settling into the sludge and sludge subsequently filling the gravel pore spaces within the first three years (some of this settlement occurred during construction). This settlement does not represent the anticipated settlement at the Gardena Sumps Site because the proposed cap does not have a gravel layer above the sludge. The Del Amo Site has seen between -0.10 and 0.08 feet of elevation change over a five year period (2000 to 2005) (EPA, 2005). McColl has experienced no significant settlement (USACE, 2007).

Settlement and creep was questioned by Perry Myers in his comments dated 6 September 2012. Our response was as follows:

> "Settlement and creep of the cap is anticipated to be negligible. Settlement is driven by consolidation of soils through deformation of soil particles, relocation or reorientation of soil particles, and expulsion of liquids (water and/or air) from the soil matrix. The tarry sludge material found within is of such a high viscosity that the material does not readily flow into the adjacent soil matrix. Therefore, the sludge material will not exhibit settlement from expolsion of liquids. Furthermore, the solid particles found within the sludge matrix are

> enveloped in fluid like, high viscosity materials that allow relocation and reorientation of solid particles but the volume of the overall sludge matrix is not changed significantly. This is evident in the fact that the Haack Sump concrete pavement has not settled over the past 14 years. Concrete cracking is evident, but likely related to durability and shrinkage rather than settlement. Last, previous capping projects like McColl, Del Amo, and Thomas Ranch sites containing similar sludge materials have not indicated significant settlement. Settlement and creep that occurs can be corrected with minor maintenance during the life of the cap. Upon completion of the closure construction, the sludge material will be insulated from direct sunlight and ambient temperature increases; therefore, the softening of the sludge will cease to be a problem once the cap is in place. The costs associated with the creep and settlement maintenance are included with the maintenance costs." (Geosyntec, 2013)

42. See response to comment #22.

New ESPO comments

43. Section 8.2.5 Reduction of Toxicity, Mobility, and Volume through Treatment. The text states the volume of waste material to be disposed of would double with Alternative 4. Per section 6.1.4.2, bulking of the sludge due to addition of the reagent is expected to be 25 percent, not 100 percent. The text should be revised to be consistent with section 6.1.4.2.

The text has been revised to reflect an expected bulking of between 25 and 40 percent.

44. Section 8.2.8 Cost. The operations and maintenance costs for alternatives 2A and 3 have not been updated to reflect the new cost estimates included in Attachment 2. The text should be revised.

The text has been revised.

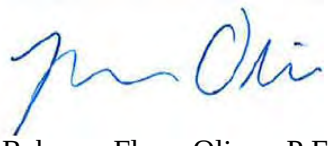
OPTIONAL ALTERNATIVE 2A COVER

In addition to incorporating the DTSC's comments as noted above, the Revised Final Draft Feasibility Study has also been updated to include the Optional Alternative 2A Cover design. The Addendum to the Revised Final Draft Feasibility Study for the Gardena Sumps Site: Optional Alternative 2A Cover (Addendum) was prepared in response to concerns with the height and appearance of the proposed retaining wall along the northern edge of the Haack Sump and a portion of the Cooper North Sump. The retaining wall was eliminated and grading in the

area affected by the elimination of the retaining wall (the "Optional Alternative 2A Cover") was revised to accommodate a minimum 5 percent (%) slope draining to the north and terminating at a 6 to 9 inch (in.) concrete curb immediately adjacent to the Artesia Boulevard (Blvd.) sidewalk (Revised Alternative 2A). The curb will deter unintended light traffic across the slope, act as a water-stop for drainage from the slope, and accommodate the slight variations in the existing Haack Sump concrete slab surface elevation. The Addendum will be included as Appendix F to the Updated Revised Final Draft FS and is included as Attachment 4 to this response to comments.

If you have questions or require additional information about the enclosed report, please contact Mr. Kyle Christie with ARC at 714-670-5303.

Sincerely,



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Attachments:

1 – Updated Revised Final Draft Feasibility Study Report Text

2 – H-20 Loading Calculation Package

3 - Wasser Polyflex 304 Information Sheet

4 - Addendum to the Revised Final Draft Feasibility Study for the Gardena Sumps Site: Optional Alternative 2A Cover

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UPDATED REVISED FINAL DRAFT FEASIBILITY STUDY

GARDENA SUMPS

Prepared by

Geosyntec consultants

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~~February 2011~~
~~November 2012~~
~~April 2013~~

November 2013

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LIST OF ACRONYMS (RTC, 1/9/2013)

amsl	above mean sea level
APA	Air pathway analysis
API	American Petroleum Institute
ARAR	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
$CaCO_3$	calcium carbonate
CalDWR	California Department of Water Resources
CalEPA	California Environmental Protection Agency
Cal-OSHA	California Occupational Safety and Health
CaO	calcium oxide
$Ca(OH)_2$	calcium hydroxide, hydrated lime
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHHSLs	California Human Health Screening Levels
cm/s	centimeters per second
COC	chemicals of concern
COPC	constituents of potential concern
cP	centipoises
CQA	Construction Quality Assurance
CY	cubic yard
DRO	diesel range organics

DTSC	Department of Toxic Substances Control
EEI	Ecology and Environmental, Inc.
FS	Feasibility Study
ft	feet
ft bgs	feet below ground surface
GAC	Granular Activated Carbon
GCL	geosynthetic clay liner
GRA	general response action
GRO	gasoline range organics
H_2S	hydrogen sulfide
HASP	Health and Safety Plan
HDPE	high-density polyethylene
HHRA	human health risk assessment
in	inch
LACDPW	Los Angeles County Department of Public Works
LADPW	Los Angeles Department of Public Works
LUCs	land use covenants
MCL	maximum contaminant level
NPDES	National Pollution Discharge Elimination System
O&M	operation and maintenance
OMM	Operations, Maintenance, and Monitoring
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PEL	permissible exposure limit
ppmv	parts per million by volume
PVC	polyvinyl chloride
QC	quality control
RAOs	Remedial Action Objectives
RAP	Remedial Action Phase
RBC	risk-based concentration/value

RI	Remedial Investigation
RL	Reporting Limit
RMP	Risk Management Plan
ROD	Record of Decision
RTC	response to comments
RWQCB	Regional Water Quality Control Board
SCAQMD	South Coast Air Quality Management District
SCBA	Self-Contained Breathing Apparatus
SO_2	sulfur dioxide
SPLP	synthetic precipitation leaching procedure
SSAL	site-specific action levels
SVOC	semi-volatile organic compound
SWPPP	Stormwater Pollution Prevention Plan
TBC	to be considered
TCLP	toxic characteristic leaching procedure
THE	total extractable hydrocarbon
USEPA	United States Environmental Protection Agency
VFH	volatile fuel hydrocarbons
VOC	volatile organic compounds
w/w	mass concentration

EXECUTIVE SUMMARY

This Revised Final Draft (RTC, 11/6/12) Feasibility Study (FS) Report was prepared for the Gardena Sumps Site (Site) in Gardena, California. This FS Report was prepared for submittal to the California Environmental Protection Agency (CalEPA), Department of Toxic Substances Control (DTSC) in accordance with the California Health and Safety Code. The FS Report is a requirement of Consent Decree CV04-7882-AHM (JTLx), (Consent Decree). This Revised Final Draft FS incorporates the comments and requests made by the DTSC on the original draft FS dated February 2011 and the Draft Feasibility Study Addendum – Alternative 2A (Addendum). Revisions to the original Draft FS resulting from the Addendum and comments are shown as either strike out (deletions) or underline (additions) with the corresponding comment package date at the end. (RTC, 11/6/12)

Background

The Site is located in the southwest corner of the Artesia Boulevard and Normandie Avenue intersection in the City of Gardena, Los Angeles County, California. Generally, the area surrounding the Site is bordered to the south by the Los Angeles County Department of Public Works (LACDPW) Dominguez Flood Channel, to the east by the Southern Pacific Railroad right-of-way, to the west by the western Haack property line, and to the north by Artesia Boulevard, although a small portion of Artesia Boulevard is included within the Site. Commercial and residential properties are currently located to the north, east, and west of the Site (Stantec, 2008).

The site was developed as a clay mine during the 1920s by the Moneta Brick Company. Clay mining resulted excavations that were ~~in what are known as the Haack, Cooper South, and Cooper North sumps and Haack Rework Area~~ reportedly used for sludge disposal beginning in approximately ~~at the Site. These sumps were reportedly used for sludge disposal beginning in March~~ (RTC, 11/6/12) 1940. By September 1946, the Haack, Cooper South and Cooper North Sumps had been ~~and two Cooper sumps were~~ (RTC, 11/6/12) filled with sludge, and vegetation had reclaimed ~~the small pit and~~ (RTC, 11/6/12) the Haack Rework Area (Stantec, 2008).

By December 1951, the western portion of the Haack Sump had been covered with dirt and was converted into a parking lot. On October 1, 1952, the northern-most strip of the Site ~~Haack~~ (RTC, 11/6/12) property was sold to the State of California for a highway easement. By early 1956, Artesia Boulevard (Highway 91) had been constructed, with the southern portion of the roadway encroaching into the Haack Sump northern berm. By January 1958, the Dominguez Channel had been reconstructed and extended eastward south of the Site (Stantec, 2008).

By November 1962, the bluff on the Haack Property (RTC, 11/6/12) had been excavated to expand the Haack ~~paved~~(RTC, 11/6/12) parking lot, although the eastern portion of the Haack property contained sludge ~~remained a vegetated area~~ (RTC, 11/6/12) immediately west of the Cooper North Sump. The Haack Rework Area appeared altered and may have received soil cover from excavation activities that occurred immediately north of the Haack Rework Area. The future Cooper property was unchanged even after it was sold to Thomas Cooper in December 1977 (Stantec, 2008).

Currently, the two Cooper sumps are capped by a geosynthetic material that was installed by OHM Corporation (OHM) in July 1993 as part of the DTSC's environmental program at the Site. The Haack Sump has been covered by asphalt and a concrete slab. Currently the Haack property is leased to various tenants who operate small businesses, including a U-Haul rental agency, a metal fabricating, sand blasting and painting company, and an auto body repair shop. Three buildings and numerous small trailer-type storage structures are present on the Haack property (Stantec 2008).

Geology and Hydrogeology

The Site is located in the Los Angeles Coastal Plain and is underlain by a thick sequence of marine and continental sediments that were deposited in a broad synclinal depression generally referred to as the Los Angeles Basin. The Los Angeles Basin is bisected by the northwest trending Newport-Inglewood uplift, which divides the Coastal Plain into two smaller synclinal troughs. The Site is located in the West Coast Basin, which constitutes the southwest portion of the Los Angeles Basin (Stantec, 2008).

The Site is located near the junction of the Torrance Plain and the Dominguez Erosion Gap. The Torrance Plain runs west of and parallel to the hills of the Newport-Inglewood uplift from the Ballona Gap southeast to the Dominguez Gap. The Plain is a broad featureless area only slightly dissected locally by the Dominguez Creek (Dominguez Channel) (Stantec, 2008).

According to boring logs in the Ecology and Environmental, Inc. (EEI) (1986), Metcalf and Eddy (1992), CalEPA (1994) and URS (1994) reports, sediments underlying the Site, to the maximum explored depth of 92 feet below ground surface (ft bgs), consist primarily of a mixture of clays and silts with interbeds of sand (Stantec, 2008).

The Site is underlain by the Bellflower Aquiclude at the ground surface, and beneath that, the Gardena and/or Gage Aquifers of the Lakewood Formation within the larger, West Coast Groundwater Basin. Regionally, the Bellflower Aquiclude contains interfingered zones of permeable and less permeable sediments with modest to relatively high hydraulic conductivity. Little beneficial use is made of water in these

shallow, discontinuous hydraulic zones because well yields tend to be low and water quality generally poor (CalDWR, 1961).

Immediately beneath the site, there are two hydraulic zones within the Bellflower Aquiclude: Zone A (upper) and Zone B (lower), which are approximately 15 to 25 and 75 to 80 ft bgs, respectively. Site groundwater monitoring wells are screened within these two zones (Stantec, 2008). Presently the shallow groundwater beneath the Site is influenced by the concrete lined Dominguez Channel and flows southward (Stantec, 2010c).

Beneath the Lakewood Formation are the Lynwood and the Silverado Aquifers, which are capable of storing or conveying groundwater in significant quantities and constitute major sources of groundwater in the West Coast Groundwater Basin. While these aquifers are designated as primary and secondary sources of domestic water supply, neither the Gardena nor Gage Aquifers are currently pumped for domestic use (Stantec, 2008).

The area surrounding the Site is urbanized, with surface waters that drain via storm drains into the Dominguez Channel. The upstream portion of the modern day Dominguez Channel originates several miles west-northwest of the Site, and it drains surface water to the southeast where it discharges to the Cerritos Channel of the Los Angeles Harbor. Historically, the Dominguez Channel flowed along a natural channel bed located approximately several hundred feet west and north of the Site, where it flowed eastward into Laguna Dominguez. Surface water at the Site generally drains towards the north and east following site topography, and is intercepted by a flood control storm drain located at the northeast corner of the Site adjacent to the intersection of Artesia Boulevard and Normandie Avenue (Stantec, 2008).

Contaminant Distribution

During the 2006, 2008, and 2009 Remedial Investigation (RI) activities, Stantec collected subsurface soil, sludge, surface water, groundwater, perched groundwater, soil gas, and soil vapor flux samples to identify the nature and extent of contamination. Results of the sampling activities are summarized in the following paragraphs.

Sludge

The Cooper North and South Sumps have a maximum thickness of 17.5 ft and 13.5 ft, respectively, while the Haack Sump varies in thickness from 0.5 to 3 ft to depths up to 14.6 ft bgs. Based on analytical results, attenuation of sludge was typically 1 to 7.5 ft below the bottom of the sludge (Stantec, 2008). The sludge volumes in the sumps are

6,700 cubic yards (cy), 7,000 cy, and 2,250 cy in the Cooper South, Cooper North, and Haack Sumps, respectively (Stantec, 2010c).

The Haack rework area consists of deposited sludge, soil, and debris in discontinuous and mixed layers beneath a soil cover with thickness varying from less than 1 foot to 10 feet. Stantec calculated approximately 650 cy of material is in the Haack Rework Area (Stantec, 2010c).

Constituents identified in the sludge included volatile fuel hydrocarbons (VFHs), total extractable hydrocarbons (TEHs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons (PAHs), Title 22 metals, mercury, and hexavalent chromium.

Surface Water

Surface water samples were collected upstream and downstream of the Site from the Dominguez Channel in 2006 and 2008. Analytical data from surface water samples indicated elevated concentrations of gasoline range organics (GRO) and VOC analytes in contrast to the non-detections for those analytes in groundwater monitored at the Site. Based on the organic chemical parameters, the Site is not impacting surface water quality in the channel.

Soil Gas

The soil gas investigation activities evaluated the subsurface concentrations of VOCs, hydrogen sulfide, and methane at various locations across the Site for use in the baseline human health risk assessment (HHRA). Constituent concentrations reported above the detection limit for targeted VOCs include benzene, toluene, ethylbenzene, m-,p-,o-xylenes, 1,3,5-trimethylbenzene, and Freon 113. Methane and hydrogen sulfide were also detected in samples collected during the 2006 RI activities.

Soil Vapor Flux

Air pathway analysis (APA) was performed on ambient air samples, exposed disturbed and undisturbed sludge on the Cooper property, soil on both the Cooper and Haack properties, and asphalt and concrete slab-covered soil on the Haack property. Results of the APA indicated methane and select VOCs were present in ambient air likely due to industrial activities on the Haack property and sludge on the Cooper property. The undisturbed sludge had low to moderate emissions, while the disturbed condition can be generally characterized as having moderate to high area source emissions. Odor analyses confirmed the potential for sulfuric compounds from disturbed sludge to create nuisance odors to people in the area or downwind of the disturbed sludge. The infiltration analysis in locations above cracks and seams in the asphalt and concrete

indicated that the individual compound emissions are greatly affected by the surface coverings and slab.

Groundwater

The *First Quarter 2010 Groundwater Monitoring Report* identified nine of ten groundwater monitoring wells as having no detectable concentrations of GRO, VOCs, or PAHs above the Reporting Limit (RL). Samples from MW-05A had detections of GRO and VOCs above the RL. SVOCs were reported in wells MW-01A, MW-01B, and MW-02A. Generally, groundwater samples from onsite wells have a pH ranging between 4.5 and 8.0. Metals detected in samples collected from the groundwater wells included barium, arsenic, cobalt, copper, nickel, and zinc.

Perched Groundwater

~~Perched groundwater in the Haack Sump area is suspected to be the result of leaking utilities.~~ (RTC, 9/29/11) Perched groundwater has been detected at several locations beneath the Site. Total metals detected above primary and/or secondary MCLs included: antimony, arsenic, beryllium, cadmium, chromium, copper, nickel, selenium, and zinc. Dissolved metals above primary and/or secondary MCLs included: nickel and zinc. Benzene was detected in a perched groundwater sample below the MCL, and some SVOCs were detected above the detection limit but below the RL.

Treatability Study

A treatability study was conducted by Stantec to define and evaluate the physical and chemical characteristics of the sludge and evaluate neutralization/stabilization options. Acidity, wet density, moisture, viscosity, softening point, and leaching were evaluated on untreated sludge samples. Different reagent mixes were tested with the sludge to evaluate their neutralization/stabilization ability. Thermal treatment and asphaltic recycling were also evaluated during the treatability study.

The treatability study indicated the following:

- The acidity of the sludge ranged from 6.1 to 20.8 percent by weight;
- The densities for the samples ranged from 63 lb/ft^3 to 79 lb/ft^3;
- The average moisture of the sludge ranged from 9.8 to 22.3 percent on a wet basis;
- The sludge is highly viscous, ranging from 1.7×10^6 to 2.5×10^6 centipoises (cP) at a reference temperature of 140ºF;

- The softening point of the sludge varied from 158ºF for samples collected from the Cooper property to over 210 ºF for samples collected from the Haack Rework area;
- A mixture of 50 percent hydrated lime ($Ca(OH)_2$) and 50 percent calcium carbonate fines ($CaCO_3$) with the addition of 10 percent water and 50 percent soil by weight effectively solidifies the sludge, fixates lead, and neutralizes acid gases such as hydrogen sulfide (H_2S) and sulfur dioxide (SO_2);
- Disrupting or heating the sludge will result in the release of H_2S and SO_2 gases, but the release of VOCs from the sludge should be minimal unless the sludge is heated;
- The SPLP extracts for untreated sludge contained detectable lead, but lead was below the detection limits in SPLP extracts for treated sludge;
- The permeability of the untreated sludge was less than $1x10^{-8}$ cm/sec due to the monolithic, asphaltic properties of the untreated sludge, but the permeability of the material increased to $9x10^{-3}$ cm/sec after treatment;
- The sludge has a high BTU value of 13,000 BTUs/lb, but the high sulfur content of the sludge (7 percent sulfur) would make incineration or use of the sludge as a fuel prohibitively expensive due to sulfur-removal and vapor treatment requirements; and
- Testing for asphaltic qualities of the sludge indicates that it will be unsuitable for use as recycled asphalt for road construction or roofing since it has no ductility, high viscosity, and high solids content.

Feasibility Study Process

The Feasibility Study (FS) process is specified by the USEPA. The purpose of the FS process is to provide sufficient information on potential remedial options so that informative treatment decisions can be made. The FS process consists of developing remedial alternatives, screening those alternatives, and then performing a detailed analysis of the most applicable alternatives. The steps to this process include:

- Developing Remedial Action Objectives (RAOs) based on the results of the RI, HHRA, and future site use;
- Identifying and selecting applicable remedial technologies for soil based on effectiveness, implementability, and cost;
- Developing alternatives from the retained remedial technologies that satisfy the RAOs;

- Screening the alternatives and performing a detailed analysis of each of the final alternatives; and
- Performing a comparative analysis of the final alternatives sufficient to provide the information necessary to select an appropriate remedy for the site.

Remedial Action Objectives and Cleanup Criteria

RAOs are goals specific to various media and apply to those media that have been identified as posing an unacceptable risk based on the HHRA work performed for the Site. The RAOs for onsite soils, soil gas, and groundwater are:

- Prevent ingestion/direct contact with sludge and/or soil having 10^{-5} to 10^{-6} excess cancer risk from carcinogenic constituents as represented by arsenic, hexavalent chromium, naphthalene, and the BaP-eq concentration;
- Prevent dermal contact with shallow groundwater having 10^{-5} excess cancer risk from carcinogenic polycyclic aromatic hydrocarbons (PAHs) as represented by dibenz(a,h)anthracene;
- Prevent dermal contact with low pH, PAH containing sludge (RTC, 2/10/12);
- ~~Prevent inhalation of benzene posing excess cancer risk levels of 10^{-5} to 10^{-6}~~ (RTC, 9/29/11);
- Prevent inhalation of volatile organic compounds (VOCs), as represented by benzene, posing excess cancer risk levels of 10^{-5} to 10^{-6} (RTC, 9/29/11); and
- Prevent explosive risks associated with methane. (RTC, 9/29/11)

Applicable Remedial Technologies

Potentially applicable technologies for soil remediation were screened based on effectiveness, implementability, and cost. The remedial technologies determined to be most applicable to the Site are:

- No action;
- Institutional controls;
- Treatment:
    - Stabilization/neutralization
- Containment;
- Excavation and removal for offsite disposal; and
- Engineered controls:
    - Vapor and gas control systems; and

- Groundwater monitoring.

Other technologies identified but eliminated from further consideration are:

- Treatment:
  - Thermal treatment and
  - Sludge recycling

These technologies were eliminated primarily due to their ineffectiveness as identified during the treatability study.

Development of Remedial Alternatives

Four alternatives were developed from the retained remedial technologies:

- Alternative (A) 1 – No action: This consists of no remedial actions or institutional controls to address soils above target cleanup levels;
- ~~A 2 – Capping with selective excavation: This alternative consists of excavating the Haack Rework area and a portion of sludge overflow along the eastern Cooper sump and consolidating the materials above the Cooper North and South Sumps. A cap consisting of a stabilization layer, foundation layer, low-hydraulic conductivity layer, and erosion resistance layer would be constructed above the sumps. A gas control and monitoring system would be installed beneath the cap and around the sumps, and groundwater monitoring would remain ongoing. Institutional controls consisting of a Health and Safety Plan (HASP), Construction Quality Assurance (CQA) Plan, and Risk Management Plan (RMP) would be implemented.~~ (RTC, 9/29/11)
- A 2A – Capping with selective excavation: This alternative consists of excavating the Haack Rework area and disposing of the sludge (RTC, 11/6/12) material offsite. A cap consisting of a high strength geotextile, foundation layer, low-hydraulic conductivity layer, and erosion resistance layer would be constructed above the sumps. A gas control and monitoring system would be installed beneath the cap and around the sumps, and groundwater monitoring would remain ongoing. Institutional controls consisting of a Health and Safety Plan (HASP), land use covenants (LUCs), Construction Quality Assurance (CQA) Plan, and Risk Management Plan (RMP) would be implemented. (RTC, 9/29/11)
- A 3 – Capping with selective excavation and stabilization/neutralization: This alternative includes mixing the top three feet of sludge in the Cooper North and South Sumps with reagent to stabilize/neutralize the sludge. The Haack Rework area and a portion of sludge overflow along the eastern Cooper sump would be

mixed with the stabilized/neutralized material. A cap consisting of a foundation layer, low-hydraulic conductivity layer, and erosion resistance layer would be constructed above the Cooper North and South and Haack Sumps. A gas control and monitoring system would be installed beneath the cap and around the sumps, and groundwater monitoring would remain ongoing. Institutional controls consisting of a Health and Safety Plan (HASP), Construction Quality Assurance (CQA) Plan, and Risk Management Plan (RMP) would be implemented.

- A 4 – Excavation with offsite disposal: This alternative includes excavation of sludge with disposal offsite. The sludge would be mixed with the neutralizing agent and loaded into trucks for disposal offsite. Major components of this alternative include concrete and asphalt removal, excavation and mixing of sludge, transportation to the disposal facility, confirmation sampling, sump backfill, and groundwater monitoring.

Detailed Analysis of Alternatives

The CERCLA guidance document explains the nine criteria that are used to evaluate each remedial alternative [USEPA, 1988]. The first two criteria are categorized as threshold criteria that a selected remedy must meet:

- Overall Protection of Human Health and the Environment; and
- Compliance with ARARs.

The following seven criteria are “balancing” criteria. They represent the primary criteria upon which the detailed analysis is based and that are used to distinguish among alternatives that meet the threshold requirements above:

- Long-term Effectiveness and Permanence;
- Reduction of Toxicity, Mobility, and Volume Through Treatment;
- Short-term Effectiveness;
- Implementability;
- Cost;
- State Acceptance; and
- Community Acceptance.

State and community acceptance are evaluated following public comment on the FS Report.

Overall Protection of Human Health and the Environment

Alternative 1, No Action, does not provide adequate protection of human health and the environment. No further assessment or comparison with this alternative is provided. Alternative ~~2~~ 2A (RTC, 9/29/11) would perform better than Alternative 3. While Alternative 3 stabilizes/neutralizes a portion of the sludge, the mixing of the reagent releases potentially hazardous amounts of hydrogen sulfide and sulfuric acid gas. Alternative 4 would provide very good protection of human health and the environment with the removal of the impacted materials; however, because of the risks associated with hazardous gas generation during excavation and transportation of the material, the overall protection is deemed moderate.

Compliance with ARARs

Alternative ~~2~~ 2A (RTC, 9/29/11) would perform better with respect to ARARs due to the reduction of gas emissions when compared to Alternatives 3 and 4.

Long-term Effectiveness and Permanence

Alternative 3 is ranked higher than ~~2~~ 2A (RTC, 9/29/11) with respect to long-term effectiveness and permanence. Both alternatives would be effective and permanent over the long-term with maintenance; however, because Alternative 3 neutralizes a portion of the sludge, the treatment is likely more permanent. Alternative 4 provides the greatest long-term effectiveness and permanence since the sludge is removed from the site and disposed offsite.

Reduction of Toxicity, Mobility, and Volume Through Treatment

Alternative 3 would slightly reduce toxicity and mobility through partial in-situ treatment of the source zone; however, toxicity would increase as acid gases are released during mixing of the sludge for treatment. Alternatives ~~2~~ 2A (RTC, 9/29/11) and 3 would reduce mobility of the sludge by limiting infiltration and wind erosion. Alternative 4 would reduce the mobility of the sludge after offsite disposal since the disposal landfill would be equipped with a liner system to collect leachate; however, transport of the material would temporarily increase the potential mobility.

Short-term Effectiveness

Alternative ~~2~~ 2A (RTC, 9/29/11) would perform the best with respect to short-term effectiveness. Unlike Alternatives 3 and 4, Alternative ~~2~~ 2A (RTC, 9/29/11) does not significantly disturb the sludge, thereby minimizing the release of acid gas. Both Alternatives ~~2~~ 2A (RTC, 9/29/11) and 3 incorporate a cap into the final design which would provide an immediate reduction in risk due to inhalation, dermal exposure, and

ingestion. Alternative 4 would provide a reduction in risk after the sludge was transported offsite; however, risk is temporarily increased in the short-term during sludge disturbance and transport.

Implementability

Alternatives 3 and 4 pose significant implementation issues due to the gas generation during mixing and excavation of the sludge. Gas control and treatment would be necessary during mixing and excavation of the sludge. Construction of a tent to contain the gases would be difficult to perform due to low bearing capacity of the sludge and the area the tent would need to span (minimum of the Cooper North sump). Gases captured by the tent would need treatment prior to discharge.

Alternative ~~2~~ 2A (RTC, 9/29/11) is relatively easy to implement. A stabilization layer on the Cooper sumps would be placed first to provide a surface in which to install the foundation and gas collection, barrier, and cover layers. Disturbance of the sludge would be limited to the eastern overflow and Haack Rework Area, which are significantly degraded and would release significantly less acid gas than the sludge in the Haack and Cooper Sumps (Appendix A, Stantec, 2008). The materials necessary for construction are available and do not require admixtures or special equipment.

All Alternatives are difficult to implement due to the Site's urban setting, size, and proximity to sensitive receptors; however, the design of Alternative 2A limits the effects of these challenges on construction. The urban setting with high traffic flows will be impacted with the significant truck traffic entering and exiting the site with imported soil and exported waste. Alternative 2A limits the traffic by only exporting Haack Rework material and importing minimal soil for backfill and foundation. The size of the Site is limited due to the extent of the sumps leaving little space available for storage, staging, and construction activities. Alternative 2A is not as affected by the space limitations because neutralization materials will not be required, and as such, storage area for these materials is not required for this Alternative. (RTC, 9/29/11)

Alternatives 3 and 4 pose significant implementation issues due to the gas generation during mixing and excavation of the sludge and the potential impacts to neighboring sensitive receptors. Limiting work to night-time only would not reduce the risks to near-by businesses which operate 24-hours a day. Implementation of Alternative 2A has fewer engineering and health and safety complications since the sludge is not fully disturbed, thus limiting the release of hazardous gas. (RTC, 9/29/11)

While Alternative 2A has implementation challenges due to the Site size and location, the design of the Alternative 2A cap results in the most implementable remedial alternative. (RTC, 9/29/11)

Cost

Alternative ~~2~~ 2A (RTC, 9/29/11) has the lowest capital cost of approximately ~~$5,206,314~~ $5,774,550 ~~with Alternatives 3 and 4 having comparable capital costs of $35,402,274 and $54,067,350, respectively~~. (RTC, 11/6/12) Alternative 3 has a capital cost highly dependent on neutralization admixture costs ranging from $11,144,880 to $12,566,880. Similarly to Alternative 3, Alternative 4 has a cost highly dependent on the admixture price ranging from a low of $26,217,950 to a high of $28,991,650. (RTC, 11/6/12)Alternatives ~~2~~ 2A (RTC, 9/29/11) and 3 have identical net present value O&M costs of approximately ~~$1,563,800~~ ~~$2,822,100.00 (RTC, 11/6/12)~~ $4,882,500 (RTC, 11/12/13). Alternative 4 has the lowest net present value O&M cost of approximately ~~$620,500~~ $113,200 (RTC, 11/6/12). Alternative 2A has the lowest combined remedial cost. (RTC, 9/29/11)

State Acceptance

In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the ROD is being prepared.

Community Acceptance

In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the ROD is being prepared. During the May 10, 2011 meeting between the DTSC and the City, the City expressed concerns regarding the appearance of the former Alternative 2 being similar to a "landfill," and the height of the cap being too high. The City expressed the desire that the final remedial Alternative be consistent with the vision and goal of future development for the Site. (RTC, 9/29/11)

Alternative 2A provides a reduced cap thickness, and accounts for future use as a parking lot subgrade consistent with the City's vision for commercial development. Alternative 3 proposes a cap sloping upward to a maximum elevation of 35 ft amsl, which makes parking lot construction more difficult above the high grades and slopes of the Site. Alternative 4 proposes the Site is excavated and filled. Alternative 4 best incorporates the City's vision for commercial development; however, given the implementation, short-term effectiveness, and cost challenges, Alternative 2A provides the best compromise to meet the City's development vision. (RTC, 9/29/11)

Remedy Selection

~~Based on the comparative analysis of the remedial alternatives, the alternative that meets the RAOs and ranks the highest is Alternative 2,capping with selective excavation. The elements of Alternative 2 are:~~ (RTC, 9/29/11)

- ~~Prepare a construction Health and Safety Plan and Construction Quality Assurance Plan;~~ (RTC, 9/29/11)
- ~~Place a 3.5-foot stabilization layer across the Cooper North and South sumps consisting of gravel, sand, and geocell;~~ (RTC, 9/29/11)
- ~~Excavate the Haack Rework area, segregating the overburden soil from the sludge/soil mixture;~~ (RTC, 9/29/11)
- ~~Install retaining wall (sheet pile) along northern perimeter (Artesia Blvd);~~ (RTC, 9/29/11)
- ~~Place the Haack Rework material and other site soils as the foundation layer above the stabilization layer with horizontal gas collection pipes embedded. The foundation layer would increase in thickness and would be graded such that the final surface would drain at 3 percent to the cap perimeters;~~ (RTC, 9/29/11)
- ~~Install vertical gas migration control wells;~~ (RTC, 9/29/11)
- ~~Install geosynthetic layers consisting of, from bottom to top, a gas collection geocomposite, GCL, 60-mil HDPE geomembrane, and drainage geocomposite;~~ (RTC, 9/29/11)
- ~~Place 2 feet of cover soil above the geosynthetics;~~ (RTC, 9/29/11)
- ~~Install groundwater monitoring wells;~~ (RTC, 9/29/11)
- ~~Operate the below-cap gas collection system and the perimeter vertical gas migration control well system as active systems for a period of at least 2 weeks. Following the start-up period, operate the below-cap gas collection system and vertical gas migration control well system passively. During passive operation, monitor the performance of the proposed alternative remedial measure with a system of perimeter gas migration sentry wells outside the limit of the perimeter vertical gas migration control wells. If the monitoring data indicate significant gas migration from the waste, convert the system to active gas control and, if required, include gas treatment;~~ (RTC, 9/29/11)
- ~~Prepare a Risk Management Plan;~~ (RTC, 9/29/11)
- ~~Perform semi-annual groundwater monitoring; and~~(RTC, 9/29/11)

- ~~Complete a formal review of remediation effectiveness after five years.~~ (RTC, 9/29/11)

~~This remedial alternative effectively mitigates the risk from ingestion, inhalation, and dermal contact with onsite soils for both future non-residential and residential occupants of buildings on site, and future landscapers and utility workers. This alternative also effectively mitigates the risk from dermal contact with site groundwater through the cap and institutional controls including the Health and Safety Plan and Risk Management Plan.~~ (RTC, 9/29/11)

~~Alternative 2 readily meets the criteria of overall protection of human health and the environment and satisfies ARARs. When evaluated against the balancing criteria, Alternative 2 provides short-term effectiveness as well as long-term effectiveness and permanence. It is readily implementable and presents an effective balance of cost against the other criteria. Alternative 2 also would best accommodate future potential redevelopment of the Site.~~ (RTC, 9/29/11)

Based on the comparative analysis of the remedial alternatives, the alternative that meets the RAOs and ranks the highest is Alternative 2A, capping with selective excavation. The elements of Alternative 2A are: (RTC, 9/29/11)

- Prepare a construction HASP and CQA Plan;
- Prepare a Risk Management Plan;
- High-strength geotextile installation;
- Select excavation of impacted material;
- Containment of sludge along Artesia Boulevard;
- Capping of sludge;
- Installation of gas control and monitoring system;
- Institutional controls;
- Perform semi-annual groundwater monitoring; and
- Complete a formal review of cap effectiveness after five years. (RTC, 9/29/11)

This remedial alternative effectively mitigates the risk from ingestion, inhalation, and dermal contact with onsite soils for future non-residential occupants of buildings onsite, and future landscapers and utility workers. This alternative also effectively mitigates the risk from dermal contact with Site groundwater through the cap and institutional controls including the Health and Safety Plan and Risk Management Plan. (RTC, 9/29/11)

Alternative 2A readily meets the criteria of overall protection of human health and the environment and satisfies ARARs. When evaluated against the balancing criteria, Alternative 2A provides short-term effectiveness as well as long-term effectiveness and permanence. It is implementable and presents an effective balance of cost against the other criteria. Alternative 2A could also accommodate future potential redevelopment of the Site as a parking lot to support a commercial operation. (RTC, 9/29/11)

1. INTRODUCTION

1.1 Terms of Reference

This document presents the Revised Final Draft (RTC, 11/6/12) Feasibility Study (Revised Final Draft FS) Report for the Gardena Sumps Site (Site) in Gardena, California. The FS Report is a requirement of Consent Decree CV04-7882-AHM (JTLx), (Consent Decree). The original draft (RTC, 11/6/12) FS Report (Draft FS) was prepared for submittal to the California Environmental Protection Agency (CalEPA), Department of Toxic Substances Control (DTSC) in accordance with the California Health and Safety Code on 11 February 2011. After submittal of the Draft FS, the following timeline of correspondence and revisions occurred:

- A meeting with the DTSC and City of Gardena on 2 May 2011 and receipt of comments from the DTSC 6 June 2011 and 9 June 2011.

- Responses to comments including the Draft Feasibility Study Addendum – Alternative 2A (FS Addendum) were prepared by Geosyntec Consultants, Inc. (Geosyntec) and submitted to the DTSC on 29 September 2011.

- Comments on the FS Addendum were received from the DTSC on 31 October 2011 and 11 November 2011.

- Calculations supporting the preliminary cap design were requested by the DTSC 28 January 2012. The calculations were subsequently transmitted to the DTSC on 1 February 2012.

- A letter in response to DTSC comments received 31 October 2011 and 11 November 2011 was issued by Geosyntec on 7 February 2012.

- Additional DTSC comments on the Addendum and 10 February 2012 response to comments package were received on 7 March 2012 and 30 March 2012.

- A response to comments package was submitted to DTSC by Geosyntec on 4 April 2012 as the Revised Draft Feasibility Study (Revised FS) which included clarification sheets for the Draft FS and FS Addendum.

- Comments were received from the DTSC on the Draft FS, comment responses, and Revised FS on 6 September 2012. (RTC, 11/6/12)

- Comments were received from the City of Gardena through the DTSC during meetings on 11 July, 30 August 2013, and 5 September. Appendix F, Alternative 2A Cover Option is the response to those comments. (RTC, 11/12/13)

- Comments were received from DTSC on the Revised Final Draft FS on 3 October 2013 and a response was issued 13 November 2013. (RTC, 11/12/13)

This document represents the Updated (RTC, 11/12/13) Revised Final Draft FS following a recommendation in the 6 September 2012 comment package to revise the documents to form one, comprehensive Feasibility Study. This package addresses the comments and concerns which were presented in the letters received from DTSC. This draft represents revisions to the original, Draft FS with the changes identified in the following manner:

- Text deleted from the report is ~~struck-out~~ with the corresponding comments package date at the end (RTC, [Date]).

- Text added to the report is underlined with the corresponding comments package date at the end (RTC, [Date]).

- Text removed from a revised text section is ~~struck-out and underlined~~ with the corresponding comments package date at the end (RTC, [Date]).

- Text added to a revised text section is double underlined with the corresponding comments package date at the end (RTC, [Date]).

A summary table of all comments received from the DTSC and their responses is included as Appendix A.

This report was prepared by Ms. Rebecca Flynn **Oliver**, P.E., of Geosyntec and reviewed by Mr. Gregory Corcoran, P.E., both of Geosyntec, in accordance with Geosyntec's peer review policy.

1.2 Description of Feasibility Study Process

The Remedial Investigation (RI) for the Site comprises three separate reports: the *Revised Draft Remedial Investigation Report* (Stantec, 2008); the *Draft Memorandum – Data Gap Analysis* (Stantec, 2010a); *Draft Human Health Risk Assessment* (HHRA) (Geosyntec, 2010); and the *Addendum to the August 22, 2008 Revised Draft 2006 Remedial Investigation Report* (Stantec, 2010c). This FS Report includes the following information and evaluations in general accordance with *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA, 1988):

- Background information on the Site, including a summary of investigative and remedial work performed to date;

- Future use of the Site, future risk exposure pathways, and receptors that may be at risk;
- Remedial Action Objectives (RAOs) and cleanup criteria;
- Identification of remedial technologies that potentially can be employed to remediate the Site contaminants;
- Screening of the remedial technologies to identify those that can realistically remediate or isolate wastes at the Site;
- Development of a range of potential remedial technologies to address impacted soil, soil gas, and groundwater, and remedial alternatives, which are combinations of remedial technologies that can address impacted media at the Site;
- Screening of the remedial alternatives to identify those that can realistically address conditions at the Site;
- Analysis of remedial alternatives using United States Environmental Protection Agency (USEPA) criteria; and
- Comparative analysis of remedial alternatives that will result in identification of the preferred remedial alternative for the Site.

1.3 Organization

This document is organized into the following sections:

- Section 2 – "Site Background," describes the history and physical characteristics of the Site, including hydrogeology;
- Section 3 – "Remedial Investigation Summary," summarizes the results of the remedial investigation;
- Section 4 – "Remedial Action Objectives and Cleanup Criteria," summarizes the findings of the draft HHRA and identifies the potential future use of the Site, future risk exposure pathways, and potential receptors that may be at risk. The RAOs also are identified, along with cleanup criteria selected to achieve those objectives;
- Section 5 – "Identification and Screening of Technologies," identifies potential remedial technologies. The remedial technologies are then screened based on their effectiveness, implementability, and cost to address human health risks and ecological risks associated with these media;
- Section 6 – "Development of Remedial Alternatives," uses the retained technologies from Section 5 to compile remedial alternatives that address a range of potential response actions and technical approaches for the Site.

Remedial alternatives are further screened, evaluated and ranked in terms of effectiveness, implementability, and cost to identify the final set of remedial alternatives for detailed analysis;

- Section 7 – "Detailed Analysis of Alternatives," presents a nine-criteria analysis of the final set of remedial alternatives;
- Section 8 – "Comparative Analysis of Alternatives," uses the nine-criteria analysis results to compare the alternatives to assess which alternative provides the best balance of the nine criteria, and is, therefore, the recommended alternative; and
- Section 9 – "References," presents the FS Report references.

Tables, figures, and appendices are included at the end of this FS Report.

2. SITE BACKGROUND

2.1 General

This section includes the following background information on the Site:

- Site location and description;
- Site history;
- Geology; and
- Hydrogeology

The information presented in this section generally has been excerpted from the *Revised Draft RI* (Stantec, 2008).

2.2 Site Location and Description

The Site is located in the southwest corner of the Artesia Boulevard and Normandie Avenue intersection in the City of Gardena, Los Angeles County, California (Figure1-1). Generally, the area surrounding Site is bordered to the south by the Los Angeles County Department of Public Works (LACDPW) Dominguez Flood Channel, to the east by the Southern Pacific Railroad right-of-way, to the west by the western Haack property line, and to the north by Artesia Boulevard, although a small portion of Artesia Boulevard is included within the Site. Commercial and residential properties are currently located to the north, east, and west of the Site (Figure 1-2) (Stantec, 2008). For the purpose of this report, the Site is comprised of the Cooper, Haack, and four (4) residential properties as shown on Figure 1-2.

The Site is greater than 5.6 acres of mixed-use development and primarily consists of two properties, the Cooper property and the Haack property. The Cooper property is approximately 3.0 acres, approximately 90 percent of which is comprised of two large sumps (referred to as the "Cooper North" and "Cooper South" sumps) containing primarily petroleum refining wastes. The Haack property is approximately 2.6 acres, contains one modified sump (referred to as the "Haack sump") and the "Haack Rework Area", which is a reworked and mixed sludge/soil area south of the Haack sump. The Haack Rework Area encroaches onto the extreme northern portions of the two easternmost residential lots. In this FS Report, the wastes in the sumps will be referred to as "sludge" for ease of reference. This FS Report will address the three sumps and the Haack Rework Area, constituting the areas of concern (Figure 1-2) (Stantec, 2008).

2.3 Site History

The *Revised Draft RI* documents the site history and presents historic aerial photographs. The following section summarizes the site history and evaluation of the photographs presented by Stantec (Stantec, 2008).

Early topographic maps show that the eastern (Cooper property area) and southern (southern Haack and residential areas) portions of the Site were elevated, which suggests that some amount of clay material could have been extracted from excavations into the elevated bluff.

During the 1920's, the Moneta Brick Company leased the Site. By 1928 the area of the two Cooper sumps had been excavated to a lower surface elevation than the current LACDPW land to the south and most of the Haack and residential properties. The railroad tracks east of the Cooper property were elevated above the land surface of the current Cooper property, and clay mining at the Cooper property had been completed by this time. Clay mining operations were occurring on the northern Haack property in 1928 and 1929. By 1929 the southern portion of the Haack property (present Haack Rework Area) had an elevated scoured slope. This elevated area sloped eastward towards the land surface of the current southern Cooper property. Boring logs from RB-2 and RB-3 indicate that fill material (including brick and concrete debris and glass) extended to elevations of approximately 8 feet above mean sea level (amsl) (depths of 17 to 20 feet below the scoured slope surface) in portions of the Haack Rework Area. An aerial photograph from May 1938 documents that creation of the disposal sumps at the Site had not yet begun. Denys Goddard purchased the land consisting of the current Haack, Cooper, and residential properties in May 1939.

Newspaper reports indicate that sludge disposal had commenced by March 1940. The Haack Sump, Cooper South Sump, and the Haack Rework Area had been constructed and contained sludge by March 1941. The Cooper North Sump had not yet been constructed. By early December 1941 the eastern and northern berms of the Cooper North Sump had been constructed and initiation of sludge disposal into this sump had commenced. Sludge deposition at the Site had occurred at the Haack Sump, the Haack Rework Area, a small pit between these two locations (constructed after March 1941), and the Cooper South Sump by this time.

By September 1946, the Haack and two Cooper sumps were filled with sludge, and vegetation had reclaimed the small pit and the Haack Rework Area. Some excavation of soil had occurred into the bluffs west and south of the western portion of the Haack Sump, but there had been no further development of the Haack and Cooper properties. Denys Goddard sold the future Haack and Cooper property parcels to Wendell and

Golda Hopkins in March 1947, but maintained ownership of the residential lots. The Hopkins' sold their property to S&L Manufacturing in January 1948.

By December 1951, the western portion of the Haack Sump had been covered with dirt and was converted to a parking lot. The eastern portion of the Haack Sump does not appear to have been altered. A significant portion of the bluff south and southwest of the Haack Sump had been excavated. This excavation activity removed the small sludge pit that was located between the Haack Sump and the Haack Rework Area. Two structures had been constructed in the northwestern portion of the Haack property. The Haack Rework Area remained vegetated and the two easternmost residential lots (on the Goddard property) had structures on them.

On October 1, 1952, S&L Manufacturing sold the northern-most strip of their property to the State of California for a highway easement. By early 1956, Artesia Blvd (Highway 91) had been constructed with the southern portion of the roadway encroaching into the Haack Sump northern berm.

By January 1958, the Dominguez Channel had been reconstructed and extended eastward south of the Site. A third structure (the "administrative building") had been constructed on the Haack property at the southern edge of the parking lot. The Cooper property had not significantly changed since 1951. The two westernmost residential lots had structures on them by this time. In May 1958, S&L Manufacturing sold the current Haack and Cooper properties to Charles Warfel. Warfel then sold the current Cooper property to William Ward in January 1959 and the Haack property to Clarence and Genevieve Haack in May 1960. In late 1960, the City of Gardena annexed the area of the Site from the County of Los Angeles.

By November 1962 significant changes had occurred at the Haack property. The bluff immediately south of the "administrative building" had been excavated back to the present day cut-bank (located west of boring HPB11). This excavation expanded the parking lot south of the "administrative building." The parking lot on the Haack property appeared to have been paved, although the eastern portion of the Haack property remains a vegetated area immediately west of the Cooper North Sump. The Haack Rework Area appeared altered and may have received soil cover from the excavation activities that occurred immediately north of the Haack Rework Area. The future Cooper property was unchanged. William Ward sold his property to Thomas Cooper in December 1977.

The two Cooper sumps currently are capped by a geosynthetic material that was installed by OHM Corporation (OHM) in July 1993 as part of the DTSC's environmental program at the Site. The Haack Sump has been covered by asphalt and a concrete slab. Currently the Haack property is leased to various tenants who operate

small businesses, including a U-Haul rental agency, a metal fabricating, sand blasting and painting company, and an auto body repair shop. Three buildings and numerous small trailer-type storage structures are present on the Haack property.

2.4 Geology

The following discussion is based on California Department of Water Resources (CalDWR) Bulletin No. 104, Planned Utilization of the Ground-water Basins of the Coastal Plain of Los Angeles County, Appendix A — Ground Water Geology, dated June 1961, reprinted April 1988 (CalDWR, 1961) and discussions contained in reports from previous investigations (CalEPA 1994, URS 1994, and Stantec, 2008).

The Site is located in the Los Angeles Coastal Plain and is underlain by a thick sequence of marine and continental sediments that were deposited in a ~~board~~ broad (RTC, 9/29/11) synclinal depression. This depression is generally referred to as the Los Angeles Basin. The Los Angeles Basin is bisected by the northwest trending Newport-Inglewood uplift, which divides the Coastal Plain into two smaller synclinal troughs. The Site is located in the West Coast Basin, which constitutes the southwest portion of the Los Angeles Basin.

The Site is located near the junction of the Torrance Plain and the Dominguez Erosion Gap. The Torrance Plain runs west of and parallel to the hills of the Newport-Inglewood uplift from the Ballona Gap southeast to the Dominguez Gap. The Plain is a broad featureless area only slightly dissected locally by the Dominguez Creek (Dominguez Channel).

According to boring logs in the Ecology and Environmental, Inc. (EEI) (1986), Metcalf and Eddy (1992), CalEPA (1994) and URS (1994) reports, sediments underlying the Site, to the maximum explored depth of 92 feet below ground surface (bgs), consist primarily of a mixture of clays and silts with interbeds of sand. Copies of the available boring logs from these previous studies are provided in Appendix F and summarized in Table 13 of the *Revised Draft RI* (Stantec, 2008). This stratigraphy correlates in general with the observed conditions in borings completed in conjunction with the *Revised Draft RI* (Stantec 2008), which reached a maximum depth of 100 feet bgs.

2.5 Hydrogeology

The following discussion is based on CalDWR *Bulletin No. 104, Planned Utilization of the Ground-water Basins of the Coastal Plain of Los Angeles County, Appendix A - Ground Water Geology*, dated June 1961, reprinted April 1988 (CalDWR, 1961) and discussions contained in reports from previous investigations (CalEPA 1994, URS 1994, Stantec, 2008).

The Site is located in what is known as the West Coast Groundwater Basin. The West Coast Groundwater Basin has existing beneficial uses for municipal and domestic supply wells, agricultural supply, industrial process supply, industrial service supply, and aquaculture (LARWQCB, 1994). (RTC, 9/29/11) This basin is hydraulically isolated from other, larger groundwater basins in the Coastal Plain by the regional Newport-Inglewood Fault. The Site is underlain by Holocene and late-Pleistocene Age alluvial and marine deposits, which include the Bellflower Aquiclude at the ground surface, and the Gardena and/or Gage Aquifers of the Lakewood Formation beneath the aquiclude. Major underlying aquifers (beneath the Lakewood Formation) are the Lynwood and the Silverado Aquifers of the San Pedro Formation.

The uppermost defined unit within the basin, and the unit that the Site is located within, is the Bellflower Aquiclude. Regionally, the Bellflower Aquiclude contains interfingered zones of permeable and less permeable sediments. The zones with modest to relatively high hydraulic conductivity consist of fine to coarse sand with gravel and silty sand. These coarser grained sediments vary in thickness from 10 to 60 feet and are not laterally continuous. However, in some areas, these permeable zones can contain significant amounts of water. Little beneficial use is made of water in these shallow, discontinuous hydraulic zones because well yields tend to be low and water quality generally poor (CalDWR, 1961).

The Gardena/Gage, Silverado, and Lynwood Aquifers are all capable of storing or conveying groundwater in significant quantities and constitute major sources of groundwater in the West Coast Groundwater Basin. The Lynwood and Silverado Aquifers are primary sources for domestic water supply, while the Gardena and Gage Aquifers are a secondary domestic water supply source. Neither the Gardena nor Gage Aquifers are currently pumped for domestic use. The intervening finer-grained aquitards have not been named. These aquitards, including those that separate the Gardena and Gage Aquifers from the Lynwood Aquifer and the Lynwood Aquifer from the Silverado Aquifer, are discontinuous in nature and absent in some areas.

Immediately beneath the Site, there are two hydraulic groundwater zones within the Bellflower Aquiclude: Zone A (upper) and Zone B (lower), which are approximately 15 to 25 and 75 to 80 ft bgs, respectively. Site groundwater monitoring wells are screened within these two zones. General groundwater chemistry analyses were performed at the Site to evaluate if a hydraulic interconnection exists between Zone A and Zone B due to the existence of a downward vertical gradient between the two zones. The groundwater chemistry analysis indicated that the two zones are characterized by different groundwater geochemistry. The concrete lined Dominguez Channel influences the flow direction of the shallow Zone A groundwater southward while the deeper Zone B groundwater has a flow direction to the east – southeast. Groundwater monitoring at the

Site over the past seven years indicates that COCs are not migrating vertically or laterally over any significant distance from the locations of the waste material. (RTC, 1/9/2013)

The area surrounding the Site is urbanized, with surface waters that drain via storm drains into the Dominguez Channel. The Dominguez Channel is a concrete-lined flood-control structure immediately south of the Site. The upstream portion of the modern day Dominguez Channel originates several miles west-northwest of the Site, and it drains surface water to the southeast where it discharges to the Cerritos Channel of the Los Angeles Harbor. Surface water at the Site generally drains towards the north and east following site topography, and is intercepted by a flood control storm drain located at the northeast corner of the Site adjacent to the intersection of Artesia Boulevard and Normandie Avenue.

Historically, the Dominguez Channel flowed along a natural channel bed located approximately several hundred feet west and north of the Site where it flowed eastward into Laguna Dominguez. Presently the shallow groundwater beneath the Site is influenced by the concrete lined Dominguez Channel and flows southward.

3. REMEDIAL INVESTIGATION SUMMARY

3.1 General

The nature and extent of hydrocarbon and metal impacts at and surrounding the Site have been evaluated through several investigation programs conducted since 1982. Sludge, soil, surface water, groundwater, and soil vapor have been investigated. The following sections provide a summary of findings for each of these media. Details of the investigations and findings can be found in the *Revised Draft RI* (Stantec, 2008) and the *Addendum to the Revised Draft RI* (Stantec, 2010c).

3.2 Nature and Extent of Contamination

3.2.1 Soil/Sludge

As part of the RI investigation, Stantec collected over 300 subsurface soil and sludge samples from beneath and surrounding the sumps and rework area to delineate the vertical and horizontal extents of continuous (nonreworked) sludge and sludge-induced impacts to the adjacent soil (Figure 3-1). The samples were analyzed for organic and inorganic constituents. In addition, pH was measured to determine the effects of the sludge on the soil pH near the sumps and adjacent berms. Organic constituents analyzed were: volatile fuel hydrocarbons (VFHs), total extractable hydrocarbons (TEHs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and polynuclear aromatic hydrocarbons (PAHs). Inorganic constituents analyzed were: Title 22 metals, mercury, and hexavalent chromium.

Sludge constituents are as follows (Stantec, 2008):

- **VFH and TEH**: Heavier hydrocarbon compounds predominate in the sludge.
- **VOCs**: Most commonly detected include ethylbenzene, p-isopropyltoluene, naphthalene, toluene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and m-, o-, p-xylene compounds.
- **Non-PAH SVOCs**: Not typically detected in sludge samples due to the dilution factor necessary to analyze the sludge samples.
- **PAHs**: The most predominant PAH compounds include benzo(a)-pyrene, benzo(b)-fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene.
- **Title 22 Metals**: Background, offsite soil, onsite non-reworked soil, and sludge samples were collected during the RI. Antimony, barium, cadmium, vanadium, and zinc were all reportedly lower in the sludge when compared with background soil, while lead and molybdenum were higher in the sludge when compared to background soil. Arsenic and thallium concentrations were

similar in the sludge and background soil while copper had a wider range (higher and lower) of concentrations in sludge compared to background soil. During the 2006 RI field investigation, arsenic was detected in background soil on the LADPW property at 82 milligrams per kilogram (mg/kg). Sampling was performed during the subsequent 2009 RI field investigation at this location and immediate vicinity and resulted in arsenic concentrations of less than 5.5 mg/kg; therefore, the 82 mg/kg concentration could not be confirmed (Stantec, 2010a). Isolated areas on the Haack property had significantly higher concentrations of antimony, arsenic, chromium, copper, molybdenum, nickel, and zinc than typically found at the Site (Stantec, 2010c).

- **Chromium VI**: Analytical results for hexavalent chromium and total chromium in sludge ranged from <0.026 to 0.73 mg/kg and 0.55 to 4.7mg/kg, respectively. Analytical results for hexavalent chromium and total chromium in background soil ranged from <0.026 to 1.3 mg/kg and 6.0 to 28 mg/kg, respectively. One background 2006 soil sample was suspect for hexavalent chromium, having hexavalent chromium and total chromium values of 100 mg/kg and 33 mg/kg respectively (Stantec, 2008; Geosyntec, 2010). Subsequent resampling of this location resulted in hexavalent chromium and total chromium values of <1.0 mg/kg and 17 mg/kg respectively; therefore, the 2006 hexavalent chromium test result of 100 mg/kg is suspect (Geosyntec, 2010).
- **pH**: ~~The pH of the sludge samples averaged 2.22~~ <u>The pH of the sludge samples ranged from 0.39 to 9.05</u> (RTC, 9/29/11) while pH of the background soil averaged 6.57 (Stantec, 2008). The 2009 RI activities included an assessment of pH in soil adjacent to the sludge. Results of testing indicate pH ranges from 5.2 to 10.3 in soil adjacent to the sludge (Stantec, 2010a).

During the RI, four areas of sludge disposal were investigated: the Cooper South Sump, the Cooper North Sump, the Haack Sump, and the Haack Rework Area. The delineation of nonreworked sludge is shown on Figure 1-2 and illustrates the lateral extent of congruent sludge having any thickness. Below is a summary of the results of the delineation (Stantec, 2008):

- **Cooper South Sump**: The Cooper South Sump has an identified maximum thickness of 13.5 feet. Figure 10A of the *Revised Draft RI* (Stantec, 2008) illustrates the general vertical profile of this sump. Vertical attenuation of sludge impacts in soil typically ranged from 1.5 to 3 feet beneath the sludge; lateral impacts of sludge in soil is negligible. Approximately 6,700 cubic yards (CY) of sludge was calculated by Stantec to be in the Cooper South Sump (Stantec, 2010c). Approximately 8,000 CY of sludge containing soil

interbeds was calculated by Stantec to be in the Cooper South Sump (Stantec, 2008).

- **Cooper North Sump**: The Cooper North Sump has an identified maximum thickness of 17.5 feet. Figure 10A of the *Revised Draft RI* (Stantec, 2008) illustrates the general vertical profile of this sump. Vertical attenuation of sludge impacts in soil typically ranged from 5 to 7.5 feet beneath the sludge, with the exception of one boring where chrysene was detected up to 11 feet beneath the sludge. Some TEH and PAH constituents were detected approximately 6 feet laterally from this sump in depths up to 15 feet bgs indicating some lateral migration in soil to the north; however, other borings indicated lateral impacts of sludge in soil is negligible. Stantec calculated approximately 7,000 CY of sludge is in the Cooper North Sump (Stantec, 2010c). Approximately 9,300 CY of sludge containing soil interbeds was calculated by Stantec to be in the Cooper North Sump (Stantec, 2008).
- **Haack Sump**: The Haack sump consists of several discontinuous layers of sludge varying in thickness from 0.5 to 3.0 feet to a depth up to 14.6 feet bgs. Boring logs indicated the western and central areas of the sump had been reworked, possibly during site development in the late 1940's. Figure 10B of the *Revised Draft RI* (Stantec 2008) illustrates the general vertical profile of this sump. Stantec calculated approximately 2,250 CY of sludge is in the Haack Sump (Stantec, 2010c). Approximately 2,900 CY of sludge containing soil interbeds was calculated by Stantec to be in the Haack Sump (Stantec, 2008).
- **Haack Rework Area**: The Haack rework area consists of deposited sludge, soil, and debris in discontinuous and mixed layers beneath a soil cover with thickness varying from less than 1 foot to 10 feet. The thickness of sludge in the western portion of the Haack Rework Area is thinner and occurs at a higher elevation than at the eastern edge of the Haack Rework Area. Figures 10E and 10F of the *Revised Draft RI* (Stantec, 2008) illustrate the general vertical profile of this area. Stantec calculated approximately 650 CY of material is in the Haack Rework Area (Stantec, 2010c). Approximately 1,200 CY of sludge containing soil interbeds was calculated by Stantec to be in Haack Rework Area (Stantec, 2008).

Delineation borings were conducted at several specific areas of the Site. The results of the sampling are provided in the *Revised Draft RI* (Stantec, 2008) and summarized below:

- **Eastern LACDPW Easement**: Borings were performed to determine if sludge had migrated offsite onto the LACDPW property east of the Cooper property. The 2006 delineation borings encountered sludge within 6 inches

bgs in all five delineation borings (Stantec, 2008). Subsequent delineation borings were performed in 2009 east of the 2006 delineation borings which delineated the extent of the continuous sludge shown on Figure 1-2 (borings DPW116 through DPW121 and GWP102) (Stantec, 2010a).

- **East-Central Haack Property (Former Drum Storage Area)**: Sampling of the former drum storage area on the Haack property was performed in 2006 to determine if metal concentrations in soil were elevated when compared to background soil concentrations. Elevated lead concentrations were detected at a depth of 1.5 feet in all four borings, but lead concentrations were in the range of background at a depth of 5 feet. Elevated concentrations of antimony, arsenic, copper, and molybdenum were detected in one boring at a depth of 1.5 feet. One hexavalent chromium concentration above background was detected at 5 feet bgs.
- **Sludge Surface Samples**: Sludge surface samples were collected to determine if analytical interference resulted in high arsenic, antimony, and thallium concentrations during the 1982 investigation. With the exception of the low level of antimony detected in one boring, antimony, arsenic, and thallium were not detected in the samples; therefore, it suggests the 1982 data is not valid.
- **Sump Perimeter**: Borings were performed around the perimeters of the sumps to assess the lateral extent of continuous sludge during both the 2006 and 2009 RI activities. Continuous sludge is a sludge-only deposit and excludes soil mixed with sludge. The results of the step-out borings indicate the extent of the continuous sludge, which is illustrated on Figure 1-2.
- **Offsite Adjacent Residential Properties**: Borings were advanced in the residential properties in the southern portion of the site during the 2006 and 2009 RI activities to investigate the presence of sludge. The results of these borings indicate that the extent of the sludge has been delineated as illustrated on Figure 1-2.

3.2.2 Surface Water

Surface water samples were collected upstream and downstream of the Site from the Dominguez Channel in 2006 and 2008. During both sampling events, the samples had gasoline range organics (GRO) concentrations of 58 µg/L and 50 µg/L in 2006 and 2008, respectively. No SVOCs were observed. Two VOCs, tetrachlorothene and trichloroethene, were observed during both events; upstream samples had higher concentrations of both VOCs than the downstream samples. Barium was found in surface water at concentrations approximately double what was detected in the soil and

sludge samples. Copper, lead, and vanadium were detected at levels below background for the Site (Stantec, 2008).

Analytical data from surface water samples collected from the inner channel of the Dominguez Channel indicated elevated concentrations of GRO and VOC analytes in contrast to the non-detections for those analytes in groundwater monitored at the Site. Based on the organic chemical parameters, the Site is not impacting surface water quality in the channel. Overall, the observed concentrations of metals in surface water adjacent to the Site support the same conclusion, that the Site groundwater conditions are not impacting surface water quality. Both upstream and downstream surface water samples have at least twice the concentration of antimony, molybdenum, nickel, barium, lead, and copper compared to shallow groundwater at the southern boundary of the Site (Stantec, 2010b).

3.2.3 Soil Gas

The soil gas investigation activities evaluated the subsurface concentrations of VOCs, hydrogen sulfide, and methane at various locations across the Site for use in the baseline HHRA. Soil gas samples were collected in the locations indicated on Figure 3-2. Constituent concentrations reported above the detection limit for targeted VOCs include benzene, toluene, ethylbenzene, m-,p-,o-xylenes, 1,3,5-trimethylbenzene, and Freon 113. Concentrations ranged from non-detect to 2.2 µg/L-vapor (toluene) (Stantec, 2008).

During the 2006 RI activities, benzene concentrations in the soil gas samples ranged from non-detect to 0.3 µg/L-vapor by Method 8260B and from non-detect to 0.260 µg/L-vapor by Method TO-15. Hydrogen sulfide concentrations in the soil vapor samples ranged from non-detect to 5.1 parts per million by volume (ppmv) except for one sample location with results of greater than 50 ppmv. Methane concentrations in the soil gas samples ranged from non-detect to 220 ppmv (Stantec, 2008).

During the 2009 RI activities, additional samples were collected from 22 semi-permanent direct-push soil gas probes. Samples collected near the Haack administrative building showed no VOCs greater than California Human Health Screening Levels (CHHSLs). On the residential properties, benzene from the sample collected from the former corral was the only constituent reported higher than the specific constituent CHHSL value. The results elsewhere at the Site during the 2009 RI activities generally confirmed the results of the 2006 RI (Stantec, 2010a).

3.2.4 Soil Vapor Flux

An Air Pathway Analysis (APA) was performed during the 2006 investigation to evaluate the exposure pathway of outdoor inhalation of vapors. The surfaces evaluated included:

- exposed, undisturbed sludge on the Cooper property;
- exposed, disturbed sludge on the Cooper property;
- soil on both the Cooper and Haack properties; and
- asphalt and concrete-slab covered soil on the Haack property.

The results of the APA are provided in the *Revised Draft RI* (Stantec, 2008) and are summarized below:

- **Ambient Air**: Methane and select VOCs were reported above the quality control (QC) criteria and/or reporting limit in the four ambient air samples collected. Detected methane levels are typical of global, outdoor, ambient air. Detections of VOCs on the Haack property are most likely related to industrial activities on the property and not from undisturbed surface emissions from the nearby sumps. The VOCs detected on the Cooper property may be related to the presence of sludge in the sumps.
- **Undisturbed**: Twenty (20) open (undisturbed) soil flux samples of 61 collected were reported to have specific compounds above the QC criteria and/or reporting limit. The undisturbed sludge had low to moderate emissions and, in general, more compounds were detected at Cooper property locations than Haack property locations. Higher emissions and more detectable compounds were detected at Cooper Sump locations overlying sludge.
- **Disturbed**: All nine (9) disturbed flux samples collected were reported to have specific compounds above the QC criteria and/or reporting limit. The disturbed condition can be generally characterized as having moderate to high area source emissions as compared to the undisturbed sludge condition. In addition, more compounds were detected in the emissions from the disturbed sludge condition than from the undisturbed sludge condition. Odor analyses confirmed the potential for sulfuric compounds from disturbed sludge to create nuisance odors to people in the area or downwind of the disturbed sludge.
- **Infiltration**: Specific compounds were detected above the QC criteria and/or reporting limit for each of the infiltration flux samples. The flux chamber was used to test the air emissions through seams and cracks in the concrete and asphalt. Compounds having the maximum detections represent a different mixture of sulfur and hydrocarbon compounds as detected in the undisturbed

sludge condition, indicating that the individual compound emissions are greatly affected by the surface coverings and slab.

3.2.5 Groundwater

3.2.5.1 Summary of Groundwater Monitoring

Well clusters MW-01A/B, MW-02A/B, and MW-03A/B were periodically sampled from 1994 through 2002. Analytical results of these samples supported the findings of earlier investigators, with trace amounts of volatile organic compounds (VOCs) detected in 1994 samples immediately after installation, and no VOC detections in the next ten years of sampling. Detections in 1994 were likely the result of cross-contamination during well installation (Stantec, 2008).

Groundwater samples obtained on February 28, 2002, contained detectable concentrations of antimony, lead, and thallium that were above the maximum concentration level (MCL), as defined in Title 22 CCR §64431. With a very few exceptions, prior to the 2002 sampling event, analytes tested in groundwater samples were either not detected or found below the laboratory reporting limit. Quarterly groundwater monitoring and sampling of MW-01A/B, MW-02A/B, MW-03A/B, and G-4 was agreed to as part of a Consent Decree entered into between DTSC and Atlantic Richfield Company, which became effective November 4, 2004 (§VIIC, paragraph 2, lines 2-3). Wells MW-4A, MW-4B and MW-5A have been installed during Atlantic Richfield Company's RI investigation of the Site.

The following summary is abstracted from the *First Quarter 2010 Groundwater Monitoring Report* (Stantec, 2010b):

The depth to Site groundwater in the A-zone ranges between 10.5 and 18 feet below the ground surface. The groundwater in the A-zone flows southward with an approximate velocity of 0.04 feet per day. The depth to Site groundwater in the B-zone ranges between 15.5 and 22 feet below the ground surface. The groundwater in the B-zone flows east-southeast with an approximate velocity of 0.18 feet per day. (RTC, 1/9/2013)

Nine of the ten groundwater monitoring wells showed no detectable concentrations of GRO, VOCs, or PAHs above the RL during the first quarter 2010 sampling event. Samples from the recently installed MW-05A well indicated a GRO detection of 390 µg/L. VOCs detected above the reporting limit in well MW-05A included benzene (0.73 µg/L), naphthalene (3.4 µg/L), m-,p-xylenes (1.5 µg/L), 1,2,4-trimethylbenzene (2.8 µg/L), and 1,3,5-trimethylbenzene (23 µg/L). Total xylene levels in MW-05A were 1.7 µg/L.

Wells with SVOCs detected included well MW-01A with acenaphthylene (5.6 µg/L), bis(2-ethylhexyl)phthalate (3.2 J[1] µg/L; detected below the reporting limit), and naphthalene (3.2 J µg/L; detected below the reporting limit); MW-01B had bis(2-ethylhexyl)phthalate (3.9 µg/L); MW-02A had acenaphthylene (2.1 µg/L), bis(2-ethylhexyl)phthalate (10 µg/L), 2-methylphenol 2.3 µg/L, naphthalene (2.6 µg/L), and phenol (1.2 µg/L); and MW-02B had acenaphthylene (0.75 µg/L).

The groundwater pH levels have remained relatively constant since project sampling began in the first quarter of 2006. The anomalously high pH levels reported during the 1994 and 2002 sampling events have not been observed recently. Generally, groundwater samples from onsite wells (with the exception of MW-5A) have a pH ranging between 6.0 and 8.0. Recently installed well MW-05A has had groundwater pH readings ranging from 4.5 to 5.8.

For each groundwater sampling event since the year 2000, both dissolved (starting in 2006) and non-dissolved phase barium have been detected above the RL in all wells. The highest concentration of barium continues to be detected up-gradient and off site in well MW-01B.

During the second quarter 2010 sampling event, reportable trace amounts of arsenic were detected in both non-dissolved phase (total metals) in wells MW-01A, MW-02A, MW-02B, MW-03A, MW-05A, and G-4 and in the dissolved phase in wells MW-02A, MW-02B, MW-03A, and MW-05A. Well MW-04B showed the highest levels of arsenic in both dissolved and non-dissolved phases (4.4 and 4.4 µg/L, respectively).

Well MW-05A had elevated non-dissolved levels of cobalt (140 µg/L), copper (62 µg/L), nickel (190 µg/L), and zinc (3,800 µg/L) (total metals), and elevated dissolved levels of cobalt (190 µg/L), copper (74 µg/L), nickel (240 µg/L), and zinc (4,400 µg/L) compared to the other site monitoring wells.

3.2.5.2 Summary of Hydropunch Sampling

During the 2009 RI activities, additional groundwater assessment was performed using hydropunch sampling. Groundwater samples were collected in the A and B horizons, respectively to test for VOCs, SVOCs, PAHs, metals, and pH. No VOCs, SVOCs, or PAHs were detected above MCLs. Dissolved metal concentrations of beryllium, cadmium, and nickel were reported in one sample (GWP-100) from the A horizon. pH ranged from 6.74 to 7.44 in the A horizon with the exception of a 4.74 pH value from GWP-100. pH was not measured in the B horizon (Stantec, 2010a).

[1] J = Analyte was detected between the method detection limit and reporting limit; reported value is estimated.

3.2.6 Perched Groundwater

Ten temporary groundwater wells were installed during the 2009 RI activities to investigate suspected perched groundwater. The results of the investigation are discussed in the *Data Gaps Memorandum* (Stantec, 2010a). In summary, benzene was detected at 1.6 µg/L, and some SVOCs were detected above the detection limit but below the reporting limit (J-flag). Lab pH ranged from 3.82 to 6.93, and PAHs were not detected in concentrations greater than 5 µg/L. Total metals above primary and/or secondary MCLs included: antimony, arsenic, beryllium, cadmium, chromium, copper, nickel, selenium, and zinc. Dissolved metals above primary and/or secondary MCLs included: nickel and zinc. ~~Perched groundwater in the Haack Sump area is suspected to be the result of leaking utilities.~~ (RTC, 9/29/11)

3.3 Fate and Transport

Based on the results from previous investigations and the extensive field work performed as part of the *Revised Draft RI* (Stantec, 2008), the current Conceptual Site Model (CSM) suggests that:

- The undisturbed sludge at the Site does not pose a threat to surface water and does not pose a threat to shallow (A-horizon) or deeper (B-horizon) groundwater quality throughout much of the Site. Shallow groundwater is impacted (lower pH, total & dissolved metals) south of the Haack sump; however, these impacts are not detected in samples collected downgradient of the sumps. (RTC, 1/9/2013)
- The undisturbed sludge at the Site does not pose a substantive threat to the air quality in the immediate vicinity of the Site. However, isolation of the sludge from temperature fluctuations above approximately 100 degrees would further minimize this potential impact; and
- The undisturbed sludge does not pose a threat to further contamination of soil surrounding the sludge by leaching of constituents of potential concern (COPCs) from the sludge (Stantec, 2008).

The transport mechanisms identified during the HHRA are discussed further in Section 4.2 but in summary are: wind erosion and dust, volatilization to indoor and ambient air, and leaching to groundwater.

3.4 Treatability Studies Conducted

3.4.1 General

A treatability study was conducted by Stantec to define and evaluate the physical and chemical characteristics of the sludge and evaluate neutralization/stabilization options. The following sections summarize the results of the treatability study found in Appendix J of the *Revised Draft RI* (Stantec, 2008) and included as Appendix B of this Revised Final Draft FS.

3.4.2 Acidity

The testing showed that the acidity of the sludge ranged from 6.1 to 20.8 percent by weight. The Cooper South Sump had the highest acidity, with an average value of 19 percent by weight (Stantec, 2008).

3.4.3 Wet Density

Wet densities of the sludge samples were determined from samples collected using a Fann Model 140 mud balance. The densities for the samples ranged from 63 lb/ft^3 to 79 lb/ft^3. The average density of the sludge collected from the Cooper North Sump was 65.7 lb/ft^3, and the average density of the sludge from the Cooper South Sump was denser at 72.8 lb/ft^3. The sludge collected in the Haack Rework Area had an average density of 74.9 lb/ft^3 (Stantec, 2008).

3.4.4 Moisture

The average moisture of the sludge ranged from 9.8 to 22.3 percent on a wet basis. The moisture of the soil below the sludge sumps ranged from 12.1 to 25.6 percent on a wet basis. The soil below the Cooper North Sump was noted to have higher moisture content (24.2 percent) when compared to the soil below the Haack Rework Area, which averaged 14 and 16.9 percent moisture, respectively (Stantec, 2008).

3.4.5 Viscosity

The viscosities of sludge samples were tested at different temperatures to determine material viscosity as a function of temperature. This data was plotted as semi-log graphs to generate trend lines for modeling the viscosity as a function of temperature in accordance with ASTM Method D 2493. The sludge is highly viscous, ranging from 1.7×10^6 to 2.5×10^6 centipoises (cP) at a reference temperature of 140ºF. The results of the testing show that the sludge in the Cooper North Sump had a slightly lower viscosity than the sludge in the Cooper South Sump. The sludge in the Cooper North Sump had an average viscosity of 1.7×10^6 cP at 140ºF while the viscosity of sludge in

the Cooper South Sump averaged 2.5 $\times 10^6$ cP at 140ºF. Sludge collected from the Haack property in the Haack Rework Area was heated to 220ºF, but it was still too viscous to test for viscosity, thus indicating the sludge may contain other solids from disruption during development activities in that area (Stantec, 2008).

3.4.6 Softening Point

The softening point of the sludge was evaluated by the softening point test defined in ASTM Method D36. The results of the testing show that the softening point of the sludge samples from the Cooper property ranged from 158ºF to 185ºF. The sludge in the Cooper North Sump had a slightly lower softening point than the sludge in the Cooper South Sump. The sludge in the Cooper North Sump had an average softening point of 159ºF while the average softening point for the sludge in the Cooper South Sump was 180ºF. The softening point of the sludge collected in the Haack Rework Area was greater than 210ºF (Stantec, 2008).

3.4.7 Neutralization and Stabilization Testing

Five different reagent mixes were tested with the sludge to evaluate their neutralization/stabilization ability. The five mixes included: calcium oxide (CaO), 50/50 (w/w) mix of CaO and calcium carbonate ($CaCO_3$), calcium hydroxide ($Ca(OH)_2$), a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$, and Portland cement (Stantec, 2008).

Testing indicated that the sludge can be neutralized by treatment using 25 percent treatment reagent addition by weight where the treatment reagent is comprised of 50 percent hydrated lime ($Ca(OH)_2$) and 50 percent $CaCO_3$ fines. Approximately 10 percent water addition was also required to help activate the lime and carbonate reactions. The addition of 50 percent soil by weight during this mixing will also effectively solidify the waste so it is no longer susceptible to viscoelastic deformation. This treatment also effectively fixates lead, as demonstrated through long-term leaching tests, and neutralizes acid gases such as hydrogen sulfide (H_2S) and sulfur dioxide (SO_2) (Stantec, 2008).

3.4.8 Vapor Evolution

Stantec also evaluated the potential rates of off-gas evolution during full-scale mixing operations as a function of temperature. Headspace analyses were performed on the sludge samples at temperatures of 60ºF, 100ºF, 140ºF, 180ºF, and 212ºF (Stantec, 2008).

3.4.8.1 VOC and TPH Headspace Results

The analyses indicated no benzene was emitted from the sludge samples at temperatures ranging from 60 to 212ºF. Toluene was not detected at 60ºF; however, detected concentrations increased as temperature increased. Similarly, ethylbenzene and xylenes were near detection limits at 60ºF, and detected concentrations increased as temperatures increased. Detected concentrations of toluene, ethylbenzene, and xylenes did not exceed the Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) (Stantec, 2008).

Total petroleum hydrocarbons (TPH) was monitored in the vapor headspace as a function of temperature, where TPH represents the total concentration of VOCs detected for GRO and diesel range organics (DRO). Initial concentrations of TPH in the vapor headspace were below 12.5 ppmv in the Cooper North and Cooper South Sump samples at 60ºF. However, TPH concentrations increased exponentially with increasing temperature. At 212ºF, the concentrations of TPH in the vapor headspace of samples from the Cooper North and Cooper South Sump were 259 ppmv and 223 ppmv, respectively. These data indicate that TPH (as petroleum distillates) will not present a health and safety issue with respect to construction work since the concentrations are less than the OSHA PEL of 500 ppmv for petroleum distillates (Stantec, 2008).

Samples collected from the Haack Rework Area did not have detectable concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) and TPH, with the exception of toluene and xylenes. These compounds were only detected when temperatures were increased to 212ºF. TPH was below detection limits at 60ºF, and detected concentrations rose to a maximum at 212ºF (Stantec, 2008).

3.4.8.2 H_2S and SO_2 Headspace Results

H_2S and SO_2 were monitored in the headspace of sludge samples at various temperatures. The results showed that these sulfurous gases were readily emitted from disturbed and heated sludge samples in the Cooper North and Cooper South Sumps. The vapor concentrations of SO_2 in equilibrium with sludge samples from both sumps exceeded 150 ppmv at 60ºF. The vapor concentration of H_2S was 408 ppmv for the Cooper North Sump and 471 ppmv for the Cooper South Sump at 60ºF, but at higher temperatures it exceeded 500 ppmv for both sumps. These data show that H_2S and SO_2 will both be present at an exposure risk to workers and the community if the sludge is disturbed for neutralization and stabilization treatment, as the OSHA PELs for H_2S and SO_2 are 10 ppmv and 2 ppmv, respectively (Stantec, 2008).

The sludge samples collected from the Haack Rework Area had substantially lower concentrations of H_2S and SO_2 in the vapor headspace. The vapor concentrations of SO_2 in equilibrium with sludge samples ranged from 8 to 71 ppmv. The vapor concentration of H_2S ranged from 2 to 50 ppmv. These data show that H_2S and SO_2 emissions from sludge on the Haack property could present an exposure risk to workers and the community if the sludge is disturbed for neutralization and stabilization (Stantec, 2008).

3.4.9 Metal and Organic Mobilization

Treated and untreated composite samples of sludge from the Cooper North and Cooper South Sumps were analyzed for total RCRA metals, VOCs, SVOCs, and PAHs and for analyses of leachable RCRA metals and organics by both the toxic characteristic leaching procedure (TCLP) and synthetic precipitation leaching procedure (SPLP) (Stantec, 2008).

3.4.9.1 Untreated Sludge Leaching

Analyses showed that the composite sludge sample contained 22.4 mg/kg lead and 1.2 mg/kg barium. The TCLP extract contained 0.24 mg/L lead and 0.06 mg/L barium, thus indicating that the sludge would not be characterized as a hazardous waste under the definitions and exclusions given in 40 CFR Part 21 for lead or barium, even in a final TCLP extract of pH 3.97. The SPLP extract contained 0.31 mg/L lead and less than 0.01 mg/L barium at a final SPLP extract pH of 2.15. This indicates that the SPLP will be more likely to produce leaching effects in laboratory analyses than the TCLP (Stantec, 2008).

The analyses for total SVOCs, PAHs and VOCs identified the following constituents in the sludge:

- Benzo(a)anthracene 70,000 µg/kg;
- Chrysene 160,000 µg/kg;
- 2-Methylnaphthalene 30,000 µg/kg;
- Phenanthrene 200,000 µg/kg;
- Pyrene 60,000 µg/kg;
- Ethylbenzene 200 µg/kg;
- Toluene 400 µg/kg;
- Xylenes 1,000 µg/kg;
- 2-Methylnapthalene 1,900 µg/kg;

- 1,2,4-Trimethylbenezene 700 µg/kg;
- 1,3,5-Trimethylbenzene 500 µg/kg; and
- 1,2,3-Trimethylbenzene 1,100 µg/kg.

Despite the presence of these compounds within the sludge itself, no PAHs or SVOCs were identified in the SPLP extract for the untreated sludge above the detection limit of 5 µg/L. This indicates that the SVOCs and PAHs within the sludge are largely immobile. Toluene was detected in the SPLP extract of the untreated sludge at 7 µg/L, and 1,2,3-trimethylbenzere was detected in the SPLP extract at 1 µg/L (Stantec, 2008).

Analysis of the sludge for TPH as GRO and DRO showed that the sludge contained 70 mg/kg GRO and 39,000 DRO. This shows that only 3.9 percent of the sludge is comprised of organics in the C6 to C28 hydrocarbon range, thus showing that the majority of organics in the sludge have a very high molecular weight in excess of 400 (Stantec, 2008).

3.4.9.2 Treated Sludge Leaching

Samples of composite sludge treated with a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$ at dosage rates of 22, 24, 26, and 28 percent reagent by weight with respect to the original mass of untreated sludge were subjected to SPLP testing. The results showed that the treatment produced non-detectable concentrations of RCRA metals and SVOCs in each of the SPLP extracts, with the exception of barium which was detected at 0.01 mg/L. This shows that the treatment reduced the concentration of leachable lead by the SPLP to less than 0.03 mg/L (Stantec, 2008).

3.4.10 Long-Term Leaching Analysis

A long-term leaching test was performed on a composite sludge sample from the Cooper North and Cooper South Sumps that was treated at a dosage of 25 percent of the 50/50 (w/w) $Ca(OH)_2$ and $CaCO_3$ reagent mix. The sample was subjected to the SPLP extraction procedure daily, with new extract water being added to the sample after each SPLP extraction to evaluate the long-term leaching effects after multiple extractions. The leachate from every other extraction was filtered and sent for analyses of PNAs, RCRA metals, and VOCs. The extracts were also tested in the laboratory for pH and alkalinity (Stantec, 2008).

Testing indicated lead did not leach from the sludge even after ten sequential SPLP extractions, indicative that treatment of the sludge with $Ca(OH)_2$ and $CaCO_3$ provides long-term stability for lead. Trace concentrations of barium, ethylbenzene, toluene and xylenes leached from the treated sludge, but the concentrations were well below the primary drinking water standards. Additionally, trace concentrations of

trimethylbenzene isomers, 2-methylnapthalene, and acetone leached from the treated sludge, but there are no primary or secondary drinking water standards for these compounds. Minimal alkalinity was removed from the sludge during the ten sequential extractions, thus indicating that many more extractions could have been performed while still maintaining alkaline stability in the treated material (Stantec, 2008).

3.4.11 Permeability

Composite samples of untreated and treated sludge from the Cooper North and Cooper South Sumps were tested for permeability by modified American Society for Testing and Materials (ASTM) D5084, Method C. The treated samples consisted of composite sludge samples treated with 15 percent calcium hydroxide and 15 percent $CaCO_3$ fines by weight. Stantec reported that the untreated sludge exhibited permeability less than $1x10^{-8}$ centimeters per second (cm/s), while the treated sludge exhibited permeability of approximately $9x10^{-3}$ cm/s (Stantec, 2008).

3.4.12 Evaluation of Soil Additive

Four composite samples of sludge were treated with 25 percent reagent comprised of a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$. Prior to adding the reagent, the samples were amended with 0, 25, 50, and 75 percent soil, by weight (Stantec, 2008).

The testing showed that the addition of soil to the neutralized sludge improved the density of the treated material and maintained high strength. Because the sludge at the Site is so viscous, it was difficult to assess how the soil additive worked as a stabilization material for bituminous stabilization at ambient temperatures. Therefore, samples of neutralized sludge treated with 0, 25, 50, and 75 percent soil were compacted into cores using a Harvard compaction apparatus, and the cores were placed into a convection oven at 220ºF to test the stability of the sludge. The testing showed that the neutralized samples containing no soil exhibited viscoelastic flow at 220ºF. The samples containing 25 percent soil exhibited minor viscoelastic properties, and the samples containing 50 and 75 percent soil by weight exhibited no viscoelastic properties. These test results show that the addition of 50 percent soil to neutralized sludge by weight converts the sludge into a stable solid material, even at elevated temperatures that exceed the softening point of the sludge (Stantec, 2008).

3.4.13 Evaluation of Thermal Treatment

Although the sludge was found to contain approximately 4 percent diesel-range organics, the majority of hydrocarbon in the sludge was comprised of very large chain hydrocarbons having a molecular weight greater than 400. When the sludge was tested for BTU value, it was found to have a very high heating value of 13,000 BTUs per pound. This confirms that the sludge is comprised primarily of organics. However, the

sludge also had an elevated sulfur content of approximately 7 percent. This high sulfur content suggests that incineration or fuel combustion of the sludge is not a viable treatment alternative due to the large amount of SO_2 gas that would be emitted during combustion. Stantec has estimated over 1,800 cubic feet (280 pounds) of SO_2 gas could be emitted for each ton of sludge incinerated or combusted. Sitewide, the total mass of SO_2 generated by thermal treatment of the sludge would exceed 2,600 tons (Stantec, 2008).

3.4.14 Evaluation of Moisture/Density Relationship for Treated Sludge

Four samples of sludge treated with 25 percent of a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$ were tested for moisture/density relationship to determine optimal dry density and moisture content for compaction after treatment. Testing was performed on a sample without soil amendment and on three samples amended with 25, 50, and 75 percent soil by weight with respect to the initial weight of untreated sludge (Stantec, 2008).

The test results showed that the neutralized sludge without soil amendment had a very low maximum dry density of 52.3 lb/ft^3 and high optimum moisture content of 46.7 percent. When the neutralized sludge was amended with 25 percent soil, the maximum dry density increased to 64.1 lb/ft^3 and the optimum moisture content decreased to a more reasonable value of 29.5 percent. The neutralized sludge sample amended with 50 percent soil had a maximum dry density of 68.8 lb/ft^3 and an optimum moisture content of 25.7 percent, and the sample amended with 75 percent soil had a maximum dry density of 71.6 lb/ft^3 and an optimum moisture content of 24.4 percent. Based on Table 13, stabilized sludge amended with 12 percent $CaCO_3$ and 12 percent $Ca(OH)_2$ has a density of 81 lb/ft^3 (RTC, 11/6/12) (Stantec, 2008).

3.4.15 Testing for Asphaltic Qualities

Testing of the sludge indicated that it will have low marketability as recycled asphalt, even when neutralized, for the following reasons:

- The sludge is a brittle, glass-like material with little to no ductility;
- The viscosity of the sludge is too high for use as asphalt cement in road construction;
- The sludge contains a high concentration of impurities and suspended solids which causes it to fail to meet the test for asphalt solubility for both asphalt cement and roofing asphalt;
- The sludge has a negative American Petroleum Institute (API) gravity;

- The softening point falls into acceptable ranges for a Type II roofing asphalt, but the sludge fails to meet most of the remaining specifications for Type II roofing asphalt; and
- Penetration values for the sludge were too low for use as asphalt cement but meet the specifications for Type IV roofing asphalt.

Although the sludge shares the softening point specifications for Type II roofing asphalt and the penetration specifications for Type IV roofing asphalt, it fails to meet the ductility requirements for either of these asphalt grades. The brittle nature of the material gives it undesirable properties because the material is easily cracked and sheared, thus making it unsuitable for roofing or pavement construction applications (Stantec, 2008).

Section VII.C. of the Consent Decree requires the evaluation of the proposal of Mr. Thomas Cooper for recycling the sludge as one of the alternatives in the FS. The Cooper Sumps sludge, in a non-neutralized state, releases significant quantities of H_2S and SO_2 gas when disturbed. The release of these gases from the sludge as well as the physical characteristics of the sludge, makes the sludge unacceptable for recycled asphalt application. The sludge recycling alternative is not evaluated further in this FS.

4. REMEDIAL ACTION OBJECTIVES AND CLEANUP CRITERIA

4.1 General

This section describes the development of remedial action objectives (RAOs) and target cleanup levels for the Site. The development of RAOs is required by RI/FS guidance as part of the FS. The process of developing the RAOs depends upon the assessment of risk to identified receptors at the Site and in the Site vicinity. A discussion of the risk assessment (RA) at the Site follows.

4.2 Chemicals of Potential Concern

The chemicals of potential concern (COPCs) for the Site were developed and discussed in the hazard identification section of the *Draft Human Health Risk Assessment* (HHRA) (Geosyntec, 2010). USEPA guidance states that the list of chemicals should include all chemicals that were:

- Positively detected in at least one sample;
- Detected above levels of the same chemicals found in associated blank samples;
- Tentatively identified, but may be associated with the Site based on historical information;
- Transformation products of detected chemicals; and
- Detected above naturally occurring levels (background).

During the RA, those contaminants posing a potential risk to receptors at the Site were identified as COPCs and can be found in Table 4-1 for soil, soil gas, and groundwater.

4.3 Human Health Risk Assessment

4.3.1 Approach

The draft HHRA included an evaluation of health risks to potentially exposed receptor populations consisting of: commercial/industrial workers, construction workers, hypothetical future residents, and trespassers. Potential exposures were evaluated for these populations assuming existing physical site conditions (without the existence of the protective caps on the Cooper and Haack properties and prior to any future remediation efforts at the Site). In addition, a current residential scenario has been included for the immediate adjacent offsite residential area (Geosyntec, 2010).

Future development of the Site and the immediate adjacent offsite residential area would be commercial as designated in the City of Gardena's report titled *Artesia*

Corridor Specific Plan (TPC, 2006). To conservatively evaluate the potential risks under an unrestricted land use scenario, a more conservative hypothetical future residential scenario was included in the HHRA to evaluate potential risks under an unrestricted land use scenario. Additionally, the conservative construction worker, shallow groundwater to outdoor vapor inhalation and dermal contact scenario was evaluated to represent groundwater in an open excavation (Geosyntec, 2010).

To evaluate the spatial distribution of risk driving chemicals, two types of comparison criteria were developed for each chemical identified in the risk characterization: (1) those based on background; and (2) risk-based values (RBCs) or target risk concentrations which are based on each receptor group and assuming site-specific soil characteristics and a target risk goal. For worker exposures (commercial/industrial and construction worker) a target risk goal of 1 in 100,000 (1×10^{-5}) was used. For residential and trespasser scenarios a 1 in 1,000,000 (1×10^{-6}) target risk goal was used. For those chemicals in which the risk-based concentrations are below background, the background concentration is used as the comparison criteria. This is the case for arsenic and residential and commercial/industrial worker scenarios, and benzo(a)pyrene toxicity equivalent (BaP-eq) for the residential scenarios (Geosyntec, 2010).

4.3.2 Results

The results of the HHRA indicate that exposures to onsite soils may potentially exceed target risk goals for all potential receptor scenarios evaluated: commercial/industrial worker, construction worker, hypothetical future onsite/current offsite resident, and trespasser. The primary contributors to the risk estimates were arsenic, hexavalent chromium, naphthalene, and predominantly the carcinogenic PAHs as represented by the BaP-eq concentration. The majority of locations where concentrations of these chemicals were elevated occurred within areas of known sludge material which are currently covered by the existing geomembrane cap, soil, concrete, and/or asphalt (Geosyntec, 2010).

4.4 Chemicals of Concern

Following completion of the HHRA, primary risk driving chemicals were identified from the list of COPCs (see Section 4.2) as chemicals of concern (COCs). These chemicals were identified as primary risk drivers because they are the most ubiquitous chemicals throughout the Site and because they are co-located with a majority of the COPCs (i.e., the risk associated with the COCs would encompass the COPCs). Based on the HHRA, the primary COCs at the Site are:

- **Soil**: arsenic, hexavalent chromium, naphthalene, and the BaP-eq
- **Air**: benzene, hydrogen sulfide

- **Groundwater**: dibenz(a,h)anthracene

These COCs are present in the Cooper and Haack Sumps as well as in the Haack rework area. Methane has been detected at low concentrations around the site but was not identified as a COC based on the HHRA. Due to the potential explosive risk associate with methane, it has been included with as a Remedial Action Objective. (RTC, 9/29/11)

4.5 Remedial Action Objectives

RAOs are goals specific to various media and apply to those media that have been identified as posing an unacceptable risk based on the HHRA work performed for the Site. The RAOs for onsite soils, soil gas, and groundwater are:

- Prevent ingestion/direct contact with sludge and/or soil having 10^{-5} to 10^{-6} excess cancer risk from carcinogenic constituents as represented by arsenic, hexavalent chromium, naphthalene, and the BaP-eq concentration;
- Prevent dermal contact with shallow groundwater having 10^{-5} excess cancer risk from carcinogenic polycyclic aromatic hydrocarbons (PAHs) as represented by dibenz(a,h)anthracene;
- Prevent dermal contact with low pH, PAH containing sludge (RTC, 2/10/12);
- ~~Prevent inhalation of benzene posing excess cancer risk levels of 10^{-5} to 10^{-6}~~ (RTC, 9/29/11);
- Prevent inhalation of volatile organic compounds (VOCs), as represented by benzene, posing excess cancer risk levels of 10^{-5} to 10^{-6}(RTC, 9/29/11); and
- Prevent explosive risks associated with methane. (RTC, 9/29/11)

4.6 Applicable or Relevant and Appropriate Requirements

The Applicable or Relevant and Appropriate Requirements (ARARs), as defined by 40 CFR 300.5, presented in this section were identified for the remedial actions presented in this document to comply with Federal environmental law or more stringent standards promulgated under State environmental law. Federal and State environmental laws are evaluated to determine if they are either applicable or relevant and appropriate.

"To Be Considered" (TBC) criteria have also been identified to cover Federal and State nonpromulgated standards, policies, or guidance documents and local requirements for constituents which do not have developed preliminary remedial goals or ARARs.

The ARARs are divided up into the following three categories according to the type of CERCLA action they govern: chemical-specific, location-specific, and action-specific requirements. ARARs and TBC criteria are presented in Table 4-2.

4.6.1 Potential Chemical-Specific Requirements

At the Site, chemical-specific requirements include RCRA provisions defining hazardous waste, maximum contaminant levels (MCLs) derived from the Safe Drinking Water Act, and primary and secondary national standards for ambient air quality. The Draft HHRA identifies the site-specific, risk-based cleanup levels (Geosyntec, 2010).

4.6.2 Potential Location-Specific Requirements

No location-specific ARARS were identified since the Site is not located in any sensitive or protected area.

4.6.3 Potential Action-Specific Requirements

The potential action-specific requirements for the Site include:

- **Porter-Cologne Water Quality Control Act**: Set on a case by case basis by the Regional Water Quality Control Board (RWQCB), water emission standards are applied to waste water, groundwater, (RTC, 1/9/2013) and stormwater runoff from the Site.
- **South Coast Air Quality Management District (SCAQMD)**: Emissions of gases, particulate matter, and fugitive dust are set by the SCAQMD and may apply if they are part of the State Implementation Plan pursuant to the Clean Air Act.
- **National Pollution Discharge Elimination System (NPDES)**: Requires the elimination of most non-stormwater discharges, Stormwater Pollution Prevention Plan (SWPPP) preparation, and stormwater discharge monitoring.
- California Civil Code and California Health and Safety Code governing land use restrictions.
- DTSC hazardous constituent regulations as outlined in 22 CCR Division 4.5.

4.7 Future Site Use

The Site is currently used for residential and commercial/industrial applications. The DTSC has requested the following three future land use scenarios be evaluated for the Site:

- Current land use will continue; residential properties would remain and Cooper and Haack areas would remain commercial/industrial;
- Use the Site for residential only; and
- Use the Site for commercial/industrial only.

As a conservative approach to meet the DTSC request, the residential cleanup goals will be used, which are the most stringent.

The City of Gardena has developed the City of Gardena Master Plan (TPC, 2006) which indicates the Site would be developed in the future as commercial property with a mix of commercial buildings and parking. To accommodate this development plan and constraints of the Site, ARC requested the remedial design be compatible with a parking lot or open space end use incorporating curbs, gutters, light poles, and utilities.

4.8 Target Cleanup Levels

The target cleanup levels for the Site were developed with consideration given to the following factors:

- Hypothetical future use scenario;
- Remedial action objectives; and
- Potential site health risk.

The cleanup levels shown in Tables 4-3, 4-4, and 4-5 were developed for each of the COCs identified in Section 4.3. Cleanup criteria either are numeric goals to be achieved through remediation or are non-numeric, performance-based criteria. The cleanup levels shown in Tables 4-3, 4-4, and 4-5 will be used subsequently in this FS Report to guide the selection and screening of remedial technologies and the development and detailed analysis of remedial alternatives. A discussion of the development of cleanup criteria follows.

4.8.1 Site-Specific Action Levels

Soil cleanup criteria are based on the derivation of risk-based concentrations (RBCs) for site COCs. RBCs were developed for each chemical identified as a COC or "risk driver" in the risk characterization of the HHRA (Geosyntec, 2010) based on each receptor group and assuming site-specific soil characteristics as presented in Appendix C. (RTC, 4/4/12) RBCs were derived for arsenic, BaP-eq, hexavalent chromium, benzene, and naphthalene in soil (Table 4-3); benzene in soil gas (Table 4-4); and dibenz(a,h)anthracene in groundwater (Table 4-5). The derivation of these concentrations is provided in Appendix B. RBCs are presented for both cancer and noncancer effects; cancer effects generally produce lower RBCs. The selected site-specific action levels (SSALs), considering background concentrations, are presented in the last column for each receptor group.

For arsenic in soil, the DTSC screening level of 12 mg/kg, which is considered background for southern California sites (Cal-EPA DTSC, 2007), was used as the SSAL for residential receptors.

For BaP-eq in soil, a concentration of 0.9 mg/kg, considered representative of background PAH concentrations in southern California soils, was used as the SSAL for residential receptors.

5. IDENTIFICATION AND SCREENING OF TECHNOLOGIES

5.1 Introduction

General response actions (GRAs) describe remedial actions that would address RAOs and achieve cleanup criteria for hypothetical future receptors that may be exposed to soil, soil gas, and groundwater contaminants. This section provides a discussion of GRAs and also provides identification of potential remedial technology types and specific technologies. A screening analysis was conducted to reduce the number of potentially applicable technologies to those that were determined to be potentially able to achieve the RAO for the COCs.

5.2 General Response Actions

Specific GRAs identified for onsite impacts include the following:

- No action;
- Remediate or remove soils that present potential ingestion and/or dermal contact risk;
- Containment;
- Reduce concentrations of COCs that present a potential inhalation risk;
- Gas monitoring and treatment;
- Monitor groundwater; and
- Implement institutional controls to restrict access to sludge and to control and manage risk associated with future mixed-use redevelopment.

5.3 Technology Identification and Screening

In accordance with USEPA guidance, potential remedial technology types and specific technologies that can be used to implement the GRAs were identified and then screened to assess their effectiveness, implementability, and cost. This section provides a screening of technologies to identify those that will be combined into remedial alternatives in Section 6 of this FS Report. The following technologies have been identified for remediation and are listed in Table 5-1:

- No action;
- Institutional controls;
- Treatment:
    - Stabilization/neutralization

    - Thermal treatment and
    - Sludge recycling
- Containment;
- Excavation and removal for offsite disposal; and
- Engineered controls:
    - Vapor and gas control systems; and
    - Groundwater monitoring.

In accordance with US EPA Feasibility Study guidance, Table 5-1 presents the screening of each technology based on its relative effectiveness, implementability, and cost. This screening provides the rationale behind the decision to retain or eliminate each technology type. Therefore, based on the screening, the following technology types were retained for further evaluation:

- No action (as required by USEPA guidance);
- Institutional controls;
- Treatment:
    - Stabilization/neutralization
- Containment;
- Excavation; and
- Engineering Controls:
    - Gas control systems; and
    - Groundwater Monitoring.

A summary of technologies retained is presented in Table 5-2. Each retained technology will be integrated into one or more remedial alternatives, described in Section 6.

6. DEVELOPMENT OF REMEDIAL ALTERNATIVES

In this section, remedial alternatives for the Site are assembled from those technologies that remain after the initial screening in Section 5. Each remedial alternative includes a remedial approach that accommodates the hypothetical future use scenario described in Section 4 and assumes that Site features are removed prior to remedy implementation. Each remedial alternative listed in Table 6-1 is designed to address each impacted media at the Site.

6.1 Remedial Alternatives

Table 6-1 presents the four remedial alternatives that were retained for evaluation:

- Alternative (A) 1 – No action;
- ~~A 2 – Capping with selective excavation~~ (RTC, 9/29/11)~~;~~
- A 2A – Capping with selective excavation (RTC, 9/29/11);
- A 3 – Capping with selective excavation and stabilization/neutralization; and
- A 4 – Excavation with offsite disposal.

Alternatives ~~2~~ 2A (RTC, 9/29/11) and 3 include institutional controls, gas control and monitoring, and groundwater monitoring. All four alternatives are described below.

Alternatives ~~2~~ 2A (RTC, 9/29/11) through 4 are depicted on Figures 6-1 through 6-16. Details shown are conceptual for estimating and comparison purposes only, and do not represent the results of full engineering design and analysis.

6.1.1 Alternative 1 – No Action

This alternative consists of performing no work now or in the future to attempt to mitigate an existing condition. The current geomembrane cover would remain and no deed restrictions would be placed on the property.

For No Action to be considered an acceptable alternative, the concentrations of COCs would have to be below RAOs. This alternative would provide no exposure pathway reductions. There would be no controls to prevent future site development or site access. Groundwater contamination would not be known since monitoring would not be performed. Future site development would be hindered due to the instability of the sludge material. The No Action Alternative is required by USEPA FS guidance.

~~6.1.2 Alternative 2 – Capping with Selective Excavation~~

~~Alternative 2 includes the following major elements:~~ (RTC, 9/29/11)

- ~~Existing surface removal;~~
- ~~Consolidation and capping of impacted material;~~
- ~~Capping of sludge;~~
- ~~Installation of gas control and monitoring system;~~
- ~~Institutional controls; and~~
- ~~Groundwater monitoring.~~

~~This alternative is depicted on Figures 6-1 and 6-2. The cap surface shown in Figure 6-2 is for comparative purposes in this Feasibility Study only and does not represent the final cap surface. Each component is discussed further in the following sections.~~ (RTC, 9/29/11)

~~*6.1.2.1 Existing Surface Removal*~~

~~A geomembrane is currently above the Cooper North and South Sumps. Prior to initiating consolidation activities, the existing geomembrane will be cut to allow sludge to permeate through and prevent the potential for gas build up. The geomembrane will remain in place and Haack Rework and Eastern Overflow material would be consolidated above it.~~ (RTC, 9/29/11)

~~*6.1.2.2 Consolidation of Material*~~

~~In general, the sludge is contained in the three sumps: Cooper North and South, and Haack. As previously discussed in Section 3.2.1, approximately 650 CY of a sludge/soil mixture is located outside of the sumps in the Haack Rework area. To excavate the sludge/soil mixture, approximately 3,550 CY of overburden will need to be excavated. Additionally, along the eastern property line, a thin layer of sludge exists which appears to be the result of spillage or overflow from the sumps. Also, as shown on Figure 6-1, some sludge material is outside of the Site boundary beneath the sidewalk and Artesia Blvd. This sludge material is considered to be already capped with asphalt, concrete, and a minimum of 18 inches of sand and/or silty sand above the first detected sludge deposits (Stantec, 2010a).~~ (RTC, 9/29/11)

~~The Haack Rework and eastern overflow areas would be consolidated into one of the three sumps prior to capping, and used as fill beneath the cap low-hydraulic conductivity layer (to be discussed in Section 6.1.2.2). Approximately 4,460 CY of Haack Rework (650 CY), Haack Rework overburden (3,550 CY), and eastern overflow (260 CY) are anticipated to be placed above the sumps.~~ (RTC, 9/29/11)

~~Following visual excavation of material from the Haack Rework and eastern overflow, confirmation sampling would be performed to confirm the material was removed.~~

~~Confirmation sample results would be compared to cleanup goals. Where testing indicates concentrations in excess of cleanup goals, additional material would be removed and consolidated above the sumps. Haack Rework and eastern overflow excavations will be backfilled using soils obtained from unimpacted areas of the site.~~ (RTC, 9/29/11)

~~*6.1.2.3 Capping of the Sumps*~~

~~The Cooper North and South and Haack Sumps would remain in place. Human health and the environment would be protected through use of a cap which would act as a barrier to prevent both dermal contact and gas exposure. The proposed, conceptual Haack and Cooper cap grades are shown on Figure 6-2. This preliminary cap design is in accordance with California Code of Regulations Title 22 (22 CCR) §66264.228. The grades show on Figure 6-2 incorporate minimum slopes to maintain cover integrity in the event of settling and/or subsidence per 22 CCR §66264.228(a)(2)(C)(4). The final design of the cap may have flatter slopes if analyses are performed to show ponding will be prevented. In accordance with 22 CCR, the cap consists of a foundation layer, low-hydraulic conductivity, and erosion-resistance layer. The Alternative 2 cap is illustrated on Figure 6-6, in Detail 1-A, and would consist of the following layers:~~ (RTC, 9/29/11)

~~*Stabilization Layer*~~

~~The stabilization layer is intended for use over the sludge material in the Cooper North and South sumps (Detail 1-A, Figure 6-6). The Haack Sump is currently overlaid by a 6-inch reinforced concrete pad which would act as the stabilization layer (Detail 1-C, Figure 6-6). Prior to placement of the stabilization layer over the Cooper Sumps, the geomembrane material will be cut to allow sludge to seep through and mix with the gravel layer. The stabilization layer on the Cooper North and South sumps will consist of, from bottom to top, 2 feet of gravel, 1 foot of sand, high-strength woven geotextile, and a 6-inch geocell filled with sand. The bottom gravel layer placed above the cut geomembrane is intended to partially sink into the sludge material to provide stabilization during construction of the overlying materials. The high-strength woven geotextile would provide separation reinforcement and, along with the geocell reinforcement, would "bridge" the soft sludge areas and provide the strength needed to support the cap.~~ (RTC, 9/29/11)

~~*Foundation and Gas Collection Layers*~~

~~The foundation soil and gas collection layers would be placed above the stabilization layers and consist of, from bottom to top, minimum 1 foot of foundation soil, gas collection piping, and a gas collection geocomposite. The minimum 1 ft foundation and gas collection layer will support the low-hydraulic conductivity layer and erosion~~

resistance layer in accordance 22 CCR §66264.228(e)(4). The foundation soil would consist of onsite, impacted soil and Haack Rework material where available. Impacted foundation layer material would be supplemented with soil material obtained from unimpacted areas of the site. Horizontal gas collection pipes surrounded by gas collection aggregate would be embedded in the foundation layer. Nonwoven geotextile would surround the aggregate to prevent clogging of the aggregate due to fines intrusion. (RTC, 9/29/11)

Low-Hydraulic Conductivity Layer

The low-hydraulic conductivity layer would be placed above the foundation and gas collection layers and would consist of a geosynthetic clay liner (GCL) and a 60-mil high density polyethylene (HDPE) geomembrane. In accordance with 22 CCR §66264.228(e)(5), the low-hydraulic conductivity layer would reduce the downward migration of precipitation and the upward migration of sludge and gas. (RTC, 9/29/11)

Erosion Resistance Layer

The erosion resistance layer is comprised of a drainage geocomposite and 2 feet of vegetated cover soil. In accordance with 22 CCR §66264.228(e)(10). the drainage geocomposite would prevent hydrostatic head buildup and drain precipitation that has infiltrated the overlying vegetated cover soil toward the outside of the cap and perimeter drainage channels while the vegetative cover soil will be resistant to foreseeable erosion effects by wind scour, raindrop impact, and runoff. (RTC, 9/29/11)

Along the northern property boundary, limited space is available to allow for grading to install the cap system. As a result, sheet piles would be installed to allow for the vertical rise of the cap without altering Artesia Boulevard or the railroad property. Furthermore, the installation of sheet piles would prevent lateral migration of the sludge material from beneath the cap due to the new weight of the cap. The sheet piles would be installed to an average depth of 20 feet bgs and extend between 4 and 10 feet from the ground surface to accommodate the cap. (RTC, 9/29/11)

6.1.2.4 Gas Control and Monitoring System

The gas control system would be comprised of perimeter vertical gas migration control wells and a below-cap horizontal gas collection system. The proposed layouts of the vertical and horizontal gas collection systems are shown on Figures 6-3 and 6-4, respectively. (RTC, 9/29/11)

Vertical Gas Migration Control Wells

The system of gas migration control wells is designed to be a passive system that, as a contingency, can be converted readily to an active system. The system will operate

actively for a period of 2 weeks following remedial action at the site. Based on the concentrations of constituents detected during the 2-week startup period, the system will remain active or switch to passive operation with the option for active control in the future. The decision to make the system active again would be based upon future gas monitoring at the Site. (RTC, 9/29/11)

As a passive system, the wells are designed to intercept gases that may migrate laterally from the sumps; the gases are then vented to the atmosphere or to a treatment system. Barometric pumping would help "flush" the wells. As an active system, alternate wells would serve as air inlet and gas extraction wells. In this way, a "curtain" of air would be created that would intercept gases that may potentially migrate from the sumps as depicted on Figure 6-5. The extracted gases would then be vented to the atmosphere or to a treatment system. The wells would be installed to the approximately 2 ft above the groundwater "A" horizon. (RTC, 9/29/11)

Below-Cap Horizontal Gas Collection System

A horizontal gas collection system would be placed within the foundation layer of the cap, as discussed above. Similar to the vertical gas migration control wells around the perimeter of the cap, the gas collection system is designed to initially operate as an active system, during a start-up period of approximately two weeks. The system would then be operated as a passive system, but is designed as a contingent measure to be readily converted to active. As a passive system, it would be vented to the atmosphere and rely on barometric pumping to flush the system. The decision to make the system active would be based upon post-remediation gas monitoring at the Site. (RTC, 9/29/11)

The design of the gas collection system incorporates two separate gas collection pipes near the perimeter of the cap. A gas transport pathway between the gas collection pipes is established by the geocomposite component of the cap. As a passive system, gas entering the geocomposite would transmit to either of the gas collection pipes and would vent to the atmosphere or gas treatment system. As an active system, one of the pipes would be an air inlet pipe and the other pipe would be an extraction pipe. A flow of air and gas from the air inlet pipe to the extraction pipe would be created across the width of the caps and would remove gas that may accumulate below the barrier component of the cap. (RTC, 9/29/11)

Gas Monitoring System

Gas migration sentry probes would be placed near the perimeter of the cap. The proposed locations of the probes are shown on Figure 6-4. The sentry probes are designed to be outside of the vertical gas migration control wells. Regular monitoring of gas concentrations at the probe locations would be performed before, during, and after system operation. The decision to convert the gas collection systems to an active

~~system would be partially based upon the results of the sentry probe monitoring activities, and threshold contaminant concentrations developed in the Operations, Maintenance, and Monitoring (OM&M) Plan.~~ (RTC, 9/29/11)

~~*6.1.2.5 Institutional Controls*~~

~~The anticipated institutional controls for the Site would prohibit sensitive land uses (i.e., single family residence, hospitals, schools, or child care centers), specify new building construction (i.e., first floor non-residential, upper floor residential, and inclusion of gas control system), and prohibit onsite groundwater extraction for municipal (i.e., drinking water purposes), industrial, and agricultural (i.e., irrigation) use. Furthermore, a Health and Safety Plan (HASP) and Construction Quality Assurance (CQA) Plan would be required to establish minimum health and safety protocol during construction, and provide documentation of proper excavation, cap, and gas control system construction. A Risk Management Plan (RMP) would be developed for the Site to reduce the risk of future construction worker exposure to groundwater if the Site is developed. The RMP would discuss the hazards at the site, minimum PPE requirements, and notification requirements. Land use covenants (LUCs) to place deed restrictions on the site will be filled with the Los Angeles County Recorder's Office and annual LUC restriction inspections will be conducted by DTSC to ensure compliance (RTC, 4/4/12)~~ (RTC, 9/29/11)

~~*6.1.2.6 Groundwater Monitoring*~~

~~Groundwater monitoring would continue to be performed on a semi-annual basis for a period of 5 years after the remedial controls have been implemented. During construction, three sets of wells would be destroyed to accommodate construction of the cap. Following construction, two wells would be installed to represent the upgradient and downgradient conditions with the remaining well network.~~ (RTC, 9/29/11)

6.1.2 Alternative 2A – Capping with Selective Excavation

Alternative 2A replaced Alternative 2 in the Draft FS dated February 2011. Alternative 2A is consistent with the former Alternative 2 in that capping and selective excavation of the sludge in the Haack Rework area are evaluated. However, the evaluated cap proposed in Alternative 2A is significantly lower in overall height than the cap of former Alternative 2. Additionally, different disposal scenarios for the Haack Rework material are proposed in Alternative 2A. The lower profile cap and different Haack Rework material disposal alternative presented in this Final Revised Draft FS is in response to comments received from the City of Gardena during the 10 May 2011 meeting. (RTC, 9/29/11)

6.1.2.1 General Overview

The Site is generally divided into three areas: the Cooper North and South Sumps on the Cooper Property, the Haack Sump and the Haack Rework Area located primarily within the Haack property, four residential properties, land owned by Los Angeles County and a small area of land beneath the Artesia Boulevard right-of-way. Because these areas of the Site are divided among different property owners, the properties may not all be available for remedial construction at one time. The following sections describe, in general, the proposed Alternative 2A approach for each area. Section ~~3.3~~ 6.1.2.2 (RTC, 11/6/12) describes the remedial implementation approach for the entire Site in greater detail. (RTC, 9/29/11)

As described ~~in the Draft FS (Geosyntec, 2011),~~ previously (RTC, 11/6/12), the sludge material beneath the Artesia Boulevard South sidewalk and Artesia Boulevard are below road base material and asphalt or sidewalk concrete. The concrete and asphalt surface prevent ingestion and direct contact with the sludge as well as reduce its mobility by containing the sludge. (RTC, 11/6/12) This sludge material is considered to be already capped; however, institutional controls will include a requirement for repaving the area with "low-permeability asphaltic concrete" and increased maintenance of the asphalt surface in this area. ~~and therefore was not addressed in the Draft FS and will not addressed in Alternative 2A.~~ (RTC, 11/6/12)

Future access from current and/or future utility and/or construction workers will be addressed in the Risk Management Plan (RMP). The RMP will describe contaminants remaining onsite, known locations of impacts, contact information, and minimum, recommended personal protective equipment for current and future utility and/or construction workers. Institutional controls will include requirements (RTC, 11/6/12) that the City of Gardena and/or Caltrans provide notice of potential subsurface hazardous materials in the area of Artesia Boulevard where sludge is potentially located, prior to (RTC, 11/6/12) issuing work permits. (RTC, 2/10/12) Institutional controls will also include requirements related to Site development and cap loading restrictions. (RTC, 11/6/12)

Cooper North and South Sumps

The existing geomembrane will remain in place with the cap installed above. The geomembrane will provide a construction surface and preliminary support during installation of the overlying materials. Furthermore, the existing surfaces minimize the dermal contact and gas inhalation exposure risks to the construction workers during installation of the cap. (RTC, 11/6/12)

The sludge in the Cooper North and South Sumps will be capped, from bottom to top, with the following materials: (1) high-strength geotextile; (2) between 1 and 4.5 feet (ft) of foundation layer material; (3) a horizontal gas collection system: gas collection geostrips and gas collection geocomposite; (4) geosynthetic clay liner (GCL); (5) high-density polyethylene (HDPE) geomembrane; (6) drainage geocomposite; and (7) 12-inches (in.) of Class II aggregate base. (RTC, 9/29/11)

Haack Sump

The existing asphalt and concrete will remain in place with the cap installed above. The asphalt and concrete will provide a construction surface and preliminary support during installation of the overlying materials. Furthermore, the existing surfaces minimize the dermal contact and gas inhalation exposure risks to the construction workers during installation of the cap. (RTC, 9/29/11) In areas where sludge has migrated to the surface, asphalt repair will be performed prior to installation of the cap. (RTC, 11/6/12)

The sludge in the Haack Sump will be capped, from bottom to top, with the following materials: (1) between 0.5 and 4.5 ft of foundation layer material; (2) a horizontal gas collection system made up of gas collection geostrips and gas collection geocomposite; (3) geosynthetic clay liner (GCL); (4) HDPE geomembrane; (5) drainage geocomposite; and (6) 12 in. of Class II aggregate base. (RTC, 9/29/11)

Haack Rework Area

The Haack Rework area is composed of soil-sludge material and soil overburden. The Haack Rework overburden material will be disposed of as foundation material beneath the Cooper North and/or South sumps cap. ~~These materials will be removed and relocated or disposed of in three possible scenarios or a combination of the following three scenarios: (1) beneath the Cooper North and/or South Sumps cap as foundation layer material; (2) beneath the Haack Sump cap as foundation layer material; and (3) offsite disposal.~~ (RTC, 11/6/12) Approximately 2,670 CY of Haack Rework soil-sludge material and 2,450 CY Haack Rework overburden are anticipated to be relocated during construction activities. Disposal of the Haack Rework material will be dependent on the material properties of the soil-sludge and (RTC, 11/6/12) ~~property~~ availability of staging areas within the property (RTC, 11/6/12) during construction, as described in greater detail in Section ~~3.3.3~~ 6.1.2.2. (RTC, 11/6/12)

6.1.2.2 Detailed Alternative 2A Components

Alternative 2A includes the following major elements:

- Existing surface preservation;
- High-strength geotextile installation;

- Select excavation of impacted material (Haack Rework material);
- Containment of sludge along Artesia Boulevard;
- Installation of gas control and monitoring system;
- Capping of the sumps;
- Institutional controls; and
- Groundwater monitoring.

The approximate area of Alternative 2A is depicted on Figures ~~3-1~~ 6-1 and ~~3-2~~ 6-2. (RTC, 11/6/12) The construction and cap components are discussed further in the following sections.

Existing Surface Preservation

The existing geomembrane surface on the Cooper Property and concrete and asphalt surfaces above the Haack Sump will remain in place and the cap will be installed above these surfaces. New asphalt will be placed above the existing, degraded areas of asphalt surface over the Haack Sump prior to the initiation of cap construction on the Haack property. (RTC, 2/10/12) The geomembrane, asphalt, and concrete surfaces will provide a barrier to minimize worker dermal exposure to sludge contact as well as gas generation and release. Additionally, the concrete and asphalt surfaces will provide strength to the cap on the Haack Sump, eliminating the need for the high-strength geotextile described ~~in Section 3.3.2.~~ below. (RTC, 11/6/12)

High-Strength Geotextile Installation

A polypropylene (RTC, 11/6/12) high-strength geotextile will be placed above the existing geomembrane surface in the Cooper North and South sump areas; no polypropylene (RTC, 11/6/12) high-strength geotextile is proposed above the Haack sump area. The geotextile will be used to provide reinforcement during installation of the foundation soil to support both the weight of the soil and construction equipment. The polypropylene (RTC, 11/6/12) high-strength geotextile will be anchored around the perimeter of the two Cooper sumps with an anchor trench and/or secured to sheet piling along Artesia Boulevard. The minimum tensile strength and anchorage of the high-strength geotextile have been evaluated and are included in Appendix D. (RTC, 2/1/12) A typical anchor trench is shown as Detail 7 on Figure ~~3-10~~ 6-14.

Haack Rework Material Excavation and Disposal

The Haack Rework area is comprised of approximately 2,670 CY of sludge and a soil-sludge mixture beneath approximately 2,450 CY of soil overburden; therefore, a total of approximately 5,120 CY of material is anticipated to be relocated during construction activities. Haack rework material excavation will be performed using standard

construction equipment. (RTC, 11/6/12) A contingency plan will be developed which establishes gas concentration thresholds and corresponding actions such as odor suppression, soil replacement, and/or evacuation (RTC, 11/12/13) Odor suppressant equipment (foaming units) will be present during excavation to control odors and gas emissions, if necessary. South Coast Air Quality Management District (AQMD) Rule 1166 and applicable California Occupational Safety and Health (Cal-OSHA) exposure limits will be followed during excavation and handling of the Haack Rework material. (RTC, 11/6/12)

As previously described, the Haack Rework soil-sludge material will be removed and disposed of offsite ~~relocated by three possible scenarios: (1) beneath the Cooper North and/or South Sumps cap; (2) beneath the Haack Sump cap; and/or (3) offsite disposal.~~ (RTC, 11/6/12) The Haack Rework area overburden soil will be used as foundation material beneath the Cooper or Haack Sumps caps.

~~Scenarios 1 and 2 are dependent on the phasing of the construction. For example, if all parcels are available for cap construction at one time, the Haack Rework soil-sludge material can be placed within the Cooper North and South cap; however, if only the Haack Sump and Residential Properties are available for cap construction, the Haack Rework soil-sludge material will be placed within the Haack Sump cap. Material will only be placed as foundation material if it meets the requirements for engineered fill as defined in the future construction specifications.~~ (RTC, 11/6/12) ~~In Scenarios 1 and 2, the Haack Rework soil-sludge mixture material would be excavated and placed as foundation material above the high strength geotextile or 6-inch reinforced concrete or asphalt on the Cooper North and South Sumps or Haack Sump, respectively. The material would be used as foundation material to support the overlying geosynthetics and erosion resistant layer, provide fill to generate the minimum grades for drainage, and support the gas collection strip composite (geostrip), gas collection piping, and gas collection geocomposite.~~ (RTC, 11/6/12)

~~The construction schedule for Scenarios 1 and 2 is estimated to require approximately 14 days to relocate the material from the Haack Rework area to the sump(s).~~ (RTC, 11/6/12)

The Haack Rework soil-sludge material would be excavated and disposed of at a commercial, non-RCRA hazardous landfill (assumed to be the Buttonwillow Facility). Assuming all 2,670 CY of soil-sludge material is disposed of offsite and assuming 16 CY capacity end-dump trucks are used, approximately 164 truckloads would be necessary to transport the material an estimated 150 miles one-way to the Buttonwillow

Facility. An estimated 18 trucks[2] per day could be loaded and transported to the Buttonwillow Facility, resulting in approximately 10 days of hauling from the Site (Appendix E [RTC, 9/29/11]). ~~Scenario 3 has been included in the cost estimation, Table 3-1, and detailed and comparative analyses, Sections 4 and 5, respectively. A potential cost savings of $314,500 may be achieved if Scenarios 1 or 2 are implemented.~~(RTC, 11/6/12)

~~Initial finger berm construction as described in Section 3.3.5.1 6.1.2.3 (RTC 11/6/12) is estimated to require 8 days, assuming approximately 500 CY per day of material can be relocated. After the initial lift is placed, an additional 9 days would be required to place the additional 9,100 CY of foundation material, assuming an increased placement efficiency of 1,000 CY per day. The increase in efficiency after the initial lift is due to the less selective and restrictive nature of the placement after the working surface becomes more supportive. A preliminary schedule is provided in Appendix E. (RTC, 9/29/11)~~ (RTC, 1/9/2013)

The Haack Rework area will be excavated no deeper than an elevation of approximately 20 ft above mean sea level (amsl) as shown on Figure ~~3-5~~ 6-5. (RTC, 11/6/12) Following excavation of material from the Haack Rework area using visual means to guide the limits of the excavation, confirmation sampling to determine the absence of sludge and (RTC, 2/10/12) COCs at 5 ft intervals to a depth of 10 ft below the planned excavation grade (RTC, 2/10/12) would be performed to confirm the material was removed. Confirmation sample results will be compared to risk-based cleanup goals ~~provided in the Draft FS~~ described in Section 4.8. (RTC, 11/6/12) Where testing indicates concentrations in excess of cleanup goals, additional material would be excavated, hauled, disposed of offsite or reused as foundation material, and additional confirmation testing would be performed.

Upon completion of excavation, confirmation sampling, and receipt of test results indicating that the samples are below risk-based cleanup goals, the area will be backfilled with clean on- or off-site soil and graded to drain. The slope from the southern residential properties resulting from the excavation of the Haack Rework area will be contoured to a 3 ft horizontal to 1 ft vertical (3H:1V) grade while portions of the excavations lower than the surrounding land will be backfilled and graded to drain (Figures ~~3-1~~ 6-1 and ~~3-2~~ 6-2). (RTC, 11/6/12)

[2] Assumptions: (1) 3 trucks are loaded per hour between 7 am and 1 pm, such that trucks can get to the disposal facility prior to closing

Vapor Control During Construction

Health and safety controls will be implemented during construction, specifically during ~~including~~ (RTC, 11/6/12) the excavation of the Haack Rework material. The Treatability Study performed by Stantec (Stantec, 2007) indicated the Haack Rework soil-sludge material is significantly degraded; however, detectable concentrations of hydrogen sulfide and sulfur dioxide are still produced when the sludge material is disturbed. Therefore, during construction activities, vapor suppressing foams can be used and workers will be provided health and safety monitoring devices such as hydrogen sulfide and sulfur dioxide indicator badges. The badges alert workers when the permissible exposure limit (PEL, 10 parts per million [ppm] and 2 ppm for hydrogen sulfide and sulfur dioxide, respectively) is nearing so the worker can exit the work area or change practices. Additionally, fixed monitoring will be performed around the perimeter of the Site to alert workers when the PEL is detected so work activities can pause and/or be altered to prevent additional releases.

At the completion of excavation activities each day, a vapor suppressing foam or soil cover will be used to cover the exposed excavation and stockpiles to minimize ~~prevent additional~~ (RTC, 11/6/12) release of vapors.

6.1.2.3 Capping of the Sumps

The proposed, conceptual Haack and Cooper cap grades of Alternative 2A are shown on Figure ~~3-1~~ 6-2 with cross sections shown on Figures 6-3 and 6-4. (RTC, 11/6/12) This preliminary cap design is in accordance with 22 CCR §66264.228. In accordance with 22 CCR, the cap consists of a foundation layer, low-hydraulic conductivity layer, and erosion-resistance layer. The Alternative 2A cap is illustrated on Figure ~~3-9~~ 6-13 (RTC, 11/6/12), in Details 1-A and 1-B, and would consist of the layers described below.

Foundation and Gas Collection Layers

The foundation soil and gas collection layers would be placed above the high-strength geotextile and asphalt and concrete for the Cooper and Haack Sumps, respectively, and consist of, from bottom to top, minimum 1 ft of foundation soil, gas collection geostrips, and a gas collection geocomposite. The minimum 1 ft foundation and gas collection layer will support the low-hydraulic conductivity layer and erosion resistance layer in accordance with 22 CCR §66264.228(e)(4). The foundation soil would consist of ~~Haack Rework soil-sludge material,~~ (RTC, 11/6/12) Haack Rework overburden soil, on-site soils and/or imported fill material. Approximately 13,000 CY of foundation material will be required for the Cooper Sumps and Haack Sump. (RTC, 9/29/11)

The foundation material would initially be placed using the "finger fill soil placement technique," which incorporates the use of parallel, narrow berms over the

polypropylene (RTC, 11/6/12) high-strength geotextile. Approximately 3,900 CY of material would be placed using the "finger fill soil placement technique." The initial, 1-ft berms will then gradually be expanded across the sumps until the entire sump surface is covered with one foot of foundation soil. (RTC, 9/29/11)

During finger fill placement of soil above the polypropylene (RTC, 11/6/12) high-strength geotextile, movement of the sludge will be minimized and contained by the existing berms and the anchor trenches securing the polypropylene (RTC, 11/6/12) high strength geotextile and existing geomembrane. (RTC, 9/29/11) Where available space onsite limits traditional anchor trenches, the high-strength geotextile may be secured with concrete anchors or attached to sheet piles with battens. (RTC, 11/6/12)

After the initial 1-ft placement of soil across the sump, an additional 9,100 CY of foundation soil will be placed in lifts until final foundation grades are met (1 ft below the final cover grades shown on Figures ~~3-1~~ 6-1 and ~~3-2~~ 6-2). (RTC, 11/6/12) The slopes will be a minimum of 2 percent (%) to reduce impacts on drainage due to settlement of the foundation material and/or sludge. (RTC, 9/29/11)

Rows of gas collection geostrips will be placed at the surface of the foundation layer. The geostrips are 6 to 12 in. wide and consist of a geosynthetic filter fabric surrounding a molded polyethylene core (US Fabrics, 2011a). The molded polyethylene core provides a pathway for the gas to travel, while the filter fabric prevents soil intrusion and clogging. A polyethylene core and polypropylene geotextile, which are more resistant to acidic environments, will be required in the technical specifications. (RTC, 11/6/12) The gas collection geocomposite will be placed above the geostrip rows and the foundation layer (Details 1-A and 1-B, Figure ~~3-9~~ 6-13). (RTC, 11/6/12) The gas collection and control system is described in greater detail (RTC, 9/29/11) ~~in Section 3.3.6~~ below. (RTC, 11/6/12)

Low-Hydraulic Conductivity Layer

The low-hydraulic conductivity layer would be placed above the foundation soil and gas collection geostrips and geocomposite and would consist of a geosynthetic clay liner (GCL) overlain by a 60-mil HDPE geomembrane (Details 1-A and 1-B, Figure ~~3-9~~ 6-13). (RTC, 11/6/12) In accordance with 22 CCR §66264.228(e)(5), the low-hydraulic conductivity layer would reduce the downward migration of precipitation and the upward migration of gas. The low-hydraulic conductivity layers would be secured within an anchor trench around the perimeter of the sumps as described below. (RTC, 9/29/11)

Anchor Trenches

The existing geomembrane (located above the two Cooper Sumps), the high strength geotextile, and the low-hydraulic conductivity layer (60-mil HDPE geomembrane overlying a GCL) are or will be anchored above the sumps using separate anchor trenches. The existing geomembrane is secured above the sumps using a 2 ft by 2 ft anchor trench (OHM, 1994). These anchor trenches act similarly to shallow, vertical barriers by minimizing the opportunity for lateral "overspilling" of surface sludge. Lateral migration of the sludge at depth has not been shown to occur through the soil based on soil borings outside the immediate areas of the sumps. (RTC, 9/29/11)

The high strength woven geotextile will be secured in a separate 2 ft by 2 ft anchor trench located outside the limits of the Cooper Sumps. (RTC, 9/29/11) During excavation of the anchor trenches, a Contingency Plan will be implemented with gas levels and corresponding corrective actions to be taken. Corrective actions will include but not be limited to odor suppression, soil replacement, and/or evacuation (RTC, 11/12/13).

The GCL and HDPE geomembrane will be secured by an additional anchor trench around the perimeter of the Haack and Cooper Sumps. The anchor trench will vary in configuration depending on the termination condition. On the eastern, southern, and portions of the northern and western perimeters, the anchor trench will consist of a vee-trench filled with concrete to form a surface water drainage ditch (Detail 6 on Figure ~~3-10~~ 6-14). (RTC, 11/6/12) On portions of the northern and western perimeters, the anchor trench will consist of a 1 ft deep by 2 ft wide anchor trench (RTC, 9/29/11) (Detail 7 on Figure ~~3-10~~ 6-14). (RTC, 11/6/12) Where sheet piles are located on the northern edge of the site, the geosynthetic materials will be secured to the sheet piles using battens. (RTC, 11/6/12)

Erosion Resistance Layer

The erosion resistance layer is comprised of a drainage geocomposite overlain by 1 ft of Class II aggregate base, in accordance with 22 CCR §66264.228(e)(10). The drainage geocomposite minimizes hydrostatic head buildup above the hydraulic barrier and provides a means to drain precipitation that has infiltrated the overlying Class II aggregate base toward the outside of the cap and perimeter drainage channels. The Class II aggregate base will be resistant to foreseeable erosion effects caused by wind-scour, raindrop impact, and runoff prior to site development. (RTC, 9/29/11)

Sheet Pile Cut-Off Wall

Along a portion of the northern Site boundary, limited space is available to allow for grading to install the cap system. As a result, sheet piles would be installed to allow for the vertical rise of the cap without altering the Artesia Boulevard right-of-way. The

sheet piles would be installed to a maximum depth of 18 feet bgs, consistent with the deepest known sludge in the Cooper North and Haack Sumps, and extend upwards to approximately 3 feet from the ground surface to accommodate the cap. The sheet piles would be coated to minimize corrosion of the steel due to the low pH and high hydrogen sulfide environment. (RTC, 11/6/12) A decorative exterior wall will cover the exposed portion of the sheet piles along Artesia Boulevard. (RTC, 9/29/11) The sheet pile cut-off wall will provide a barrier between the Haack sump sludge and Artesia Blvd and its adjacent sidewalk. (RTC, 2/10/12)

Final Cap Topography

The final cap surface is shown on Figures ~~3-1~~ 6-1 and ~~3-2~~ 6-2. (RTC, 11/6/12) Cross sections of the final cap topography are provided on Figures ~~3-3~~ 6-3 and ~~3-4~~ 6-4. (RTC, 11/6/12) Drainage channels are shown on the exterior of the sumps to the north, south, east, and west as well as bisecting the Cooper North and South sumps. The channels drain with a 0.5% slope to the northeast and northwest corners of the Cooper North and Haack sumps, respectively. The cap slopes up from the drainage channels with a minimum 2% slope to a maximum elevation of 25.7, 24.8, and 25.6 ft amsl on the Haack, Cooper North, and Cooper South sumps, respectively. Along Artesia Boulevard, the approximate height of the cap will be 22 to 23 ft amsl which includes the maximum 3 ft wall to support the final cover and an additional 6-inch curb to direct stormwater runoff to the perimeter drainage channels. The Haack Rework area will be backfilled and graded to drain as shown on Figures ~~3-1~~ 6-1 and ~~3-2~~ (RTC, 9/29/11) 6-2. (RTC, 11/6/12)

Optional Final Cover Configuration

An optional final cover configuration was identified which eliminated the retaining wall described in the *Sheet Pile Cut-off Wall* section, above. The grading in the area affected by the elimination of the retaining wall was revised to accommodate a minimum 5 percent (%) slope draining to the north and terminating at a 6 to 9 inch (in.) concrete curb immediately adjacent to the Artesia Boulevard (Blvd.) sidewalk (Optional Alternative 2A). The curb will deter unintended light traffic across the slope, act as a water-stop for drainage from the slope, and accommodate the slight variations in the existing Haack Sump concrete slab surface elevation. The modifications necessary to eliminate the retaining wall and allow for the Optional Alternative 2A Cover will require waivers of some requirements in California Code of Regulations, Title 22 (22 CCR). A complete description of the alternative cover configuration is provided in Appendix F. (RTC, 11/12/13)

6.1.2.4 Gas Control and Monitoring System

The gas control system would be comprised of perimeter vertical gas migration control wells and a below-cap horizontal gas collection system. The proposed layouts of the vertical and horizontal gas collection systems are shown on Figures ~~3-6~~ 6-6 and ~~3-7~~ 6-7 (RTC, 11/6/12), respectively. (RTC, 9/29/11)

Vertical Gas Migration Wells

The system of gas migration control wells is designed to be a passive system that, as a contingency, can be converted readily to an active system. The system will operate actively for a period of two weeks following completion of the remedial action construction at the Site. Based on the concentrations of constituents detected during the two-week startup period, the system will remain active or switch to passive operation with the option for active control in the future. The system may be converted to passive operation with written prior approval from the DTSC. (RTC, 1/9/2013) The decision to make the system active again would be based upon future gas monitoring at the Site. (RTC, 9/29/11)

A series of alternating air inlet and gas extraction piping would be placed approximately every ~~20~~ 80 ft (RTC, 11/6/12) along the perimeter of the cap, except where sheet piles are installed as shown on Figure 3-6. The wells would be installed to approximately 2 ft above the groundwater "A" horizon ("A" horizon approximate elevation between 5.85 and 11.55 ft msl [Stantec, 2011]). The air inlet and gas extracting wells act to create a "curtain" of air surrounding the sumps, minimizing the horizontal migration of gas without extracting gas from the sludge. (RTC, 9/29/11)

During active gas extraction, a vacuum will be applied to the gas extraction wells, thus extracting gases from these wells, which will be conveyed to a treatment system for treatment prior to discharge to the atmosphere. The location of the system is shown on Figures ~~3-6~~ 6-6 and ~~3-7~~ 6-7. (RTC, 11/6/12) The vacuum pressure in the gas extraction wells imparts a vacuum on the soils surrounding each gas extraction well. With the air inlet wells equally spaced between the gas extraction wells, the air inlet forces a "short-circuiting" of the flow into the gas extraction wells. The "short circuiting" effect creates a preferential flow path between the air inlet and gas extraction wells, thereby allowing the system to "sweep" or "flush" gases migrating from the sludge material laterally without extracting gases from within the sludge (RTC, 9/29/11) (Figure ~~3-8~~ 6-8). (RTC, 11/6/12)

During passive gas extraction, subsurface gas movement is non-existent or very small, allowing barometric pumping and diffusion to vent subsurface gases from the vertical gas migration control wells. (RTC, 9/29/11)

Below-Cap Horizontal Gas Collection System

A horizontal gas collection system (utilizing geostrips) would be placed within the foundation layer of the cap, as discussed above. ~~in Section 3.3.5.1.~~ (RTC, 11/6/12) Similar to the vertical gas migration control wells around the perimeter of the cap, the horizontal gas collection system is designed to initially operate as an active system, during a start-up period of two weeks. The system would then be operated as a passive system, but is designed as a contingent measure to be readily converted to active, if necessary. As a passive system, it would be vented to the atmosphere and rely on barometric pumping and diffusion to vent subsurface gases from the system. The decision to make the system active would be based upon post-cap construction gas monitoring at the Site (RTC, 9/29/11) as described in *Gas Treatment System*, below. (RTC, 11/6/12)

The design of the gas collection system incorporates gas collection geostrips and air inlet geostrips, both connected to separate gas collection and air inlet piping. Piping is connected to the treatment compound where actively extracted gases can be treated prior to discharge to the atmosphere and fresh air can be pulled into the system through the air inlet piping. Gases fluxing out of the sludge and vertically rising to the base of the hydraulic barrier component of the cap will be collected in the continuous gas collection geocomposite layer. Parallel geostrips will allow collected gases to be "flushed" or "swept" from the gas extraction geocomposite to the gas extraction geostrips by allowing fresh air into the air inlet geostrips. Geostrips will convey the collected gases to the gas extraction piping and the treatment compound. (RTC, 9/29/11)

*Gas Treatment System (*RTC, 11/6/12)

The gas extracted from the control system would be treated using specialized granular activated carbon (GAC). Specialized Granular Activated Carbon (GAC) products have been manufactured to include hydrogen sulfide and sulfur dioxide oxidation. Specifically, Calgon Carbon has a number of specialized GAC products for hydrogen sulfide and sulfur dioxide environments. (RTC, 11/6/12)

The gas system will be operated actively for a period of time defined in a future Operations, Maintenance, and Monitoring (OMM) Plan. During initial operation, soil gas data, including constituents extracted and their concentrations, will be collected. The need for active gas collection will be based on the extracted soil gas COC concentrations and associated, calculated health risk goals. If start-up data indicates that COC concentrations are below risk-based trigger concentrations, and therefore, active gas collection is not needed, the system may be converted to a passive system which vents to the atmosphere or is turned off with no venting. (RTC, 4/4/12)

Soil gas samples will be collected from the treatment system and perimeter soil gas probes on a regularly basis to evaluate the operation of the system and/or migration of soil gas. Sample results will be compared to risk-based trigger concentrations developed with the OMM Plan for each COC. Development of the risk-based trigger concentrations will assume soil gas will cause outdoor air to become impacted with COCs; however, the outdoor air concentration used to develop the trigger concentration will be low enough to not result in adverse health effects. Based on the assumed conditions at the Site, if soil gas trigger concentrations are not exceeded, outdoor air concentrations will remain below human-health risk based concentrations. If soil gas concentrations are triggered, the gas collection and treatment system may be activated. (RTC, 4/4/12)

Gas Monitoring System

Multi-level gas migration probes would be placed outside of the perimeter of the cap. The proposed locations of the nine probes are shown on Figure 3-6. The probes are designed to be outside of the vertical gas migration control wells. (RTC, 9/29/11)

The gas probes are shown on Figure ~~3-7~~ 6-7. (RTC, 11/6/12) A total of nine probes were selected based on the average distance between probes of 300 ft to provide multiple locations to detect potential gas migration, if any. (RTC, 2/10/12) Each monitoring location will consist of three nested probes with 1 ft screen lengths at 5 ft intervals for discrete sample collection.(RTC, 9/29/11) The rationale for the location was based on a location outside of the radius of influence of the vertical gas migration control wells and within the property boundary and/or in a location accessible for monitoring which increased or decreased some distances between the probes. For example, probes were placed within the median of Artesia Boulevard rather than in the street to provide a safer location for monitoring. With further refinement of design, the location and number of probes may change with adjustments to the radius of influence of the vertical gas migration control wells and the locations of buildings and utilities for future site development. (RTC, 2/10/12)

Regular monitoring of gas concentrations at the probe locations would be performed before, during, and after system operation. The decision to convert the gas collection systems to an active system would be partially based upon the results of the probe monitoring activities and threshold contaminant concentrations developed in the Operations, Maintenance, and Monitoring (OMM) Plan (RTC, 2/10/12) as described in the *Gas Treatment System* section, above. (RTC, 11/6/12)

6.1.2.5 Institutional Controls

The anticipated institutional controls for the Site would consist of governmental controls, such as zoning and building permit restrictions, proprietary controls that

restrict property use, and informational controls. Governmental controls would restrict the zoning of the Site to commercial (as identified in the Artesia Corridor Specific Plan) and prohibit sensitive land uses (i.e., residential, hospitals, schools, or child-care centers), specify building construction requirements (i.e., inclusion of gas control system beneath new structures). Environmental land use restrictions may also be applicable. Proprietary controls would place use restrictions on the Site properties. Restrictions would include future land use, the prevention of excavation or drilling within certain areas of the Site (i.e., within the capped areas), (RTC, 9/29/11) controlled traffic loads over the caps (RTC, 11/6/12), prohibit onsite groundwater extraction for municipal and domestic use (i.e., drinking water purposes), industrial, and agricultural (i.e., irrigation) use, future building location restrictions, provide for potential easements (i.e., for O&M activities) and conveyance of proprietary control restrictions to future property owners (i.e., restrictions "run with the land"). Informational controls would include deed notices on the Site property titles and ensure inclusion of the Site on a California registry of contaminated sites. (RTC, 9/29/11) Land use covenants (LUCs) to place deed restrictions on the site will be filed with the Los Angeles County Recorder's Office and annual LUC restriction inspections will be conducted by DTSC to ensure compliance. (RTC, 4/4/12) The asphalt cap above the sludge within Artesia Boulevard will have increased maintenance to repair cracking and normal wear that increase the permeability. (RTC, 11/6/12)

Furthermore, a Health and Safety Plan (HASP) and Construction Quality Assurance (CQA) Plan would be required to establish minimum health and safety protocol during construction, and provide documentation of proper excavation, cap, and gas control system construction. A Risk Management Plan (RMP) would be developed for the Site to reduce the risk of future construction worker exposure to groundwater if the Site is developed. The RMP would discuss the hazards at the Site, minimum PPE requirements, and notification requirements. (RTC, 9/29/11)

6.1.2.6 Groundwater Monitoring

~~The existing ten groundwater monitoring wells would be properly abandoned prior to commencement of the remedial action. During the remedial action activities an appropriate groundwater monitoring network would be agreed upon with input from the DTSC. After the completion of the remedial action, the future groundwater monitoring wells would be installed. Groundwater monitoring would continue to be performed on a semi-annual basis for a period of 5 years (RTC, 2/7/12)after the remedial controls have been implemented. A typical groundwater monitor well is shown as Detail 3 on Figure 6-9 in the Draft FS (Geosyntec,2011).~~ (RTC, 4/4/12)

Eight of the existing ten groundwater monitoring wells would be properly abandoned prior to commencement of the remedial action. Upgradient wells MW-1A and MW-1B

would not be abandoned. (RTC, 4/4/12) During the remedial action activities, an appropriate groundwater monitoring network would be agreed upon with input from the DTSC. After the completion of the remedial action, the future groundwater monitoring wells would be installed. Groundwater monitoring would continue to be performed on a semi-annual basis. A typical groundwater monitor well is shown as Detail 3 on Figure ~~6-9 in the draft FS (Geosyntec, 2011)~~ 6-13.(RTC, 11/6/12)

The future development plans of the Site, which are currently unknown, would control where future monitoring wells would be installed. The well locations of the future monitoring well network would be agreed upon in consultation with the DTSC prior to completion of the remedial action. It is anticipated that the new monitoring wells would be installed shortly after completion of the remedial action. (RTC, 4/4/12)

6.1.2.7 Future Site Development

Following completion of the cap construction, the resulting Site conditions will facilitate the construction of a parking lot and an ingress/egress road to accommodate future commercial development at the Site. The 12-in. thick Class II aggregate base will provide a working surface for construction equipment used for parking lot construction, prevent the accumulation of free water within or below the pavement structure, and affect the rate of load distribution on the cap (Caltrans, 2008). Final landscape development designed in conjunction with the future parking lot above the cap will require the use of above grade planters to prevent biological intrusion into the cap. (RTC, 9/29/11)

The grades and final elevation of the cap have been reduced to allow for a flatter surface on which to construct a parking lot and be a less prominent feature along Artesia Boulevard. As described in Section ~~3.3.5~~ 6.1.2.3 (RTC, 11/6/12), the maximum elevation of the cap will be 25.7 ft amsl and the slopes will vary between 2H:1V and 2 percent. During commercial development of the Site, the slopes of the parking lot can be further reduced by adding fill above the lower portions of the cap, provided drainage from the geocomposite is maintained. Selective fill would allow for a flatter surface and ramp features to facilitate car movement. (RTC, 9/29/11) The cap has been shown to support construction loads at the surface (Appendix D). During final design of the cap, traffic load restrictions will be developed and incorporated into the institutional controls. (RTC, 11/6/12)

6.1.3 Alternative 3 – Capping with Selective Excavation and Stabilization/ Neutralization

Alternative 3 includes the following major elements (Figures ~~6-2~~ 6-9 and ~~6-7~~ 6-10): (RTC, 11/6/12)

- Existing surface removal;
- Consolidation of material;
- Stabilization/neutralization of the current upper 3 feet of sludge in the Cooper Sumps;
- Capping of sludge remaining onsite;
- Installation of gas control and monitoring system;
- Institutional controls; and
- Groundwater monitoring.

Some of these elements were discussed in Section 6.1.2; therefore, ~~the existing surface removal (Section 6.1.2.1), the consolidation of material (Section 6.1.2.2),~~ (RTC, 11/6/12) the installation of the gas control and monitoring system (Section 6.1.2.4), institutional controls (Section 6.1.2.5), and groundwater monitoring (Section 6.1.2.6) will not be repeated herein. Existing surface removal, the consolidation of material, ~~surface covering material removal,~~ (RTC, 11/6/12) sludge stabilization/neutralization, and capping are discussed further in the following sections.

6.1.3.1 Existing Surface Removal

A geomembrane is currently above the Cooper North and South Sumps. Prior to initiating neutralization and stabilization activities, the existing geomembrane will be removed to permit access to the sludge. The reinforced concrete and asphalt covers above the Haack Sump will remain in place. (RTC, 11/6/12)

6.1.3.2 Consolidation of Material

In general, the sludge is contained in the three sumps: Cooper North and South, and Haack. As previously discussed in Section 3.2.1, approximately ~~650~~2,670 (RTC, 1/9/2013) CY of a sludge/soil mixture is located outside of the sumps in the Haack Rework area. To excavate the sludge/soil mixture, approximately ~~3,550~~ 2,450 (RTC, 1/9/2013) CY of overburden will need to be excavated. Additionally, along the eastern property line, a thin layer of sludge exists which appears to be the result of spillage or overflow from the sumps. (RTC, 11/6/12)

The Haack Rework and eastern overflow areas would be consolidated into one of the three sumps prior to capping, and used as fill beneath the cap low-hydraulic conductivity layer (to be discussed in Section 6.1.3.4). The Haack Reworked material will be tracked during placement and will not be placed where it will be in contact with the gas collection system (RTC, 11/12/13). Approximately ~~5,120~~5,470 ~~-~~ 5,380 (RTC 11/12/13) CY (RTC, 1/9/2013) of Haack Rework ~~(2,670 CY)~~(2,670 CY) (RTC,

1/9/2013), Haack Rework overburden ~~(2,450 CY)~~(2,450 CY) (RTC, 1/9/2013), and eastern overflow (260 CY) are anticipated to be placed above the sumps. (RTC, 11/6/12)

Following visual excavation of material from the Haack Rework and eastern overflow, confirmation sampling would be performed to confirm the material was removed. Confirmation sample results would be compared to cleanup goals. Where testing indicates concentrations in excess of cleanup goals, additional material would be removed and consolidated above the sumps. Haack Rework and eastern overflow excavations will be backfilled using soils obtained from unimpacted areas of the site. (RTC, 11/6/12)

6.1.3.3 Stabilization/Neutralization of Cooper North and South Sludge

Stabilization/neutralization of the sludge material would be performed to the top 3 feet of the sludge to solidify the sludge for support of the proposed overlying cap. From the treatability studies performed by Stantec, it was determined that the addition of a 50/50 weight for weight (w/w) mix of calcium hydroxide ($Ca(OH)_2$) and calcium carbonate ($CaCO_3$) at a dosage rate of 20 to 30 percent reagent to sludge mix and 10 percent water neutralizes the sludge material. The addition of 50 percent soil (by weight) to this mix would effectively solidify the waste such that it is no longer susceptible to viscoelastic deformation (Stantec, 2008).

In-situ mixing would be performed through use of an excavator. The sludge on the edges of the sump would be mixed first to establish a foundation for equipment to move inward. Mixing would be performed to the minimum depth to support equipment, which is estimated at 3 feet. Due to the difficulty segregating the sludge and interbedded soil layers, it is assumed both the sludge and soil materials within the top 3 feet would be mixed as sludge. Therefore, the sludge volume used to calculate the reagent volume was the 2008 sludge volume in the top 3 feet, or 13,500 CY (Stantec, 2008).

Mixing with the reagents and soil (RTC, 11/6/12) would cause bulking of the materials. According to the Treatability Study performed by Stantec, the sumps are expected to bulk 69 percent, based on the mix design specified (Appendix A, Stantec, 2008). Therefore, the bulked materials are anticipated to increase the height of the sumps by approximately 2 feet, resulting in a total treated sludge thickness of approximately 5 feet.

Respirators (or if warranted by conditions, more stringent personal protective equipment such as Self-Contained Breathing Apparatus [SCBA]), engineering controls (potentially tenting over the excavation), and air monitoring may be required to address

potential emissions of sulfurous gases from the sludge generated during mixing (Stantec, 2008).

6.1.3.4 Capping of the Sumps

Similar to Alternative 2A, the Alternative 3 cap would consist of foundation, gas collection, barrier, drainage, and protective layers covering the Cooper North and South, and Haack sumps contiguously within the Site boundary; however, the gas collection layer, erosion protection layer, and sheet piling proposed for Alternative 3 are different than Alternative 2A, as described below. As discussed in Section 6.1.2.1, (RTC, 11/6/12) the portion of the Haack sump outside of the Site boundary beneath the sidewalk and Artesia Blvd. is considered to be already capped in this Alternative (Stantec, 2010a). The proposed final grades are shown on Figure ~~6-2~~ 6-10. (RTC, 11/6/12) The Alternative 3 cap is depicted on Figure ~~6-6~~ 6-15 in Details 1-C and 1-D. (RTC, 11/6/12)

Foundation and Gas Collection Layers

The foundation soil and gas collection layers would be placed above the stabilized sludge layer and consist of, from bottom to top, minimum 1 foot of foundation soil, gas collection piping, and a gas collection geocomposite. The minimum 1 ft foundation and gas collection layer will support the low-hydraulic conductivity layer and erosion resistance layer in accordance 22 CCR §66264.228(e)(4). The foundation soil would consist of onsite, impacted soil and Haack Rework material where available. Impacted foundation layer material would be supplemented with soil material imported from offsite. Impacted soil and Haack Rework material will be tracked during placement and placed such that it is not in contact with the gas collection system. (RTC, 11/12/13) Horizontal gas collection pipes surrounded by gas collection aggregate would be embedded in the foundation layer. Nonwoven geotextile would surround the aggregate to prevent clogging of the aggregate due to fines intrusion. The foundation layer would be graded with 3 percent slopes to accommodate drainage. (RTC, 11/6/12)

Low-Hydraulic Conductivity Layer

The low-hydraulic conductivity layer would be placed above the foundation and gas collection layers and would consist of a geosynthetic clay liner (GCL) and a 60-mil high density polyethylene (HDPE) geomembrane. In accordance with 22 CCR §66264.228(e)(5), the low-hydraulic conductivity layer would reduce the downward migration of precipitation and the upward migration of sludge and gas. (RTC, 11/6/12)

Erosion Resistance Layer

The erosion resistance layer is comprised of a drainage geocomposite and 2 feet of vegetated cover soil. In accordance with 22 CCR §66264.228(e)(10), the drainage

geocomposite would prevent hydrostatic head buildup and drain precipitation that has infiltrated the overlying vegetated cover soil toward the outside of the cap and perimeter drainage channels while the vegetative cover soil will be resistant to foreseeable erosion effects by wind-scour, raindrop impact, and runoff. (RTC, 11/6/12)

Along the northern property boundary, limited space is available to allow for grading to install the cap system. As a result, sheet piles would be installed to allow for the vertical rise of the cap without altering Artesia Boulevard or the railroad property. The sheet piles would be installed to an average depth of 18 feet bgs and extend between 4 and 10 feet from the ground surface to accommodate the cap. (RTC, 11/6/12)

Final Cap Topography

The final cover grades are shown on Figure 6-10. The minimum thickness of the cover is ~~6.5~~ 6(RTC, 11/6/12) feet which accounts for the ~~3.5~~ 3-foot stabilization layer (with bulking, 3 ft sludge layer increases to a total thickness of 5 feet) (RTC, 11/6/12), 1-foot (minimum) foundation layer, and 2-foot erosion resistance layer. The maximum cover thickness would be approximately 12.5 feet due to increasing the foundation layer to 9.5 feet to create a cover surface with 3 percent (%) slopes. (RTC, 9/29/11)

The maximum elevation of the cover for Alternative 3 is 35 feet amsl. Artesia Boulevard north of the Haack property has an elevation of approximately 20 feet amsl. Along Artesia Boulevard, the Alternative 3 cap elevation varies from approximately 26 feet amsl to 29 feet amsl resulting in a retaining wall height along Artesia Boulevard between 4 and 10 feet high. (RTC, 9/29/11)

Gas Monitoring System

The gas control and monitoring system is shown on Figures 6-11 and 6-12. The design of the Alternative 3 system is the same Alternative 2A; however, Alternative 3 will incorporate 3-inch solid and perforated polyvinyl chloride (PVC) pipes rather than geostrips. Pipes are proposed for Alternative 3 because the thicker foundation layer can accommodate the pipes and filter material. (RTC, 11/6/12)

6.1.3.5 Future Site Development

The resulting Site conditions following cap construction will facilitate an open-space end use; however, use as a parking lot may be difficult due to steep slopes around the cap edges. The maximum height of the cap is approximately 34.5 ft amsl or approximately 14.5 ft above the surrounding area (Figure 6-10). Areas around the site are available for future development such as the residential properties to the south. (RTC, 11/6/12)

6.1.4 Alternative 4 – Excavation with Offsite Disposal

Excavation and offsite disposal of the sludge would involve excavating the sludge materials to depths between 0.5 and ~~23.5~~ 17.5(RTC, 11/6/12) feet bgs (Figure ~~6-8~~ 6-16 [RTC, 11/6/12]). Shoring would be required in areas to support the sump walls in locations shown on Figure ~~6-8~~ 6-16, (RTC, 11/6/12) at a minimum. ~~Active dewatering for the duration of excavation would be required to remove perched water and groundwater from the excavation.~~ Active dewatering would be required to remove perched groundwater and shallow groundwater when excavation and backfill are below the water table. Additionally, dewatering would be necessary to remove ponded misting agents. (RTC 1/9/2013) Respirators (or if warranted by conditions, more stringent personal protective equipment such as Self-Contained Breathing Apparatus [SCBA]), engineering controls (potentially tenting over the excavation), and air monitoring may be required to address potential emissions of sulfurous gases from the sludge generated during excavation (Stantec, 2008). Alternative 4 includes the following major elements:

- Concrete and asphalt removal;
- Excavation of sludge material from the (RTC, 11/6/12) Cooper North and South and Haack Sumps;
- Excavation of soil-sludge material from the (RTC, 1/9/2013) (RTC, 11/6/12) Haack Rework Area;
- Transportation to a disposal facility;
- Confirmation sampling;
- Backfill of sumps; and
- Groundwater monitoring.

Groundwater monitoring was discussed in Section ~~6.1.2.5~~ 6.1.2.6, (RTC, 11/6/12) and will not be repeated herein. Surface covering material removal, sludge stabilization/neutralization, and capping are discussed further in the following sections. These elements are discussed further in the following sections.

6.1.4.1 Concrete and Asphalt Removal

In order to access the Haack sump, the existing 6-inch reinforced concrete slab and 8-inch asphalt pavement would need to be removed. Since the underside of the concrete slab is in contact with the sludge material, after the concrete is demolished, it would be stockpiled onsite to allow for characterization sampling. Representative concrete samples should be collected and analyzed for metals, PAHs, and VOCs. Concrete found to contain metals, PAHs, or metals at concentrations exceeding hazardous waste classification thresholds would require disposal at an offsite hazardous

waste facility. If materials are found to be nonhazardous, they may be recycled or disposed of at a nonhazardous facility.

6.1.4.2 Excavation of Sumps

The sumps would be excavated to the maximum depth of sludge as reported during the RI. Based on the boring logs, sludge depth varies between 0.5 ~~foot~~ and ~~23.5~~ 17.5 (RTC, 11/6/12) ~~feet~~ft bgs (RTC, 1/9/2013) (Figure ~~6-8~~ 6-16 [RTC, 11/6/12]) (Stantec, 2008). Where significant overburden is present, such as on the Haack Sump, the overburden may be stockpiled separately, sampled, and used as backfill if testing indicates concentrations of constituents are below cleanup objectives. Using an excavator, sludge and interbedded soil would be mixed with the $Ca(H)_2/CaCO_3$ reagent and loaded directly into trucks for transport to the disposal facility. Due to the difficulty segregating the sludge and interbedded soil layers, it is assumed both the sludge and soil materials would be excavated and managed as sludge. Because of the acid gas generation during mixing, a tent would be necessary around the excavator and working surface to capture and treat the gas during mixing. As discussed in Section ~~6.1.3.2~~ 6.1.3.3 (RTC, 11/6/12), the addition of the reagent would result in bulking of the material. With only the addition of the reagent, it is anticipated bulking of the sludge would be approximately 25% and assuming 15% over-excavation, resulting in a total disposal volume of approximately ~~52,000~~ 45,923 CY or ~~49,900~~ 50,200 (RTC, 11/6/12) tons (based on a bulk density assumption of 81 lb/cy [Stantec, 2008]). It is assumed that the sludge containing 25% admixture will be acceptable as-is for disposal at a landfill permitted to accept non-RCRA hazardous waste such as the Buttonwillow Facility.

During excavation below the groundwater table or within the perched water zones, some dewatering may be necessary. The area where this is most likely is in the Haack Sump near the northern border of the Site. In this region, groundwater entering the excavation would be pumped to a tank where it would be sampled prior to disposal.

6.1.4.3 Excavation of Haack Rework Area

The Haack Rework area would be excavated without the addition of the reagent. Based on the Treatability Study, the rework material is significantly degraded indicating stabilization/neutralization is likely not necessary. Furthermore, the Treatability Study demonstrated that significant quantities of gas are not likely to be produced when the Haack Rework material is disturbed; therefore, a tent system with gas treatment is not necessary (Stantec, 2008).

The Haack Rework overburden would be excavated and stockpiled separately. Similar to the Haack overburden, the overburden material would be sampled and used as backfill if testing indicates concentrations of constituents are below cleanup objectives.

Using an excavator, the Haack Rework sludge material would be loaded directly into trucks for transport to the disposal facility.

6.1.4.4 Confirmation Sampling

Following excavation of the sumps and Rework area, confirmation samples would be collected and analyzed for the COCs. Where confirmation sampling indicates ~~impacted~~ sludge (RTC, 11/6/12) material remains, additional material would be excavated in the area represented by the confirmation sample. When confirmation sampling indicates ~~impacted~~ sludge (RTC, 11/6/12) material has been removed, the removal would be considered complete and backfill would be initiated.

6.1.4.5 Backfill of Sumps

Following removal completion, the sumps would be backfilled with ~~onsite material outside of the impacted areas where available.~~ (RTC, 11/6/12) non-impacted, imported soil ~~would be placed if additional material is required~~. (RTC, 11/6/12) The sumps would be backfilled to pre-excavation grades.

6.1.4.6 Transportation to Disposal Facility

The neutralized sludge material would be transported to the Button Willow Facility ~~a disposal facility~~ (RTC, 11/6/12) in covered trucks. This disposal facility was selected because it accepts non-RCRA hazardous wastes containing petroleum. (RTC, 11/6/12) The total volume estimated for disposal includes the sludge volume with interbedded soil calculated by Stantec in 2008, 0.5 foot over-excavation at the base of the sumps, and reagent volume for a total disposal volume of ~~49,900~~ 45,923 CY and the total disposal weight of 50,200 tons. (RTC, 11/6/12) Based on testing performed by Stantec during the treatability study, the neutralized sludge would be disposed at a non-hazardous facility (Appendix ~~A~~ B [RTC, 11/6/12], Stantec, 2008); however, due to avoid potential future disposal liability (RTC, 11/6/12), a non-RCRA hazardous waste facility, the Buttonwillow Facility, was selected for this Alternative analysis. (RTC, 11/6/12)

7. DETAILED ANALYSIS OF ALTERNATIVES

7.1 General

This section includes a detailed analysis of the final remedial alternatives for the Site. An overview of the nine criteria used for the detailed analysis is presented below.

7.2 Detailed Analysis Criteria

The CERCLA guidance document explains the nine criteria that are used to evaluate each remedial alternative [USEPA, 1988]. The first two criteria relate directly to findings that must be made in the Record of Decision (ROD) for the Site. These are categorized as threshold criteria that a selected remedy must meet.

1. **Overall Protection of Human Health and the Environment** – This criterion requires evaluation of how the alternative achieves and maintains protection of human health and the environment. The overall assessment of protectiveness draws on the assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. Evaluation of the overall protectiveness of an alternative focuses on whether an alternative achieves adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineered controls or institutional controls. This evaluation also considers whether an alternative poses any unacceptable short-term or cross-media impacts.
2. **Compliance with ARARs** – This criterion requires an evaluation of how the alternative complies with identified ARARs and applicable advisories or guidance that are "to be considered." ARARs are generally categorized as action-specific, location-specific, or chemical-specific Federal or state-promulgated requirements. A list of potential Federal and state action-specific, location-specific, or chemical-specific ARARs have been identified for the Site and are included in Table 4-2.

The following seven criteria are "balancing" criteria. They represent the primary criteria upon which the detailed analysis is based and that are used to distinguish among alternatives that meet the threshold requirements above. The alternative that strikes the best balance among these seven criteria and that meets the threshold criteria generally is the preferred alternative.

3. **Long-term Effectiveness and Permanence** – Requires evaluation of the long-term effectiveness of the remedial alternative in maintaining protection

of human health and the environment following implementation of the alternative.

4. **Reduction of Toxicity, Mobility, and Volume Through Treatment** – The assessment against this criterion evaluates the anticipated performance of the treatment technologies that the alternative comprises, and assesses their ability to reduce the toxicity, mobility and volume of contaminated materials through the use of treatment.
5. **Short-term Effectiveness** – Requires an assessment of the protection of human health and the environment during construction and implementation of the remedial alternative until RAOs are met. The following factors are addressed as appropriate for each alternative: protection of the community during remedial actions; protection of workers during remedial actions; environmental impacts; and time until remedial response objectives are achieved.
6. **Implementability** – This criterion requires an assessment of the technical and administrative feasibility of an alternative, including the availability of required services and materials to execute the alternative. How each alternative is impacted by the property ownership (i.e., one, large, single property or seven individual properties) will also be discussed.
7. **Cost –** Requires evaluation of the anticipated capital costs and operation and maintenance (O&M) costs of an alternative. For this FS Report, O&M costs are presented in ~~2011~~ 2012 (RTC, 11/6/12) dollars using a ~~7~~ 2 (RTC, 11/6/12) percent discount rate per EPA Guidance (EPA, 2000).
8. **State Acceptance** – Allows for consideration of preferences or apparent concerns by the State of California Department of Toxic Substances Control (DTSC).
9. **Community Acceptance** – Allows for consideration of the community's preferences or concerns regarding remedial alternatives. DTSC formally considers the community's preferences or concerns after this FS Report and proposed plan are prepared.

7.3 Final Remedial Alternatives – Detailed Analysis

7.3.1 General

This section includes the detailed analysis of the four final remedial alternatives presented in Section 6.1 and in Table 6-1. Each alternative is analyzed separately according to the nine criteria listed above. The common elements of the final remedial alternatives are not evaluated as they are the same for each alternative.

7.3.2 Final Remedial Alternative 1– No Action

7.3.2.1 Overall Protection of Human Health and the Environment

The no action alternative does not effectively mitigate potential future risks associated with the ingestion, inhalation, or direct contact of Site soils or soil gas. It does not provide any means for source zone mass removal or containment and would not be protective of human health under the hypothetical future scenario use. Because the no action alternative does not meet the threshold requirement of providing overall protection of human health and the environment, no further analysis of this alternative is performed.

~~7.3.3 Final Remedial Alternative 2 – Capping with Selective Excavation~~

~~*7.3.3.1 Overall Protection of Human Health and the Environment*~~

~~Capping with selective excavation would provide moderate to high overall protection of human health and the environment. The exposure routes for receptors as identified in the HHRA are dermal contact with sludge, ingestion of sludge, and inhalation of soil gas. Selective excavation and consolidation within the sumps would remove the eastern overflow and Haack Rework area with the associated gas risks. The sumps would be capped reducing the risk associated with dermal contact and ingestion. Additionally, a gas control and monitoring system would be installed beneath the cap to control gas which may be generated by the sludge. High overall protection is not achieved with the method due to the source remaining onsite.~~ (RTC, 9/29/11)

~~*7.3.3.2 Compliance with ARARs*~~

~~ARARs potentially applicable to Site remedial actions are shown in Table 4-2. Precautions would be required to ensure that short-term community and worker exposures to dust, noise, truck traffic, and VOC emissions are limited to acceptable levels during soil excavation and handling, per ambient air quality health standards.~~ (RTC, 9/29/11)

~~*7.3.3.3 Long-Term Effectiveness and Permanence*~~

~~The permanent cap with the below-cap and perimeter passive gas control system provides long-term effectiveness. To maintain the long-term integrity of the cap and related remedial measure components, maintenance and monitoring would be provided. If gas monitoring indicates concentrations in excess of acceptable values, the below-cap and perimeter vertical gas migration control wells can be made active, which adds to long-term effectiveness in controlling the migration of gas to the environment.~~ (RTC, 9/29/11)

~~*7.3.3.4 Reduction in Toxicity, Mobility, or Volume Through Treatment*~~

~~The cap design would include a gas collection system that can be connected to a treatment system during start-up and continued use, if necessary, based upon start-up monitoring results. If the gases are treated, some reduction in toxicity would be realized. The cap and Site drainage improvements would provide a reduction in mobility of the waste as infiltration of water would be mitigated. No reduction in waste volume would be realized with the remedial measure~~. (RTC, 9/29/11)

~~Gas transport at the Site occurs as a result of diffusion; therefore, the rate of lateral migration of gas constituents is very low. If necessary, the perimeter vertical gas migration control wells can be activated to collect potentially migrating gases and/or remove in-place gases from subsurface soils. The collected gas can be treated if necessary, which results in reduction of the toxicity of the waste~~. (RTC, 9/29/11)

~~*7.3.3.5 Short-Term Effectiveness*~~

~~The cap construction would provide immediate short-term effectiveness since worker risk is low and impacts on environment are minor (grading operations). Liquid infiltration, gas migration, and physical contact would be controlled upon cap placement. Because the disturbance to the sludge would be limited, hazardous gas generation would be minimal.~~ (RTC, 9/29/11)

~~*7.3.3.6 Implementability*~~

~~Technical implementation of Alternative 2 is relatively easy. The alternative uses conventional construction technologies~~. (RTC, 9/29/11)

~~*7.3.3.7 Cost*~~

~~The estimated capital cost of Alternative 2 is $5,206,314. The estimated net present value of operating and maintenance costs is $1,563,800. Therefore, the total present value cost of Alternative 2 is $6,770,114. Table 7-1 presents a cost breakdown of Alternative 2.~~ (RTC, 9/29/11)

~~*7.3.3.8 State Acceptance*~~

~~State acceptance of Alternative 2 will be assessed during the public comment period.~~ (RTC, 9/29/11)

~~*7.3.3.9 Community Acceptance*~~

~~Community acceptance of Alternative 2 will be assessed during the public comment period~~. (RTC, 9/29/11)

7.3.3 Alternative 2A – Capping with Selective Excavation

7.3.3.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is moderate to high with this remedial alternative. The exposure routes for receptors as identified in the HHRA are dermal contact with sludge, ingestion of sludge, and inhalation of soil gas. Selective excavation would remove the Haack Rework area sludge material that is associated with potential gas risks. The sludge in the three sumps would be capped, reducing the risk associated with dermal contact and ingestion. Additionally, a gas control and monitoring system would be installed beneath the cap to control gas which may be generated by the sludge. High overall protection is not achieved with this method due to the source remaining onsite. (RTC, 9/29/11)

7.3.3.2 Compliance with ARARs

Compliance with ARARS is ~~high~~ moderate (RTC, 1/9/13) with this remedial alternative. ARARs potentially applicable to Site remedial actions are provided in Table 4-2. Precautions would be required to ensure that short-term community and worker exposures to dust, noise, truck traffic, and VOC emissions are limited to acceptable levels during soil excavation and handling, per AQMD standards.(RTC, 9/29/11) This remedial alternative is compliant with the Groundwater ARARs by implementing institutional controls limiting onsite extraction of groundwater. Groundwater data has indicated that the sumps are not contributing to offsite impacts; therefore, institutional controls limiting onsite extraction are sufficient for groundwater ARAR compliance. (RTC, 11/6/12)

At some locations of the Site groundwater in the A-zone may encounter the waste material where excavations are the deepest. Waste impacted groundwater has been documented at Well MW-5A which is located immediately down gradient of the Haack Sump. Where these impacts occur the groundwater is characterized by a lower pH, occurrence of gasoline range hydrocarbons, the occurrence of some volatile organic compounds in the low ppb range, elevated concentrations of some metals and modifications to its inorganic groundwater chemistry. However these impacts are attenuated over a short lateral distance down-gradient of the waste as documented in wells MW-3A and MW-4A which are located within or downgradient of the Site's sumps. Impacts to deeper water bearing zones have not been confirmed as the groundwater impacts observed in Well MW-5A are not observed in the B-zone monitoring wells at the Site and the geochemistry of the two water bearing zones are noticeably different suggesting limited hydraulic communication. (RTC, 1/9/13)

The Bellflower Aquiclude groundwater in the vicinity of the Site is naturally degrade as evidence by the Total Dissolved Solids (TDS) concentrations in the A-zone and the TDS and chloride concentrations in the B-zone which exceed the recommended secondary MCL values as documented in the up-gradient, background wells (wells MW-1A and MW-1B). During development of the Site's existing monitoring wells prior to reinstituting the groundwater monitoring program in 2006, some wells were pumped dry and development operations were halted to allow for recharge. This observation suggests that the two hydraulic zones immediately beneath the Site have limited yield that cannot be sustained over time. The naturally degraded groundwater quality and limited yield of the Bellflower Aquiclude at the Site indicates that human use of the groundwater beneath the Site is not likely. (RTC, 1/9/13)

The California Regional Boards are required to assure that the beneficial uses of municipal and domestic supply are designated for protection wherever those uses are presently being attained. This ARAR requirement may not be applicable to the Site because the groundwater upgradient of the Site is naturally degraded and the beneficial uses requirement is not presently being attained . Institutional controls preventing onsite extraction or use of groundwater should be sufficient for groundwater ARAR compliance. (RTC, 1/9/13)

7.3.3.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence is moderate to high for this remedial alternative. The permanent cap with the below-cap and perimeter passive gas control system provides long-term effectiveness. To maintain the long-term integrity of the cap and related remedial measure components, maintenance and monitoring would be provided. If the Site is developed, the parking lot surface above the cap should be maintained by the future property owner(s) to prevent cracking and/or ponding of surface water. If gas monitoring indicates concentrations in excess of acceptable values, the below-cap and perimeter vertical gas migration control wells can be made active, which adds to long-term effectiveness in controlling the migration of gas to the environment. (RTC, 9/29/11)

Based on its location, the Site is potentially at risk for high ground shaking and liquefaction during an earthquake. High ground shaking would minimally affect this alternative because its planned future use is a parking lot. Liquefaction may result in differential settlement of the cap; however, the differential settlement can be corrected with maintenance of the cap. High ground shaking would minimally affect this alternative because its planned future use is a parking lot; however, veneer stability may be compromised. Damage due to a loss of veneer stability may be repaired with maintenance. (RTC, 11/6/12)

High long-term effectiveness and permanence is not achieved with this method due to maintenance requirements. (RTC, 9/29/11)

7.3.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction in toxicity, mobility, or volume through treatment is moderate ~~to high~~ (RTC 1/9/13) with this remedial alternative. The cap design would include a gas collection system that can be connected to a treatment system during start-up and continued use, if necessary, based upon start-up monitoring results. If the gases are treated, some reduction in toxicity would be realized. The cap and site drainage improvements would provide a reduction in mobility of the waste as infiltration of water would be mitigated. (RTC, 9/29/11) ~~No reduction in waste volume would be realized with this remedial measure~~. Waste volume would be reduced with the removal of the Haack Rework material; however, the sludge contained in the Cooper and Haack sumps would not be reduced. (RTC, 1/9/13)

Mobility of the sludge would be reduced with this Alternative. On the Haack Sump, there is evidence of sludge movement from beneath the cap at the edges of the concrete and asphalt cover. The installation of low-hydraulic conductivity layer, associated anchor trench, along with existing soil containment, will minimize the lateral migration of sludge. (RTC, 9/29/11)

Gas transport at the Site occurs as a result of diffusion; therefore, the rate of lateral migration of gas constituents is very low. If necessary, the perimeter vertical gas migration control wells can be activated to collect potentially migrating gases and/or remove in-place gases from subsurface soils. The collected gas can be treated if necessary, which results in reduction of the toxicity of the waste. (RTC, 9/29/11)

7.3.3.5 Short-Term Effectiveness

The short-term effectiveness of Alternative 2A is moderate to high. Cap construction would be performed above the existing surfaces on the Cooper and Haack sumps reducing gas generation, gas migration, and dermal contact risks from the exposed sludge. The Cooper sumps currently have an exposed geomembrane covering the sludge which minimizes dermal contact and gas migration. The high-strength geotextile will be installed above the existing geomembrane in a manner that minimizes damage to the existing liner surface (e.g., hand placement). Prior to the installation of the high-strength geotextile, only limited foot traffic will be permitted above the sumps. (RTC, 9/29/11)

The existing concrete and asphalt surfaces will be maintained above the Haack Sump. The geosynthetic cap components (geostrips, gas extraction geocomposite, GCL, HDPE geomembrane, and drainage geocomposite) will be installed directly above the foundation soil overlying the concrete and asphalt surfaces and anchored outside of the

perimeter of the sumps as identified in the RI, between the Cooper North and Haack Sumps (RTC, 1/9/2013), or to the sheetpile along Artesia Boulevard. The sludge between the Cooper North and Haack Sumps is discontinuous and degraded, and occurs deeper than the proposed anchor trench depth of 3 ft bgs, as identified in the RI. Therefore gas generation due to the construction of the anchor trench between the Cooper North and Haack Sumps is anticipated to be minimal to non-existent. (RTC, 1/9/2013) By maintaining the current concrete and asphalt surfaces, the dermal contact and gas migration risks are minimized during construction. (RTC, 9/29/11)

The short-term effectiveness of Alternative 2A is not high due to the excavation and offsite transport of the Haack Rework material. If the Haack Rework soil material were used as fill beneath the cap, a reduced construction time is achievable as less imported material would be needed. Additionally, there would be a reduced risk of exposure to the public during transport to the final disposal facility. (RTC, 9/29/11)

The cap construction would provide immediate short-term effectiveness since worker risk is low and impacts on environment are minor (grading operations). Liquid infiltration, gas migration, and physical contact would remain controlled due to limited disturbance of the existing surfaces. Because the disturbance to the sludge would be limited, hazardous gas generation would be minimal. (RTC, 9/29/11)

The duration of Alternative 2A, not including preliminary startup of the gas control system, is estimated at approximately 129 calendar days. The estimated construction breakdown schedule is provided in Appendix A. (RTC, 9/29/11)

7.3.3.6 Implementability

Technical implementation of Alternative 2A is relatively easy; however, construction implementation due to the urban setting of the Site, as well as Site size constraints and property owner agreements, create implementation challenges as discussed below. (RTC, 9/29/11)

Urban Setting

Due to the urban setting of the Site, traffic and close proximity to sensitive receptors affect the implementability of Alternative 2A. Traffic will increase the length of time to haul impacted material to an offsite disposal facility and the time to import material such as fill for the foundation layer. Alternative work hours may be proposed to reduce the effects of traffic on construction activities. Close proximity to sensitive receptors concerns are mitigated by leaving the existing surfaces on the sumps in place and by providing continuous monitoring during excavation of the Haack Rework area. The technologies for continuous monitoring are readily available and can easily be deployed at the Site during construction. (RTC, 9/29/11)

Site Size

The majority of the Cooper property contains sludge within the North and South sumps, while approximately one quarter of the Haack property contains the Haack Sump. Of the Haack property not containing the sump, approximately half is sloped and elevated leaving the one quarter available for construction staging and storage. As a result, easements and/or leases may be necessary on the southern Los Angeles Department of Public Works (LADPW) property to provide additional space and additional site ingress/egress. Furthermore, due to the eastern sludge boundary corresponding to the Cooper property boundary, the eastern drainage channel and anchor trench will be located within the LADPW property and will require fill to be placed to maintain and control drainage of that parcel. Additional agreements with the LADPW will be required in order to construct the cap. (RTC, 9/29/11)

By leaving the existing surfaces in place, material may be staged above the Haack Sump while construction is occurring on the Cooper Sumps. Additionally, the reduced fill needed for Alternative 2A requires less imported material and material stockpiling. The lower ground pressure equipment which will be used to place the fill above the high strength geotextile is generally smaller than traditional equipment, thereby requiring less storage space than larger, heavier equipment. As a result, while Alternative 2A has implementation challenges due to the Site size and location, the design of the Alternative 2A cap reduces the effect of the challenges. (RTC, 9/29/11)

7.3.3.7 Cost

The estimated capital cost of Alternative 2A is ~~$4,544,913 $5,774,550,.(RTC, 11/6/12)~~ $5,844,150. (RTC, 1/9/13) However, a cost savings of approximately $314,500 may be achieved by using the Haack Rework soil-sludge material onsite as foundation soil. (RTC, 11/6/12) The estimated net present value of operation and maintenance costs is ~~$1,563,800~~ ~~$2,822,100. (RTC, 11/6/12)~~ $4,882,500 (RTC, 1/9/2013). Therefore, the total present value cost of Alternative 2A is ~~$6,108,713 $8,596,650. (RTC, 11/6/12)~~ $10,726,650. (RTC, 1/9/13) Table 7-1 presents a cost breakdown of Alternative 2A. (RTC, 9/29/11)

7.3.3.8 State Acceptance

State acceptance of Alternative 2A will be assessed during the public comment period. (RTC, 9/29/11)

7.3.3.9 Community Acceptance

During the May 10, 2011 meeting between the DTSC and City of Gardena (City), the City expressed concerns regarding the appearance of Alternative 2 (since removed

[RTC, 9/29/11]) being similar to a "landfill," and the height of the cap being too high. The City expressed the desire that the final remedial alternative be consistent with the vision and goal of future development for the Site. (RTC, 9/29/11)

Alternative 2A is a lower cap option for the Site. The maximum height of the cap is approximately 25.5 ft amsl near the center of the Site. This elevation is approximately 5.5 ft higher than Artesia Boulevard north of the Haack Property. Immediately adjacent to Artesia Boulevard, the maximum height of the cap and associated retaining wall is 23 ft amsl, or 3 ft higher than Artesia Boulevard. The elevation of the cap on the Cooper Property is similar to the elevation of the railroad grade immediately east of the Cooper Property. The final cap surface will consist of Class II aggregate base to support construction of a parking lot consistent with the future commercial development of the Site. Additionally, the cap structure has been designed to support loading associated with traffic and parking. Lower areas of the cap such as drainage channels may be filled to provide a more level surface on which to construct a future parking lot, provided the functionality of the cap is not compromised. (RTC, 9/29/11)

7.3.4 Alternative 3 – Capping with Neutralization/Stabilization and Selective Excavation

7.3.4.1 Overall Protection of Human Health and the Environment

Capping of the partially stabilized/neutralized sludge, combined with selective excavation, would provide moderate ~~to high~~ (RTC 1/9/13) overall protection of human health and the environment. The exposure routes for receptors as identified in the HHRA are dermal contact with sludge, ingestion of sludge, and inhalation of soil gas. Neutralization/stabilization of the sludge would further improve the pH, neutralize acid gases, fixate lead, and provide long-term strength (Stantec, 2008). This Alternative is not ranked higher because (RTC, 1/9/13) the neutralization/stabilization process would require substantial mixing of the sludges, releasing hazardous gases and odors, thereby requiring a tent and gas treatment system to control gas emissions during construction. Selective excavation and consolidation within the sumps would remove the eastern overflow and Haack Rework area with the associated gas risks. Further, this Alternative does not address localized groundwater impacts at the Site (RTC, 1/9/13). The sumps would be capped, reducing the risk associated with dermal contact and ingestion. Additionally, a gas control and monitoring system would be installed beneath the cap to control gas which may be generated by the sludge.

7.3.4.2 Compliance With ARARs

ARARs potentially applicable to Site remedial actions are shown in Table 4-2. Alternative 3 would provide moderate compliance with ARARs. (RTC, 1/9/2013).

Precautions would be required to ensure that short-term community and worker exposures to dust, noise, truck traffic, and VOC emissions are limited to acceptable levels during soil mixing and handling, per ambient air quality health standards.

This remedial alternative is compliant with the Groundwater ARARs by implementing institutional controls limiting onsite extraction of groundwater. Groundwater data has indicated that the sumps are not contributing to offsite impacts; therefore, institutional controls limiting onsite extraction are sufficient for groundwater ARAR compliance. (RTC, 11/6/12) This Alternative does not remediate the groundwater; therefore, this Alternative is not given a "high" ARAR compliance rating. (RTC, 1/9/13)

7.3.4.3 Long-Term Effectiveness and Permanence

The permanent cap with stabilization/neutralization and the below-cap and perimeter passive gas control system provide moderate to high (RTC, 11/6/12) long-term effectiveness. Routine maintenance and monitoring would be provided and would positively contribute to the long-term effectiveness of the remedial measure. If gas monitoring indicates impacts in excess of acceptable values, the below-cap and perimeter vertical gas migration control wells can be made active, which adds to long-term effectiveness in controlling the migration of gas to the environment.

Based on its location, the Site is potentially at risk for high ground shaking and liquefaction during an earthquake. High ground shaking would minimally affect this alternative because its planned future use is open space; however, veneer stability may be compromised. Damage due to a loss of veneer stability may be repaired with maintenance. Liquefaction may result in differential settlement of the cap; however, the differential settlement can be corrected with maintenance of the cap. (RTC, 11/6/12)

7.3.4.4 Reduction of Toxicity, Mobility, and Volume Through Treatment

The toxicity of the sludge would be reduced through stabilization/neutralization by improving the pH, neutralizing acid gases, fixating lead, and providing long-term strength (Stantec, 2008). The cap design would include a gas collection system that can be connected to a treatment system during start-up and continued use, if necessary, based upon start-up monitoring results. If the gases are treated, some reduction in toxicity would be realized. The cap and Site drainage improvements would provide a reduction in mobility of the waste as infiltration of water would be mitigated; hence, migration of liquids from waste would be reduced. An increase in waste volume through bulking would be realized with the remedial measure.

Gas transport at the Site occurs as a result of diffusion; therefore, the rate of lateral migration of gas constituents is very low. If necessary, the perimeter vertical gas migration control wells can be activated to collect potentially migrating gases and/or

remove in-place gases from subsurface soils. The collected gas can be treated if necessary, which results in reduction of the toxicity of the waste.

7.3.4.5 Short-Term Effectiveness

Stabilization/neutralization would require the mixing of the top 3 feet of sludge with $Ca(OH)_2/CaCO_3$. In order to mix the top 3 feet of sludge, the existing cover on the Cooper Sumps would require removal, temporarily increasing the risks associated with the sumps and decreasing the effectiveness of this Alternative. During the exposed period, stormwater could come into contact with the sludge, increasing the volume of materials requiring treatment. While fencing around the Site would be continuously maintained to prevent trespasser entry, animals, such as birds, may enter the Site and either become entrapped in the sludge or potential spread sludge to off-site areas. Additionally, during sludge mixing, ~~As a result,~~ (RTC, 11/6/12)significant quantities of acid gases would be released. Therefore, there may be an increased, short-term risk during mixing activities which would require mitigation through treatment of the acidic gases. The cap construction would provide short-term effectiveness as liquid infiltration, gas migration, and physical contact would be controlled upon cap placement.

7.3.4.6 Implementability

Alternative 3 may be difficult to implement due to the mixing of $Ca(OH)_2/CaCO_3$ compounded with the urban setting of the Site and the Site size. (RTC, 11/6/12) During mixing operations, significant quantities of acid gases would be released which would require treatment. Uncontrolled reactions have been known to occur when neutralizing acid sludges which require constant supervision to prevent the uncontrolled release of hydrogen sulfide gas. (RTC, 11/6/12) A tent would be necessary to contain the gases for treatment prior to discharge to the atmosphere. Due to the size of the sumps, a tent large enough to span the sumps to locations where stable foundations can be achieved may be difficult or impossible to engineer or construct. Similarly to Alternative 2A, the urban setting of the Site increases the impacts the construction would have on area traffic and the proximity to sensitive receptors. Business operations near the Site operate 24-hours a day meaning limiting mixing activities to night-time work only would still affect the public. Significant quantities of neutralizing material as well as soil would need to be imported and stored at the Site; the importing of material could significantly impact traffic as large trucks are forced to enter the Site off Artesia Blvd. Storage at the Site is limited due to the sumps and topography with staging, office, and storage areas limited to the eastern portion of the Haack Property. Stormwater controls or treatment systems, such as retention basins, would be limited by the amount of space at the site. (RTC, 11/6/12)

7.3.4.7 Cost

The estimated capital cost of Alternative 3 ~~is~~ ranges between ~~$11,144,880~~ $11,219,880(1/9/13) and ~~$35,402,274~~ ~~$12,566,880~~ $12,646,280 (1/9/13). This range is due to the variable cost of neutralization admixture, $CaCO_3$ and $CaOH_2$. The costs are highly variable based where the material is sourced from, shipping costs, and construction activities. The high cost variability adds to the low cost rating of this Alternative due to the uncertainty of prices during construction. (RTC, 11/6/12) The estimated net present value of operating and maintenance costs assuming quarterly groundwater and soil vapor probe monitoring for 30 years (RTC, 1/9/2013) is ~~$1,563,800~~ ~~$2,822,100. (RTC, 11/6/12)~~ $4,882,500 (RTC, 1/9/2013). Therefore, the total present value cost of Alternative 3 ~~is $36,966,074~~ ranges from ~~$13,996,980 to $15,388,980. (RTC, 11/6/12)~~ $16,102,380 to $17,528,780 (RTC, 1/9/13). Table 7-2 presents a cost breakdown of Alternative 3.

7.3.4.8 State Acceptance

State acceptance of Alternative 3 will be assessed during the public comment period.

7.3.4.9 Community Acceptance

As discussed in Section 7.3.3.9, the City of Gardena expressed concerns regarding the appearance of Alternative 3 and the desire for a final remedial alternative to be consistent with future development plans. As a result, Alternative 3 has low community acceptance. ~~Community acceptance of Alternative 3 will be assessed during the public comment period.~~ (RTC, 11/6/12)

7.3.5 Alternative 4 – Excavation with Offsite Disposal

7.3.5.1 Overall Protection of Human Health and the Environment

Alternative 4 would provide moderate to high (RTC, 1/9/2013) protection of human and health and the environment by removing the sludge and rework material from the Site. The risk to human health through dermal contact, inhalation, or ingestion would be eliminated because the sludge and rework material would be removed and disposed of offsite. During construction activities and transport of the material, risk to human health and the environment would be increased as significant quantities of acid gases would be released when the sludge is disturbed. Furthermore, there is an increased risk to human health during transport of the material as it would require hauling to a facility where transport would potentially expose many more individuals to the sludge than if it were to remain onsite.

7.3.5.2 Compliance With ARARs

ARARs potentially applicable to Site remedial actions are shown in Table 4-2. Alternative 4 would provide high compliance with ARARs. (RTC, 1/9/2013) ~~Excavation and offsite disposal of sludge can be difficult or impossible to perform in compliance with applicable emissions, disposal, and transportation regulations.~~ (RTC, 1/9/2013) Precautions would be required to ensure that short-term community and worker exposures to dust, noise, truck traffic, and VOC emissions are limited to acceptable levels during soil excavation and handling, per ambient air quality health standards. Poor groundwater quality (as documented in MW-05A immediately adjacent) may be improved as the suspected sludge source is removed. (RTC, 11/6/12)

7.3.5.3 Long-Term Effectiveness and Permanence

Alternative 4 would provide high long-term effectiveness and permanence ~~is effective and permanent~~ (RTC, 1/9/2013) since the impacted material would be removed from the Site.

7.3.5.4 Reduction of Toxicity, Mobility, and Volume Through Treatment

Alternative 4 would provide low to moderate reduction of toxicity, mobility, and volume of the sludge or rework material through treatment. This alternative creates a large amount of waste compared to the other alternatives presented and discussed. This waste should be taken into consideration for evaluating these criteria. (RTC, 1/9/2013) Alternative 4 will ~~not~~ (RTC, 1/9/2013) reduce the toxicity ~~or volume~~ (RTC, 1/9/2013) of the sludge or rework material. The mobility of the sludge would be temporarily increased due to transportation of the sludge, then (RTC, 1/9/2013) reduced since it would be disposed of in an appropriate facility with a bottom liner system. The migration of sludge constituents is further reduced by the admixture prior to transport which was shown to reduce leaching and gas generation during the Treatability Study (Appendix A, Stantec, 2008). The volume of the sludge would ~~double~~ increase approximately 20 to 40 percent (RTC, 11/12/13) following admixture. Other wastes that would be produced during treatment include impacted groundwater, vapor treatment associated liquid and solid wastes, and decontamination wastes. Taking these wastes into consideration, Alternative 4 would provide low to moderate reduction of toxicity, mobility, and volume of sludge and associated wastes through treatment. (RTC, 1/9/2013)

7.3.5.5 Short-Term Effectiveness

Alternative 4 would provide moderate short-term effectiveness ~~is effective in the short term~~ (RTC, 1/9/2013) by removing the sludge and rework material from the Site; however, in order to neutralize the sludge for off-site disposal, risks associated with the

sludge are temporarily increased. Neutralization of the sludge requires deep mixing of the sludge with $Ca(OH)_2/CaCO_3$. In order to mix the sludge, the existing sump covers would require removal, temporarily increasing the risks associated with the sumps and decreasing the effectiveness of this Alternative. During the exposed period, stormwater could come into contact with the sludge, increasing the volume of materials requiring treatment. While fencing around the Site would be continuously maintained to prevent trespasser entry, animals, such as birds, may enter the Site and either become entrapped in the sludge or potentially spread sludge to off-site areas. Additionally, during sludge mixing, ~~significant~~ large quantities of acid gases, when compared to the other alternatives presented and discussed, (RTC, 1/9/2013) would be released. Therefore, there may be an increased, short-term risk during mixing activities which would require mitigation through treatment of the acidic gases. ~~The cap construction would provide short-term effectiveness as liquid infiltration, gas migration, and physical contact would be controlled upon cap placement. (RTC, 11/6/12~~) (RTC, 1/9/2013)

7.3.5.6 Implementability

Implementability ~~Implementation~~ of Alternative 4 would be low~~challenged~~ (RTC, 1/9/2013) due to the sludge depth, site proximity to sensitive receptors, site size, (RTC, 11/6/12) and site access issues. The majority of the sludge to be excavated is previously undisturbed sludge, which has a less viscous consistency than the degraded soil-sludge material that is proposed to be removed in Alternative 2A and Alternative 3. (RTC, 1/9/2013) As an area is excavated, sludge would flow to the newly excavated portion of the sump. The depth of the excavation would be between 0.5 and ~~23.5~~ 17.5 (RTC, 11/6/12) ~~feet~~ ft bgs (RTC, 1/9/13), depending on the sump, and due to the size of the Site there would not be enough room to slope the sides of the excavation. Therefore, shoring would be required, which would limit the ability to "chase" impacted materials laterally during excavation and obtain side wall conformance samples. Shoring may be used, but due to the discontinuity of sludge material, during mixing of the reagent and sludge, acid gas containment and treatment would be necessary. A tent would be necessary to contain the gases for treatment prior to discharge to the atmosphere. Due to the size of the sumps, a tent large enough to span the sumps to locations where stable foundations may be achieved would be difficult to implement. An equipment hood may provide the necessary containment; however, the working area is limited by the size of the hood.

Similarly to Alternatives 2A and 3, the urban setting of the Site increases the impacts the construction would have on area traffic and the proximity to sensitive receptors. Business operations near the Site operate 24-hours a day meaning limiting mixing activities to night-time work only would still affect the public. Significant quantities of neutralizing material as well as soil would need to be imported and stored at the Site; the importing of material could significantly impact traffic as large trucks are forced to

enter the Site off Artesia Blvd. Storage at the Site is limited due to the sumps and topography with staging, office, and storage areas limited to the eastern portion of the Haack Property. Stormwater controls or treatment systems, such as retention basins, would be limited by the amount of space at the site. (RTC, 11/6/12)

7.3.5.7 Cost

The estimated capital cost of Alternative 4 is high compared to the alternatives presented and discussed, and (RTC, 1/9/2013) ~~is $54,067,350~~ ranges between $26,217,950 and $28,991,650. The costs are highly variable based where the admixture material is sourced from, shipping costs, and construction activities. The high cost variability adds to the low cost rating of this Alternative due to the uncertainty of prices during construction. (RTC, 11/6/12) The estimated net present value of groundwater monitoring costs is ~~$620,500~~ $113,200. (RTC, 11/6/12) Therefore, the total present value cost of Alternative 4 is ~~$54,687,850~~ between $26,331,150 and $29,104850. (RTC, 11/6/12) Table 7-3 presents a cost breakdown of Alternative 4.

7.3.5.8 State Acceptance

State acceptance of Alternative 4 will be assessed during the public comment period.

7.3.5.9 Community Acceptance

~~Community acceptance of Alternative 4 will be assessed during the public comment period.~~ (RTC 9/29/11) During the 10 May 2011 meeting with the DTSC and City of Gardena, the City felt Alternative 4 best achieved their future development goals (RTC, 11/6/12); therefore, this Alternative receives a moderate to high ranking for community acceptance (1/9/2013).

8. COMPARATIVE ANALYSIS OF ALTERNATIVES

8.1 General

In this section, the final remedial alternatives are compared by using the detailed analysis criteria. The purpose of this comparative analysis is to identify the relative advantages and disadvantages of each final remedial alternative and to provide a basis for identifying the preferred remedial alternative.

8.2 Final Remedial Alternatives

8.2.1 General

In Table 8-1, each final remedial alternative is assigned a ranking for each detailed analysis criterion. These rankings range from "low" to "high" and are accompanied by a numeric ranking from 1 to 5 (Note 3, below). At the conclusion of the comparative analysis, the preferred remedial alternative is identified.

8.2.2 Overall Protection of Human Health and the Environment

~~Alternative 1, No Action, does not provide adequate protection of human health and the environment. No further assessment or comparison with this alternative is provided. Alternative 2 would perform better than Alternative 3. While Alternative 3 stabilizes/neutralizes a portion of the sludge, the mixing of the reagent releases hazardous amounts of hydrogen sulfide and sulfuric acid gas. Alternative 4 would provide very good protection of human health and the environment with the removal of the impacted materials; however, because of the risks associated with hazardous gas generation during excavation and transportation of the material, the overall protection is deemed moderate~~. (RTC, 9/29/11)

Alternative 1, No Action, does not provide adequate protection of human health and the environment. No further assessment or comparison with this alternative is provided. Alternative 2A performs better than Alternatives 3 and 4 due to disturbance of only the degraded Haack Rework sludge material. As demonstrated in the Treatability Study and Surface Flux Testing (RTC, 1/9/13) (Stantec, 2007), disturbing the non-degraded sludge results in the generation of significant quantities of hydrogen sulfide and sulfur dioxide. Significant mechanical disturbance of the non-degraded sludge occurs in Alternatives 3 and 4. Both Alternatives 2A and 3 would leave the majority of the sludge onsite, which reduces their overall protection of human health and the environment; however,

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(3) A numeric ranking of "1" is lowest, or worst; "5" is highest, or best. With respect to cost, "1" is most expensive; "5" is least expensive.

Alternative 4 excavates the sludge from the Site and transports the sludge along public streets and highways en route to final disposal at the Buttonwillow Facility. During transport, the public may become potentially exposed to the sludge due to traffic accidents resulting in a sludge release or gas release from the truck. The same transport risks are not anticipated with transport of the Haack Rework soil-sludge material as proposed in Alternative 2A due to the degraded nature of this sludge and the significantly reduced volume of sludge to be transported. (RTC, 9/29/11)

8.2.3 Compliance With ARARs

~~Alternative 2 would perform better with respect to ARARs due to the reduction of gas emissions when compared to Alternatives 3 and 4.~~ (RTC, 9/29/11)

~~Alternative 2A would perform with respect to ARARs due to the minimal gas emissions, reduced truck traffic, and lack of sludge exposed to air and possible stormwater when compared to Alternatives 3 and 4. (RTC, 9/29/11)~~ (RTC, 1/9/13)

Alternative 4 would perform the best with respect to ARARs due to the removal of the sludge and source for potential onsite groundwater impacts. All Alternatives perform well with respect to ARAR compliance; however, Alternatives 2A and 3 are ranked lower because a potential source for onsite groundwater impacts remains in place. (RTC, 1/9/13)

8.2.4 Long-Term Effectiveness and Permanence

~~Alternative 3 is ranked higher than Alternative 2 with respect to long-term effectiveness and permanence. Both alternatives would be effective and permanent over the long-term with maintenance; however, because Alternative 3 neutralizes the sludge, the treatment is likely more permanent. Alternative 4 provides the greatest long-term effectiveness and permanence since the sludge is removed from the site and disposed of offsite.~~ (RTC, 9/29/11)

Alternative 4 is ranked the highest for long-term effectiveness and permanence because the sludge is removed from the site and disposed of offsite. (RTC, 1/9/13) Alternative 3 is ranked higher than Alternative 2A with respect to long-term effectiveness and permanence. Both alternatives would be effective and permanent over the long term with maintenance; however, because Alternative 3 neutralizes some of (RTC, 11/6/12) the sludge, the treatment is likely more permanent. (RTC, 9/29/11)

Based on its location, the Site is at risk for high ground shaking and liquefaction during an earthquake regardless of the remedial alternative. High ground shaking would minimally affect Alternatives 2A and 3 because of their planned future use as a parking lot or open space, respectively. High ground shaking on Alternatives 2A and 3 slopes

may result in veneer failure and liquefaction may result in differential settlement of the cap. Both the veneer failure and differential settlement can be corrected with maintenance of the cap. (RTC, 11/6/12) Alternative 4 provides the greatest long-term effectiveness and permanence since the sludge is removed from the site and disposed of offsite. (RTC, 9/29/11)

8.2.5 Reduction of Toxicity, Mobility, and Volume through Treatment

~~Alternative 3 would slightly reduce toxicity and mobility through partial in-situ treatment of the source zone; however, toxicity would increase as acid gases are released during mixing of the sludge for treatment. Alternatives 2 and 3 would reduce mobility of the sludge by limiting infiltration and wind erosion. Alternative 4 would reduce the mobility of the sludge after offsite disposal since the disposal landfill would be equipped with a liner system to collect leachate; however, transport of the material would temporarily increase the potential mobility.~~ (RTC, 9/29/11)

Alternatives 2A and 3 would reduce mobility of the sludge by limiting infiltration and wind erosion. Alternative 3 would slightly reduce toxicity and mobility through partial in-situ treatment of the source zone; however, toxicity would increase as gases are released during mixing of the sludge for treatment. The volume of material within the sumps would increase due to bulking during neutralization and increase the cap height by a minimum of 3 ft. In Alternative 3, the net toxic material (non-stabilized sludge) would be reduced. The volume of sludge material in the sumps would remain the same with Alternative 2A. Treatment of sludge with Alternative 4 would ~~double the volume of waste material to be disposed~~ increase the volume of waste material to be disposed of by 20 to 40 percent due to neutralization (RTC, 11/12/13) as well as generate more waste from decontamination water, spent vapor treatment carbon, and ponded dust and emissions control liquid. (RTC, 1/9/13) Alternative 4 would reduce the mobility of the sludge after offsite disposal since the disposal landfill would be equipped with a liner system to collect leachate; however, transport of the material would temporarily increase the potential mobility. (RTC, 9/29/11)

8.2.6 Short-Term Effectiveness

~~Alternative 2 would perform the best with respect to short-term effectiveness. Unlike Alternatives 3 and 4, Alternative 2 does not significantly disturb the sludge thereby minimizing the release of acid gas. Both Alternatives 2 and 3 incorporate a cap into the final design which would provide an immediate reduction in risk due to inhalation, dermal exposure, and ingestion. Alternative 4 would provide a reduction in risk after the sludge was transported offsite; however, risk is temporarily increased in the short-term during sludge disturbance and transport.~~ (RTC, 9/29/11)

Alternative 2A would perform the best with respect to short-term effectiveness. Unlike Alternatives 3 and 4, Alternative 2A does not significantly disturb the sludge, thereby minimizing the release of gas. The existing surfaces, which have been shown to reduce the migration of gas, will remain in place during construction resulting in limited sludge disturbance and therefore, gas generation. Alternatives 2A and 3 incorporate a cap into the final design which would provide a reduction in risk due to inhalation, dermal exposure, and ingestion. (RTC, 9/29/11)

Alternatives 3 and 4 significantly disturb the sludge, which has been demonstrated to generate significant quantities of hydrogen sulfide and sulfur dioxide gas requiring tenting and gas control systems during mixing and excavation operations. The gas control system, incorporating a tent, blower, and treatment system, would significantly increase the amount of time to remediate the Site due to the limited operating space within the enclosed facility. Additionally, waste materials from the treatment system components, such as a scrubber, could generate additional waste, which could increase the total volume of hazardous materials at the Site. (RTC, 11/6/12) The length of time would be increased due to the use of smaller equipment as well as down time during treatment system maintenance. (RTC, 9/29/11)

Alternative 4 would provide a reduction in risk after the sludge was transported offsite; however, risk is temporarily increased in the short-term during sludge disturbance and transport. Given that the weight of material estimated for offsite disposal is approximately ~~49,900 tons and a typical end dump truck capacity is 14 tons, approximately 3,565 truck loads are anticipated for Alternative 4~~ 45,900 CY and a typical end dump truck capacity is 16 CY(RTC, 11/6/12, approximately ~~3,565~~ 2,870 (RTC, 11/6/12 truck loads are anticipated for Alternative 4. Smaller, 16 CY trucks are proposed for Site work due to the limited space available onsite for staging and operating larger trucks (RTC, 11/6/12) Additionally, using the estimated 20 trucks per day discussed in Section ~~3.3.3~~ 6.1.2.2, trucks (RTC, 11/6/12) transport of the sludge would require a minimum of ~~179~~ 160 (RTC, 11/6/12) days for transport, which does not include additional delays due to limitations from tenting and gas control during excavation. (RTC, 9/29/11)

Due to the nature of the sludge disposal within the sumps, Alternative 4 would require the excavated sumps to be exposed for periods of time during confirmation sampling. Temporary backfill of sludge in the interim would generate the potential for non-impacted material to become impacted through contact, thereby increasing the amount of material excavated and the time to remediate. (RTC, 9/29/11)

The durations of the Alternatives are estimated at 129, 235, and 301 calendar days for Alternatives 2A, 3, and 4, respectively. The construction duration of Alternative 2A is approximately half of Alternative 3 and 4 times less than Alternative 4, meaning the

potential exposure time of sludge hazards to workers is significantly reduced. Additionally, the construction impacts on the community including truck traffic and visual distractions are significantly reduced with Alternative 2A. The estimated construction schedules are provided in Appendix ~~A~~ (RTC, 9/29/11) E.(RTC, 11/6/12)

8.2.7 Implementability

~~Alternatives 3 and 4 pose significant implementation issues due to the gas generation during mixing and excavation of the sludge. Gas control and treatment would be necessary during mixing and excavation of the sludge. Construction of a tent to contain the gases would be difficult to perform due to low bearing capacity of the sludge and the area the tent would need to span (minimum of the Cooper North sump). Gases captured by the tent would need treatment prior to discharge. (RTC, 9/29/11)~~

~~Alternative 2 is relatively easy to implement. A stabilization layer on the Cooper sumps would be placed first to provide a surface in which to install the foundation and gas collection, barrier, and cover layers. Disturbance of the sludge would be limited to the eastern overflow and Haack Rework, which are significantly degraded and would release significantly less acid gas than the sludge in the Haack and Cooper Sumps (Appendix A, Stantec, 2008). The materials necessary for construction are available and do not require admixtures or special equipment.~~ (RTC, 9/29/11)

All Alternatives are difficult to implement due to the site location and size; however, the design of Alternative 2A limits the effects of these challenges on construction. These challenges are discussed in further detail below: (RTC, 9/29/11)

Urban Setting

Due to the urban setting of the Site, traffic and close-proximity to sensitive receptors affect the implementability of all Alternatives. Traffic will increase the length of time to haul impacted material to an offsite disposal facility and the time to import construction materials such as fill. (RTC, 9/29/11)

Alterative 2A requires the least amount of imported and exported material, thus reducing overall truck traffic on Artesia Boulevard. Both Alternatives 3 and 4 require significant truck traffic to import stabilization material as well as, in the case of Alternative 4, export sludge offsite. As discussed previously in Section 6.1.4.2, 3,565 truck loads are estimated for transport of excavated sludge to an offsite facility, which could negatively affect the traffic flows in the vicinity of the Site. (RTC, 9/29/11)

Site Size

The majority of the Cooper property contains sludge in the North and South sumps, while approximately one quarter of the Haack property contains the Haack Sump. The

portion of the Haack property not containing the sump is split into a sloped and elevated portion and a flatter portion that could be available for construction staging and material storage. Furthermore, easements and/or leases may be necessary on the Los Angeles Department of Public Works (LADPW) property for grading and fill placement to provide for surface water flow and collection, as well as providing additional space and additional site ingress/egress. (RTC, 9/29/11)

Alternatives 3 and 4 require stockpiling of stabilization material; therefore, the time for stabilization is directly proportional to how much material is available onsite to mix. If only limited quantities of material are available onsite due to storage area constraints, the length of time to implement Alternatives 3 and 4 will increase. (RTC, 9/29/11)

Site Proximity to Sensitive Receptors

Alternatives 3 and 4 pose significant implementation issues due to the gas generation during mixing and excavation of the sludge and the potential impacts to neighboring sensitive receptors. Gas control and treatment would be necessary during mixing and excavation of the sludge. Construction of a tent to contain the gases would be difficult to perform due to low bearing capacity of the sludge and the area the tent would need to span (minimum of the Cooper North sump). Gases captured by the tent would need treatment prior to discharge. In addition, the size of the tent and treatment system would further reduce the space available on the Site to stage construction including equipment storage, stockpiling of fill material, and construction facilities. (RTC, 9/29/11)

Implementation of Alternative 2A has fewer engineering and health and safety complications. By maintaining the existing surfaces, gas generation from the sumps would be minimized and continuous monitoring with readily available vapor suppression equipment will provide a means to minimize potential effects of gas generation during excavation in the Haack Rework area. In addition, Alternative 2A requires less imported material and material stockpiling, thus reducing the effects of traffic and the reduced Site size on construction. As a result, while Alternative 2A has implementation challenges due to the Site size and location, the design of the Alternative 2A cap reduces the effect of the challenges. (RTC, 9/29/11)

8.2.8 Cost

~~Alternative 2 has the lowest capital of approximately $5,206,314 and O&M cost, with Alternatives 3 and 4 having comparable capital costs of $35,402,274 and $54,067,350, respectively. Alternatives 2 and 3 have identical net present value O&M costs of approximately $1,563,800. Alternative 4 has the lowest net present value O&M cost of approximately $620,500. Alternative 2 has the lowest combined remedial cost.~~ (RTC, 9/29/11)

Alternative 2A has the lowest capital cost of approximately ~~$4.5~~ $5.8 million, with Alternatives 3 and 4 having ~~having comparable~~ low-range capital costs of approximately ~~$35.4~~ $11.1 million and ~~$54.1~~ $26.2 million, respectively and high-range costs of approximately $12.6 and $29.1 million. (RTC, 11/6/12) Alternatives 2A and 3 have identical net present value O&M costs of approximately ~~$1.6~~ ~~$2.8~~ (RTC, 11/6/12) $4.9 (RTC, 11/12/13) million. (RTC, 11/6/12) Alternative 4 has the lowest net present value O&M cost of approximately ~~$0.6 million~~ $113,200. Alternative 2A has the lowest combined remedial cost and is not dependent on the highly variable neutralization admixture cost which may vary from as low as $300/ton to as high as $750/ton or more. (RTC, 11/6/12)

8.2.9 State Acceptance

In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the ROD is being prepared.

8.2.10 Community Acceptance

~~In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the ROD is being prepared.~~ (RTC, 9/29/11)

During the May 10, 2011 meeting between the DTSC and the City, the City expressed concerns regarding the appearance of the former (RTC, 11/6/12) Alternative 2 being similar to a "landfill," and the height of the cap being too high. The City expressed the desire that the final remedial Alternative be consistent with the vision and goal of future development for the Site. (RTC, 9/29/11)

Alternative 2A provides a reduced cap thickness, and accounts for future use as a parking lot subgrade consistent with the City's vision for commercial development. Alternative 3 proposes a cap sloping upward to a maximum elevation of 35 ft amsl, which makes parking lot construction more difficult above the high grades and slopes of the Site. Alternative 4 proposes the Site is excavated and filled. Alternative 4 best incorporates the City's vision for commercial development; however, given the potential health risks associated with implementation, short-term effectiveness, and cost challenges, Alternative 2A provides the best compromise to meet the City's development vision. (RTC, 9/29/11)

8.3 Preferred Remedial Alternative

~~Based on the comparative analysis of the remedial alternatives, the alternative that meets the RAOs and ranks the highest is Alternative 2, capping with selective excavation. The elements of Alternative 2 are~~: (RTC, 9/29/11)

- ~~Prepare a construction Health and Safety Plan and Construction Quality Assurance Plan;~~ (RTC, 9/29/11)
- ~~Place a 3.5-foot stabilization layer across the Cooper North and South sumps consisting of gravel, sand, and geocell; (RTC, 9/29/11)~~
- ~~Excavate the Haack Rework area, segregating the overburden soil from the sludge/soil mixture;~~ (RTC, 9/29/11)
- ~~Install retaining wall (sheet pile) along northern perimeter (Artesia Blvd);~~ (RTC, 9/29/11)
- ~~Place the Haack Rework material and other site soils as the foundation layer above the stabilization layer with horizontal gas collection pipes embedded. The foundation layer would increase in thickness and would be graded such that the final surface would drain at 3 percent to the cap perimeters;~~ (RTC, 9/29/11)
- ~~Install vertical gas migration control wells;~~ (RTC, 9/29/11)
- ~~Install geosynthetic layers consisting of, from bottom to top, a gas collection geocomposite, GCL, 60-mil HDPE geomembrane, and drainage geocomposite~~; (RTC, 9/29/11)
- ~~Place 2 feet of cover soil above the geosynthetics;~~ (RTC, 9/29/11)
- ~~Install groundwater monitoring wells;~~ (RTC, 9/29/11)
- ~~Operate the below-cap gas collection system and the perimeter vertical gas migration control well system as active systems for a period of at least 2 weeks. Following the start-up period, operate the below-cap gas collection system and vertical gas migration control well system passively. During passive operation, monitor the performance of the proposed alternative remedial measure with a system of perimeter gas migration sentry wells outside the limit of the perimeter vertical gas migration control wells. If the monitoring data indicate significant gas migration from the waste, convert the system to active gas control and, if required, include gas treatment;~~ (RTC, 9/29/11)
- ~~Prepare a Risk Management Plan;~~ (RTC, 9/29/11)
- ~~Perform semi-annual groundwater monitoring; and~~ (RTC, 9/29/11)
- ~~Complete a formal review of remediation effectiveness after five years.~~ (RTC, 9/29/11)

~~This remedial alternative effectively mitigates the risk from ingestion, inhalation, and dermal contact with onsite soils for both future non-residential and residential occupants of buildings on site, and future landscapers and utility workers. This alternative also~~

~~effectively mitigates the risk from dermal contact with site groundwater through the cap and institutional controls including the Health and Safety Plan and Risk Management Plan.~~ (RTC, 9/29/11)

~~Alternative 2 readily meets the criteria of overall protection of human health and the environment and satisfies ARARs. When evaluated against the balancing criteria, Alternative 2 provides short-term effectiveness as well as long-term effectiveness and permanence. It is readily implementable and presents an effective balance of cost against the other criteria. Alternative 2 also would accommodate future potential redevelopment of the Site~~. (RTC, 9/29/11)

~~Figures 6-2 through 6-7 demonstrate the conceptual design of Alternative 2 and are for the purposes of evaluating costs in this Feasibility Study. The overall height of the cap may be reduced by alternatives such as flatter final cap slopes and a narrower stabilization layer which will be evaluated and presented in the Remedial Action Plan (RAP). The final design for Alternative 2 will be presented in the RAP~~. (RTC, 9/29/11)

Based on the comparative analysis of the remedial alternatives, the alternative that meets the RAOs and ranks the highest is Alternative 2A, capping with selective excavation. The elements of Alternative 2A are (RTC, 9/29/11):

- Prepare a construction HASP and CQA Plan;
- Prepare a Risk Management Plan;
- High-strength geotextile installation;
- Select excavation of impacted material;
- Containment of sludge along Artesia Boulevard;
- Capping of sludge;
- Installation of gas control and monitoring system;
- Institutional controls;
- Perform semi-annual groundwater monitoring; and
- Complete a formal review of cap effectiveness after five years. (RTC, 9/29/11)

This remedial alternative effectively mitigates the risk from ingestion, inhalation, and dermal contact with onsite soils for future non-residential occupants of buildings onsite, and future landscapers and utility workers. This alternative also effectively mitigates the risk from dermal contact with Site groundwater through the cap and institutional controls including the Health and Safety Plan and Risk Management Plan. (RTC, 9/29/11)

Alternative 2A readily meets the criteria of overall protection of human health and the environment and satisfies ARARs. When evaluated against the balancing criteria, Alternative 2A provides short-term effectiveness as well as long-term effectiveness and permanence. It is implementable and presents an effective balance of cost against the other criteria. Alternative 2A also would accommodate future potential redevelopment of the Site. (RTC, 9/29/11)

Figures ~~3-1~~ 6-1 through ~~3-10~~ 6-8, 6-13, and 6-15 (RTC, 11/6/12) demonstrate the conceptual design of Alternative 2A and were prepared for the purposes of evaluating costs in this Addendum. The design for Alternative 2A will be presented in the Remedial Action Plan. (RTC, 9/29/11)

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Attachment 2

Geosyntec
consultants

COMPUTATION COVER SHEET

Client: **Arco** Project: **Gardena Sumps** Project/ Proposal No.: **SC0467** Task No.

Title of Computations: **Evaluation of Bearing Capacity with Respect to Vehicle Loading**

Computations by:	Signature		10/24/13
	Printed Name	Jay L. Griffin, P.E.	Date
	Title	Sr. Staff Engineer	
Assumptions and Procedures Checked by: (peer reviewer)	Signature		11/8/13
	Printed Name	FOR Jennifer L. Nevius, P.E.	Date
	Title	Senior Engineer	
Computations Checked by:	Signature		11/8/13
	Printed Name	Rebecca F. Oliver, P.E.	Date
	Title	Senior Engineer	
Computations backchecked by: (originator)	Signature		10/24/13
	Printed Name	Jay L. Griffin, P.E.	Date
	Title	Sr. Staff Engineer	
Approved by: (pm or designate)	Signature		11/10/13
	Printed Name	Gregory T. Corcoran, P.E.	Date
	Title	Principal Engineer	

Approval notes:

Revisions (number and initial all revisions)

No.	Sheet	Date	By	Checked by	Approval

Written by:	J. Griffin	Date: 10/24/13	Reviewed by:	R. Oliver	Date:
Client:	Arco	Project: Gardena Sumps	Project/ Proposal No.:	SC0467	Task No.:

EVALUATION OF BEARING CAPACITY WITH RESPECT TO VEHICLE LOADING

PURPOSE

The purpose of this calculation package is to evaluate the bearing capacity of soft, low permeability sludge when heavy vehicular loading is applied to the overlying soil cap. The intent of the calculation is to demonstrate adequate margin of bearing capacity when the cap system is subject to temporary H 20 loading.

From top to bottom, the cap overlying the sludge consists of the following:

- 3-inch thick asphalt paving (assumed minimum thickness);
- 12-inches Class 2 aggregate base;
- Drainage geocomposite;
- 60-mil High Density Polyethylene (HDPE) geomembrane;
- Gas collection geocomposite;
- 12-inches (minimum) of foundation soil;
- High-strength woven geotextile; and
- Existing hypalon geomembrane.

The cap is proposed to serve as a parking lot for future site development.

PROCEDURE

The bearing capacity of the sludge was determined using the method outlined in the Naval Facilities Engineering Command Engineering Design Manual (NAVFAC, 1986) for shallow footings with concentric loads. The loading imposed on the sludge from an H 20 vehicle on the cap surface was estimated using Bousinnesq stress distribution as presented by NAVFAC (1986). Stabilization/reinforcement provided by the high strength geotextile and the asphalt surfacing was neglected in this calculation.

Vehicle Loading Estimation

The assumed loading on the cap is modeled as an H 20-44 truck as defined in the 2004 California Department of Transportation (Caltrans) Bridge Design Specifications (Attachment A). Caltrans H 20-44 loading specifies a rear axle load of 32,000 pounds

(lbs). Assuming that the rear axle is equipped with dual 315/80R22.5 tires with a maximum dual tire load of 8,270 lbs (Attachment B), the load from each tire on the rear axle is determined:

$$Load\ per\ Tire = \frac{32{,}000 lbs}{4} = 8{,}000 \text{lbs}$$

Michelin (2013) provides a loaded tire width of 12.5 inches for a 315/80R22.5 tire and a recommended maximum inflation pressure of 130 pounds per square inch (psi) (Attachment B). The estimated loaded area is calculated to be:

$$Area\ per\ Tire = \frac{8{,}000\ lb}{130\ psi} = 61.5\ \text{in}^2$$

The estimated loaded length is calculated to be:

$$Length\ of\ 1\ Tire = \frac{61.5 in^2}{12.5 in} = 4.9\ \text{in}$$

Since the dual tires are close together, the total contact area for the set of dual tires can be estimated as twice the contact area of one tire (123 in^2).

The loading at the top of the sludge was estimated using Boussinesq vertical stress distribution through the minimum 2.25 foot thick cap. A surface load of 16,000 lbs (2 tires) was distributed below a surface contact area with a width of 25 inches (2 tires * 12.5 inches per tire) and a length of 4.9 inches (Attachment B). As presented in Attachment C, at a depth of 2.25 feet, the vertical stress imposed below the center of the vehicular loading area is estimated to be approximately 1,350 pounds per square foot (psf).

Bearing Capacity Analysis

The ultimate bearing capacity (q_{ult}) was determined based on the following equation presented in NAVFAC (1986) for cohesive materials with surface loading (depth, D = 0 feet):

$$q_{ult} = cN_c$$

where:

q_{ult}= Foundation ultimate bearing capacity (psf)

c = cohesion of the foundation (sludge) (psf) = 300 psf*

N_c = Bearing capacity coefficient (psf) = 5.53

* The sludge material is estimated from Cone Penetration Test (CPT) soundings performed at the site to have undrained shear strength between approximately 300 psf and 1,600 psf.

An expression for N_c as a function of the angle of internal friction of the sludge (N_c = 5.53 for ϕ = 0) and was determined based on NAVFAC (1986) (Attachment D). The lower bound ultimate bearing capacity was determined by:

$$q_u = (300\,psf)(5.53) = 1{,}659\,psf$$

The lower bound factor of safety (FS) against bearing capacity failure of the sludge is estimated by:

$$FS = \frac{q_u}{qe} = \frac{(1{,}659\,psf)}{(1{,}350\,psf)} = 1.2$$

The table below summarizes the calculated factors of safety for the estimated range of sludge strength.

Sludge Strength (psf)	Calculated q_{ult} (psf)	Calculated FS
300	1,659	1.2
600	3,318	2.5
900	4,977	3.7
1,200	6,636	4.9
1,600	8,848	6.6

DISCUSSION

A design applications guide (Synthetic Industries, 1998) for a similar application of a lagoon cover presents a discussion of factor of safety criteria for bearing capacity evaluation (Attachment E). For temporary loading conditions, such as vehicular loading, the referenced publication states that a factor of safety of 1.5 is appropriate, with a factor of safety as low as 1.2 that could be used if the foundation strength is

either well known or conservatively estimated. For this evaluation, the selected 300 psf strength of the sludge is considered the lower bound (conservatively estimated) and results in a factor of safety of 1.2, neglecting contribution from the geotextile. With an estimated strength of 600 psf, which is a relatively conservative strength from the estimated strength range, the calculated FS is equal to 2.5, which is in the rage of FS considered appropriate for (permanent) foundation design, commonly using FS between 2.5 and 3.0.

The geotextile above the sludge would provide separation and stabilization for the cap. As the soil is loaded from the surface, the surrounding soil is held in place, preventing a local punching (shear) failure; this change in the soil failure mode from local shear to general shear allows about 80% additional loading before the soil strength is exceeded (Propex, 2011 – Attachment F).

The reinforcement action (strength) of the geotextile would be generated by the application of vertical stresses causing vertical and lateral deformations of the cap materials and the geotextile. In paved applications such as this project, the allowable deformation to reduce significant pavement cracking is relatively low, and the reinforcement action would not be as applicable.

Additionally, the asphalt pavement would provide some lateral distribution/reduction of the applied vehicle load at the top of the sludge, which has been neglected in this calculation.

RESULTS

Because the factors of safety determined with respect to bearing capacity of the sludge and the H 20-44 loading at the cap surface, sludge bearing capacity failure is not anticipated.

REFERENCES

Caltrans (2004). "Bridge Design Specifications", February. (Attachment A)

Michelin (2013). XDN 2 GRIP Specifications and Load and Inflation Tables. (Attachment B)

NAVFAC (1986). "Foundations & Earth Structures," Design Manual 7.02, September. (Attachments C and D)

Propex (2011). "EB-101 Geotextile Functions in Paved and Unpaved Roads." (Attachment F)

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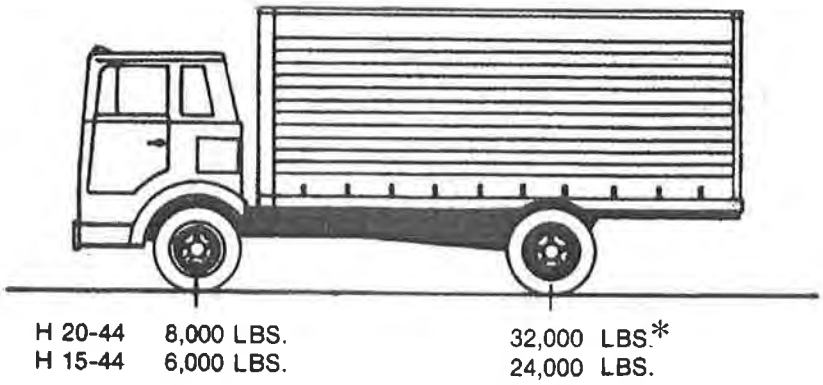


FIGURE 3.7.6A Standard H Trucks

* In the design of timber floors and orthotropic steel decks (excluding transverse beams) for H 20 loading, one axle load of 24,000 pounds or two axle loads of 16,000 pounds each spaced 4 feet apart may be used. whichever produces the greater stress, instead of the 32,000-pound axle shown.

** For slab design, the center line of wheels shall be assumed to be 1 foot from face of curb (See Article 3.24.2)

Long Haul

XDN®2 GRIP

The all-weather, directional, premium drive tire optimized for exceptional traction with no compromise on tread wear.

- Michelin's Matrix™ siping technology helps provide exceptional traction on dry and slippery surfaces. Over 1,300 biting edges combine to help provide excellent levels of traction while the 3 dimensional Matrix™ sipes lock together for the stability norma
- Extra-wide tread (nearly 1" wider than Michelin XDN tire) helps provide stability while helping to improve handling and mileage.
- Full 28/32 tread depth helps provide long original tread life.
- Wide, open shoulder grooves help deliver additional traction balanced with tread life.

Specifications for Tread Design: XDN®2 GRIP

Size	Load Range	Catalog Number	Tread Depth 32nds	Max Speed mph	Loaded Radius		Overall Diameter		Overall Width		Approved Rims	Min. Dual Spacing		Revs per Mile	Max. Tire Load Single				Max. Tire Load Dual			
					in.	mm.	in.	mm.	in.	mm.		in.	m		lbs.	psi	kg.	kPa	lbs.	psi	kg.	kPa
315/80R22.5	L	04355	28	75	20.0	507	43.1	1094	12.5	317	9.00, 8.25	13.8	351	486	9090	130	4125	900	8270	130	3750	900

Note: Rim listed first is the measuring rim.
Exceeding the lawful speed limit is neither recommended nor endorsed.
Overall widths will change 0.1 inch (2.5 mm) for each 1/4 inch change in rim width. Minimum dual spacing should be adjusted accordingly.
Michelin® tires and tubes are subject to a continuous development program. Michelin North America, Inc. reserves the right to change product specifications at any time without notice or obligations.
Please consult rim manufacturer's load and inflation limits. Never exceed rim manufacturer's limits without permission of component manufacturer.

WARNING! SERIOUS INJURY MAY RESULT FROM:
***TIRE FAILURE DUE TO UNDERINFLATION/OVERLOADING OR MISAPPLICATION – FOLLOW TIRE PLACARD INSTRUCTIONS IN VEHICLE. CHECK INFLATION PRESSURE FREQUENTLY WITH AN ACCURATE GAUGE**
***EXPLOSION OF TIRE/RIM ASSEMBLY DUE TO IMPROPER MOUNTING – ONLY SPECIALLY TRAINED PERSONS SHOULD MOUNT TIRES. WHEN MOUNTING, USE SAFETY CAGE AND CLIP-ON EXTENSION AIR HOSE TO INFLATE.**
CONSULT OWNER'S MANUAL FOR ADDITIONAL SAFETY INFORMATION

Load and Inflation Tables: XDN®2 GRIP

S = Single configuration, or 2 tires per axle.
D = Dual configuration, or 4 tires per axle.

315/80R22.5 LRL

PSI		85	90	95	100	105	110	115	120	125	130
kPa		590	620	660	690	720	760	790	830	860	900
LBS	SINGLE	12940	13540	14140	14740	15320	15900	16480	17060	17620	18180
	DUAL	23540	24640	25740	26800	27880	28960	30000	31040	32040	33080
KG	SINGLE	5880	6120	6440	6680	6900	7200	7440	7740	7960	8250
	DUAL	10680	11120	11720	12120	12560	13120	13520	14040	14480	15000

MAXIMUM LOAD AND PRESSURE ON SIDEWALL				
S	9090	LBS at	130	PSI
D	8270	LBS at	130	PSI
S	4125	KG at	900	kPa
D	3750	KG at	900	kPa

Industry load and inflation standards are in a constant state of change, and Michelin continually updates its product information to reflect these changes. Printed material may not reflect the latest load and inflation standards.

NOTE: Never exceed the wheel manufacturer's maximum air pressure limitation.

Geosyntec consultants

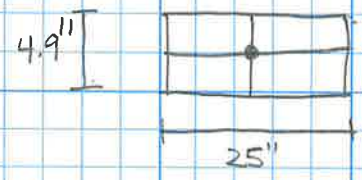
Written by: J. Nevius Date: 30/10/13 (DD MM YY) Reviewed by: _____ Date: ___/___/___

Client: _____ Project: Gardena Project/Proposal No. SC0467 Task No. _____

Stress at top of sludge layer - 27 inches deep

Boussinesq Case - Reference NAVFAC 1986

Stress below the center of a rectangle - break into four equal rectangles.



L = 2.45 inches = (1/2)(5)
B = 12.5 inches = (1/2)(25)
D = 27 inches

See Figure Four

$m = \frac{B}{z} = \frac{12.5}{27} = 0.46$

$n = \frac{L}{z} = \frac{2.45}{27} = 0.09$

$I_\sigma = 0.018$

$\sigma_z = q I_\sigma$

$\sigma_z = (4 \text{ rectangles})(130 \text{ psi})(0.018) = 9.36 \text{ psi}$

$\sigma_z = 1{,}350 \text{ psf}$

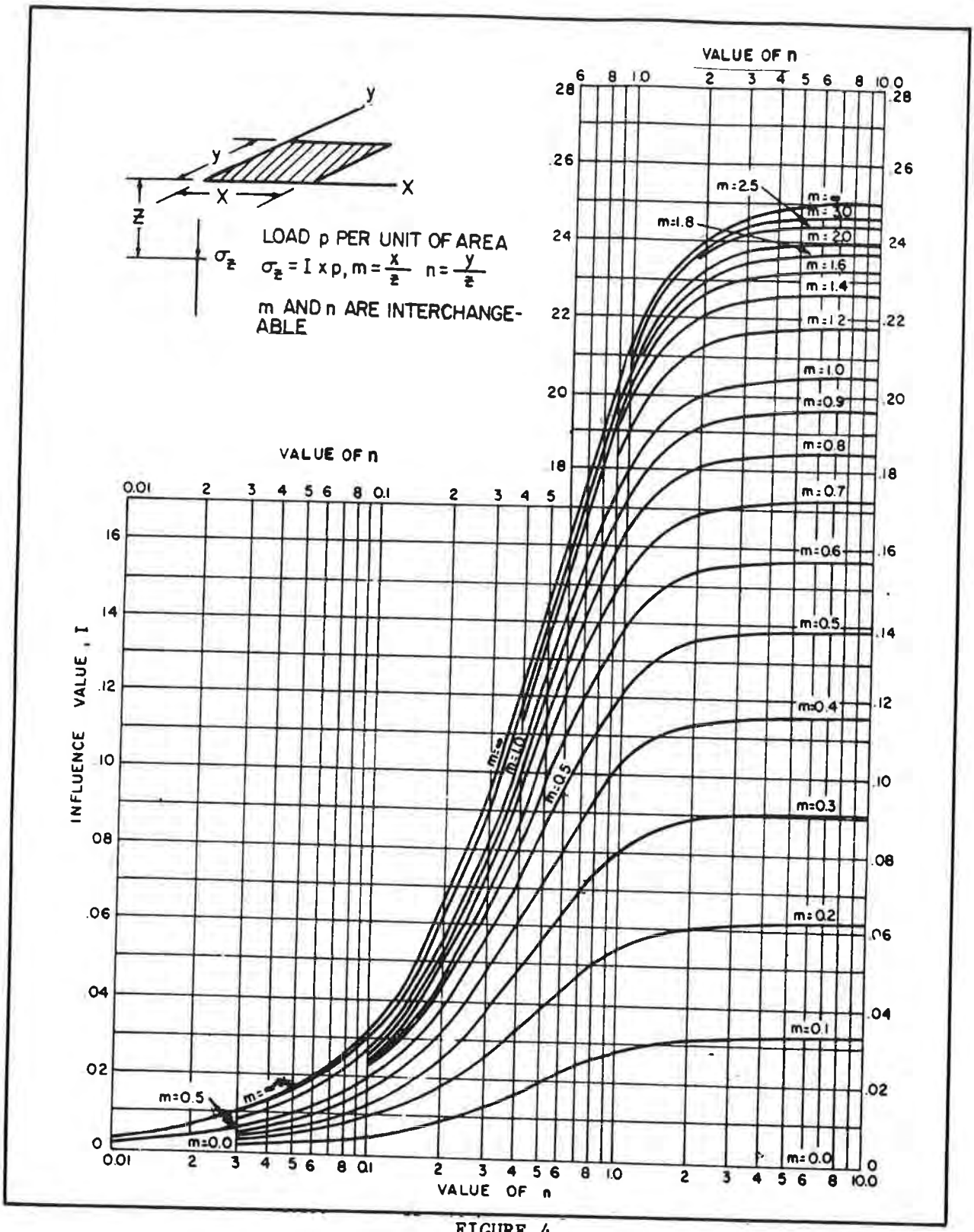


FIGURE 4
Influence Value for Vertical Stress Beneath a Corner of a Uniformly Loaded Rectangular Area (Boussinesq Case)

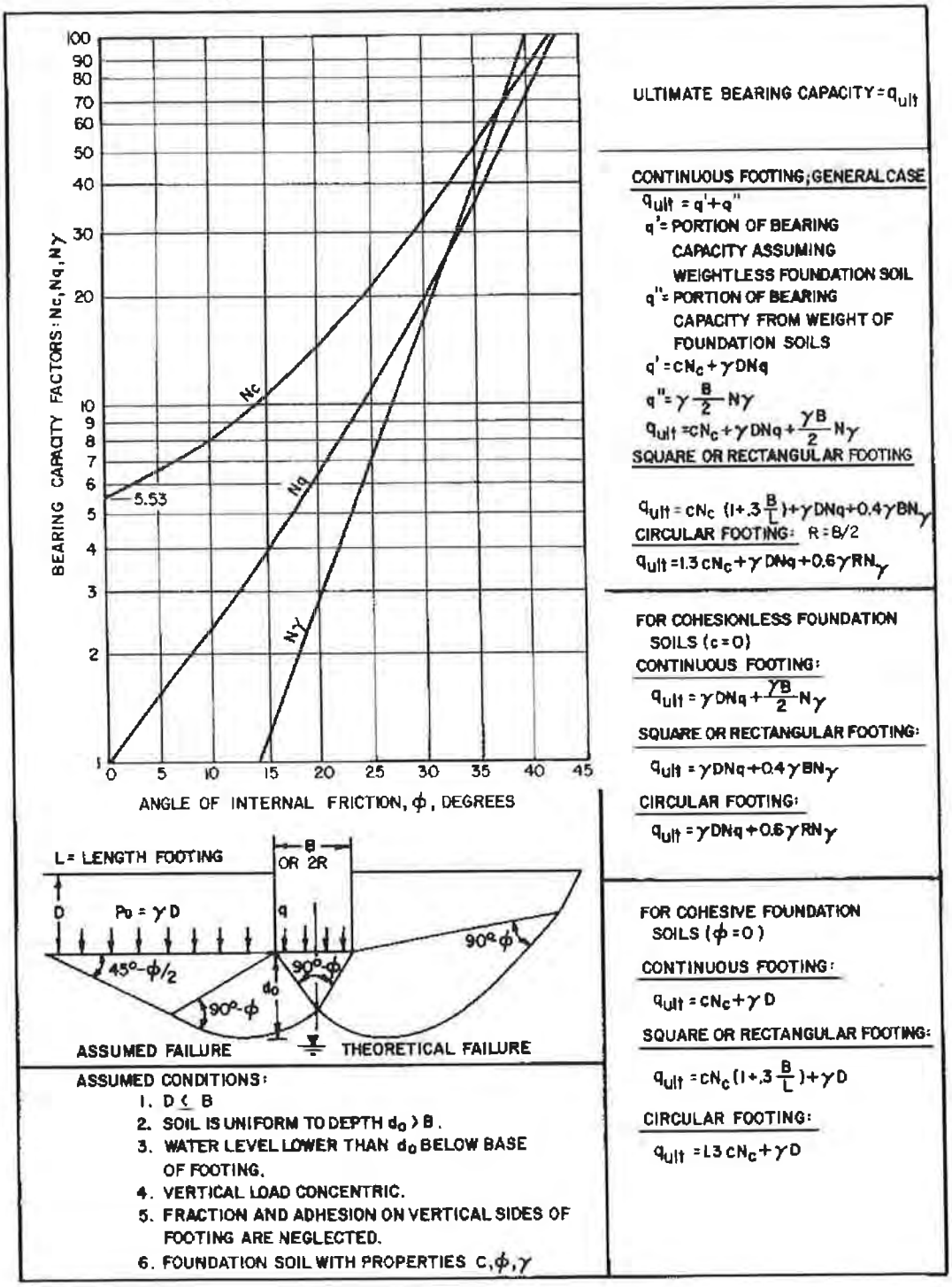


FIGURE 1
Ultimate Bearing Capacity of Shallow Footings With Concentric Loads

DESIGN GUIDELINES (cont'd)

Step 4. Calculate the Bearing Capacity Safety Factor

Check to ensure that the fill soil/geotextile system has sufficient bearing capacity to support the construction equipment loading during placement of initial lift of soil. Use a classical net bearing capacity approach [12], modified for squeezing if the soft soil is relatively thin [13], where only additional (i.e. equipment) loadings, are considered.

Calculate the net bearing capacity of the foundation soil, q_{net} :

$$q_{net} = c_{us} N_c$$

where:

c_{us} = Average Undrained Soil / Sludge shear strength, psf
Note: if varies, average through depth = 1.5 (W+2T) , ft.

N_c = 5.14, when $(W+2T) < 2 D_s$
otherwise, $N_c = 4.14 + 0.5 [(W+2T) / D_s]$

Calculate the Bearing Capacity safety factor for the foundation soil, FS_{bc} :

$$FS_{bc} = q_{net} / q_{ae}$$

The minimum bearing capacity safety factor acceptable for design is a critical engineering parameter that is selected based upon engineering judgement. The bearing capacity calculated is for the extreme equipment loading scenario present for only a short period of time. Therefore, safety factors greater than 1.5 are considered acceptable. However, the designer may recognize that because the consequences of failure are small (pulling the dozer out of sludge) that lower safety factors may be an acceptable risk, since the equipment can move in response to unsatisfactory behavior, i.e. failure won't be catastrophic. In these scenarios, when the undrained shear strength is well known or conservatively estimated safety factors as low as 1.2 can be acceptable.

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Soil Reinforcement Handbook

Design, Specifications & Construction Procedures for:

- ▲ Embankments Over Soft Soil
- ▲ Lagoon Closures
- ▲ Retaining Walls
- ▲ Steepened Slopes
- ▲ Lining System Support
- ▲ Geotextiles versus Geogrids

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Design Worksheets
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Other Geosynthetic Products
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GEOFIBERS® for soil reinforcement
GEOTEX woven and nonwoven geotextiles
LANDLOK® erosion control materials
FIBERMESH® fibers for secondary reinforcement of concrete

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ENGINEERING BULLETIN

EB-101
Geotextile Functions in Paved and Unpaved Roads

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GEOTEXTILE FUNCTIONS IN PAVED AND UNPAVED ROADS

FORWARD

The most common use of geotextiles is beneath paved and unpaved roadways, and this is referred to as the separation/stabilization application. Geotextiles used in paved and unpaved roadways actually provide several benefits through primarily four geotextile functions: Separation, Stabilization, Reinforcement, and Filtration.

The benefits derived from these four geotextile functions are most significant when subgrade soils are weak, i.e., CBR < 3. These benefits are well documented in the literature. However, long-term benefits (improved pavement performance over time) from separation in applications where the subgrade is competent, (i.e., CBR >3), are just now beginning to surface, as roads 30 years old have been exhumed and have maintained their full structural section since they were built over a geotextile.

This Engineering Bulletin describes the functions of a geotextile beneath roadways. For design assistance using geotextiles beneath either paved or unpaved roads, the use of our free Roadways And Civil Engineering (R.A.C.E.) software is recommended.

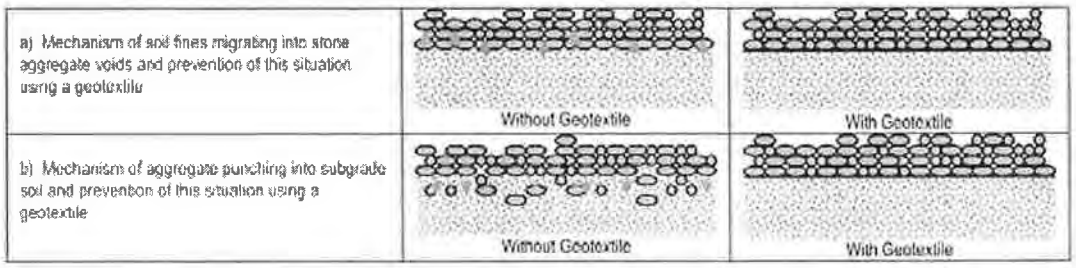
SEPARATION

Geotextile separation is defined as the introduction of a flexible, porous textile placed between dissimilar materials so that the integrity and functioning of both materials can remain intact or be improved (Koerner, 1994).

In paved and unpaved roadways where granular aggregate is placed on fine-grained sols, two detrimental mechanisms occur over time without the use of a geotextile separator:

1. First, the fine-grained soils enter into the voids of the granular aggregate, preventing it from draining properly and the aggregate loses the required rock-to-rock contact, greatly diminishing the strength of the aggregate support layer and accelerating road failure (Figure 1).
2. Second, the granular aggregate punches into the fine-grained soil, thereby decreasing the effective thickness of the aggregate layer (Figure 1).

FIGURE 1.
From: FHWA Designing with Geosynthetics, Robert M. Koerner, 1994.



Properly selected woven and nonwoven geotextiles prevent these failure mechanisms from occurring, thereby greatly improving the performance of a road. For these reasons, separation is considered to be a very important geotextile function and is the key to the longevity of the road. Also, over the years, road builders have felt obligated to use a tight, well graded aggregate to help minimize subgrade soil migration upward. This proved to be only partially effective and, to the detriment of the road, these tight aggregates were weaker because they would not drain. The use of a separation geotextile allows the use of stronger, more free-draining aggregates with stronger AASHTO drainage coefficients. If a geogrid is used, there is no effective separation and a less cost effective tight aggregate must be used. The tight, well-graded aggregate recommended for use with geogrids, actually negates the structural benefit of using the geogrid.

STABILIZATION

Paved and unpaved roadway applications are long-term stabilized in two ways when a geotextile is placed at the subgrade/aggregate interface. First, when the aggregate is compacted over the top of a geotextile, the individual stones are "seated" making impressions in the geotextile and the subgrade. This interaction locks the bottom of the aggregate into a fixed position, thus stabilizing the aggregate layer indefinitely. An expensive geogrid is not needed to effect this interaction stabilization. Also, the subgrade soil is stabilized beneath the geotextile. This is because as the soil is loaded, from the top, the surrounding soil is held down in place, preventing a local punching, or shear failure. This change in the soil failure mode from local shear to general shear allows about 80% additional loading before the soils strength is exceeded. This mechanism allows for a reduced structural section over a subgrade stabilized with a geotextile. The use of less base aggregate and/or pavement section thickness over a geotextile saves the owner up front and, the permanent preservation of the entire structural section saves the owner down the road with additional years of maintenance-free service.

These first two functions, Separation and Stabilization, act together as the key reasons roads over geotextiles cost less and last longer. It is for this reason that the two terms are often used together to describe this application...a separation/stabilization geotextile.

REINFORCEMENT

Geotextile reinforcement is defined as the synergistic improvement of a total system's strength created by the introduction of a geotextile (good in tension) into a soil (good in compression but poor in tension) or other disjointed and separated material (Koerner, 1994).

In paved and unpaved roadway applications, geotextiles provide tensile reinforcement through frictional interaction with base course materials, thereby reducing applied stresses on the subgrade and preventing rutting caused by subgrade overstress.

Properly selected woven and nonwoven geotextiles provide reinforcement in roadways. However, woven geotextiles typically have a higher tensile modulus than a comparable nonwoven. By providing high tensile strength at low strains (i.e., high modulus) woven geotextiles generally are considered better reinforcement materials than nonwoven geotextiles which typically provide high strength at high elongations (low modulus). Therefore, benefits derived from the reinforcement function are dependent on the amount of system deformation allowed. In unpaved roads, a large amount of deformation is sometimes allowed and the reinforcement function of a geotextile can provide significant benefits. In paved roads, allowable system deformation is usually very low and, as a result, reinforcement is generally not considered to be applicable in most paved roadways but separation and stabilization are still key functions. Likewise, geogrids are rarely strained enough to provide a reinforcement function in roads. There is a misconception that geogrids are stronger than woven geotextiles. Much less expensive woven reinforcement geotextiles are available with much higher strengths and moduli than available geogrids.

FILTRATION

Geotextile filtration is defined as the equilibrium geotextile-to-soil system that allows for adequate liquid flow with limited soil loss across the plane of the geotextile over a service lifetime compatible with the application under consideration (Koerner, 1994).

In paved and unpaved roadway applications, geotextiles provide filtration through their defined openings that retain soil particles but allow the flow of water. This results in a free-draining pavement system. In paved and unpaved roadways, filtration is similar to separation. However a geotextile that is a good separator (a barrier) will not always be able to provide adequate filtration (retain particles and allow water flow). Properly selected, woven and nonwoven geotextiles can provide filtration in paved and unpaved roadway applications, thereby improving pavement performance. Depending on site conditions (e.g. if the subgrade is extremely wet) the filtration function may be as important as the other functions. This is because if water is trapped in the subgrade when a load is applied, pore pressures immediately build up and weaken the soil, even to the point of creating an unstable, "waterbed" effect, if severe. Propex supplies both woven and nonwoven geotextiles with greater ability to pass water than will ever be required beneath a road.

SUMMARY

All four of these geotextile functions are in effect to varying degrees when a geotextile is used in the separation/stabilization application beneath paved and unpaved roads. The life of a geotextile in this application is considered indefinite since the most harsh treatment the geotextile receives is during the actual construction, not in the long term use. Durability testing has shown that polypropylene geotextiles can last over 200 years in the ground.

For information on how to design both paved and unpaved roads, with and without the benefit of a separation/stabilization geotextile, please request a copy of our free design software, Roadways And Civil Engineering (R.A.C.E.). The software also helps you select the proper geotextile and allows you to quantify the significant cost savings associated with the use of a geotextile beneath your roads.

REFERENCES

Koerner, R.M. and Koerner, G.R, "Separation: Perhaps the Most Under-estimated Geotextile Function" Geotextile Fabrics Report, January 1994, pp. 4-10.

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Attachment 3

Wasser Polyflex 204

Product Description

Polyflex 204 is a high performance membrane of Polyurea. It provides excellent insulation and is resistant to a variety of chemical products. It can be used in a wide range of climatic conditions while continuing to offer excellent durability. Applications are done primarily by brush and roller. Due to its aliphatic nature the product is suitable in exterior applications. It has high solid content and remains flexible. While it can be used as a repair kit, it can also be used as a complete water proofing membrane

Area of Use

Substrates

Over properly prepared:

- Ferrous Metal
- Aluminum/Non-Ferrous Metal
- Galvanized Metal
- Concrete
- Concrete Block
- Geotextile

Possible Uses

- Steel or Concrete Tanks
- Refineries
- Food Processing Facilities
- Water and Wastewater Treatment Facilities
- Chemical Processing Facilities
- Pulp and Paper Mills
- Concrete Structures
- Dry Holds/Wet Holds
- Pipes
- Containment and Secondary Containment
- Floors
- Material Handling Equipment
- Port and Pier Facilities

Ready Reference Information

Color: Various colors

Type of cure: 2 components
Binder: Aliphatic

***Solids by volume:** 91%*
***Solids by weight:** 90%*
*combine with the catalyst

V.O.C.: 96 g/l

Flash Point: 102° F
Recommended dry film thickness/coat: 40 mils
1000 microns

Theoretical Coverage:
At 1 mil: 1461 ft^2/gal
At 25 microns: 135 m^2/3.78 liter

Ratio: 1:1

Pot Life: 20 minutes max
Shelf Life: 1 year

Drying Times and Temperatures*

Gel Time: 45 minutes
Tack free: 4 hours
To recoat: 2 hours minimum; 24 hours maximum
Hard dry: 24 hours
*(may vary with climatic conditions)

Product Features

- Superior anti-corrosive protection for steel and concrete in cold service climates.
- Protective membrane on metal, masonry, silos, all kinds of pipes and stone slabs.
- Application on geotextile to form ponds, to retain overflow, prevent effluent leakage, water and petroleum product leakage.
- Provides an excellent waterproof protection on rigid urethane insulation.
- Garage and parking decks.
- Can be used to repair or replace an existing membrane.
- Excellent abrasion resistance.

Wasser Corporation 4118 B Place NW Suite B Auburn, WA 98001
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Recommended Systems

Moisture Cure Urethanes (MCU) Approved Primers (when appropriate):
MC-CR
MC-Miozinc
MC-Zinc
MC-Ferroclad 100 PW

Compatible Coatings

Moisture Cure Urethane (MCU) Coatings:
Primers:
MC-Ferroclad 100 PW
MC-Zinc
MC-Miozinc
MC-CR

Surface Preparation

See Wasser's Polyurea Application Guide.

Application Information

For Polyurea and/or polyurethane membranes:*
Roughen the surface of Polyflex with a 40 grit (or less) abrasive, remove dust with a dust rag or vacuum. Make sure the surface is clean, dry and dust free before the application. Clean the surface with acetone, let the acetone evaporate and apply the repair kit.

For concrete: Make sure the concrete surface is dry and clean. The grout and loose particles on concrete surface need to be cleaned before the application. If a hardener was used in the concrete, it must be roughened with a Blastrac machine or equal impact tools. Direct or primed applications can be done.(Blastrac is a registered trademark of the Wheelabrator Corporation.)*

For steel: First remove all grease, oil, salt contaminants and dirt in accordance with SSPC SP-1 solvent cleaning procedure. High pressure water wash using salt solubilizing agents can be used to remove the remaining salt. SSPC SP6 or SSPC SP10 may be used depending on the application.*

** Consult your Wasser representative for specific and detailed applications as well as choosing the appropriate primer.*

Performance Testing Data

Resistance to tearing:
(ASTM D-624-C) Tear strength = 21.6 N/mm(123.1 PLI)

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Physical Properties

Properties under tension:
(ASTM D 412-C) *Ultimate Elongation = 327 %*
Tensile strength = 5.2 N/mm2 *(754 PSI)*
Indication of hardness:
(ASTM D-2240) *Shore A 85*

Ordering Information

Product Numbers:

Package Size: 5 gallon pails (10 gallon sets)
1 gallon pails (2 gallon sets)
Order in sets only.
Shelf Life: 1 year

Shipping Information

Safety Precautions

Precaution:
See the material safety data sheet and product label for complete safety and precaution requirements.

"The following is made in lieu of all warranties, expressed or implied: Manufacturer's obligation shall be to replace such quantity of the product proven to be defective. The manufacturer shall not be liable for any injury, loss or damage, direct or incidental or consequential, arising out of the use of or the inability to use the product. Before using, the user shall determine the suitability of the product for the intended use and the user assumes all risk and liability whatsoever in connection therewith. All values shown are approximations. Values indicated are for guide purposes only, as actual values can change due to application conditions, application methods, environmental conditions etc. The information contained herein is subject to change without notice." Contact your Wasser Representative for current Product Data Sheets.

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Attachment 4

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11 November 2013

Mr. Kyle Christie
Remediation Manager
Atlantic Richfield Company
6 Centerpointe Drive
La Palma, California 92048

Subject: **Addendum to the Revised Final Draft Feasibility Study for the Gardena Sumps Site: Optional Alternative 2A Cover**
Gardena Sumps Site
Gardena, California

Dear Mr. Christie,

Geosyntec Consultants, Inc. (Geosyntec) has prepared this Addendum to the Revised Final Draft Feasibility Study (Revised Final Draft FS) in response to comments received from Department of Toxic Substances Control (DTSC) and the City of Gardena (City). The DTSC and City comments on the Revised Final Draft FS were presented in meetings held 11 July, 30 August, and 5 September 2013. The Addendum presents and discusses the changes to Alternative 2A resulting from the comments as well as future Site development concerns. A detailed analysis and ranking of the Optional Alternative 2A Cover will not be performed as the changes associated with the Optional Alternative 2A Cover do not affect the analyses of Alternative 2A presented in the Revised Final Draft FS (Geosyntec, 2013).

OPTIONAL ALTERNATIVE 2A COVER

Introduction

During the meeting on 11 July 2013, the DTSC expressed the City's concerns with the height and appearance of the proposed retaining wall along the northern edge of the Haack Sump and a portion of the Cooper North Sump. In response to this concern, the DTSC request Atlantic Richfield Company (ARC) to evaluate an alternative design that would eliminate the proposed retaining wall. Geosyntec has conceptually redesigned Alternative 2A in this Area. The retaining wall was eliminated and grading in the area affected by the elimination of the retaining wall (the "Optional Alternative 2A Cover") was revised to accommodate a minimum 5 percent (%) slope

draining to the north and terminating at a 6 to 9 inch (in.) concrete curb immediately adjacent to the Artesia Boulevard (Blvd.) sidewalk. The curb will deter unintended light traffic across the slope, act as a water-stop for drainage from the slope, and accommodate the slight variations in the existing Haack Sump concrete slab surface elevation. The modifications necessary to eliminate the retaining wall and allow for the Optional Alternative 2A Cover will require waivers of some requirements in California Code of Regulations, Title 22 (22 CCR). The elements of Optional Alternative 2A Cover are discussed in more detail in the following Sections.

Cap Modifications

The Optional Alternative 2A Cover will be comprised of the same foundation and gas collection layers, and low-hydraulic conductivity layer as described in the Revised Final Draft FS for Alternative 2A. The Optional Alternative 2A Cover foundation layer will have no minimum thickness to accommodate the northern border slope and requires a 30-foot set-back southward from the Artesia Boulevard sidewalk before the cover system has sufficient strength to allow for vehicle traffic. To allow vehicle traffic over the cover to the south, the foundation layer will thicken from north to south at an approximate minimum slope of 2.5 percent until a minimum foundation layer thickness of 0.5 foot (ft) and 1 ft on the Haack and Cooper Sumps, respectively, is achieved. In addition, the erosion protection layer will have no minimum requirement and will thicken southward with an approximate minimum slope of 5 percent until 1 foot of Class II aggregate base is present over the drainage geocomposite. As a result, a 30 ft wide landscaped strip will border the northern Gardena Sumps site where no vehicle traffic will be permitted. The revised grading and cross sections are shown on Figures 1 through 4.

There are no proposed changes to the gas collection layer, high-strength geotextile, or low-hydraulic conductivity layer resulting from this cap modification. Drainage above the low-hydraulic conductivity layer and below the erosion protection layer will be accommodated with the geocomposite drainage layer as described in the Revised Final Draft FS (Geosyntec, 2013).

Drainage

A 6 to 9 in. concrete curb is proposed between the border of the Haack and Cooper North sumps and the Artesia Blvd. sidewalk where drainage would otherwise run off the Site. The curb will minimize the amount of run off flowing from the Site onto the Artesia Blvd. sidewalk as well as support a trench drain or shallow water conveyance feature at the toe of the slope. The variation in height of the curb is proposed due the variable height of the existing Haack Sump concrete slab relative to the sidewalk. The variable height will also support drainage to the east and west. The curb will further prevent inadvertent light traffic, such as foot traffic, bicycles, and/or

wheelchairs, from entering the sloped portion of the cover. The cover slope and concrete curb are shown in Detail 2 on Figure 7.

Monitoring and Control Systems

The Optional Alternative 2A Cover does not affect the gas monitoring and control system or the groundwater monitoring program. The sheet pile cut-off wall is still proposed along the northern edge of the Haack Sump and a portion of the Cooper Sump; however, the wall will not extend above the existing ground surface. As a result, no additional gas extraction wells are proposed in this area. The locations of the gas control system components are shown on Figures 5 and 6 with the Revised Alternative 2A Cover grading.

Land Use Covenants

Institutional controls were discussed in the Revised Final Draft FS; however, the specific land use covenants (LUCs) are described herein. The term "land use covenants" includes written instruments and agreements restricting land uses, easements, servitudes, and land use restrictions. The LUCs entered into or required by DTSC will "run with the land," i.e., are binding on current and subsequent property owners, and remain in effect until they are formally removed or modified (DTSC, 2003). The list of LUCs presented is not all-encompassing; other necessary LUCs may be identified in the future.

LUCs identified for the Site include maintenance requirements, zoning restrictions, limited development above the cover, and limited excavation in and around the cover. Specific LUCs for the property owner(s) and responsible parties (RPs) are listed below:

- The property owner(s) will be responsible for maintenance of a parking lot or other non-structural surface above the Alternative 2A engineered cap such as asphalt paving, concrete, or vegetation;
- The property owner(s) will be responsible for maintaining vegetation and ensuring minimal root depth of vegetation;
- The property owner(s) will be responsible for maintenance of necessary fencing, gates, and walls around the Site;
- The property owner(s) will be responsible for posting and maintaining notification signs within onsite buildings, the RPs will be responsible for posting and maintaining signs within open spaces;

- The property owner(s) will notify the DTSC and RPs of activities within limits of cover such as trenching or filling and not proceed with activities without a written approval of activities;
- The Cooper and Haack properties will be restricted to open space, commercial use, or industrial use;
- Pumping and removal of shallow groundwater beneath the Site will be restricted except for sampling and monitoring purposes;
- Use of the Cooper and Haack properties will be limited to those which will not disturb the integrity of the cap or monitoring systems;
- The property owner(s) will notify the DTSC and RPs of any disturbance of the soil, such as excavation, grading, removal, trenching, mining, or drilling of gas, oil, or water wells on the Properties. Excavation, grading, removal, trenching, mining, and/or drilling will be limited and only as approved by the DTSC and RPs on the capped portions of the Cooper and Haack properties;
- Easements will be granted to the DTSC and RPs for inspection, surveillance, monitoring, maintenance, or other purposes necessary to protect public health or safety;
- Subdivision of the Cooper or Haack Properties will be prohibited;
- Notifications will be required for those purchasing, leasing, subleasing, and/or renting the property stating that residual contamination exists. Notifications will be provided by the RPs or owner, as appropriate;
- Notification to the DTSC of any sale, lease, or other conveyance of the properties by the owner or RPs, as appropriate; and
- Requirement for a deed notice notifying potential purchasers that the properties have been used to manage hazardous waste and that use of the properties is restricted.

The LUCs will be recorded at the county recorder's office so they will be found during a title record search of the property deed.

REGULATORY WAIVERS

A waiver would be necessary from the requirements in 22 CCR in order to remove the minimum foundation and erosion protection material thicknesses presented for the Optional Alternative 2A Cover. The specific requirements that would need to be waived are provided below:

- Foundation Layer

  - Requirement: “A foundation layer shall be provided for the compacted barrier layer of the final cover… …The layer shall be compacted at a moisture content sufficient to achieve the density required to provide adequate support for the nonearthen membrane…” (22 CCR Section 66264.228(e)(4))
  - Discussion: The foundation layer would be reduced to zero at the northern Haack and portion of the Cooper North Sumps property line. The existing concrete slab in the Haack Property and in-place soil in the Cooper North Property will provide support for the gas collection geocomposite and overlying low-hydraulic conductivity layer.
- Cover Soil
  - Requirement: “The owner or operator shall provide a layer of top soil of thickness sufficient to support vegetation for erosion controlled deep enough to prevent root penetration into the filter layer. The top soil shall have characteristics to protect the compacted layer against drying that would lead to cracking, to resist erosion and to support vegetation growth…” (22 CCR Section 66264.228(e)(12))
  - Discussion: The 1-ft. thick cover soil at Site will primarily be Class II Aggregate Base in accordance with the proposed parking lot end use. In the sloped areas, the cover soil will be a vegetative cover soil with a thickness that may be reduced to zero.

Other waivers of requirements in 22 CCR may be required once the final design of Optional Alternative 2A is completed.

The gas collection system and geomembrane will be supported by either the existing concrete slab on the Haack Property or existing in-place soil on the Cooper Property. The geomembrane will be protected by the overlying geocomposite with vegetative cover soil, Class II Aggregate Base, artificial turf, or concrete or other durable materials.

SPECIFIC PLAN COMPLIANCE

The City developed the Artesia Corridor Specific Plan (Specific Plan) which establishes the development vision for the properties on the south side of Artesia Boulevard between Western and Normandie Avenues (TPC, 2006). The Specific Plan designates the vast majority of the Gardena Sumps site for commercial use.

Site Layout

The Alternative 2A conceptual design complies with the City's Specific Plan. Commercial/retail structures up to 80,000 sf in size may be accommodated outside of the Alternative 2A engineered cap portion. Space may be allocated above the capped portions of the property for parking.

Utilities and Lighting

Utilities for the building may be accommodated by trenching outside of the capped portions of the Gardena Sumps site, primarily parallel to the Haack and Cooper boundaries on the west and south. Some electrical conduit may be installed within or above the aggregate base layer of the cover in accordance with the Risk Management Plan discussed in the Revised Final Draft FS (Geosyntec, 2013). Parking lot lighting may be accommodated by installing light poles around the perimeter of the parking lot and/or within the parking lot outside of the cover. Within the capped portion of the Gardena Sumps site, lighting structures with minimal foundations depths would be suitable.

Long Term Monitoring

Long term monitoring at the Gardena Sumps site will include settlement, groundwater, and soil gas monitoring. If development occurs shortly after the remedy is implemented, monitoring locations can be incorporated into the development features such as walkways, vegetative strips, etc. to limit disruption to the commercial activities during monitoring events. If development occurs after monitoring locations have been installed, monitoring locations could be moved to accommodate the development.

Zoning

The Strategic Plan has identified the Gardena Sumps site for commercial development. The Site-Specific Action Levels (SSALs) identified in the Revised Final Draft FS were a derivation of risk-based concentrations for the Gardena Sumps site's constituents of concern (COCs). These SSALs were used to identify areas of the Gardena Sumps site which would require action based on cancer and non-cancer risks for residential receptors, the most conservative receptor. The areas of the Gardena Sumps site in excess of the residential SSALs were addressed in Alternative 2A through capping or select excavation. As a result, the Gardena Sumps site can accommodate the less conservative, commercial receptor development.

CONCLUSIONS

The Optional Alternative 2A Cover does not impact the evaluation and comparison of Alternative 2A to the nine evaluation criteria (USEPA, 1988). Alternative 2A readily meets the criteria of overall protection of human health and the environment and satisfies Applicable or Relevant and Appropriate Requirements (ARARs). When evaluated against the balancing criteria, Alternative 2A provides short-term effectiveness as well as long-term effectiveness and permanence. It is implementable and presents an effective balance of cost against the evaluation criteria. Alternative 2A also would accommodate future potential redevelopment of the Site (Geosyntec, 2013). As a result, Alternative 2A, as revised by this Addendum, is the preferred remedy for the Site.

If you have any questions, please contact Mrs. Rebecca Oliver at (858) 716-2926.

Sincerely,

Rebecca F. Oliver, P.E.
Senior Engineer

Gregory T. Corcoran, P.E.
Principal Engineer

Attachment: Optional Alternative 2A Figures

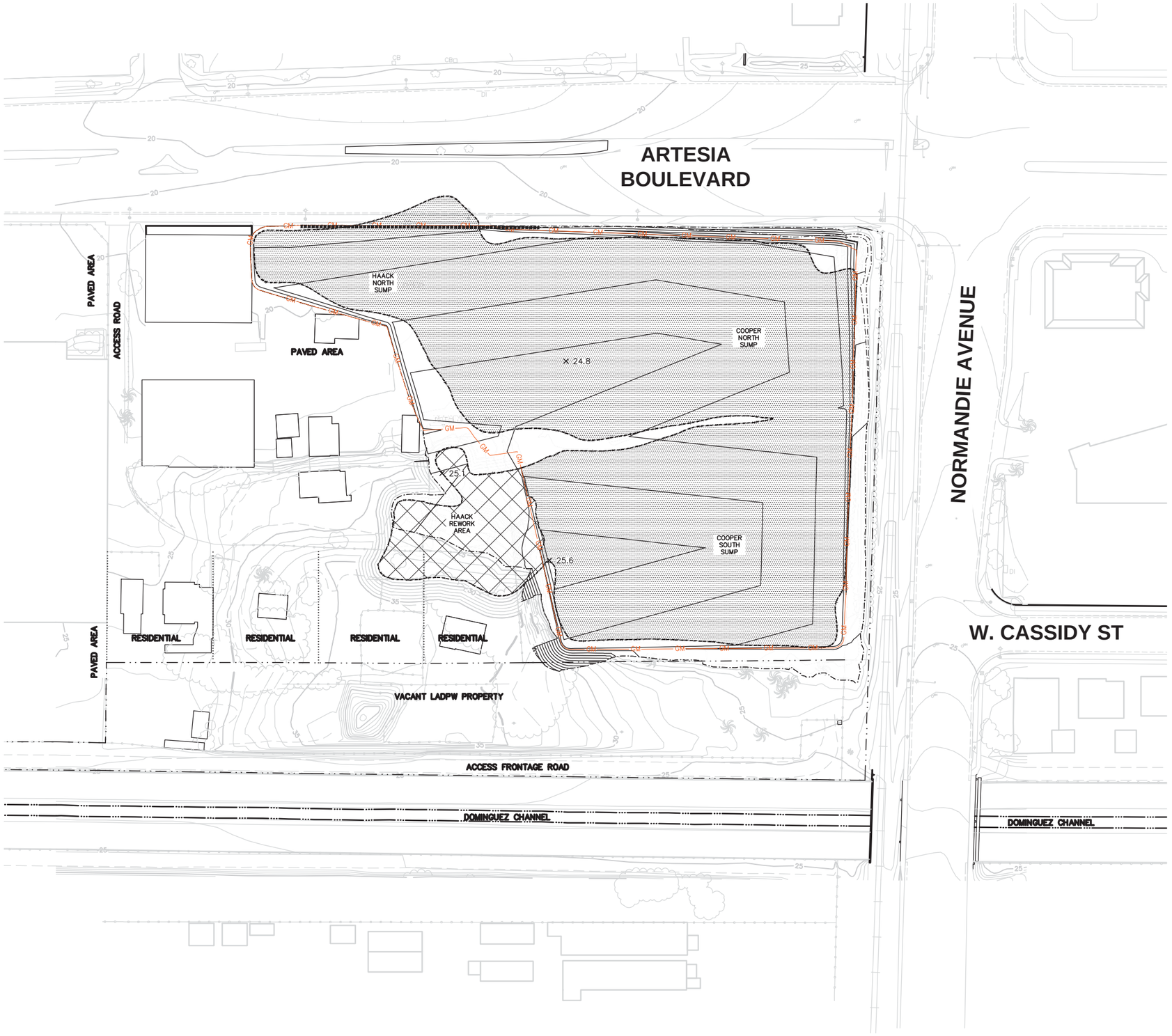
REFERENCES

22 CCR Section 66264.228. Closure and Post Closure Care.

DTSC, 2003. Fact Sheet: Recorded Land Use Covenants (Assembly Bill 2436) and Regulations, April.

Geosyntec, 2013. Revised Final Draft Feasibility Study, Gardena Sumps, Gardena, California, April.

The Planning Center (TPC), 2006. Artesia Corridor Specific Plan, July.



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- LIMIT OF FINAL COVER GEOMEMBRANE
- SHEET PILE CUT OFF WALL (NOTE 4)
- CHAIN–LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- PALM TREE
- APPROXIMATE DISTRIBUTION OF SLUDGE
- HAACK REWORK MATERIAL TO BE REMOVED

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.
4. SHEET PILE CUT OFF WALL WILL NOT EXTEND ABOVE EXISTING GROUND SURFACE.

0 100' 200'

SCALE IN FEET

OPTIONAL ALTERNATIVE 2A FINAL COVER – OVERVIEW
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2013

PROJECT NO. SC0467A

FIGURE 1

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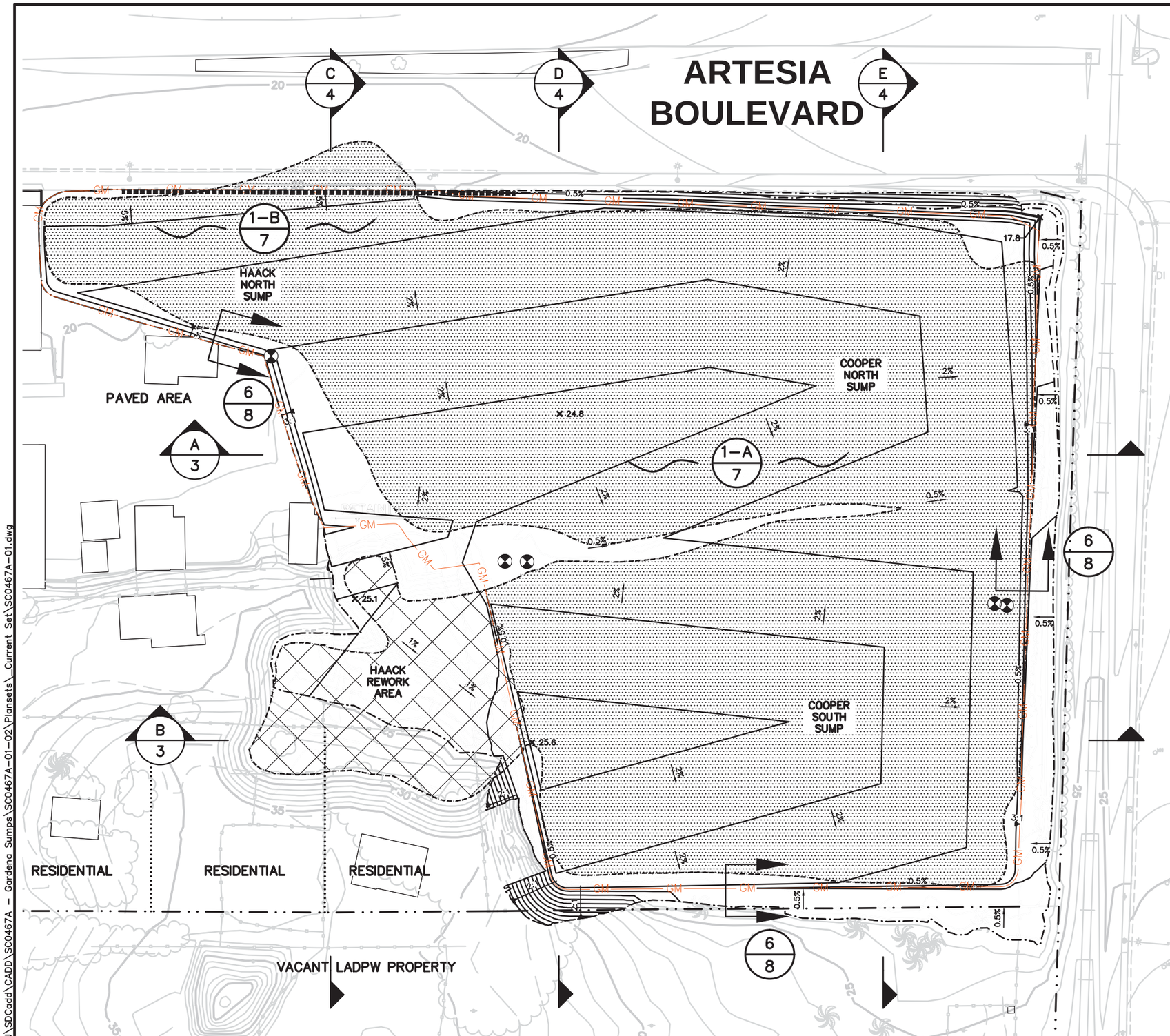

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- LIMIT OF FINAL COVER GEOMEMBRANE
- SHEET PILE CUT OFF WALL (NOTE 4)
- CHAIN–LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- APPROXIMATE DISTRIBUTION OF SLUDGE
- HAACK REWORK MATERIAL TO BE REMOVED
- EXISTING GROUNDWATER MONITORING WELL TO BE ABANDONED

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.
4. SHEET PILE CUT OFF WALL WILL NOT EXTEND ABOVE EXISTING GROUND SURFACE.

0 60' 120'

SCALE IN FEET

OPTIONAL ALTERNATIVE 2A FINAL COVER
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE:	NOVEMBER 2013	FIGURE
PROJECT NO.	SC0467A	2

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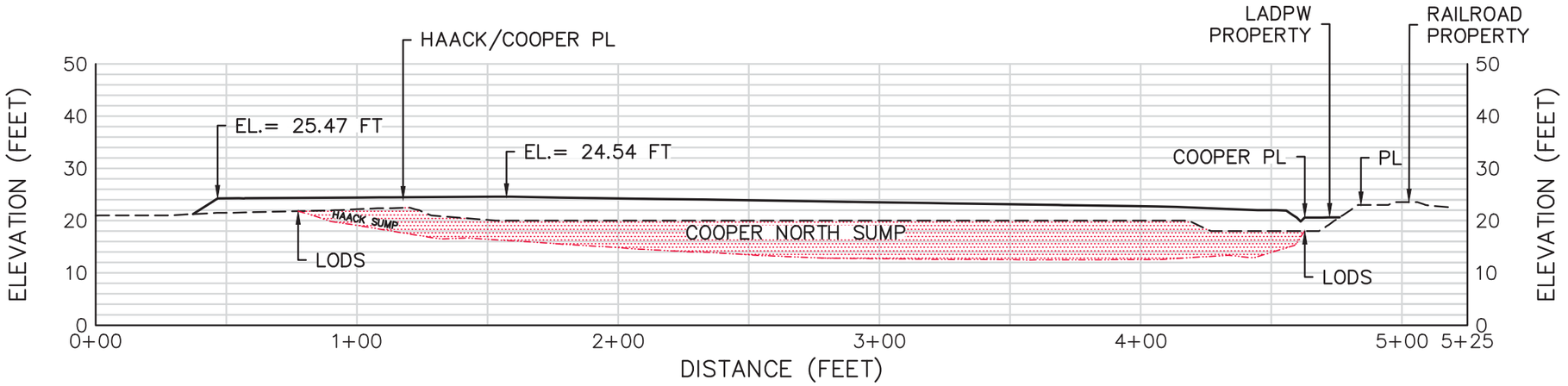
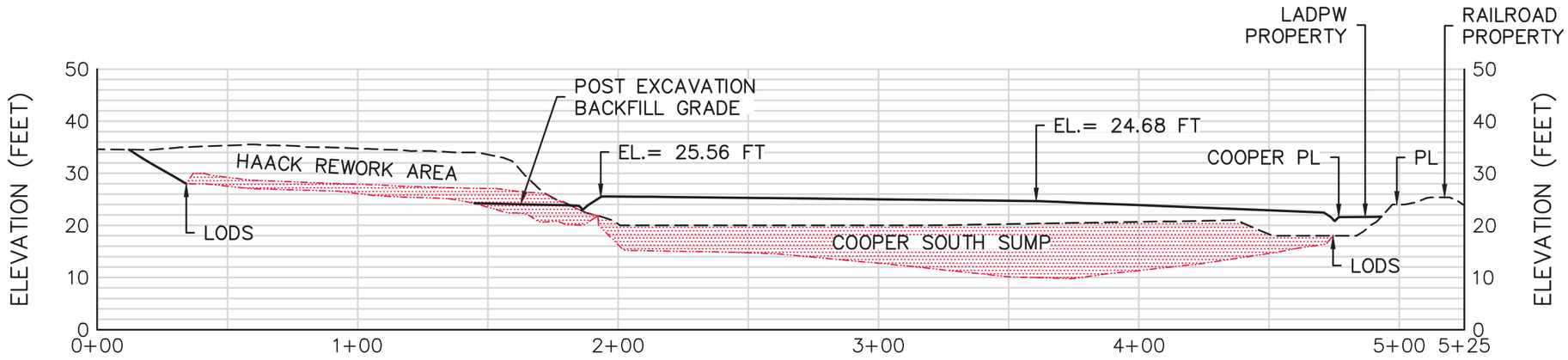
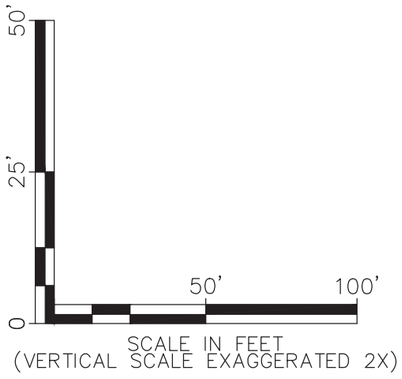


SECTION A



SECTION B



LEGEND

- EXISTING GRADE
- FINAL GRADE
- APPROXIMATE LIMITS OF DETECTED SLUDGE

NOTES:

1. LODS = LIMIT OF DETECTED SLUDGE
2. LADPW = LOS ANGELES DEPARTMENT OF PUBLIC WORKS
3. PL = PROPERTY LINE

OPTIONAL ALTERNATIVE 2A EAST–WEST SECTIONS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2013

PROJECT NO. SC0467A

FIGURE 3

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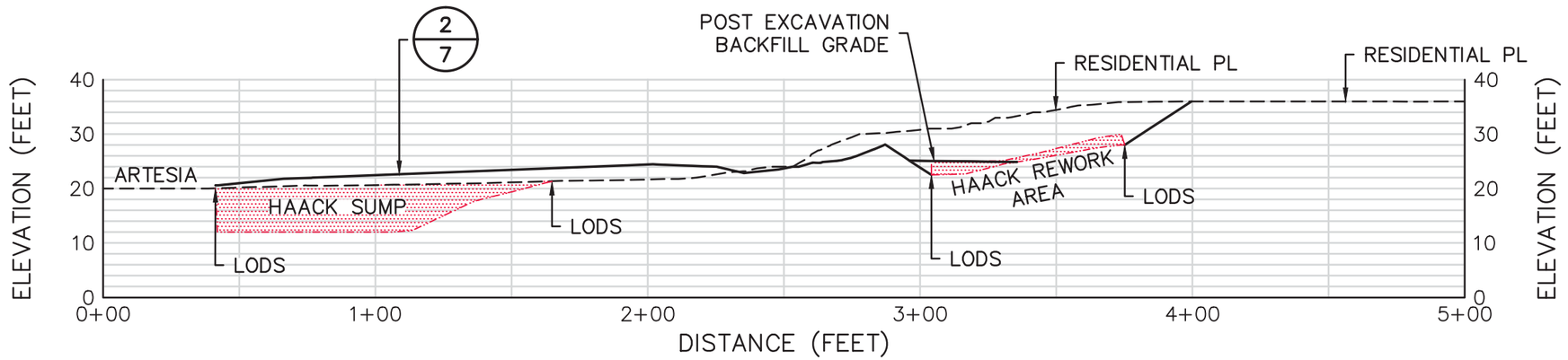

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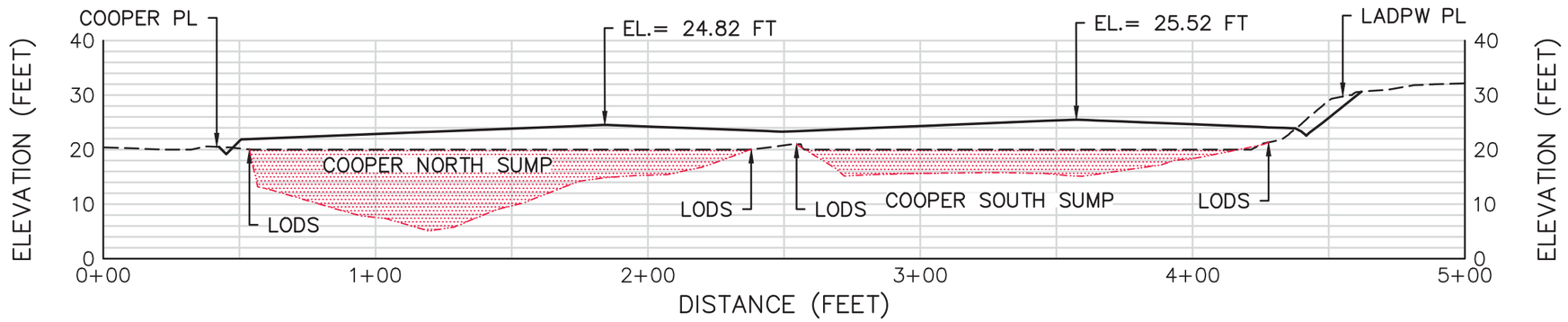

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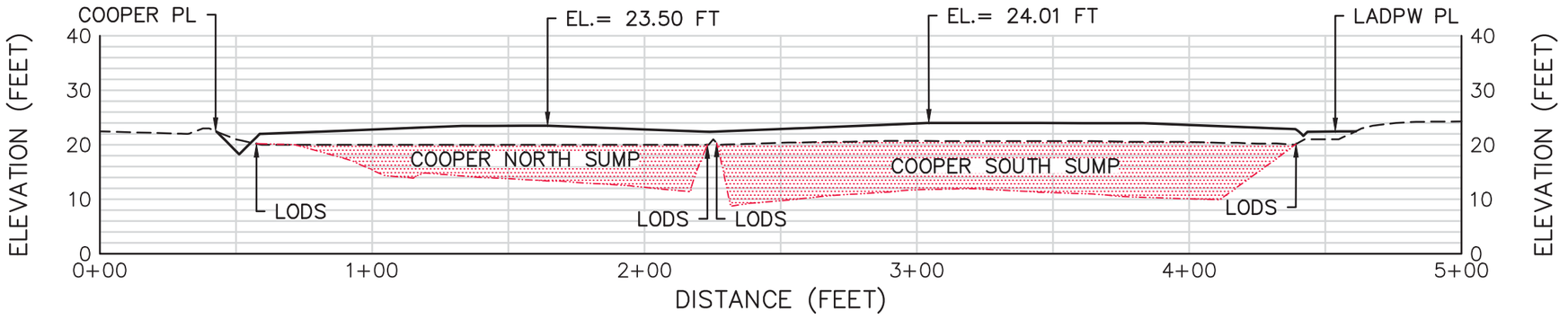
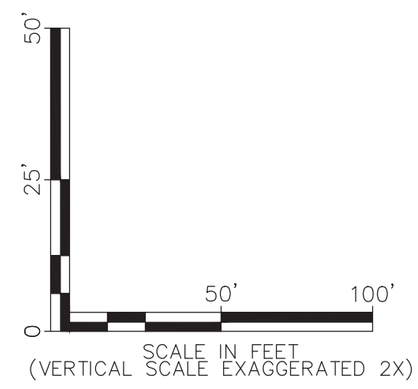


SECTION E



LEGEND

- EXISTING GRADE
- FINAL GRADE
- APPROXIMATE LIMITS OF DETECTED SLUDGE

NOTES:

1. LODS = LIMIT OF DETECTED SLUDGE
2. LADPW = LOS ANGELES DEPARTMENT OF PUBLIC WORKS
3. PL = PROPERTY LINE

OPTIONAL ALTERNATIVE 2A NORTH–SOUTH SECTIONS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2013

PROJECT NO. SC0467A

FIGURE 4

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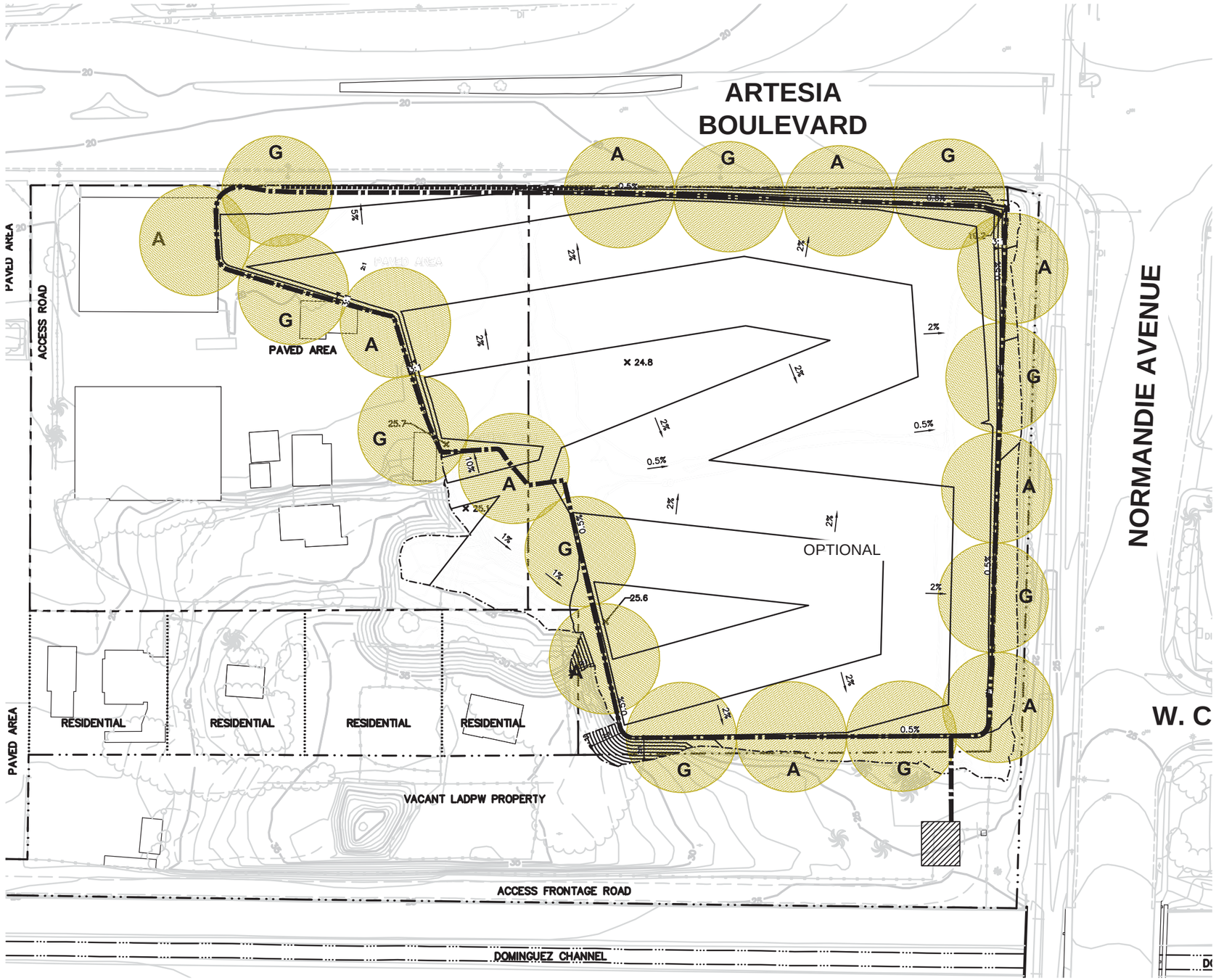

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- SHEET PILE CUT OFF WALL (NOTE 5)
- CHAIN–LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH

VERTICAL GAS CONTROL WELL RADIUS OF INFLUENCE (WELL AT CENTER OF CIRCLE)
A = AIR INLET WELL
G = GAS EXTRACTION WELL

4/8

VERTICAL GAS COLLECTION PIPE LOCATION

PROPOSED TREATMENT SYSTEM LOCATION (NOTE 4)

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.
4. TREATMENT SYSTEM LOCATION MAY BE MODIFIED TO ACCOMODATE FUTURE SITE DEVELOPMENT.
5. SHEET PILE CUT OFF WALL WILL NOT EXTEND ABOVE EXISTING GROUND SURFACE.

0 80' 160'
SCALE IN FEET

OPTIONAL ALTERNATIVE 2A VERTICAL GAS CONTROL LAYOUT PLAN
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2013

PROJECT NO. SC0467A

FIGURE 5

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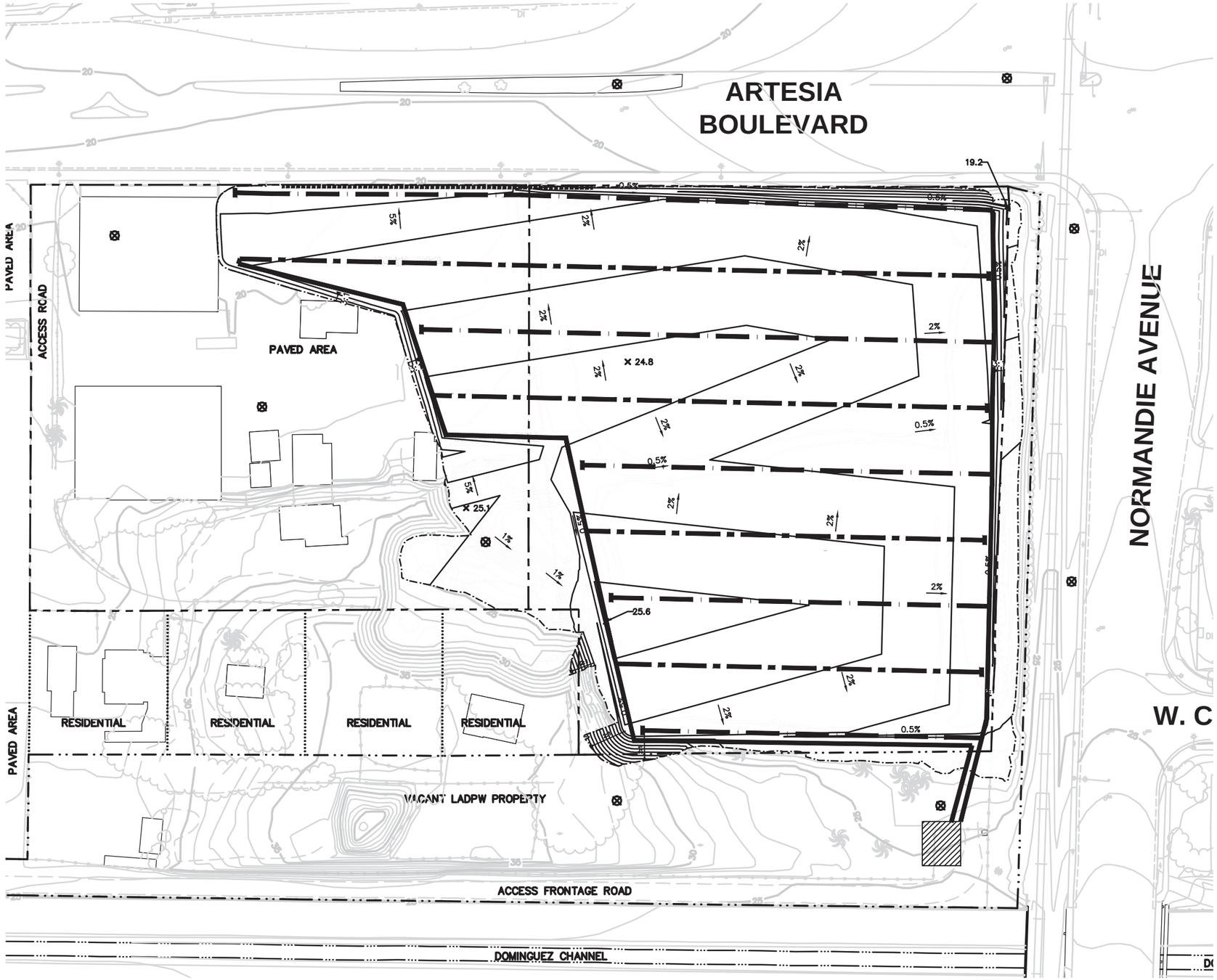

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- SHEET PILE CUT OFF WALL (NOTE 5)
- CHAIN–LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- HORIZONTAL GAS COLLECTION GEOSTRIP
- HORIZONTAL AIR INLET GEOSTRIP
- HORIZONTAL GAS COLLECTION / AIR INLET SOLID WALL PIPE LOCATION
- PROPOSED TREATMENT SYSTEM LOCATION (NOTE 4)
- GAS MONITORING PROBE 5/8

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.
4. TREATMENT SYSTEM LOCATION MAY BE MODIFIED TO ACCOMODATE FUTURE SITE DEVELOPMENT.
5. SHEET PILE CUT OFF WALL WILL NOT EXTEND ABOVE EXISTING GROUND SURFACE.

0 80' 160'

SCALE IN FEET

OPTIONAL ALTERNATIVE 2A HORIZONTAL GAS CONTROL SYSTEM
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2013

PROJECT NO. SC0467A

FIGURE 6

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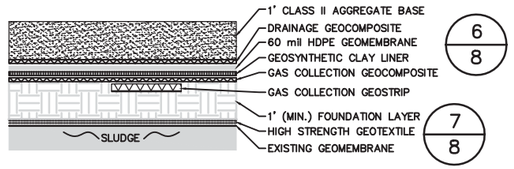
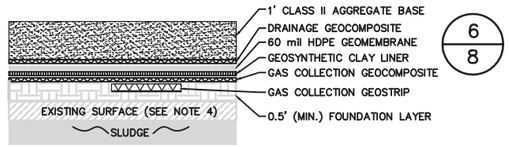


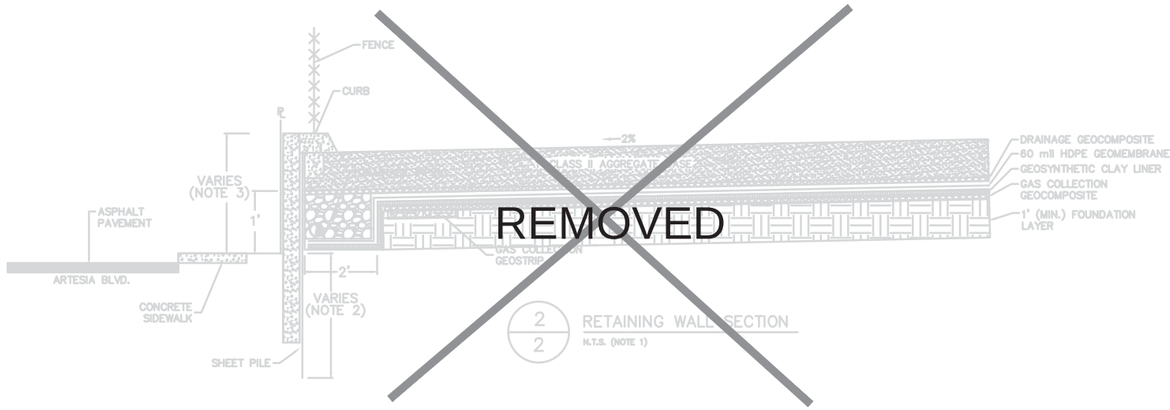
1-A / 2 ALTERNATIVE 2A COOPER SUMP CAP DETAIL

SCALE = 1" = 4' (NOTE 1)



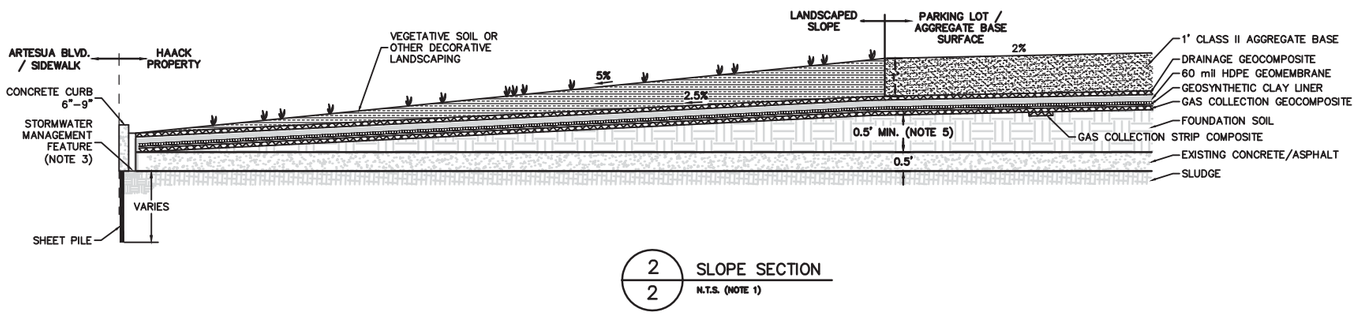
1-B / 2 ALTERNATIVE 2A HAACK SUMP CAP DETAIL

SCALE = 1" = 4' (NOTE 1)



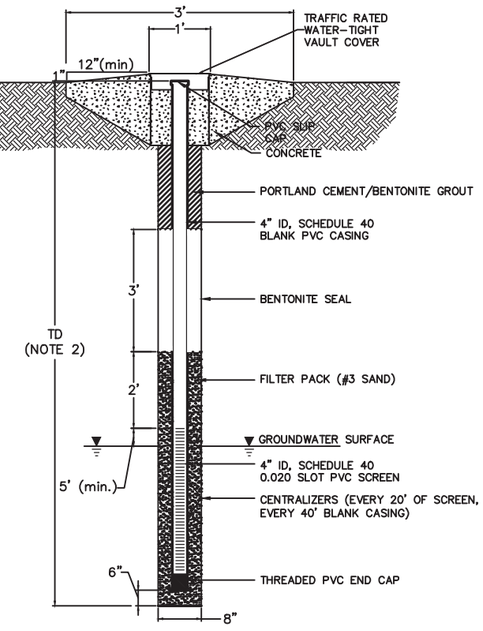
2/2 RETAINING WALL SECTION

N.T.S. (NOTE 1)



2/2 SLOPE SECTION

N.T.S. (NOTE 1)



3 DETAIL

NEW MONITORING WELL

N.T.S.

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NOTES:

1. GEOSYNTHETIC THICKNESS EXAGGERATED FOR CLARITY.
2. FINAL CONSTRUCTION DEPTHS BASED ON FIELD CONDITIONS. ALL DEPTHS IN FEET BELOW GROUND SURFACE.
3. STORMWATER MANAGEMENT FEATURE MAY DIFFER FROM SHOWN AS IDENTIFIED DURING FINAL DESIGN.
4. EXISTING SURFACE IS DEGRADED ASPHALT OR CONCRETE. SURFACE WILL BE PROTECTED IN PLACE.

OPTIONAL ALTERNATIVE 2A DETAILS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2013

PROJECT NO. SC0467A

FIGURE 7

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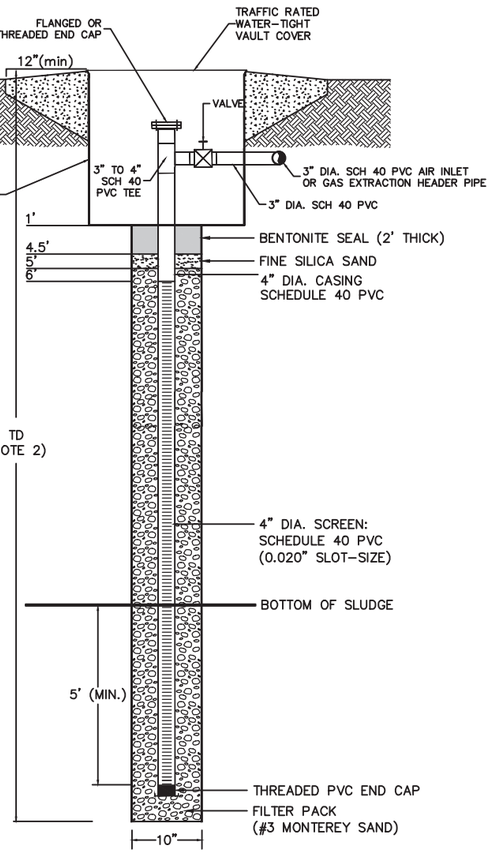

4/5 ALTERNATIVE 2 AND 3 CONCEPTUAL VERTICAL GAS CONTROL WELL

N.T.S.

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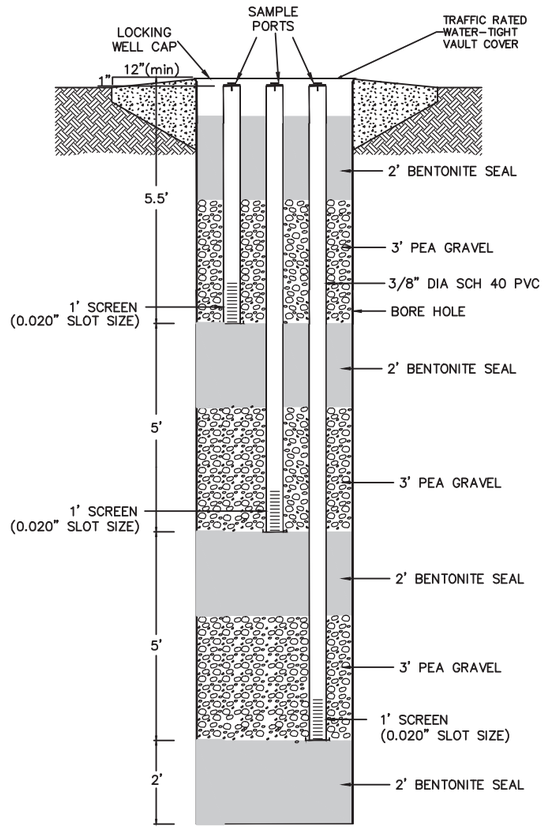

5/6 DETAIL GAS MONITORING PROBE

N.T.S.

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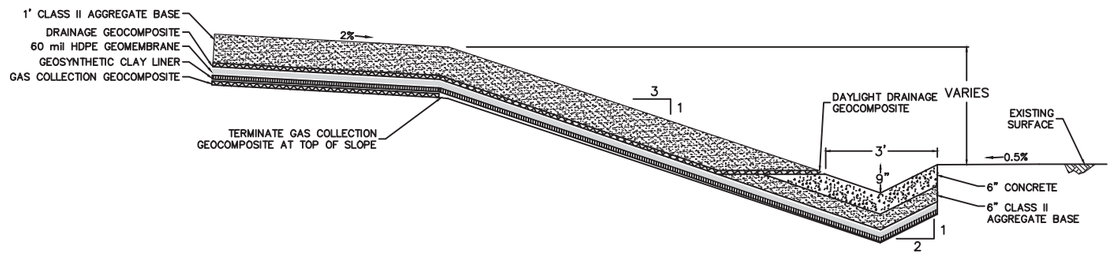
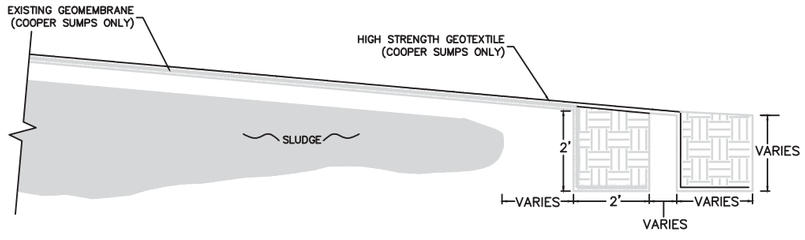


6/2 ALTERNATIVE 2A COVER TERMINATION

SCALE = 1" = 4' (NOTE 1)



7/7 ALTERNATIVE 2A HIGH STRENGTH GEOTEXTILE ANCHOR TRENCH DETAIL

SCALE = 1" = 4' (NOTE 1)

NOTES:

1. GEOSYNTHETIC THICKNESS EXAGGERATED FOR CLARITY.

OPTIONAL ALTERNATIVE 2A DETAILS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2013

PROJECT NO. SC0467A

FIGURE 8

P:\PRJ\SDCadd\CADD\SC0467A - Gardena Sumps\SC0467A-01-02\Planset_Current Set\SC0467A-07.dwg

Geosyntec consultants

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San Diego, CA 92127

PH 858.674.6559
FAX 858.674.6586

www.geosyntec.com

27 January 2014

Mr. Joseph Cully
Hazardous Substance Scientist
Southern California Cleanup Operations Branch
Cypress Office, Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630

Transmittal: **Response to Comments on the Revised Final Draft Feasibility Study Report**
Gardena Sumps Site
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California
DTSC Site No. 400067

Dear Mr. Cully:

Geosyntec Consultants (Geosyntec), on behalf of the Atlantic Richfield Company (ARC), is pleased to provide this response to Department of Toxic Substances Control's (DTSC) comments on the Updated Revised Final Draft Feasibility Study Report (Updated Revised Final Draft FS). These responses were prepared to address the DTSC comments dated 13 December 2013 and 6 January 2014. The DTSC comments are provided below in *italics* with ARC's response following.

COMMENTS

1. No further comment.

2. No further comment.

3. No further comment.

4. The Material in the Haack Rework area is distinctly different than the material in the sumps, composed of soil-sludge material and soil overburden according to the feasibility study (FS), so excavation of this area would not provide the same information as the pilot study previously discussed in comments from DTSC. ESPO stands by its opinion regarding the value of a pilot study but notes that at this point the decision on whether or not to require a pilot study is a management decision. In the absence of a pilot study the contingency plan included in section

6.1.2.2 will need to account for any uncertainty regarding gas generation potential and should be reviewed and approved by DTSC before construction is allowed to commence.

ARC agrees that the Contingency Plan will provide provisions for gas-generation uncertainty and will be reviewed and approved by DTSC.

5. No further comment.

6. The September 2012 ESPO comment requested the basis of the assumption that sludge material beneath Artesia Boulevard and the adjacent sidewalk be clarified. This comment was in part related to ESPO's understanding that sludge material has daylighted through cracks/seams in this area in the past. The basis of the assumption was not adequately clarified in the April Response to Comments but the requirement for "low permeability asphaltic concrete" was added, apparently in an effort to address DTSC's concerns. The FS should provide adequate justification for considering the sludge material to be already capped that specifically addresses the daylighting of sludge material through seams and cracks in the current surface. The need for low permeability asphaltic concrete should be evaluated and only be required if it is determined necessary to prevent unacceptable exposures.

Sludge has not been observed to daylight through cracks or seams in the sidewalk or Artesia Boulevard pavement. Sludge has been observed to daylight at the northeast corner of the Haack property where sludge material has seeped out from beneath the existing Haack concrete pad onto the ground surface adjacent to the fence separating the Haack property and the grass strip immediately south of the Artesia Boulevard sidewalk. Additionally, sludge material has been observed to daylight along cracks and seams in the Haack parking lot. With the proposed Alternative 2A remedy, these seep areas would be capped with the engineered final cover system and laterally constrained at the property boundary with the proposed sheet pile wall.

Beneath Artesia Blvd, sludge was identified in boring AB-101 at a depth of approximately 5.5 feet bgs. As documented in the boring log, the sludge material is overlain by approximately 2.7 feet of silt with reworked brick and sludge fragments, approximately 2.0 feet of roadway base, and 0.8 feet of asphalt (Stantec, 2010). These layers effectively act as a barrier providing protection from unacceptable exposure by minimizing dermal, ingestion, and inhalation risk. As a result, the low permeable asphalt concrete would only add minimal enhancement of the existing exposure protection. The requirement has been removed from the Updated Revised Final Draft FS (Attachment 1).

7. No further comment.

8. ESPO: No further comment.

HERO: HERO recommends that the RAP provide a more detailed description of the proposed monitoring, action levels, and descriptions of the actions to be taken to prevent on and off-Site exposures. A discussion and recommendations on action levels and monitoring are provided here.

PELs are not appropriate standards for protection of the general public. In addition the point of compliance for PELs is the work area while the point of compliance for protecting the public is the fence-line. Alternate action levels and sampling locations will be required to protect the nearby businesses and residents. These action limits and monitoring are discussed below. Monitoring plans and actions to be taken if the levels are exceeded will depend on multiple factors including the proposed remedy chosen, monitoring frequency and locations and the technical feasibility of measuring low levels of the chemicals of concern.

A) The main potential source of risks are the high levels of sulfur dioxide (SO2) generated when the sludge material is disturbed. Concurrent with remedial work continuous fence-line monitoring will be required (upwind and downwind) to evaluate whether the emissions of sulfur dioxide are exceeding short term action limits for protecting the general public. Appropriate action levels are the California ambient air quality standards. The California 1-hour time weighted average action levels for sulfur dioxide (SO2) dioxide is 655 ug/m3 (0.25 ppm). In addition, for a 24-hour period (time weighted average), the SO2 levels should not exceed 105 ug/m3 (0.04 ppm). These action levels are health based levels to protect people with asthma who are at risk from low levels of SO2.

B) Hydrogen sulfide (H2S) will also require monitoring due to the potentially very low levels which may impact the neighboring businesses and residents. For hydrogen sulfide (H2S) the California ambient air quality criteria 1-hour time weighted average limit is 42 ug/m3 (0.03 ppm). There is no 24-hour standard. This standard is based upon odor however it must be noted that the odor detection threshold for is even lower (11 ug/m3) . It is also worthwhile to note that the Project should also comply with SCAQMD rule 402 which deals with nuisances including odors. Since the remedial actions proposed will take on the order of ½ to 1-year it is also important to consider chronic health effects from hydrogen sulfide. The OEHHA chronic reference exposure level is 10 ug/m3. Therefore to be protective of risks from chronic exposures

as well as to prevent odor nuisances HERO recommends an action level of 10 ug/m3. HERO notes that the analytical methods for hydrogen sulfide measurements may not permit real time/high frequency monitoring at these detection limits. If that is the case it may also be appropriate to include periodic monitoring for H2S using laboratory based methods, especially at times of work activity where sulfide gases are more likely to be generated.

C) AQMD rule 403 In addition to vapors and gases, there will be other routine monitoring which will be required to comply with AQMD rule 403 for the generation of dust including PM 2.5 (50 ug/m3 downwind versus upwind).

D) Sampling locations: Due to the presence of potentially impacted neighbors in multiple directions, there will need to be multiple monitoring points.

E) Worker Protection: HERO also notes that based upon the description above and the extent of what is defined as "the work area" it may be that the location of the proposed monitoring will not be appropriate for monitoring workers exposure since "the perimeter of the work zone" may be expected to have lower concentrations than the breathing zone of the workers. An industrial hygienist should oversee the health and safety plan including the monitoring of air to protect workers.

The RAP will provide a more detailed description of the proposed monitoring, action levels, and descriptions of the actions to be taken to minimize on and off-Site exposures associated with soil gas.

9. No further comment.

10. No further comment.

11. No further comment.

12. No further comment.

13. No further comment.

14. No further comment.

15. No further comment.

16. No further comment.

17. No further comment.

18. No further comment.

19. No further comment.

20. No further comment.

21. No further comment.

22. No further comment.

23. No further comment.

24. No further comment.

25. ESPO's original comment was: "Section 7.3.3.5 Short-Term Effectiveness. The text states cap construction would be performed above the existing surfaces, reducing gas generation. ESPO notes the anchor trench for the high strength geotextile runs, in part, between the Cooper North and Haack Sumps, creating the potential for disturbing sludge that was shown to generate gases in the Treatability Study. This section should discuss the potential for excavating gas generating sludge material, the required actions to prevent unacceptable exposures, and how this may affect the short term effectiveness and implementability of Alternative 2A. Geosyntec's April 12 response was: "Gas generation is not anticipated during the construction of the anchor trench. The depth of the anchor trenches (3 feet) is anticipated to be above the sludge reported in the area. Additionally, the sludge which runs between the Cooper North and Haack sumps is similar to the Haack rework material in that it is discontinuous and degraded and therefore gas generated from the disturbance of this sludge is anticipated to be minimal." To which ESPO replied in the May 23 memo: "ESPO could not find a figure that provides the location of the high-strength geotextile anchor trench. Please provide a figure (similar to 6-2) that depicts the high-strength geotextile anchor trench location in detail sufficient to allow us to evaluate its elevation above the sludge on Section A of Figure 6-3, or inform us which existing figure contains this information, so we may complete our review. Also, the response states an anchor trench depth of three feet while section 6.1.2.3 states this anchor trench will be two-foot by two-foot. Please clarify and revise the response or report as necessary." Geosyntec's follow-up

response of November 12th referred ESPO to Detail 7 on Figure 6-13. Detail 7 on Figure 6-13 does not provide the information request. The location of the high-strength geotextile anchor trench between the Cooper North and Haack sumps should be shown on Figure 6-2, or similar, and indicated on Section A of Figure 6-3 so we can evaluate its elevation above the sludge and the potential for construction activities to disturb gas generating sludge material. If a concrete anchor system will be employed in this area to avoid the need for an anchor trench, please provide a detail for its construction.

The approximate location of the high-strength geotextile is shown on the revised Figures 6-2 and 6-3 (Attachment 2). The location was selected to be outside of the existing geomembrane cap while allowing enough room for the proposed 2 foot by 2 foot high strength geotextile anchor trench and the proposed 2 foot by 2 foot high density polyethylene (HDPE) geomembrane anchor trench. Based on borings CPB28, CPB29, and CPB30 performed during the Remedial Investigation (RI) between the Haack and Cooper North sumps, degraded soil-sludge was encountered intermittently between the ground surface and 7 to 8 feet below the ground surface (ft bgs). As a result, degraded soil-sludge may be encountered during both anchor trench excavations in this area. Degraded soil-sludge will be removed as necessary during anchor trench construction and anchor trenches will be backfilled with non-impacted soil. Degraded soil-sludge handling and potential gas generation will be managed in accordance with the Contingency Plan.

26. No further comment.

27. No further comment.

28. The current RTC indicates that an average shear wave velocity of 520 meters per second was used for the upper 30 meters of soil based on a review of subsurface explorations presented in the 2008 Revised Draft Remedial Investigation by Stantec. This shear wave velocity corresponds to Site Class C, very dense soil or soft rock. However, our review of subsurface information in the referenced report as well as previous boring logs indicates that the subsurface conditions do not justify use of Site Class C (Site Class D appears more appropriate). Please indicate the basis for using Site Class C, or revise the report to use Site Class D, and evaluate the effects of the increase predicted peak ground acceleration.

The calculated average shear wave velocity within top 30 m, or 100 ft, of the profile, or V_{s30}, of 520 m/s falls within Site Class C category of the California Building Code (CBC, see Table 1613.5.2 of CBC for reference). In accordance with CBC, Site Class D should be used "*when the*

soil properties are not known in sufficient detail to determine the site class." Based on the review of the CPT logs and soil data, it was determined that the soil properties are known in sufficient detail and, therefore, Site Class C was selected for the site.

29. No further comment.

30. No further comment.

31. No further comment.

32. No further comment.

33. No further comment.

34. No further comment.

35. No further comment.

36. No further comment.

37. No further comment.

38. ESPO believes the estimate of 40 feet for the zone of influence is optimistic but has no further comments regarding this issue for the feasibility study.

Acknowledged.

39. No further comment.

40. The response has adequately addressed the previous comment. However, we note that if the optional Alternative 2A presented with the RTC is selected, the majority [sic] *the sloping section of the cap likely will not be adequate for supporting the indicated traffic loads.*

Noted. ARC agrees that sloped areas will not be adequate for supporting indicated traffic loads. The sloped portions of the cap will be protected from traffic loads by curbs to prevent inadvertent access to those areas.

41. No further comment.

42. No further comment.

43. No further comment.

44. No further comment. However, ESPO notes detailed cost estimates were not provided and the updated costs to no appear to include financial assurance.

Cost tables were not included as only the report text needed to be updated for the new operations and maintenance costs; the cost tables already included the revised costs.

New Comments on Optional Alternative 2A as proposed in the November 12 RTC

45. It is not clear if the proposed Optional Alternative 2A is a revision to Alternative 2A or if both the original Alternative 2A and the Optional Alternative 2A will be included in the revised FS. The text in the response to comments section of the November 12, 2013 correspondence from Geosyntec indicates Alternative 2A has been revised to eliminate the portion of the sheet pile wall extending above the ground surface along Artesia Boulevard and renamed Optional Alternative 2A. The body of the FS indicates the new proposal is an option whose details are included in the appendices. If the proposal to eliminate the retaining wall is an option to Alternative 2A then the manner in which it has been included in the FS is acceptable. If the proposal to eliminate the retaining wall is a revision then the FS should be revised as necessary (text, tables, figures, etc.) to incorporate the changes into [sic] *body of the document to avoid confusion.*

The Optional Alternative 2A presented in Attachment 4 is not intended to replace Alternative 2A. It is an optional substitute for Alternative 2A.

46. Attachment 4 Optional Alternative 2A Cover, Cap Modifications. The proposed modification will result in a significant strip of the high-strength geotextile and geomembrane with minimal to no cover, rendering them vulnerable to degradation from the elements and incidental damage from activities on the cover. How will degradation of these membranes or damage from activities such as landscaping maintenance be prevented?

The high-strength geotextile will be protected by the overlying geocomposite and geomembrane. Landscaping in the form of decorative rock, artificial turf, or planter box-type vegetation structures will limit maintenance and potential impacts to the geomembrane. If necessary,

cushion geotextiles may be used above the geomembrane where geocomposite is not present to prevent damage from installed landscaping.

47. Attachment 4 Optional Alternative Cover, Drainage. A trench drain likely will not be feasible adjacent to the sheet pile wall. The base layer in this area of the site is either a concrete slab or the high-strength geotextile and the thickness of the foundation layer above the concrete/geotextile is described as zero inches, leaving no space for a trench. A surface water conveyance could work if the impermeable membrane layer extends under the conveyance and wraps up the curb to prevent intrusion of surface water where the membrane meets the curb/sheet pile. ESPO notes this configuration will likely be difficult to construct and the proposed design does not allow many options for field modifications should difficulties arise. While these details would normally be covered in a review of the design document, this issue has the potential to render the proposed modification to Alternative 2A infeasible. Please include details on how surface water intrusion will be prevented at the impermeable membrane and sheet pile wall/curb interface.

High strength geotextile is not present above the Haack Sump or adjacent to the sheet pile wall. The geomembrane will run below the drainage channels where drainage channels are present over sludge and will wrap up the curb. A concrete-lined swale may be utilized for stormwater management control as shown in Detail 4 on Figure 7 (Attachment 3). The distance between the property line and concrete cap above the Haack Sump varies, as does the height of the concrete cap above the existing ground surface. As a result, a small portion of the existing concrete cap may need to be removed or modified to incorporate the swale. Minimal runoff is anticipated along the curb as cap runoff from the 2 percent slopes (parking lot area) will be redirected with curbs and/or surface drainage features prior to descending the 5 percent slopes.

48. Attachment 4 Optional Alternative 2A Cover, Regulatory Waivers. The decision to grant the required waivers is a management decision but ESPO notes a reduction in the thickness of the foundation layer and cover soil has implications for the longevity and performance of this remedy. See comments 46 and 47.

Noted.

If you have questions or require additional information about the enclosed report, please contact Mr. Kyle Christie with ARC at 714-670-5303.

Sincerely,

Rebecca Oliver, P.E.
Senior Engineer
Geosyntec Consultants

Gregory T. Corcoran, P.E.
Principal Engineer
Geosyntec Consultants

References:

Bowers, John, Loehr, Erik, Mooney, Todd, and Bouazza, Abdelmalek, 2000. Asphalt Barriers for Waste Isolation, GeoEng2000, Melbourne Australia, 19-24 November 2000.

Geosyntec, 2013. Response to Comments on Revised Final Draft Feasibility Study Report for Gardena Sumps Site, 12 April 2013.

Stantec, 2010. Addendum to the August 22, 2008 Revised Draft 2006 Remedial Investigation Report, Gardena Sumps Site, DTSC Project No. 400067, 24 November 2010.

Attachments:

1 – Page 42 of the Updated Revised Final Draft FS

2 – Revised Figures 6-2 and 6-3

3 – Revised Figures 4 and 7 of Addendum to the Revised Final Draft Feasibility Study: Optional Alternative 2A Cover

Distribution:

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Attachment 1

6.1.2.1 General Overview

The Site is generally divided into three areas: the Cooper North and South Sumps on the Cooper Property, the Haack Sump and the Haack Rework Area located primarily within the Haack property, four residential properties, land owned by Los Angeles County and a small area of land beneath the Artesia Boulevard right-of-way. Because these areas of the Site are divided among different property owners, the properties may not all be available for remedial construction at one time. The following sections describe, in general, the proposed Alternative 2A approach for each area. Section ~~3.3~~ 6.1.2.2 (RTC, 11/6/12) describes the remedial implementation approach for the entire Site in greater detail. (RTC, 9/29/11)

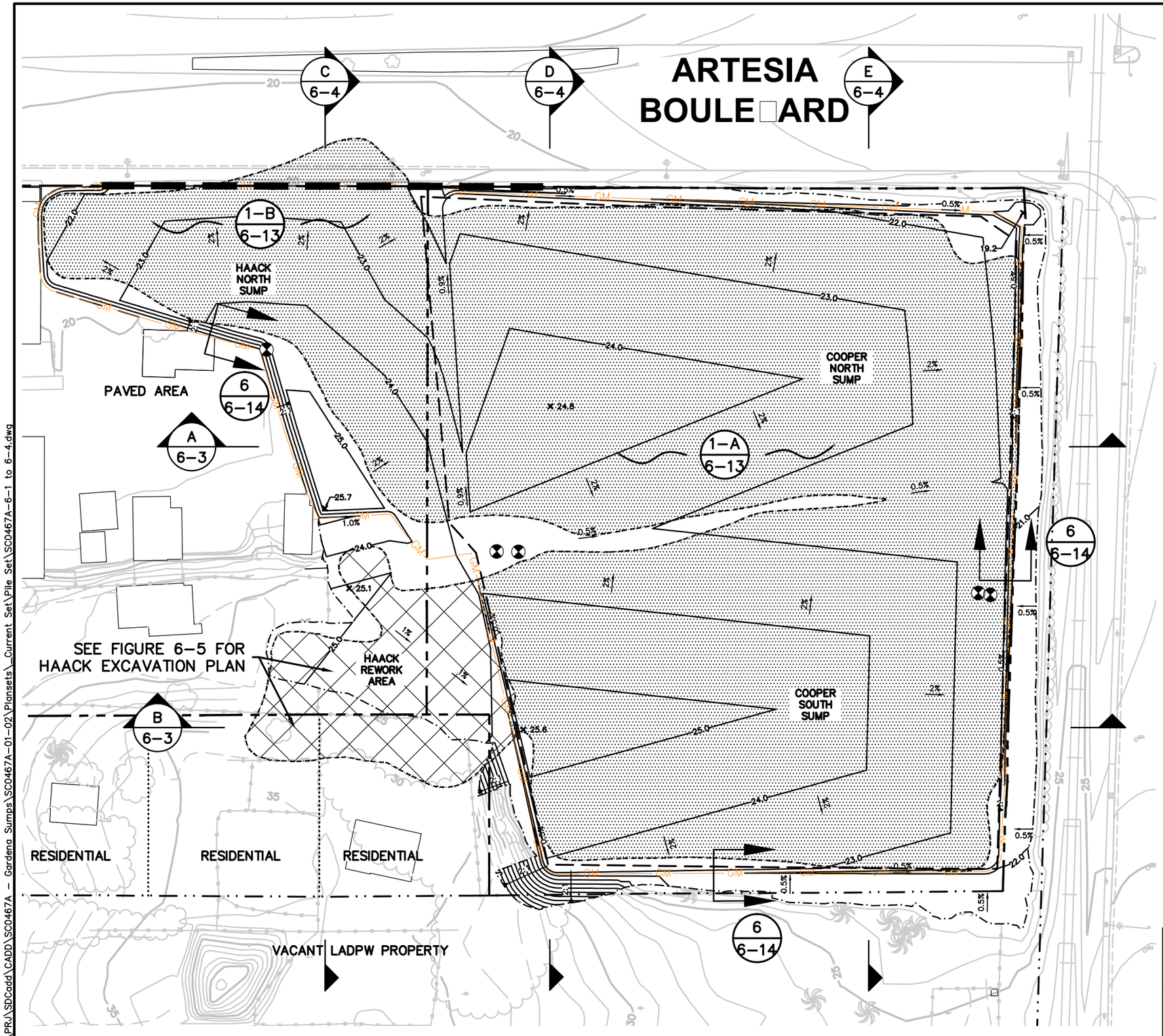
As described ~~in the Draft FS (Geosyntec, 2011),~~ previously (RTC, 11/6/12), the sludge material beneath the Artesia Boulevard South sidewalk and Artesia Boulevard are below road base material and asphalt or sidewalk concrete. The concrete and asphalt surface prevent ingestion and direct contact with the sludge as well as reduce its mobility by containing the sludge. (RTC, 11/6/12) This sludge material is considered to be already capped~~; however, institutional controls will include a requirement for repaving the area with "low-permeability asphaltic concrete" and increased maintenance of the asphalt surface in this area.~~(RTC, 1/16/14) ~~and therefore was not addressed in the Draft FS and will not addressed in Alternative 2A.~~ (RTC, 11/6/12)

Future access from current and/or future utility and/or construction workers will be addressed in the Risk Management Plan (RMP). The RMP will describe contaminants remaining onsite, known locations of impacts, contact information, and minimum, recommended personal protective equipment for current and future utility and/or construction workers. Institutional controls will include requirements (RTC, 11/6/12) that the City of Gardena and/or Caltrans provide notice of potential subsurface hazardous materials in the area of Artesia Boulevard where sludge is potentially located, prior to (RTC, 11/6/12) issuing work permits. (RTC, 2/10/12) Institutional controls will also include requirements related to Site development and cap loading restrictions. (RTC, 11/6/12)

Cooper North and South Sumps

The existing geomembrane will remain in place with the cap installed above. The geomembrane will provide a construction surface and preliminary support during installation of the overlying materials. Furthermore, the existing surfaces minimize the dermal contact and gas inhalation exposure risks to the construction workers during installation of the cap. (RTC, 11/6/12)

Attachment 2



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- LIMIT OF FINAL COVER GEOMEMBRANE (NOTE 4)
- PROPOSED RETAINING WALL (2 / 6-13)
- CHAIN-LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- LIMIT OF HIGH STRENGTH GEOTEXTILE (NOTE 4)
- APPROXIMATE DISTRIBUTION OF SLUDGE
- HAACK REWORK MATERIAL TO BE REMOVED
- EXISTING GROUNDWATER MONITORING WELL TO BE ABANDONED

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.
4. LIMIT OF GEOSYNTHETICS IS APPROXIMATE. ACTUAL LIMIT TO BE DETERMINED DURING FINAL DESIGN ON CONSTRUCTION DRAWINGS.

0 60' 120'

SCALE IN FEET

ALTERNATIVE 2A FINAL COVER
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: JANUARY 2014

PROJECT NO. SC0467A

FIGURE 6-2

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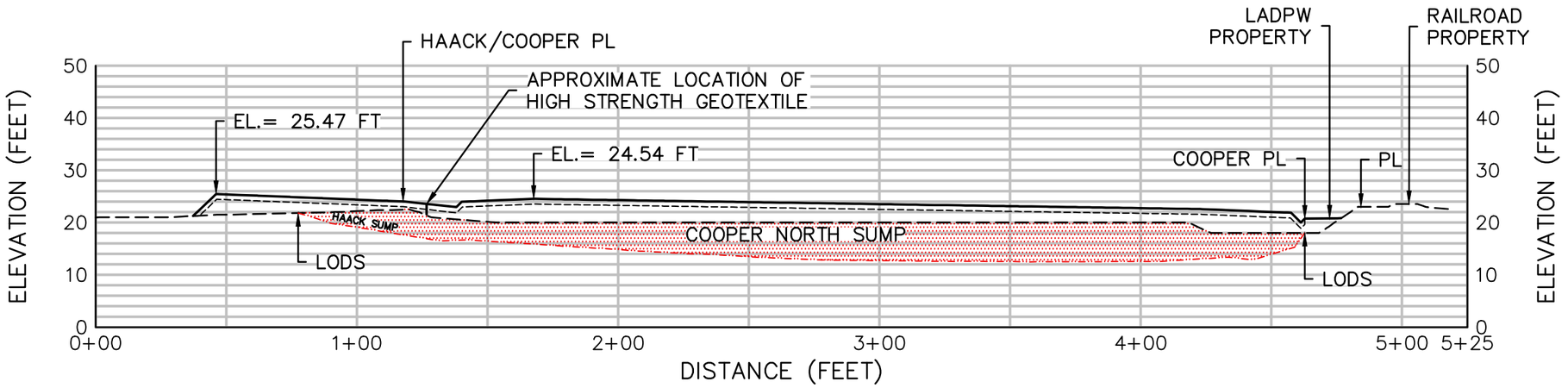
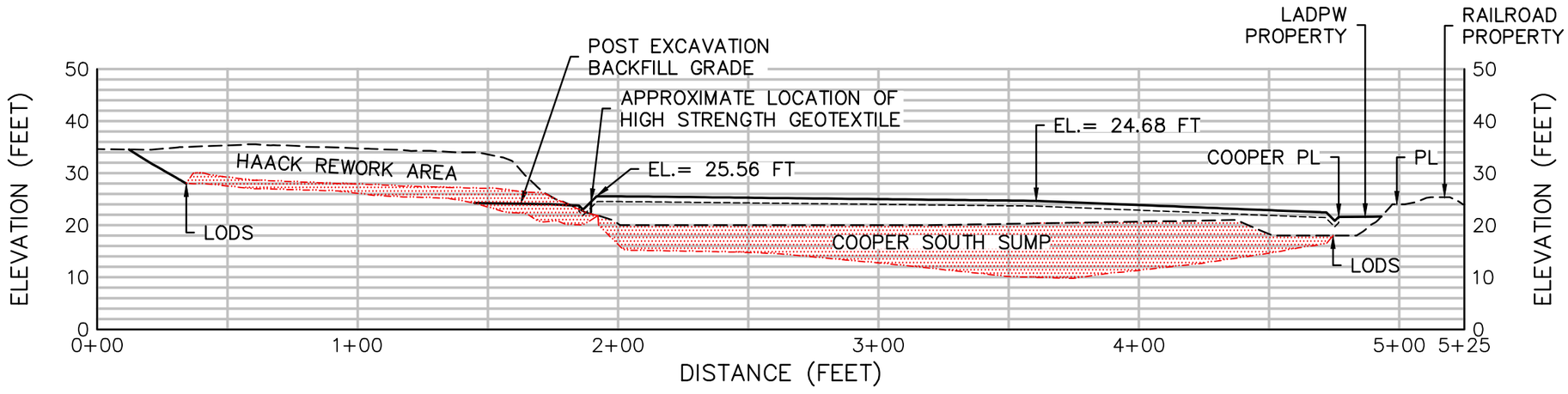
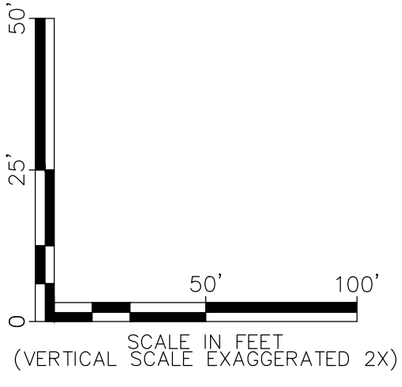


SECTION A



SECTION B



LEGEND

- EXISTING GRADE
- GEOMEMBRANE
- FINAL GRADE
- APPROXIMATE LIMITS OF DETECTED SLUDGE

NOTES:

1. LODS = LIMIT OF DETECTED SLUDGE
2. LADPW = LOS ANGELES DEPARTMENT OF PUBLIC WORKS
3. PL = PROPERTY LINE

ALTERNATIVE 2A EAST–WEST SECTIONS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2012

PROJECT NO. SC0467A

FIGURE 6–3

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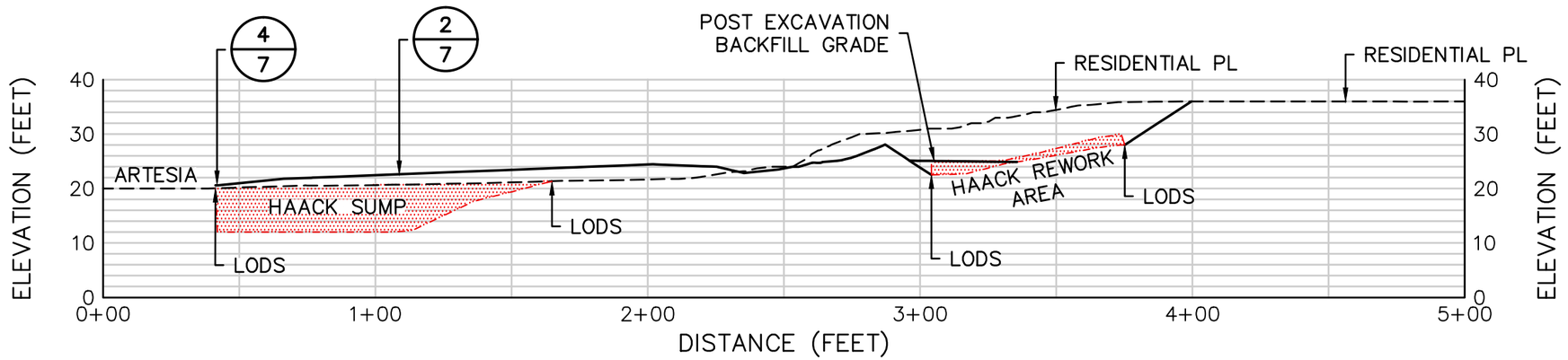
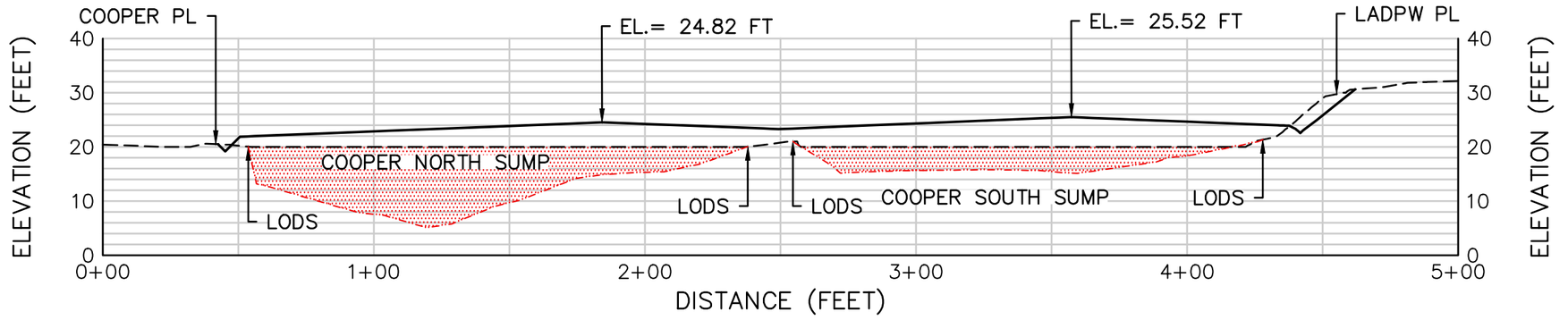
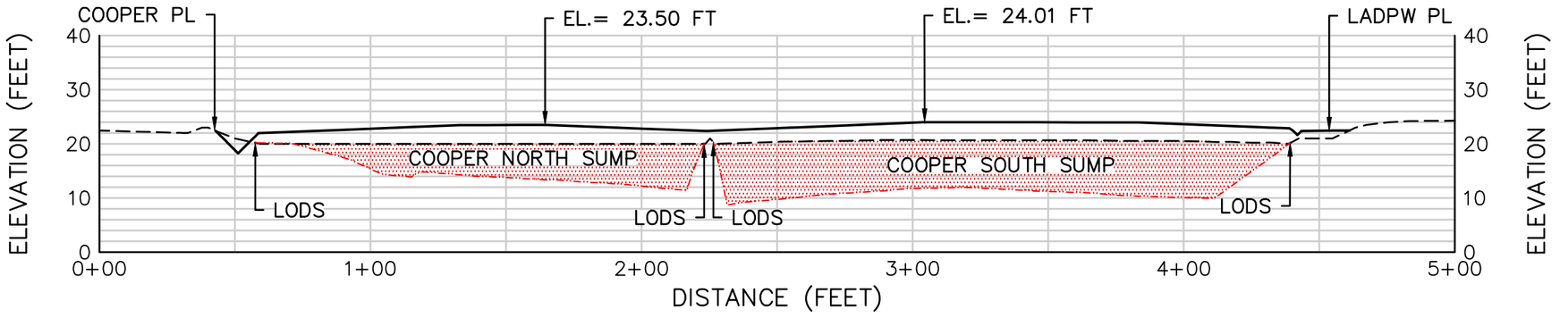
Attachment 3



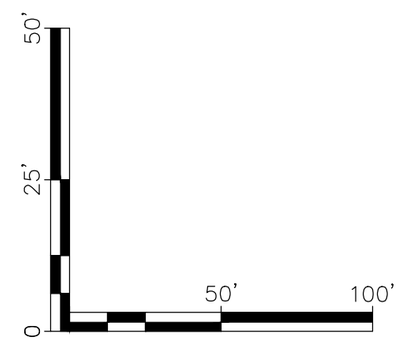
SECTION C



SECTION D



SECTION E



LEGEND

- EXISTING GRADE
- FINAL GRADE
- APPROXIMATE LIMITS OF DETECTED SLUDGE

NOTES:

1. LODS = LIMIT OF DETECTED SLUDGE
2. LADPW = LOS ANGELES DEPARTMENT OF PUBLIC WORKS
3. PL = PROPERTY LINE

REVISED ALTERNATIVE 2A NORTH–SOUTH SECTIONS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: JANUARY 2014

PROJECT NO. SC0467A

FIGURE 4

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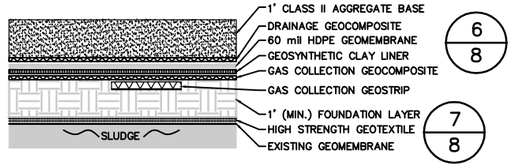
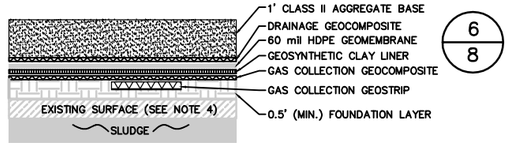


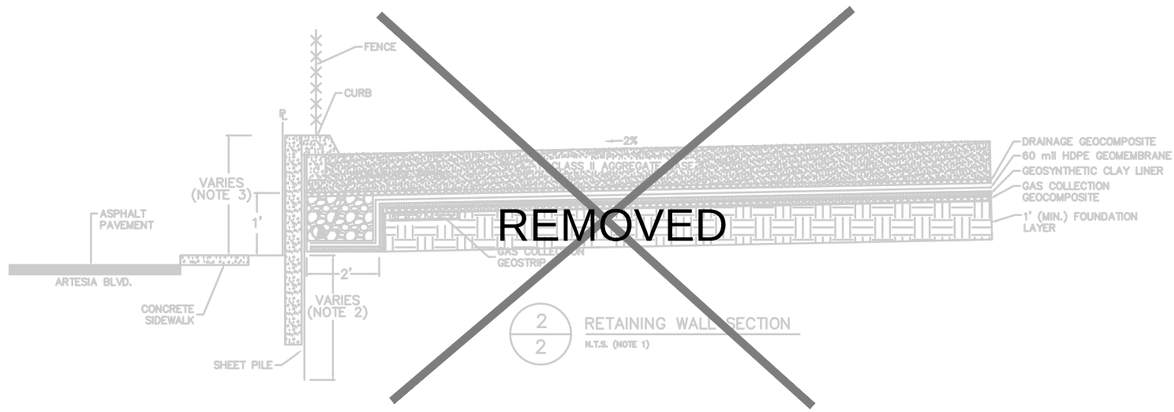
1-A/2 ALTERNATIVE 2A COOPER SUMP CAP DETAIL

SCALE = 1" = 4' (NOTE 1)



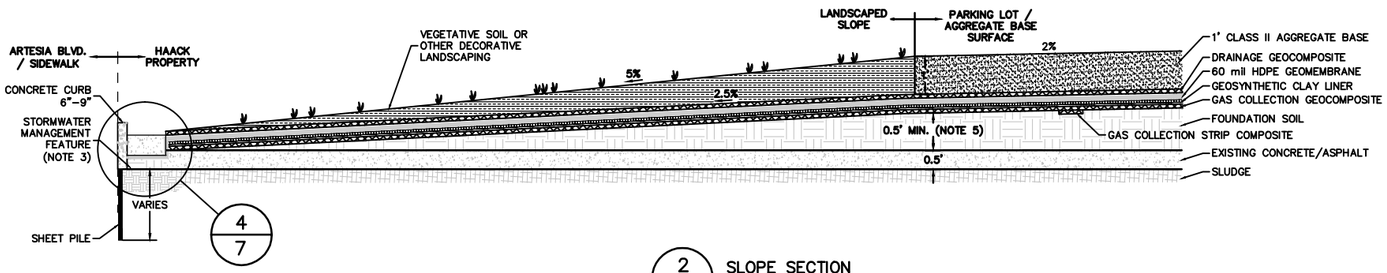
1-B/2 ALTERNATIVE 2A HAACK SUMP CAP DETAIL

SCALE = 1" = 4' (NOTE 1)



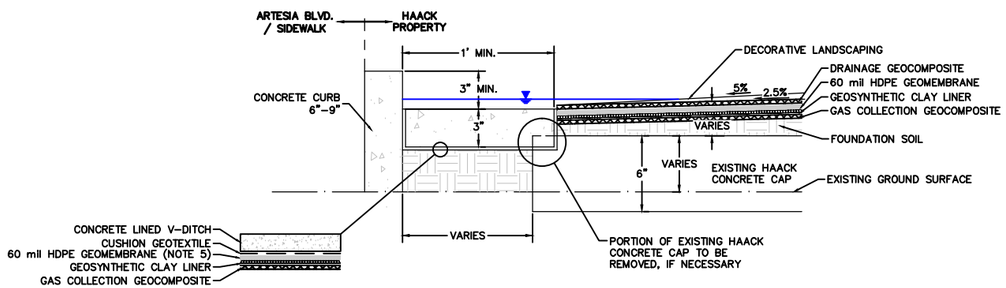
RETAINING WALL SECTION

N.T.S. (NOTE 1)



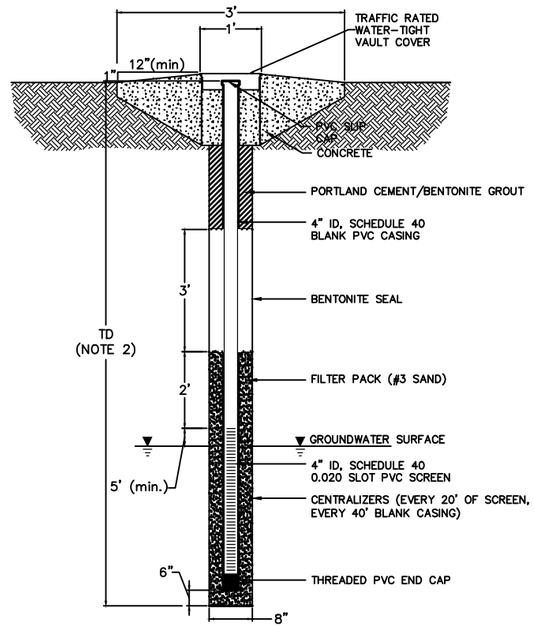
2/4 SLOPE SECTION

N.T.S. (NOTE 1)



4/4 STORMWATER CONTROL FEATURE – HAACK SUMP

N.T.S. (NOTE 1)



3/DETAIL

NEW MONITORING WELL

N.T.S.

P:\PR\SDCadd\Library\Monitoring_wells\MW_Flush.dwg

NOTES:

1. GEOSYNTHETIC THICKNESS EXAGGERATED FOR CLARITY.
2. FINAL CONSTRUCTION DEPTHS BASED ON FIELD CONDITIONS. ALL DEPTHS IN FEET BELOW GROUND SURFACE.
3. STORMWATER MANAGEMENT FEATURE MAY DIFFER FROM SHOWN AS IDENTIFIED DURING FINAL DESIGN.
4. EXISTING SURFACE IS DEGRADED ASPHALT OR CONCRETE. SURFACE WILL BE PROTECTED IN PLACE.
5. GEOMEMBRANE SHALL BE SECURED TO CURB WITH CONCRETE EMBEDMENT STRIP.

REVISED ALTERNATIVE 2A DETAILS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: JANUARY 2014

PROJECT NO. SC0467A

FIGURE 7

P:\PRJ\SDCadd\CADD\SC0467A - Gardena Sumps\SC0467A-01-02\Plansets_Current Set\SC0467A-07.dwg

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www.geosyntec.com

24 March 2014

Mustapha Guerbaz
Project Manager – Cleanup Program
Cypress Office, Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630

Subject: Response to Comments dated 19 February 2014
Gardena Sumps, Gardena, California

Dear Mr. Guerbaz,

Geosyntec Consultants (Geosyntec), on behalf of the Atlantic Richfield Company (ARC), is pleased to provide this response to Department of Toxic Substances Control's (DTSC) comments on the Updated Revised Final Draft Feasibility Study Report (Updated Revised Final Draft FS). These responses were prepared to address the DTSC comments dated 19 February 2014. The DTSC comments are provided below in italics with ARC's response following. For ease of review, the "No Further Comment" responses are not repeated herein.

COMMENTS

28. The RTC states that Site Class C was selected based on CPT logs and soil data, and that a shear wave velocity of 520 m/s was calculated for the upper 100 feet of the soil profile. Our previous comment was based on a review of blow count data and CPT tip resistance equivalent blow counts which appear to indicate Site Class D. Please provide the shear wave calculations, or shear wave field measurements for our review.

Geosyntec used information from CPT sounding logs CPB09-GW, CPB25-GW, CPB26-GW, CPB27-GW, and HPB-10 (Attachment 1) and the Mayne and Rix [1995] and Mayne [2007] correlations to evaluate representative shear wave velocity (Vs) at the site. The calculations were performed assuming that groundwater level is 20 feet (ft) below the existing ground surface the average calculated Vs was 505 meters per second (m/s). Sites with Vs ranging of 505 m/s classify as the IBC Site Class C (370 m/sec < Vs < 760 m/sec).

40. We note that additional protection may be needed near the curb/sheet pile where the geocomposite appears to be exposed to the environment (as shown in attachment 3, Figure 7, Detail 4).

Agreed, if the Optional Alternative 2A approach is selected, protection of the geocomposite will be incorporated into the final design.

47. The response states that high-strength geotextile is not adjacent to the sheet pile wall. Section 6.1.2.2 of the revised FS states the high-strength geotextile is to be secured to the sheet pile wall in the north-west corner of the Cooper North Sump. If the high-strength geotextile will be terminated in an anchor trench adjacent to the sheet pile wall in this area instead of being secured to the sheet pile wall, the test in section 6.1.2.2 should be revised. Also, it is ESPO's understanding that any curb along the interface between the 2 percent sloped parking area and 5 percent sloped landscaped area will not be installed as part of the remedy but will be part of the parking lot construction to be complete at a later date by others. As such, calculations of runoff for the design of the northern drainage feature should include appropriate portions of the parking lot/aggregate base surface.

Section 6.1.2.2 states "where available space onsite limits traditional anchor trenches, the high-strength geotextile may be secured with concrete anchors or attached to sheet piles with battens." Anchorage of the high-strength geotextile will be determined during final design when final grading, sheet pile location, and drainage features are finalized. Anchorage will be by one or a combination of the following: anchor trench, concrete anchors, and/or sheet pile batten.

The interim drainage of the site prior to parking lot development will be evaluated during final design. Temporary berms or other diversion structures with down drains may be implemented to minimize runoff from the 2 percent aggregate base surface onto the 5 percent slopes.

If you have questions or require additional information, please contact Mr. Kyle Christie with ARC at 714-670-5303.

Sincerely,

Rebecca Oliver, P.E.
Senior Engineer

Gregory T. Corcoran, P.E.
Principal Engineer

Attachment: CPT Logs CPB09-GW, CPB25-GW, CPB26-GW, CPB27-GW, and HPB-10

Distribution: Mr. Mustapha Guerbaz
Southern California Cleanup Operations Branch
Cypress Office
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630-4732

Mr. Kyle A. Christie
Atlantic Richfield Company
LPR 4-440
4 Centerpointe Drive
La Palma, CA 90623-1066

References: Mayne, P.W. (2007), “Cone Penetration Testing State-of-Practice,” NCHRP Project 20-05 Topic 37, pp. 14.

Mayne, P.W., and Rix, G.J. (1995), "Correlations between Shear Wave Velocity and Cone Tip Resistance in Natural Clays," Soils and Foundations, Vol. 35, No. 2, pp. 107-110.

Attachment 1

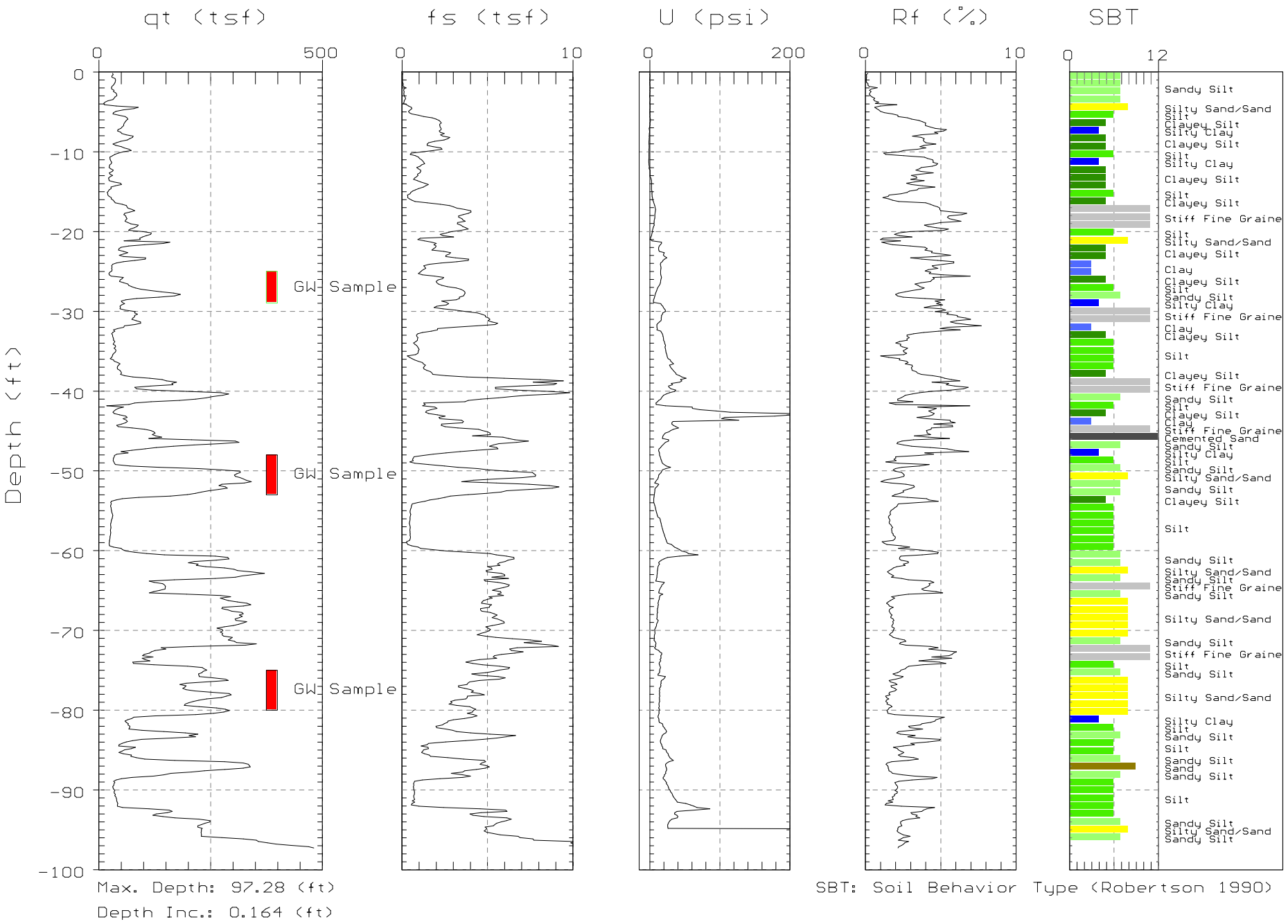
CPT Logs

GREGG

SECOR

Site: GARDENA SUMPS
Location: CPB09-GW

Engineer: P.KINNEY
Date: 01:23:06 09:31

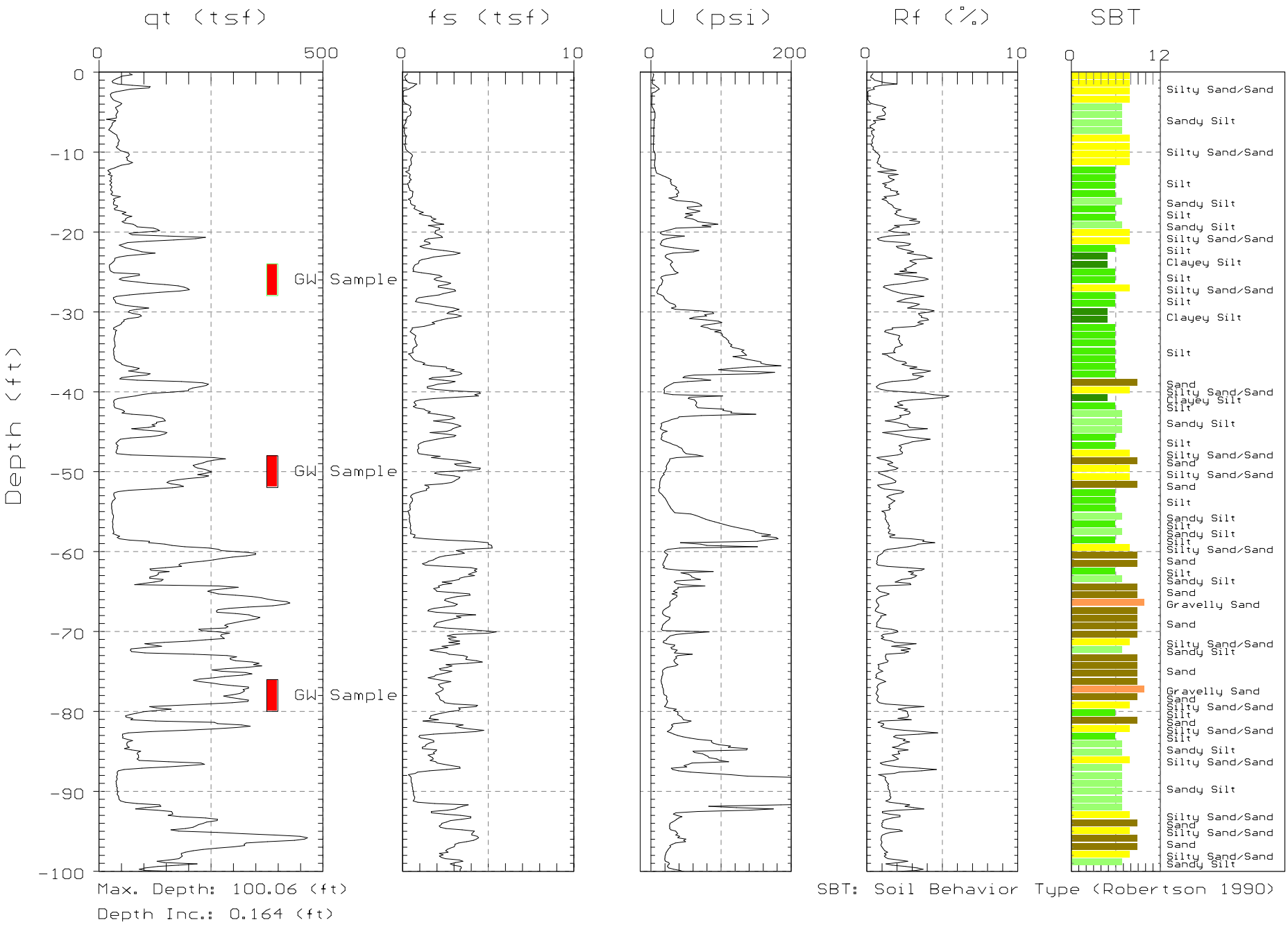


GREGG

SECOR

Site: GARDENA SUMPS
Location: CPB25-GW

Engineer: P.KINNEY
Date: 01:25:06 09:20



Max. Depth: 100.06 (ft)
Depth Inc.: 0.164 (ft)

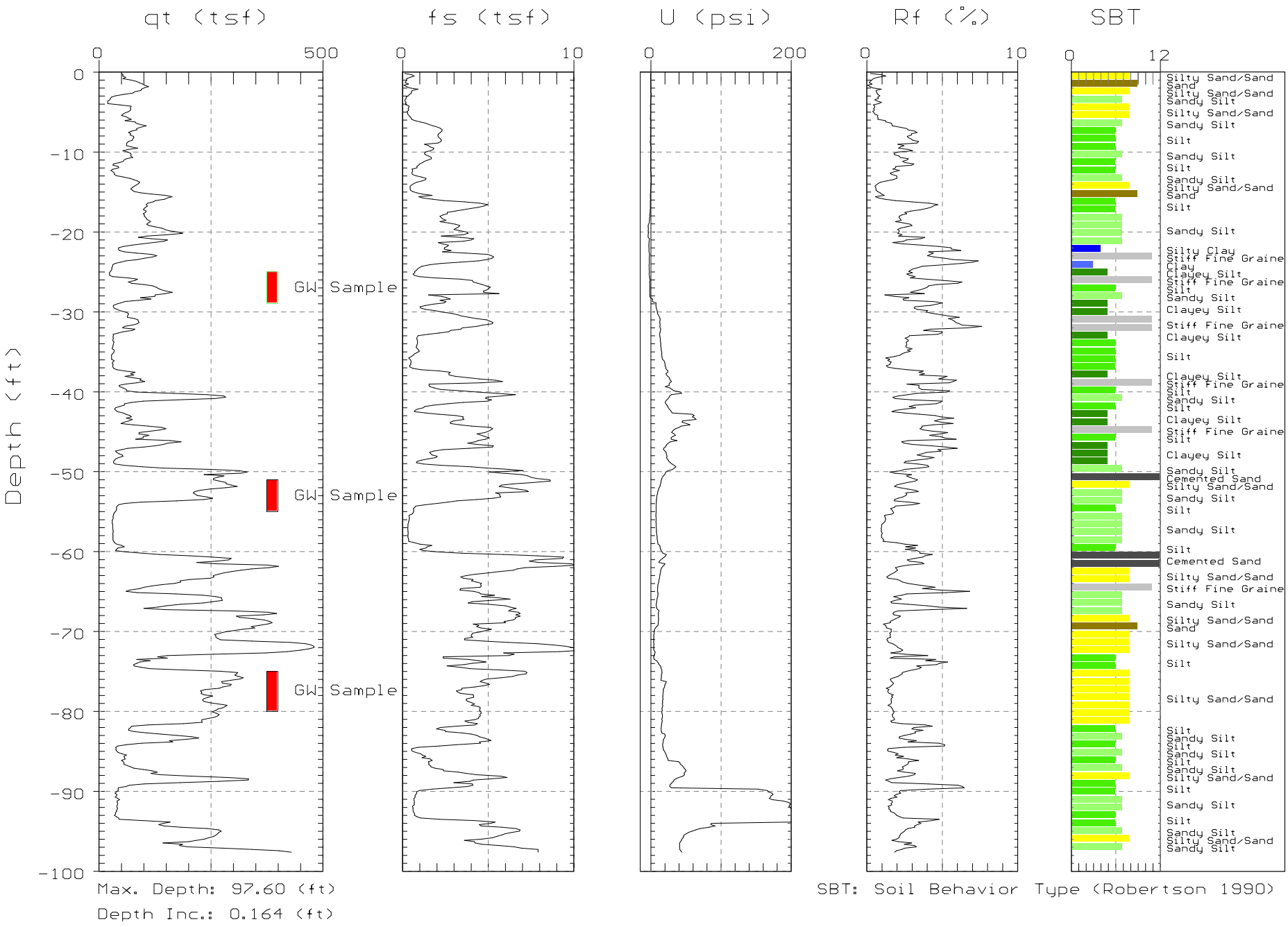
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SECOR

Site: GARDENA SUMPS
Location: CPB26-GW

Engineer: P.KINNEY
Date: 01:23:06 13:31



Max. Depth: 97.60 (ft)
Depth Inc.: 0.164 (ft)

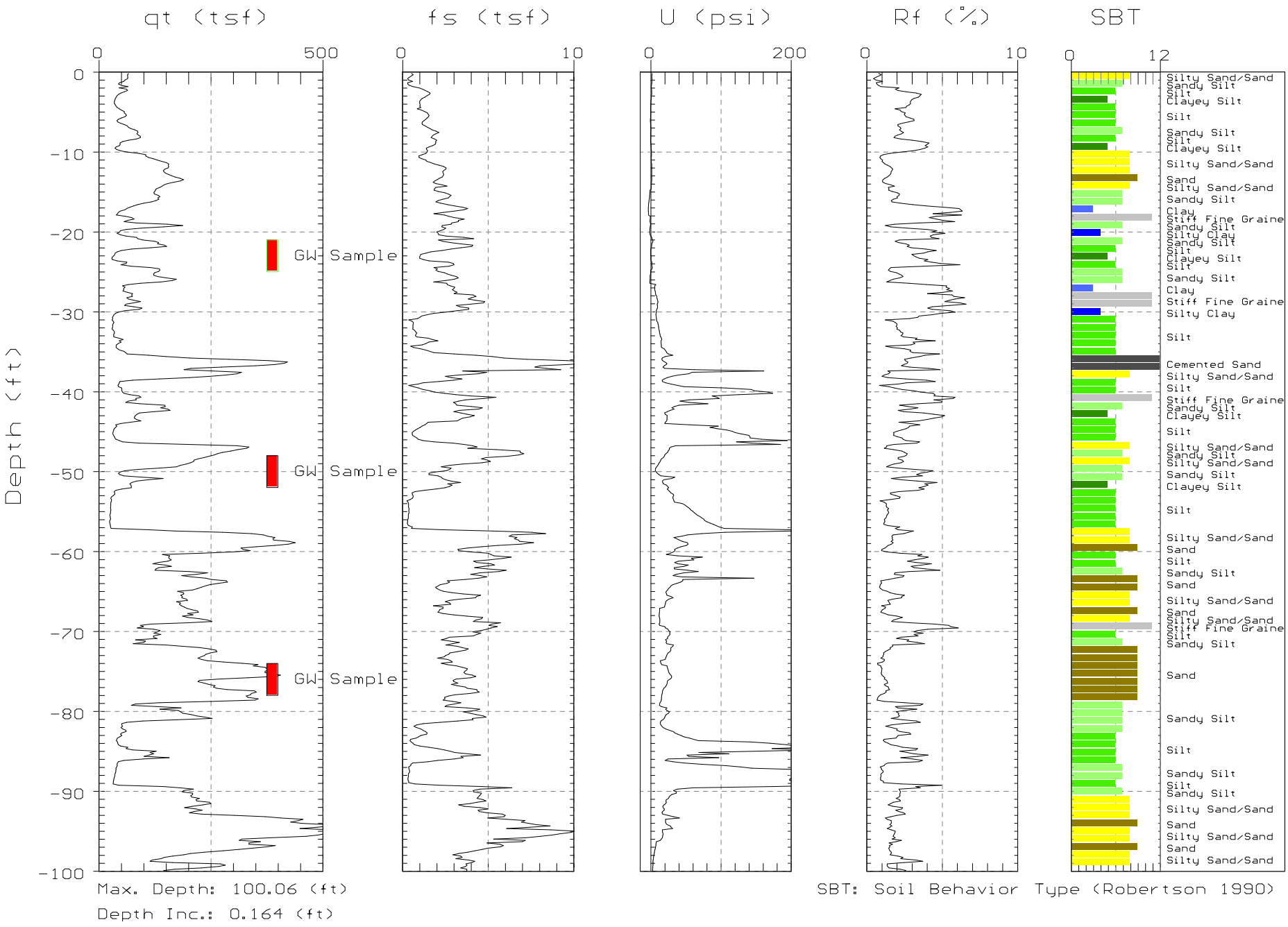
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SECOR

Site: GARDENA SUMPS
Location: CPB27-GW

Engineer: P.KINNEY
Date: 01:24:06 09:21



Max. Depth: 100.06 (ft)
Depth Inc.: 0.164 (ft)

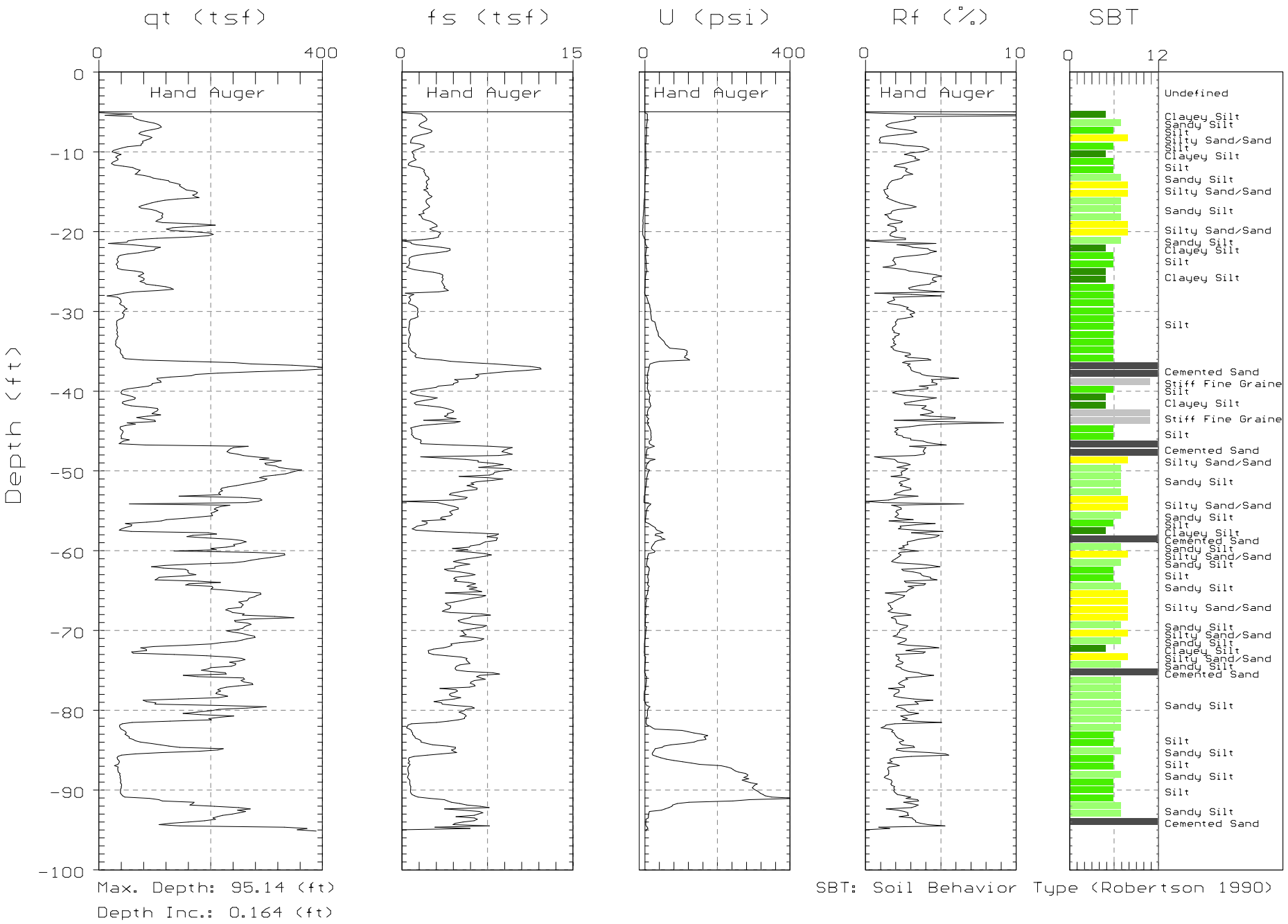
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SECOR

Site: GARDENA SUMPS
Location: HPB-10

Engineer: R.COUTURE
Date: 02/23/06 07:51



Max. Depth: 95.14 (ft)
Depth Inc.: 0.164 (ft)

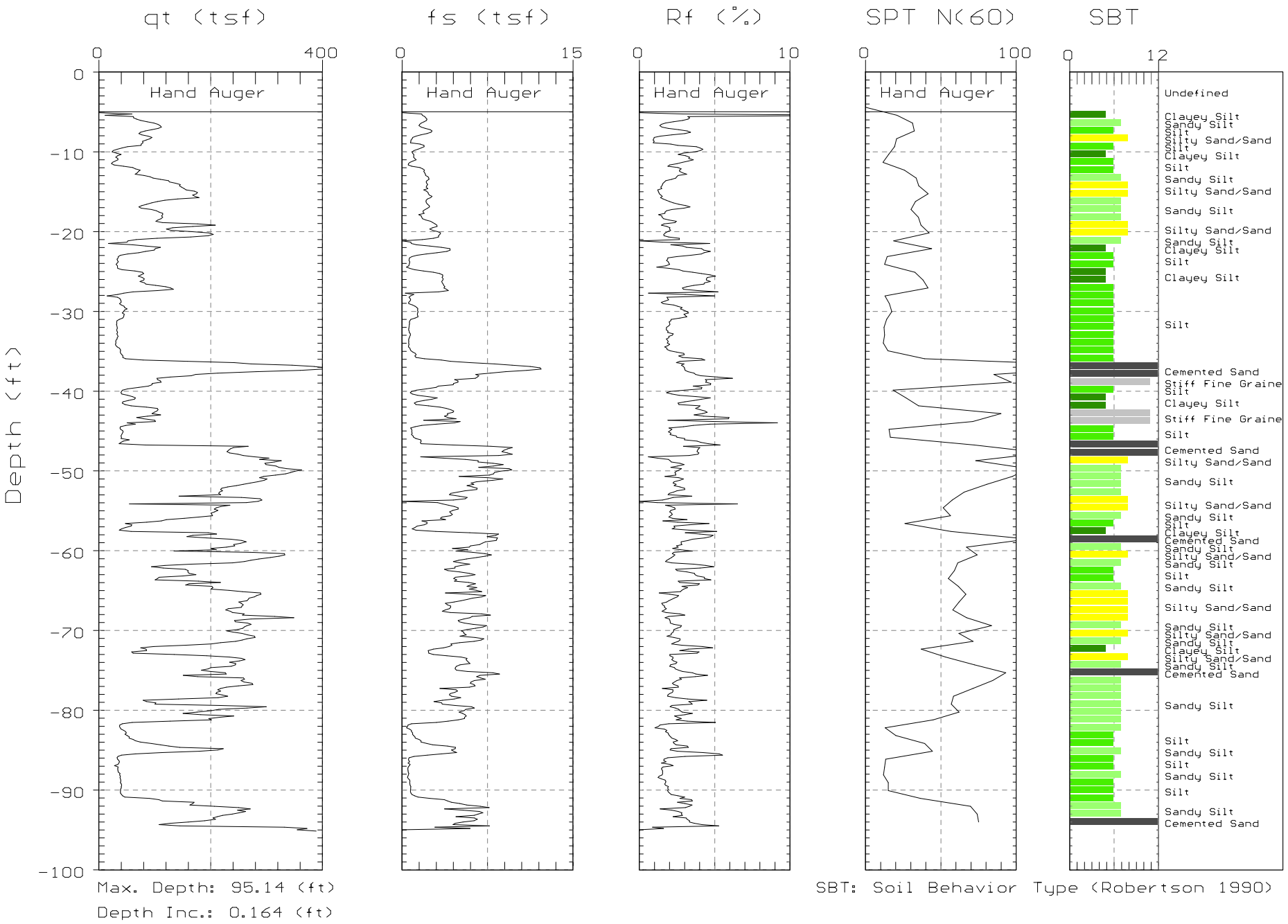
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SECOR

Site: GARDENA SUMPS
Location: HPB-10

Engineer: R.COUTURE
Date: 02/23/06 07:51



Max. Depth: 95.14 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Guerbaz, Mustapha@DTSC

From: Myers, Perry@DTSC
Sent: Friday, March 14, 2014 12:14 PM
To: Guerbaz, Mustapha@DTSC
Cc: Gathungu, Peter@DTSC
Subject: RE: Gardena Sumps Waivers

Hi Mustapha,
ESPO has reviewed the CCR 66264.228 waiver request and light pole foundation calculation package from Geosyntec.

We have the following comments on the waiver request.

1. The waiver discussion for the Foundation Layer states the surface on which the GCL and geomembrane will be installed will be able to support the overlying materials, which satisfies the purpose of the foundation layer if not the technical requirements of CCR 66264.228.
2. The Waiver discussion for the Cover Soil states alternative cover materials will be used to protect the geomembrane, which fulfills the purpose of the cover soil layer.
3. We believe installation of these alternative materials and reduced thickness of the foundation layer will likely increase the potential for damage to the geomembrane during construction/maintenance and may lead to a reduced service life of the cover system. These issues can be managed, but DTSC should monitor them closely and the Operations and Maintenance Plan should include urgent repair/response procedures.

We have the following comments on the Light Pole Calculation Package:

1. The wind load calculations do not consider a light fixture at the top of the pole for the overturning moment. The calculations should be revised to include a light fixture and the report should note that when light poles are installed if the selected light fixture has a larger surface area than that used for the included calculations then new calculations must be performed.
2. The fundamental period equation on page 3 of 8 (T = 0.1N (s)) appears to be in error, since it is based on building structures, but the proposed lighting is a non-building structure. Equation 12.8-7 of ASCE 7-10 appears more appropriate and the report should be revised to use the proper equation.
3. The Site Class E presented on page 3 of 8 of the "Analysis of Light Pole Foundation Design, Gardena Sumps, Gardena, California" appears to be conservative based on site subsurface conditions. The FS had used Site Class C, However, Site Class D appears more appropriate. However, use of the more conservative Site Class E is acceptable.

Let me know if you have any questions or wish to discuss our comments.

From: Guerbaz, Mustapha@DTSC
Sent: Tuesday, March 11, 2014 2:10 PM
To: Myers, Perry@DTSC
Subject: FW: Gardena Sumps Waivers

Good afternoon Perry
Last week I met with Stantec, Geosyntec and ARC from the Gardena Sump site. Geopsyntec discussed the optional alternative 2a instead of the option of the wall opposed by the city. I forwarded to you the e-mail that Geosyntec sent me for approval of the waver of 22CCR requirements. Please review and let me know if this option sounds. Do you want me to send a work request or the e-mail is sufficient?. Thank you for your help Perry

From: Becky Oliver [mailto:ROliver@Geosyntec.com]
Sent: Thursday, March 06, 2014 3:32 PM
To: Guerbaz, Mustapha@DTSC
Cc: Christie, Kyle A. (kyle.christie@bp.com)
Subject: Gardena Sumps Waivers

Hi Mustapha,

It was nice meeting you the other day. Per our conversation, please find the regulatory requirements from 22 CCR with a note/discussion regarding the waiver, if necessary. I have also attached the light pole foundation calculation we discussed.

Please let me know if you have any questions or need anything else.

Thanks,
Becky

Cover Component	22 CCR	Waiver/Discussion
Foundation Layer	A foundation layer shall be provided for the compacted barrier layer of the final cover. If needed, the foundation layer shall contain herbicide sufficient to prevent vegetative growth, and shall be free of decomposable organic matter. The layer shall be compacted at a moisture content sufficient to achieve the density required to provide adequate support for the nonearthen membrane. The unit shall be compacted before any portion of the final cover is installed.	A foundation layer may not be p the curb and the cushion layer (concrete or soil). The surface in installed will be able to support minimum 1 foot of foundation a vehicle loading will be restricte
Cushion Layer	If a synthetic membrane is used in the final cover system, the owner or operator shall provide a layer of material above the synthetic membrane of the final cover, and a layer of material below this synthetic membrane, to protect the membrane from damage	No waiver required
Compacted Barrier Layer	A compacted barrier layer of clean earth shall be provided above the foundation layer, and shall be provided around the unit to a depth as low as the level at which the owner or operator has deposited waste, to prevent lateral migration of waste and gas and vapor from the waste. The layer of earth shall be wholly below the average depth of frost penetration, and shall be compacted at a moisture content sufficient to achieve a percent compaction that has been demonstrated, with the specific cover material to be used, to prevent the downward entry of water into the foundation layer for a period of at least 100 years. The earthen material shall contain herbicide sufficient to prevent growth of vegetation. The slope of the final top surface of the compacted barrier layer shall be sloped after allowance for settling and subsidence to prevent the build up of hydraulic head. The owner or operator may use nonearthen materials for the barrier layer provided it is demonstrated to the satisfaction of the Department that a barrier layer of alternative composition will equally impede movement of fluid and be as durable as a compacted earthen barrier. If hazardous waste is underlain by a liner containing a synthetic membrane, then a synthetic membrane shall be provided in the final cover above the compacted barrier layer.	No waiver required

	The membrane shall be made of material chemically resistant to the waste at the facility, whether or not contact between the membrane and the waste is anticipated, and shall have thickness and strength sufficient to withstand the stresses to which it shall be including shear forces, puncture from rocks or penetration from roots.	
Drainage Layer	The owner or operator shall provide a water drainage layer, blanket or channel above the compacted barrier layer of the final cover to provide a path for water to exit rapidly.	No waiver required
Filtration Layer	The owner or operator shall provide a filter layer above the water drainage layer to prevent soils from clogging the drainage layer.	No waiver required
Cover Soil	The owner or operator shall provide a layer of top soil of thickness sufficient to support vegetation for erosion controlled deep enough to prevent root penetration into the filter layer. The top soil shall have characteristics to protect the compacted layer against drying that would lead to cracking, to resist erosion and to support vegetation growth. Unless vegetation on the cover would pose a significant fire hazard unacceptable to the fire prevention authority or would interfere with a planned postclosure use of the site that is acceptable to the Department, the owner or operator shall provide conditions favorable for hearty growth of vegetation that will provide erosion control without forming roots that would penetrate the compacted earth cover, and shall estimate the cost of providing such conditions and vegetation as part of the cost of closure. Vegetation for closed disposal areas shall be selected to require minimum watering and maintenance. Plantings shall not impair the integrity of containment structures or the final cover.	The cover soil layer will be non- and the cover soil depth may no some distance away from the c cushion geosynthetic, and/or co protect the geomembrane.
Final Cover Slopes	Permanent disposal areas shall be graded at closure so that with allowance for settling and subsidence, the slope of the land surface above all portions of the cover, shall be sufficient to prevent ponding of water. Such areas shall be graded to drain precipitation away from the disposal area. Portions of the land surface above the cover unavoidably slopes great enough to invite erosion which cannot be readily controlled by vegetation shall be protected by gunite, riprap or other material sufficient to provide erosion control.	No waiver required
Perimeter Drainage	At and after closure, permanent disposal areas shall have drainage systems capable of transporting water from the water drainage layer away from the closed facility and capable of diverting surface runoff away from or around disposal areas, containment structures, leachate collection systems and monitoring facilities. Drainage systems shall be capable of	No waiver required

	preventing erosion of containment structures. Drainage system components themselves shall be lined or otherwise protected against erosion.	

Becky (Flynn) Oliver, P.E.
Senior Project Engineer

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Please consider the environment before printing this e-mail. Thank you.

Rebecca Oliver

From: Rebecca Oliver
Sent: Thursday, April 17, 2014 9:58 AM
To: 'Guerbaz, Mustapha@DTSC'
Cc: Christie, Kyle A. (kyle.christie@bp.com); Myers, Perry@DTSC
Subject: RE: Gardena Sumps RTCs Dated 3-24-2014
Attachments: SC0467.ShearWaveVelocity.20140411.F.pdf

Hi Mustapha,

The seismic shear wave velocity calculations are attached. Please let me know if you have any questions or need any additional information.

Thanks,
Becky

From: Guerbaz, Mustapha@DTSC [mailto:Mustapha.Guerbaz@dtsc.ca.gov]
Sent: Tuesday, April 15, 2014 7:21 AM
To: Rebecca Oliver
Cc: Christie, Kyle A. (kyle.christie@bp.com); kelly.brown@stantec.com; Myers, Perry@DTSC
Subject: FW: Gardena Sumps RTCs Dated 3-24-2014

Good morning
Did you get the chance to finalize the calculations. Please let me know. Thank you

---

From: Myers, Perry@DTSC
Sent: Tuesday, April 15, 2014 7:15 AM
To: Guerbaz, Mustapha@DTSC
Subject: FW: Gardena Sumps RTCs Dated 3-24-2014

Any word on when they will get us the calcs?

From: Myers, Perry@DTSC
Sent: Tuesday, April 08, 2014 8:52 AM
To: Guerbaz, Mustapha@DTSC
Subject: RE: Gardena Sumps RTCs Dated 3-24-2014

No problem. We can wrap this up pretty quickly if we get the calcs.

From: Guerbaz, Mustapha@DTSC
Sent: Tuesday, April 08, 2014 8:47 AM
To: Myers, Perry@DTSC
Subject: RE: Gardena Sumps RTCs Dated 3-24-2014

Thank you for letting me know

From: Myers, Perry@DTSC
Sent: Tuesday, April 08, 2014 8:16 AM
To: Guerbaz, Mustapha@DTSC
Cc: Gathungu, Peter@DTSC
Subject: RE: Gardena Sumps RTCs Dated 3-24-2014

This is a follow-up to their response, we still need more information. Peter is asking for the actual calculations they performed and the shear wave velocity calculated for each CPT. Their response dated March 24, 2014 did not include this information. Peter did some calculations on his own and the classification is on the bubble, it could be C or D. He would like to see the actual numbers, instead of interpolating plots, before we proceed.

Perry

From: Guerbaz, Mustapha@DTSC
Sent: Tuesday, April 08, 2014 7:57 AM
To: Myers, Perry@DTSC
Subject: RE: Gardena Sumps RTCs Dated 3-24-2014

Perry
Can you check I did submit a work request on 3/28/14 and I attached their response to the calculations. I attached it to this e-mail too. Please check and let me know if that is the wright response. Thank you

---

From: Myers, Perry@DTSC
Sent: Monday, April 07, 2014 2:45 PM
To: Guerbaz, Mustapha@DTSC
Cc: Gathungu, Peter@DTSC
Subject: FW: Gardena Sumps RTCs Dated 3-24-2014

Hi Mustapha,
Please contact Geosyntec and ask them to provide the shear wave velocity calculations and the calculated shear wave velocity for each CPT, as requested by Peter Gathungu below.

Thanks,
Perry

From: Gathungu, Peter@DTSC
Sent: Monday, April 07, 2014 2:38 PM
To: Myers, Perry@DTSC
Subject: Gardena Sumps RTCs Dated 3-24-2014

Hi Perry,

The 3-24-2014 RTC to Comment #28 from Geosyntec states that an average shear wave velocity (Vs) of 505 meters per second (m/s)was calculated from five CPTs. My calculations based on the CPT profiles for CPB27-GW, and SPT blow counts for HPB-10 indicate that the soils may fall in Site Class C, or borderline between Site Class C and D. These calculation were based on the CPT profiles based on averaging of the indicated profile. It is not clear what method was used to calculate the shear wave velocity. Inclusion of shear wave velocity calculations as well as the calculated shear wave velocity at each CPT would be helpful for clarity and completeness.

Thanks

Peter M. Gathungu, P.E.; G.E.
Hazardous Substances Engineer
Engineering and Special Projects Office
Cal/EPA Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826
Phone: (916)255-6662; Fax: (916)255-3878
Email: Peter.Gathungu@dtsc.ca.gov

Geosyntec
consultants

COMPUTATION COVER SHEET

Client: ARCO **Project:** Gardena Sumps **Project No.:** SC0467A
Task No.: 05-01

Title of Computations: SHEAR WAVE VELOCITY EVAULATION AT GARDENA SUMPS BASED ON CONE PENETRATION TESTING DATA

Computations by:	Signature		Date 4/11/14
	Printed Name	Spencer Marcinek, EIT	
	Title	Staff Engineer	
Assumptions and Procedures Checked by: (peer reviewer)	Signature		Date 4/11/14
	Printed Name	Neven Matasovic, Ph.D., P.E.,G.E.	
	Title	Associate	
Computations Checked by:	Signature	for	Date 4/11/14
	Printed Name	Alexander Stern, EIT	
	Title	Senior Staff Engineer	
Computations back checked by: (originator)	Signature		Date 4/11/14
	Printed Name	Spencer Marcinek, EIT	
	Title	Staff Engineer	
Approved by: (pm or designate)	Signature		Date 4/11/14
	Printed Name	Rebecca Oliver, P.E.	
	Title	Senior Engineer	

Approval notes:

Revisions (number and initial all revisions)

No.	Sheet	Date	By	Checked by	Approval

Written by:	Spencer Marcinek	Date:	4/9/14	Reviewed by:	Alexander Stern	Date:	4/10/14
Client:	ARCO	Project:	Gardena Sumps	Project No.:	SC0467A	Task No.:	05-01

SHEAR WAVE VELOCITY EVAULATION AT GARDENA SUMPS BASED ON CONE PENETRATION TESTING DATA

PURPOSE

The purpose of this calculation package is to document the average shear wave velocity calculations at the Gardena Sumps project site (Site) based on the provided geotechnical investigation data. The calculations documented herein were developed to assist the Department of Toxic Substances Control in providing a site classification at the Site for seismic design.

BACKGROUND

Between 23 January 2006 and 23 February 2006, Gregg Drilling (Gregg) use a 25-ton rig to performed cone penetration tests (CPTs) to depths of up to 100 feet below ground surface (ft bgs) at the Site (Stantec, 2008). According to ASCE 7-10, the site classification to be used in seismic design is based on the average shear wave velocity in the upper 100 feet (ft) of the soil profile. CPTs CPB09, CPB25, CPB26, CPB27, and HPB10 were performed to a depth of 100 ft bgs; therefore, these five CPTs were used to analyze the shear wave velocity at the Site. The CPT results from these locations are included as Attachment 1.

ASSUMPTIONS

Based on the CPT data provided, Geosyntec subdivided the measurements into 10 ft thick layers (layers) and determined the average cone bearing resistance and pore pressure across each layer. The soil behavior type of each layer was determined based on correlations between the corrected cone tip resistance and friction ratio (Robertson, 1990). The layers were classified as either cohesive or noncohesive soil based on the prevalent soil behavior type in each layers.

In determining the total stress and effective stress versus depth at the site, a unit weight of 120 pounds per cubic foot was assumed across the entire depth of the soil profile and the water table was assumed to be at a depth of 20 ft based on data from the boring logs.

CALCULATION METHODS

Two empirical formulas were employed for calculating the average shear wave velocity versus depth at the Site. The Mayne (2007) formula applies to cohesionless-type soil.

$$V_s = 277\ {q_c}^{0.13}\ {\sigma'_{vo}}^{0.27} \qquad \text{(Mayne, 2007)}$$

V_s is the average shear wave velocity in meters per second (m/sec);
q_c is the cone tip resistance in Megapascal (MPa); and
σ'_{vo} is the effective stress: the difference between the total stress, σ, and the pore water pressure, μ, in MPa.

The Mayne and Rix (1995) formula applies to cohesive-type soil.

$$V_s = 1.75\ {q_t}^{0.627} \qquad \text{(Mayne and Rix, 1995)}$$

$$q_t = q_c - u(1 - a_n)$$

V_s is the average shear wave velocity in m/sec;
q_t is the corrected cone tip resistance in Kilopascal (KPa);
u is the pore pressure in KPa; and
a_n is the cone tip end area ratio = 0.85 (dimensionless).

For each of the five CPTs conducted at the Site, the empirical formulas above were used to evaluate the average shear wave velocity at each layer. The average shear wave velocity across the entire depth for each of the five CPTs was calculated using the formula below:

$$V_{savg} = \frac{\sum_{i=1}^{10} 30\ m}{\sum_{i=1}^{10} \frac{d_i}{V_{si}}}$$

V_{savg} is the average shear wave velocity across the entire soil profile depth = 30 meters (m);
d_i is the layer thickness = 3 m; and
V_{si} is the average shear wave velocity across each layer in m/sec.

RESULTS

The average shear wave velocity results for each of the CPTs are summarized in Table 1 below and the calculations are included in Attachment 2.

Table 1. Average Shear Wave Velocity at Gardena Sumps.

CPT Location	Average Shear Wave Velocity (m/sec)
CPB09	615
CPB25	353
CPB26	472
CPB27	453
HPB10	601
Average	**499**

The average shear wave velocity calculated based on the five cone penetration tests that extended to a depth of 100 ft is approximately 500 m/sec for the Site. According to ASCE 7-10, the Site is classified as Site Class C (very dense soil to soft rock) due to the fact that the soil shear wave velocity is in the range between 370 m/sec and 760 m/sec.

REFERENCES

American Society of Civil Engineers (2013), "Minimum Design Loads for Buildings and Other Structures," Reston, VA, pp. 203-205.

Mayne, P.W. (2007), "Cone Penetration Testing State-of-Practice," NCHRP Project 20-05 Topic 37, pp. 14.

Mayne, P.W., and Rix, G.J. (1995), "Correlations between Shear Wave Velocity and Cone Tip Resistance in Natural Clays," Soils and Foundations, Vol. 35, No. 2, pp. 107-110.

Robertson, P.K. (1990), "Soil Classification Using the Cone Penetration Test," Canadian Geotechnical Journal, 46, pp. 1-26.

Stantec (2008), "Gardena Sumps Site, Revised Draft 2006 Remedial Investigation Report," 22 August 2008.

ATTACHMENT 1

CONE PENETRATION TESTING LOGS (25 TON RIG)

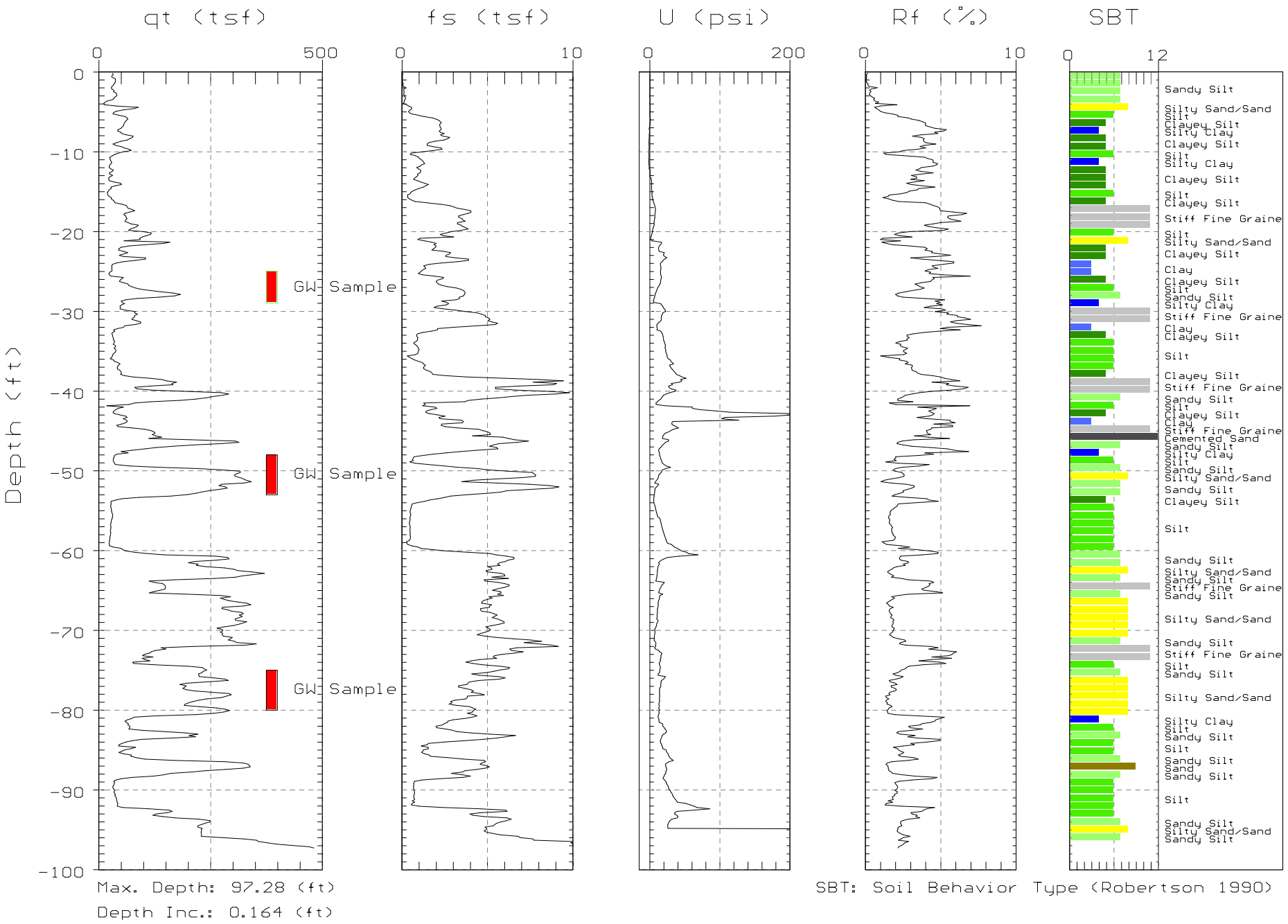
(Provided by Gregg Drilling between January and February 2006)

GREGG

SECOR

Site: GARDENA SUMPS
Location: CPB09-GW

Engineer: P.KINNEY
Date: 01:23:06 09:31

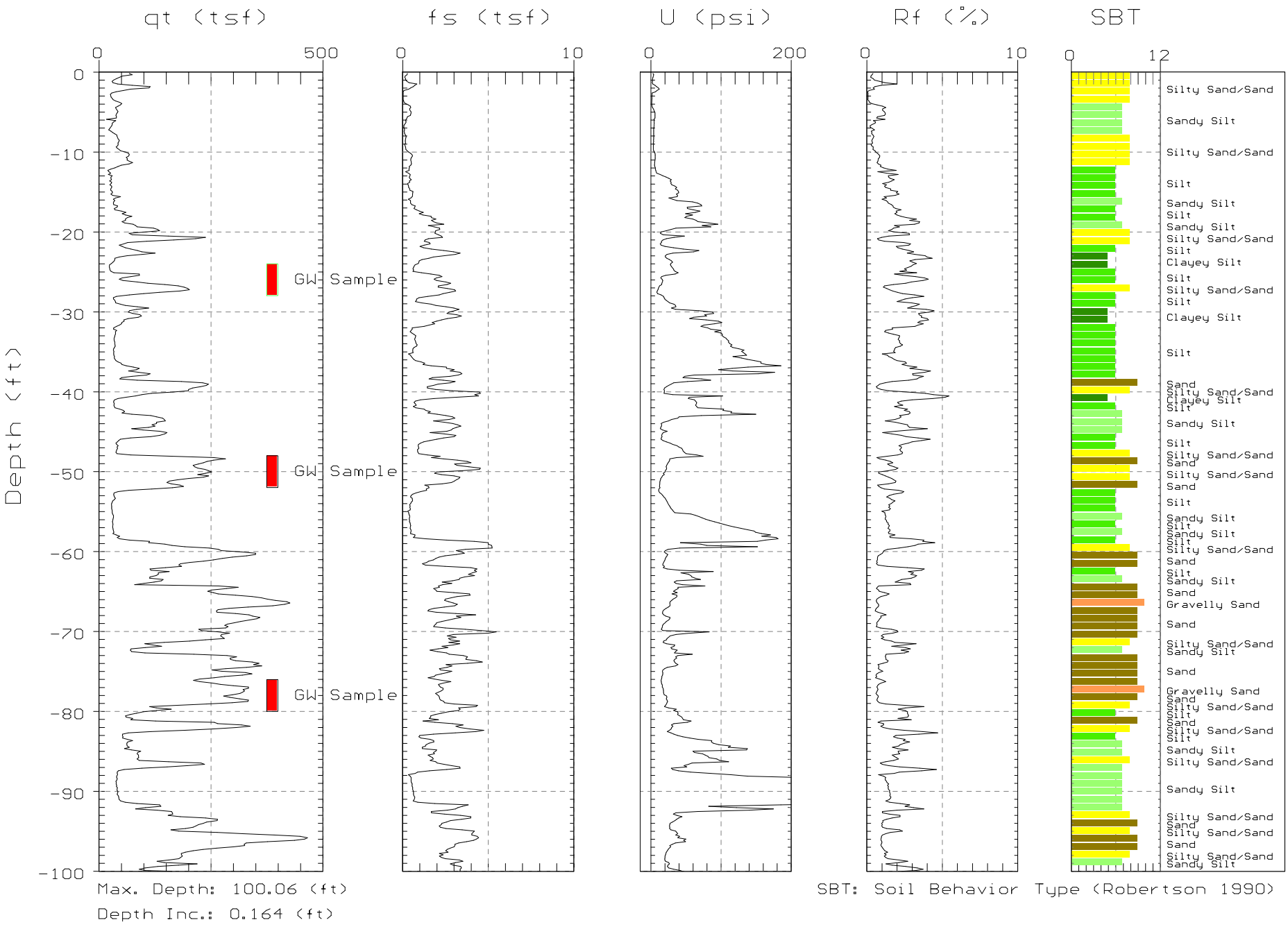


GREGG

SECOR

Site: GARDENA SUMPS
Location: CPB25-GW

Engineer: P.KINNEY
Date: 01:25:06 09:20



Max. Depth: 100.06 (ft)
Depth Inc.: 0.164 (ft)

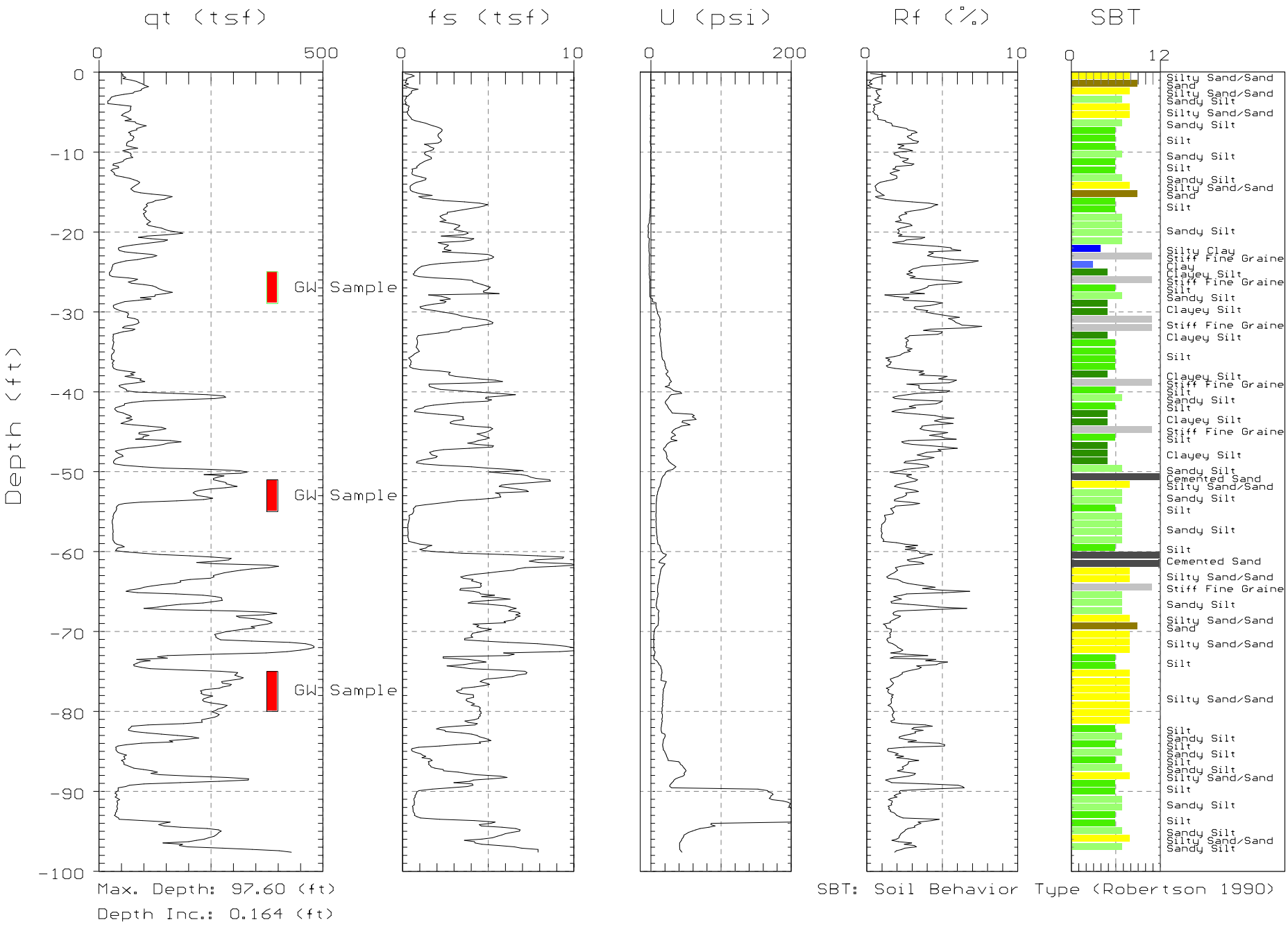
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SECOR

Site: GARDENA SUMPS
Location: CPB26-GW

Engineer: P.KINNEY
Date: 01:23:06 13:31



Max. Depth: 97.60 (ft)
Depth Inc.: 0.164 (ft)

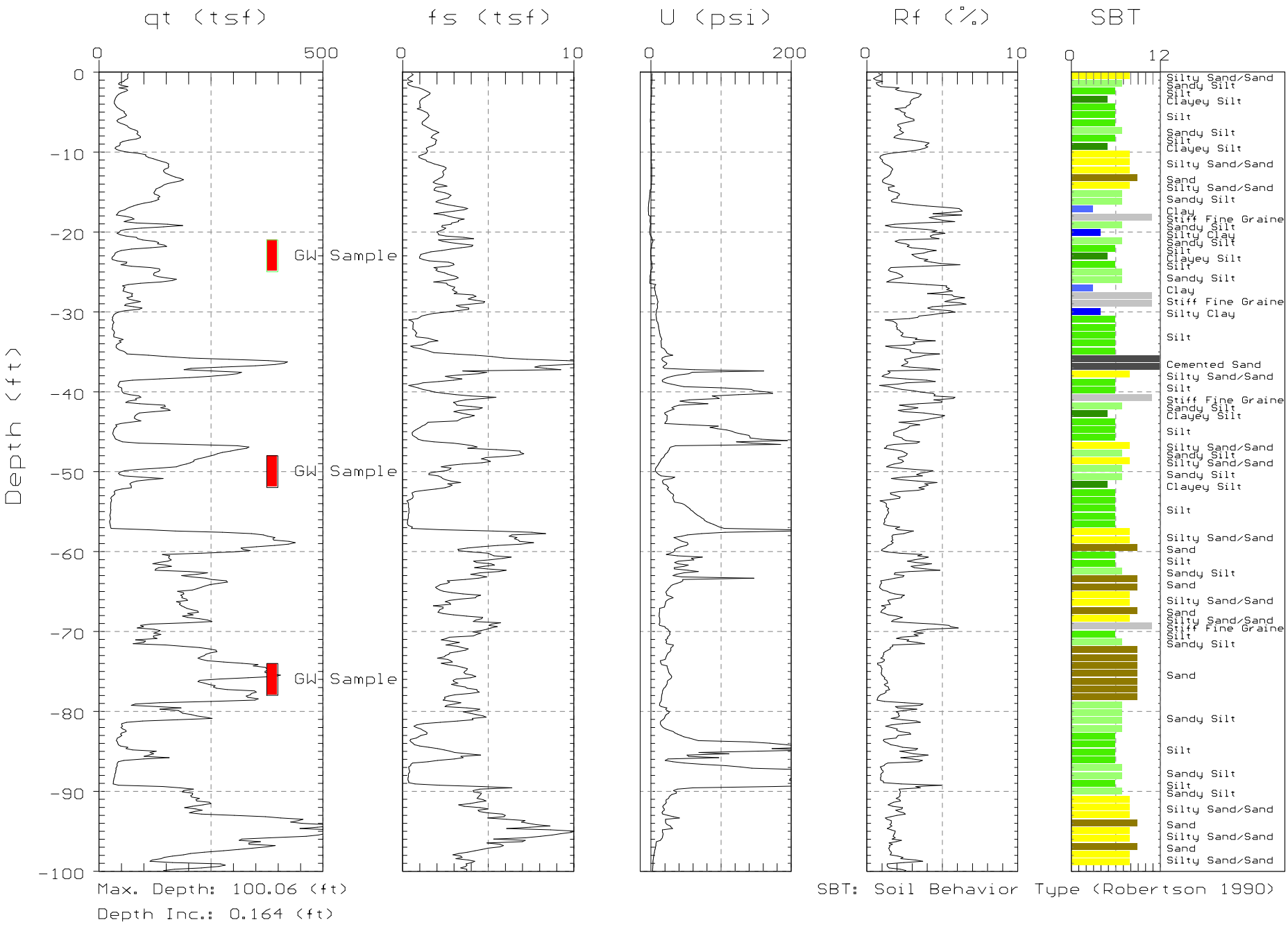
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SECOR

Site: GARDENA SUMPS
Location: CPB27-GW

Engineer: P.KINNEY
Date: 01:24:06 09:21



Max. Depth: 100.06 (ft)
Depth Inc.: 0.164 (ft)

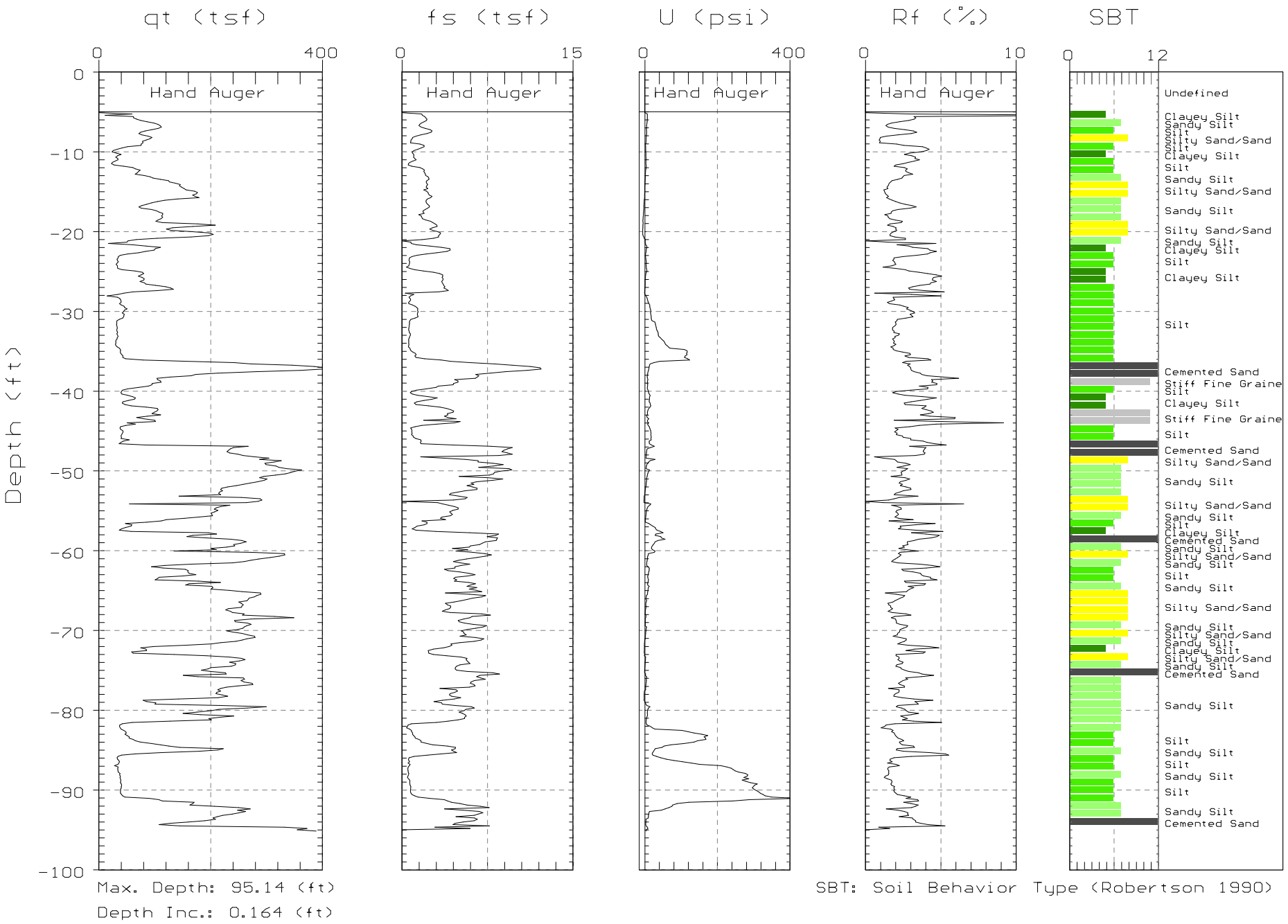
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SECOR

Site: GARDENA SUMPS
Location: HPB-10

Engineer: R.COUTURE
Date: 02/23/06 07:51



Max. Depth: 95.14 (ft)
Depth Inc.: 0.164 (ft)

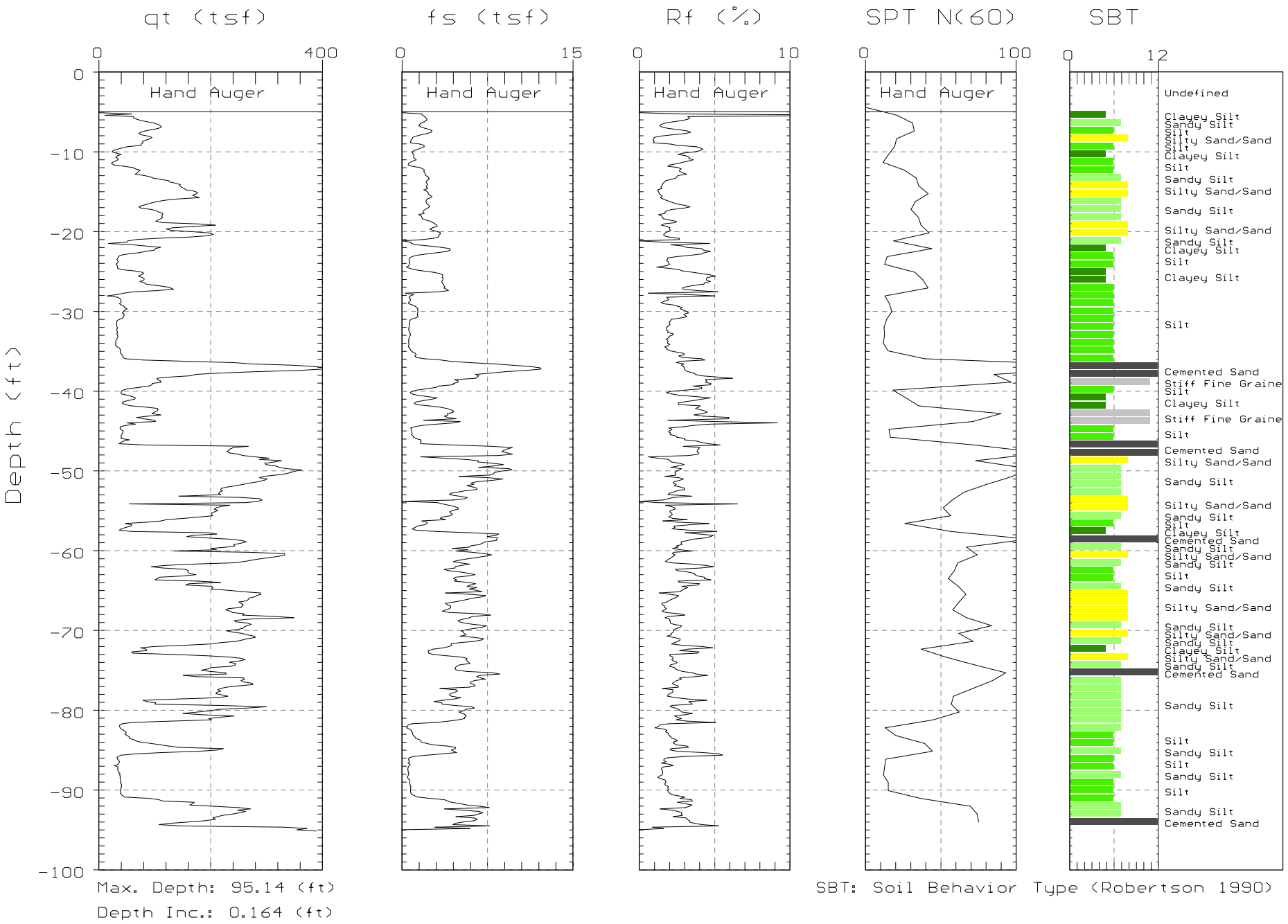
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SECOR

Site: GARDENA SUMPS
Location: HPB-10

Engineer: R.COUTURE
Date: 02/23/06 07:51



Max. Depth: 95.14 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

ATTACHMENT 2

SHEAR WAVE VELOCITY CALCULATIONS

CPB09							
Depth (ft)	σ (MPa)	σ' (MPa)	q_t (KPa)	μ (KPa)	q_c (MPa)	Soil Type	vs (m/s)
5	0.029	0.029	4787	0	4.800	Cohesive	355.2
15	0.086	0.086	4787	69	4.790	Cohesive	355.2
25	0.144	0.129	9574	103	9.584	Cohesive	548.6
35	0.202	0.157	7181	207	7.169	Cohesive	458.0
45	0.259	0.184	19148	345	19.148	Cohesive	847.2
55	0.317	0.212	19148	138	19.179	Cohesive	847.2
65	0.374	0.240	26329	138	26.379	Cohesive	1034.4
75	0.432	0.267	21542	138	21.579	Cohesive	912.1
85	0.490	0.295	16755	172	16.774	Cohesive	779.2
95	0.547	0.323	28722	276	28.759	Cohesive	1092.4

Vs30 (m/s)
615.0

CPB25							
Depth (ft)	σ (MPa)	σ' (MPa)	q_t (KPa)	μ (KPa)	q_c (MPa)	Soil Type	vs (m/s)
5	0.029	0.029	5744	34	5.755	Noncohesive	133.5
15	0.086	0.086	5744	276	5.719	Cohesive	398.2
25	0.144	0.129	9574	2068	9.289	Cohesive	548.6
35	0.202	0.157	9574	827	9.476	Cohesive	548.6
45	0.259	0.184	13404	483	13.367	Cohesive	677.4
55	0.317	0.212	10531	621	10.467	Cohesive	582.4
65	0.374	0.240	26329	345	26.348	Noncohesive	288.2
75	0.432	0.267	26329	276	26.359	Noncohesive	296.8
85	0.490	0.295	14361	689	14.296	Cohesive	707.4
95	0.547	0.323	23935	689	23.896	Noncohesive	308.3

Vs30 (m/s)
352.9

CPB26							
Depth (ft)	σ (MPa)	σ' (MPa)	q_t (KPa)	μ (KPa)	q_c (MPa)	Soil Type	vs (m/s)
5	0.029	0.029	6702	0	6.720	Cohesive	438.6
15	0.086	0.086	8617	0	8.640	Cohesive	513.5
25	0.144	0.129	9574	0	9.600	Cohesive	548.6
35	0.202	0.157	5744	138	5.739	Cohesive	398.2
45	0.259	0.184	11968	241	11.964	Cohesive	631.0
55	0.317	0.212	14361	103	14.384	Cohesive	707.4
65	0.374	0.240	21542	103	21.584	Noncohesive	280.8
75	0.432	0.267	26329	138	26.379	Noncohesive	296.8
85	0.490	0.295	14361	276	14.359	Cohesive	707.4
95	0.547	0.323	16755	689	16.696	Cohesive	779.2

Vs30 (m/s)
472.0

CPB27							
Depth (ft)	σ (MPa)	σ' (MPa)	q_t (KPa)	μ (KPa)	q_c (MPa)	Soil Type	vs (m/s)
5	0.029	0.029	4787	0	4.800	Cohesive	355.2
15	0.086	0.086	10531	0	10.560	Cohesive	582.4
25	0.144	0.129	8617	69	8.630	Cohesive	513.5
35	0.202	0.157	19148	345	19.148	Cohesive	847.2
45	0.259	0.184	16755	552	16.717	Cohesive	779.2
55	0.317	0.212	19148	621	19.107	Cohesive	847.2
65	0.374	0.240	19148	276	19.159	Noncohesive	276.5
75	0.432	0.267	26329	207	26.369	Noncohesive	296.8
85	0.490	0.295	9574	689	9.496	Cohesive	548.6
95	0.547	0.323	31116	138	31.179	Noncohesive	319.2

Vs30 (m/s)
453.2

HPB-10							
Depth (ft)	σ (MPa)	σ' (MPa)	q_t (KPa)	μ (KPa)	q_c (MPa)	Soil Type	vs (m/s)
5	0.029	0.029	7181	0	7.200	Cohesive	458.0
15	0.086	0.086	11968	0	12.000	Cohesive	631.0
25	0.144	0.129	5744	0	5.760	Cohesive	398.2
35	0.202	0.157	19148	276	19.159	Cohesive	847.2
45	0.259	0.184	21542	207	21.569	Cohesive	912.1
55	0.317	0.212	21542	276	21.559	Cohesive	912.1
65	0.374	0.240	23935	69	23.990	Noncohesive	284.7
75	0.432	0.267	23935	0	24.000	Cohesive	974.4
85	0.490	0.295	14361	1034	14.244	Cohesive	707.4
95	0.547	0.323	23935	1310	23.803	Cohesive	974.4

Vs30 (m/s)
601.3

CPT No.	Average V_{s30} (m/sec)
CPB-09	615
CPB-25	353
CPB-26	472
CPB-27	453
HPB-10	601
Average:	**499**

Geosyntec consultants

COMPUTATION COVER SHEET

Client: **ARC** Project: **Gardena Sumps** Project/ Proposal No.: **SC0467A** Task No.

Title of Computations **ANALYSIS OF LIGHT POLE FOUNDATION DESIGN**

Computations by:	Signature		4/23/14
	Printed Name	Keaton J. Botelho, P.E.	Date
	Title	Project Engineer	
Assumptions and Procedures Checked by: (peer reviewer)	Signature		4/21/14
	Printed Name	Rebecca F. Oliver, P.E.	Date
	Title	Senior Engineer	
Computations Checked by:	Signature		4/21/14
	Printed Name	Rebecca F. Oliver, P.E.	Date
	Title	Senior Engineer	
Computations backchecked by: (originator)	Signature		4/23/14
	Printed Name	Keaton J. Botelho, P.E.	Date
	Title	Project Engineer	
Approved by: (pm or designate)	Signature		4/21/14
	Printed Name	Gregory T. Corcoran, P.E.	Date
	Title	Principal Engineer	

Approval notes:

Revisions (number and initial all revisions)

No.	Sheet	Date	By	Checked by	Approval

Written by:	K. Botelho	Date: 4/11/14	Reviewed by: G. Corcoran	Date:	4/21/14
Client: ARC	Project: Gardena Sumps	Project/ Proposal No.: SC0467A		Task No.:	

ANALYSIS OF LIGHT POLE FOUNDATION DESIGN
GARDENA SUMPS,
GARDENA, CALIFORNIA

PURPOSE

The purpose of this calculation package is to evaluate the feasibility of constructing an above grade foundation to support a light pole over the proposed final cover system for the Gardena Sumps closure project. Details of the final cover system are provided in the Update Revised Final Draft Feasibility Study (Geosyntec 2013).

This calculation is not intended to serve as final design for development of the Gardena Sumps site. The purpose of this calculation is to demonstrate the feasibility of light pole development over the proposed Alternative 2A cover. Design of the future lighting at the Site will be the responsibility of the Site Developer.

LOADING

The loads evaluated for the design of the light pole foundation included bending moments cause by wind loading and seismic loading.

For the purpose of this evaluation, a 20 foot high, 5-inch diameter, 0.188-inch thick wall, round, straight, aluminum light pole manufactured by Hapco (Attachment A) with two, 16" x 21" x 6.75" luminaires manufactured by Sterner attached to the light pole with two, 2" x 4" x 8" arms (Attachment L) are assumed. The unit weight of the aluminum pole is assumed to be 5 pounds per foot (lb/ft) with a luminaire weight of 36 lbs for a total weight (W_{ip}) of 172 lbs. Typical values for the unit weight of Schedule 40 aluminum piping are presented in Attachment B.

Wind Loading

The wind loading on the light pole was calculated in accordance with the 2013 California Building Code (CBC), Section 1609.6.3 (Attachment C):

$$P_{net} = 0.00256V^2 K_z C_{net} K_{zt}$$

where:

P_{net} = Design wind pressure to be used in determination of wind loads on buildings or other structures or their components and cladding (psf)

z = Height above Ground Level = 20 ft

K_z = Velocity Pressure Exposure Coefficient = 0.62 for exposure category B (Attachment D and Attachment E, 1 of 3)

K_{zt} = Topographic Factor = 1.0 assuming no hills or escarpments nearby (Attachment E, 2 of 3)

C_{net} = Net pressure coefficient = 0.97 for a round, non-building structure where the ratio between the height of the structure and the diameter is at least 25 (Attachment F).

V = Basic wind speed = 100 miles per hour (mph) for Risk Category I (Attachment J)

$$P_{net} = 0.00256(100)^2(0.62)(0.97)(1.0)$$

$$P_{net} = 15.4 \text{ psf}$$

In accordance with CBC 2013, Section 1609.6.3 the designed wind force shall not be less than 16 psf. Therefore, for the purpose of this calculation, **$P_{net} = 16$ psf**

To calculate the resultant force on the light pole imposed by the wind force, the design wind force is multiplied by the projected area of the light pole and luminaire, where the projected area is calculated as follows:

$$P = P_{net}(A_P + A_l)$$

where:

$A_p = d \cdot z$ = Projected area of the light pole.

z = Height of the light pole = 20 ft

d = Pole diameter = 5 in

$$A_p = \frac{5in}{12\ ^{in}/_{ft}}(20ft) = 8.3\ ft^2$$

and:

$A_l = (h \cdot l) + (h_{arm} \cdot l_{arm})$ = Projected area of the luminaire (assume two luminaires on opposite sides of the light pole plus the support arm from the light pole).

h = Height of luminaire= 6.75 in (Attachment L)

l = Length of luminaire = 21 in (Attachment L)

h_{arm} = Height of luminaire arm = 4 in (Attachment L)

l_{arm} = Length of luminaire arm = 8 in (Attachment L)

$$A, = \frac{6.75in \times 21in}{144\ in^2/ft^2}(2) + \frac{(4in \times 8in)}{144\ in^2/ft^2}(2) = 2.4\ ft^2$$

The resultant wind load calculated on the light pole becomes:

$$P = P_p + P_l$$

$$P_p = 16psf \times (8.3\ ft^2) = 132.8lbs$$

$$P_l = 16psf \times (2.4\ ft^2) = 38.4lbs$$

The maximum moment imposed by the wind loading is then calculated as follows:

$$M_{max} = P_p X_p + P_l X_l$$

where:

X_p = The moment arm for the resultant force acting at the center of the light pole since the design wind pressure is assumed to be uniformly distributed = 10 ft

X_l = The moment arm for the luminaire is assumed to be the height of the light pole = 20 ft

$$M_{max} = (132.8lbs)(10ft) + (38.4lbs)(20ft) = 2{,}096lb - ft$$

Seismic Loading

The seismic base shear (V) is calculated from the following equation when the fundamental period, T, is greater than 0.06 seconds (Attachment G, 1 of 7):

$$V = C_s W$$

where:

W = Total seismic weight = 5 lbs/ft x 20 ft + (36 lb x 2) = 172 lbs

C_s = Seismic response coefficient

where the approximate fundamental period is calculated as follows (Attachment G, 5 of 7):

$$T_a = C_t h_n^x \ (s)$$

and,

n = structural height

C_t and x = approximate period parameters from Table 12.8-2 (Attachment G, 6 of 7)

$$T_a = 0.02 * 20ft^{0.75} = 0.189\ s > 0.06\ s$$

The seismic response coefficient is calculated from the following equation (Attachment G, 2 of 6):

$$C_s = 0.044 S_{DS} I_e$$

where:

SDS = Five percent damped design spectral response acceleration for a period of 0.2 seconds. Determined for the site (33.88835°N, 118.30896°W) assuming Site Class E (soft clay soil) using the online United States Geological Survey (USGS) online application (Attachment H) = 0.969g

I = Importance factor based on a Risk Category I = 1.0 (Attachment G, 7 of 7)

The seismic response coefficient is calculated to be:

$$C_s = 0.044 * 0.969 * 1.0 = 0.043$$

The fundamental period of the structure is greater than 0.06s and therefore the seismic base shear is calculated as follows:

$$V = (0.043)(172lbs) = 7.4\ lbs$$

Since the light pole does not contain any support other than at the base, the base shear is assumed to be applied at the top of the light pole creating a maximum moment of:

$$M_{max} = (7.4lbs)(20ft) = 148\ lb - ft$$

Design Loading

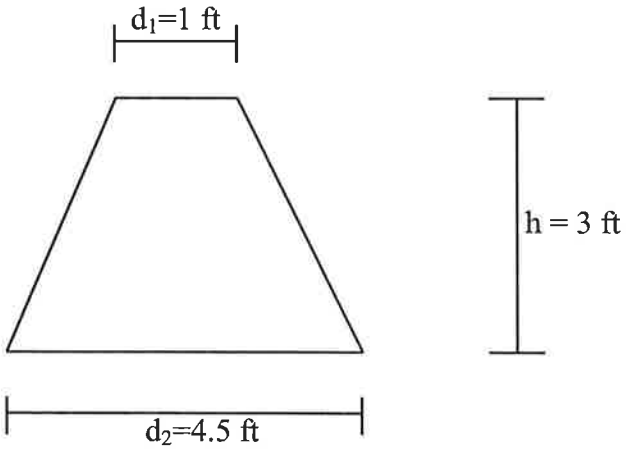
Since the maximum moment imposed by the wind is greater than that imposed by the seismic base shear (2096 lb-ft > 148 lb-ft), the wind loading governs.

FOUNDATION DESIGN

The foundation of the light pole is designed to resist the dead load and overturning moment of the light pole without being embedded into the soil since the cover soil overlying the proposed geosynthetic cover of the impoundment is restricted to a thickness of 1-foot. In addition, the foundation is designed such that the bearing pressure of the foundation does not exceed the bearing capacity of the underlying sludge (conservatively disregarding the cover system soil, rock, and reinforcement elements).

The design of the reinforcement for the footing is not included in this calculation package since the purpose is address the feasibility of the foundation and is not intended for construction.

The footing for the light pole is designed as a reinforced concrete truncated cone with a base diameter of 4.5 feet, a top diameter of 1 foot, and a height of 3 feet.



The volume of footing is calculated as follows:

$$V = \frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 + r_2)$$

where:

h = the height of the foundation.

r_1 = the radius at the top of the foundation.

r_2 = the radius at the bottom of the foundation.

$$V = \frac{1}{3}\pi \times 3ft((0.5ft)^2 + (2.25ft)^2 + 0.5ft + 2.25ft) = \mathbf{25.3ft^3}$$

The weight of the concrete footing is then calculated as:

$$W_c = V\gamma_c$$

where:

W_c = The weight of the concrete foundation (lbs)

γ_c = The unit weight of concrete = 150 lbs/ft^3

$$W_c = 25.3ft^3 \times 150\,{}^{lb}/_{ft^3} = 3795\ lbs$$

Check the bearing pressure imposed by the concrete footing is less than the bearing capacity of the underlying sludge:

Bearing Capacity Analysis

$$q_u = cN_c \qquad \text{(Attachment K)}$$

where:

q_u= Foundation ultimate bearing capacity (psf)

c = cohesion of the soil foundation (psf) = 300 psf*

N_c = Bearing capacity coefficient (Attachment K) = 5.14

* The sludge material is estimated from CPT soundings performed at the site to have an undrained shear strength of approximately 300 psf (Stantec, 2008).

$$q_u = 300 \times 5.14 = 1542\ psf$$

Utilizing a factor of safety of 3, the bearing capacity of the sludge material becomes approximately **500 psf.**

Bearing Pressure Analysis

$$p_{footing} = \frac{W_c + W_{lp}}{A_f} = \mathbf{250\ psf}$$

where:

W_{lp} = The total weight of the light pole plus luminaire

$W_{lp} = 5\ ^{lb}/_{ft} \times 20lb + (36lb \times 2) = 172lb$

$A_f = \pi r_2^2 = 15.9\ ft^2$

250 psf < 500 psf, therefore the bearing capacity of the sludge can support the concrete footing.

Check Factor of Safety Against Overturning

The overturning moment imposed by the wind loading on the light pole is resisted by the weight of the concrete footing. The concrete footing is a symmetric truncated cone and therefore the resultant of the weight of the footing acts at the center of the footing. The capacity for the footing to resist the overturning moment imposed by the wind load is applied at a distance of 2.25 feet from the center of the footing.

$$FS = \frac{M_n}{M_{max}}$$

where:

FS = The factor of safety against overturning.

M_n = The nominal moment strength of the concrete footing.

M_{max} = The maximum moment imposed at the top of the footing due to the wind load.

$$M_n = (W_c + W_{lp})X$$

where:

X = The moment arm for the resultant force due to the weight of the concrete footing acting at the perimeter of the footing.

$$M_n = (3795bs + 172lbs) \times 2.25ft = 8926\ lb - ft$$

And:

$$FS = \frac{8926lb - ft}{2096lb - ft} = \mathbf{4.3}$$

Check maximum bearing pressure due to eccentric loading

The footing carries moment in addition to a vertical load and therefore an eccentric loading condition is created. The maximum bearing pressure is evaluated assuming the area of the footing is reduced by twice the eccentricity. The maximum pressure exerted by the footing accounting for the eccentric loading is calculated as follows (Attachment I):

$$p_{max} = \left(\frac{W_c + W_{lp}}{A_f}\right)\left(1 + \frac{6\epsilon}{D}\right)$$

where:

D = The diameter of the bottom of the footing = 4.5 ft

ϵ = The eccentricity due to the moment and vertical load

$$\epsilon = \left(\frac{M_{max}}{W_c + W_{lp}}\right) = 0.53$$

and:

$$p_{max} = \left(\frac{3795 + 172}{15.9}\right)\left(1 + \frac{6 \times 0.53}{4.5}\right) = 425.8\ psf$$

425.8 psf is less than the allowable bearing capacity of the sludge (500 psf), therefore the bearing capacity of the sludge can support the concrete footing under eccentric loading conditions.

RESULTS

The results of the analyses presented herein demonstrate that a concrete footing shaped as a truncated cone with a top diameter of 1 ft, bottom diameter of 4.5 ft, and a height of 3 ft can support the dead load and overturning moment of the assumed 20 foot tall aluminum light pole with two, 16" x 21" x 6.75" luminaires (including support arms) on the surface of the proposed cap. In addition, the bearing capacity of the sludge material underlying the proposed cap can support the proposed concrete footing.

REFERENCES

Alaskan Copper, www.alaskancopper.com

American Society of Civil Engineers (2010). "ASCE 7-10, Minimum Design Loads on Buildings and Other Structures."

California Building Standards Commission (2013) (CBC, 2013). "California Building Code (CBC, 2013)", California Code of Regulations, Title 24, Part 2, Volume 2.

Geosyntec Consultants (2013), "Updated Revised Final Draft Feasibility Study," November 2013.

Hapco, www.hapco.com

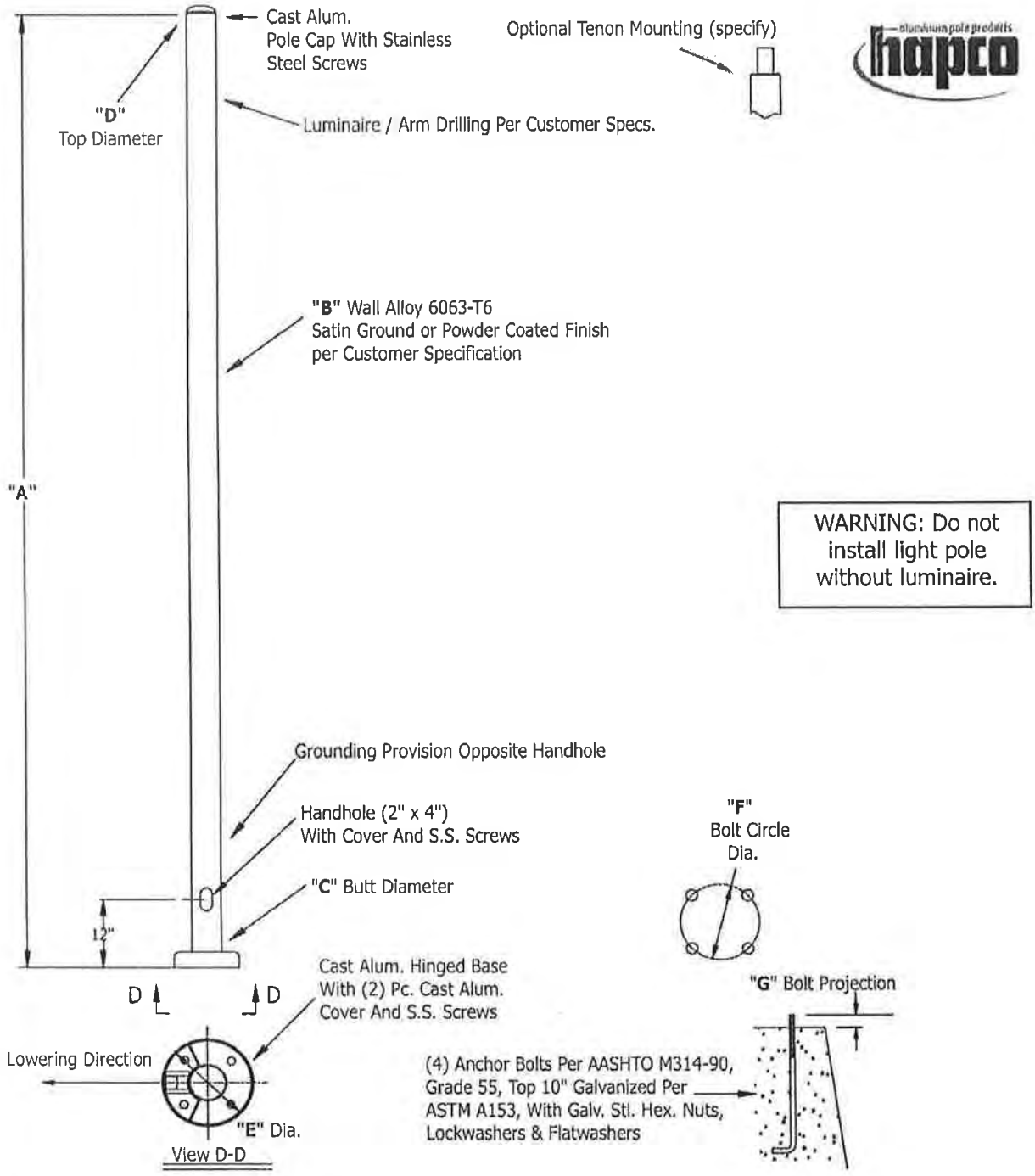
Lindeburg, M.R., "Civil Engineering Reference Manual for the PE Exam", Eleventh Edition, Professional Publications, Inc, Belmont, CA.

Stantec (2008), "Revised Draft 2006 Remedial Investigation Report," August 2008.

Sterner Lighting, www.sternerlighting.com

United Stated Geologic Survey (2013), geohazards.usgs.gov

Round Straight Aluminum Pole, tenon top, hinged base (73145 Series)



Shaft:
Pole shaft shall be constructed of extruded tube of 6063 aluminum alloy per ASTM B221 and shall be full-length heat treated after welding on the base flange to T-6 temper. Shaft shall be free of longitudinal welds. Pole shaft cap, when required, shall be of cast aluminum of 443 or 356F aluminum alloy and attached utilizing stainless steel hardware.

Customer PO: _____ Customer Name: _____ Date: _____

Part #: _____ Finish: _____ Quantity: _____ Project Name: _____

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Attachment A, 1 of 2

R	S	A				-	H	-	
			Mounting Height	Wall Thick.	Butt Dia.	Top Dia.	Base Style		Finish

Mtg. Ht.	Wall	Butt Dia.	Weight (lbs.)	Maximum EPA 70	80	90	100	110	New Catalog Number	Old Catalog Number
06	.125"	4	100	12.6	9.4	7.3	5.7	4.7	RSA06B4-H-**	73145-001
06	.156"	4	100	15.6	11.8	9.1	7.2	5.9	RSA06C4-H-**	
06	.188"	4	100	18.5	14.0	10.9	8.7	7.1	RSA06D4-H-**	
08	.125"	4	100	8.9	6.5	4.8	3.7	3.0	RSA08B4-H-**	73145-002
08	.156"	4	100	11.3	8.3	6.3	4.9	3.9	RSA08C4-H-**	
08	.188"	4	100	13.5	10.0	7.6	6.0	4.9	RSA08D4-H-**	
10	.125"	4	100	6.4	4.5	3.2	2.4	1.9	RSA10B4-H-**	74145-003
10	.125"	5	100	12.1	8.8	6.8	5.4	4.4	RSA10B5-H-**	74145-011
10	.156"	4	100	8.3	5.9	4.3	3.3	2.6	RSA10C4-H-**	
10	.156"	5	100	15.5	11.5	8.9	7.1	5.8	RSA10C5-H-**	
10	.188"	4	100	10.1	7.3	5.4	4.1	3.3	RSA10D4-H-**	
10	.188"	5	100	18.9	14.1	11.0	8.8	7.2	RSA10D5-H-**	
12	.125"	4	100	4.6	3.1	2.0	1.4	1.0	RSA12B4-H-**	74145-004
12	.125"	5	100	9.3	6.6	5.0	3.9	3.2	RSA12B5-H-**	74145-008
12	.156"	4	100	6.1	4.2	2.9	2.1	1.6	RSA12C4-H-**	
12	.156"	5	100	12.2	8.8	6.8	5.4	4.3	RSA12C5-H-**	
12	.188"	4	100	7.7	5.3	3.8	2.8	2.2	RSA12D4-H-**	
12	.188"	5	100	15.1	11.0	8.5	6.8	5.5	RSA12D5-H-**	
14	.125"	4	80	3.2	2.0	1.1	0.5	-	RSA14B4-H-**	74145-005
14	.125"	5	100	7.1	4.8	3.6	2.8	2.2	RSA14B5-H-**	74145-009
14	.156"	4	100	4.4	2.9	1.8	1.2	0.8	RSA14C4-H-**	
14	.156"	5	100	9.6	6.7	5.1	4.0	3.2	RSA14C5-H-**	
14	.188"	4	100	5.7	3.8	2.6	1.8	1.3	RSA14D4-H-**	
14	.188"	5	100	12.1	8.6	6.6	5.2	4.1	RSA14D5-H-**	
16	.125"	4	45	1.8	0.8	-	-	-	RSA16B4-H-**	
16	.125"	5	100	4.4	2.8	2.1	1.5	1.1	RSA16B5-H-**	74145-010
16	.156"	4	65	2.7	1.5	0.7	-	-	RSA16C4-H-**	
16	.156"	5	100	6.3	4.2	3.1	2.4	1.9	RSA16C5-H-**	
16	.188"	4	85	3.5	2.2	1.2	0.6	0.4	RSA16D4-H-**	
16	.188"	5	100	8.2	5.6	4.2	3.3	2.6	RSA16D5-H-**	
18	.125"	5	75	3.0	1.7	1.1	0.7	0.5	RSA18B5-H-**	74145-006
18	.156"	5	100	4.6	2.9	2.1	1.5	1.1	RSA18C5-H-**	
18	.188"	5	100	6.2	4.0	3.0	2.3	1.7	RSA18D5-H-**	
20	.125"	5	45	1.9	0.7	-	-	-	RSA20B5-H-**	74145-007
20	.156"	5	80	3.2	1.8	1.2	0.7	0.5	RSA20C5-H-**	
✳ 20	.188"	5	100	4.5	2.8	2.0	1.4	1.0	RSA20D5-H-**	

CATALOG NUMBER SYSTEM
Complete the catalog number with the entry codes below.

WALL THICKNESS:
B = .125" **C** = .156" **D** = .188"

BUTT DIAMETER:
4 = 4" **5** = 5"

TOP DIAMETER:
- = no taper

BASE STYLE:
H = Hinged

FINISH: ** (add as suffix)
BA = Black Powder Paint
BH = White Powder Paint
BM = Bronze Powder Paint
BV = Dark Green Powder Paint
GC = Gray Powder Paint
01 = Satin
- Other finishes available, consult factory

SPECIFY MOUNTING:
Tenon Mount: Specify Tenon diameter (2.375", 2.875", 4.0", etc.) and length (3", 4", etc.)
Side mounting: Specify luminaire type, quantity and orientation. Luminaire drilling must be supplied at time of order.

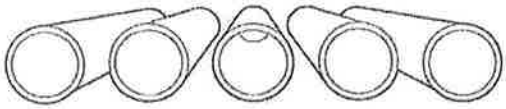
NOTES:
Effective Projected Area (EPA) in square feet. EPA's calculated using wind velocity (mph) indicated plus 30% gust factor. EPA's are calculated assuming 25 lbs. per square foot of EPA to a maximum of 100 lbs. Maximum EPA is based on the luminaire weight shown. Increased luminaire weight reduces the maximum EPA.

"C" Butt Diameter	"E" Base Square	"F" Bolt Circle	"G" Bolt Projection	Bolt Size
4"	9.25"	7"	2"	.75 x 17 x 3
5"	10.75"	8.5"	2"	.75 x 17 x 3

Attachment A, 2 of 2

Aluminum Pipe

6063-T52 Schedule 40 & 80 Extruded Structural Pipe



6063-T52 Schedule 40

- Specifications: ASTM B 221
- Stocked in 20 foot lengths

Nominal Pipe Size	Outside Diameter	Wall	Lbs Ft	Lbs/Length	Part Number
1/2	.840	.109	.294	5.880	136110
3/4	1.050	.113	.391	7.820	136128
1	1.315	.133	.581	11.620	136136
1 1/4	1.660	.140	.786	15.720	136144
1 1/2	1.900	.145	.940	18.800	136152
2	2.375	.154	1.264	25.280	136160
2 1/2	2.875	.203	2.000	40.000	136178
3	3.500	.216	2.620	52.400	136186
3 1/2	4.000	.226	3.150	63.000	136194
4	4.500	.237	3.730	74.600	136209
6	6.625	.280	6.556	131.120	421109
8	8.625	.322	9.867	197.340	421117
10	10.750	.365	14.004	280.080	468541

6063-T52 Schedule 80

- Specifications: ASTM B 221
- Stocked in 20 foot lengths

Nominal Pipe Size	Outside Diameter	Wall	Lbs Ft	Lbs/Length	Part Number
1/2	0.840	.147	.384	7.680	596182
3/4	1.050	.154	.520	10.440	637514
1	1.315	.179	.751	15.020	136275
1 1/2	1.900	.200	1.256	25.120	136283
2	2.375	.218	1.737	34.740	136291
2 1/2	2.875	.276	2.650	53.000	136306
3	3.500	.300	3.547	70.940	420797
4	4.500	.337	5.183	103.660	670287
6	6.625	.432	9.884	197.680	421086

Dimensions are in inches. All weights are approximate.

Attachment B

q_h = Wind velocity pressure, psf (kN/m^2) determined from Section 27.3.2 of ASCE 7.

Concrete and clay roof tiles complying with the following limitations shall be designed to withstand the aerodynamic uplift moment as determined by this section.

1. The roof tiles shall be either loose laid on battens, mechanically fastened, mortar set or adhesive set.
2. The roof tiles shall be installed on solid sheathing which has been designed as components and cladding.
3. An underlayment shall be installed in accordance with Chapter 15.
4. The tile shall be single lapped interlocking with a minimum head lap of not less than 2 inches (51 mm).
5. The length of the tile shall be between 1.0 and 1.75 feet (305 mm and 533 mm).
6. The exposed width of the tile shall be between 0.67 and 1.25 feet (204 mm and 381 mm).
7. The maximum thickness of the tail of the tile shall not exceed 1.3 inches (33 mm).
8. Roof tiles using mortar set or adhesive set systems shall have at least two-thirds of the tile's area free of mortar or adhesive contact.

1609.6 Alternate all-heights method. The alternate wind design provisions in this section are simplifications of the ASCE 7 Directional Procedure.

1609.6.1 Scope. As an alternative to ASCE 7 Chapters 27 and 30, the following provisions are permitted to be used to determine the wind effects on regularly shaped buildings, or other structures that are regularly shaped, which meet all of the following conditions:

1. The building or other structure is less than or equal to 75 feet (22 860 mm) in height with a height-to-least-width ratio of 4 or less, or the building or other structure has a fundamental frequency greater than or equal to 1 hertz.
2. The building or other structure is not sensitive to dynamic effects.
3. The building or other structure is not located on a site for which channeling effects or buffeting in the wake of upwind obstructions warrant special consideration.
4. The building shall meet the requirements of a simple diaphragm building as defined in ASCE 7 Section 26.2, where wind loads are only transmitted to the main windforce-resisting system (MWFRS) at the diaphragms.
5. For open buildings, multispan gable roofs, stepped roofs, sawtooth roofs, domed roofs, roofs with slopes greater than 45 degrees (0.79 rad), solid freestanding walls and solid signs, and rooftop equipment, apply ASCE 7 provisions.

1609.6.1.1 Modifications. The following modifications shall be made to certain subsections in ASCE 7: in Section 1609.6.2, symbols and notations that are specific to this section are used in conjunction with the symbols and notations in ASCE 7 Section 26.3.

1609.6.2 Symbols and notations. Coefficients and variables used in the alternative all-heights method equations are as follows:

C_{net}= Net-pressure coefficient based on K_d [(G) (C_p) - (GC_{pi})], in accordance with Table 1609.6.2.

G = Gust effect factor for rigid structures in accordance with ASCE 7 Section 26.9.1.

K_d = Wind directionality factor in accordance with ASCE 7 Table 26-6.

P_{net}= Design wind pressure to be used in determination of wind loads on buildings or other structures or their components and cladding, in psf (kN/m^2).

1609.6.3 Design equations. When using the alternative all-heights method, the MWFRS, and components and cladding of every structure shall be designed to resist the effects of wind pressures on the building envelope in accordance with Equation 16-35.

$$P_{net} = 0.00256V^2K_zC_{net}K_{zt} \quad \textbf{(Equation 16-35)}$$

Design wind forces for the MWFRS shall not be less than 16 psf (0.77 kN/m^2) multiplied by the area of the structure projected on a plane normal to the assumed wind direction (see ASCE 7 Section 27.4.7 for criteria). Design net wind pressure for components and cladding shall not be less than 16 psf (0.77 kN/m^2) acting in either direction normal to the surface.

1609.6.4 Design procedure. The MWFRS and the components and cladding of every building or other structure shall be designed for the pressures calculated using Equation 16-35.

1609.6.4.1 Main windforce-resisting systems. The MWFRS shall be investigated for the torsional effects identified in ASCE 7 Figure 27.4.6.

1609.6.4.2 Determination of K_z and K_{zt}. Velocity pressure exposure coefficient, K_z, shall be determined in accordance with ASCE 7 Section 27.3.1 and the topographic factor, K_{zt}, shall be determined in accordance with ASCE 7 Section 26.8.

1. For the windward side of a structure, K_{zt} and K_z shall be based on height z.
2. For leeward and sidewalls, and for windward and leeward roofs, K_{zt} and K_z shall be based on mean roof height h.

Attachment C

Main Wind Force Resisting System – Part 1	All Heights
Velocity Pressure Exposure Coefficients, K_h and K_z	
Table 27.3-1	

Height above ground level, z		Exposure		
ft	(m)	B	C	D
0-15	(0-4.6)	0.57	0.85	1.03
20	(6.1)	0.62	0.90	1.08
25	(7.6)	0.66	0.94	1.12
30	(9.1)	0.70	0.98	1.16
40	(12.2)	0.76	1.04	1.22
50	(15.2)	0.81	1.09	1.27
60	(18)	0.85	1.13	1.31
70	(21.3)	0.89	1.17	1.34
80	(24.4)	0.93	1.21	1.38
90	(27.4)	0.96	1.24	1.40
100	(30.5)	0.99	1.26	1.43
120	(36.6)	1.04	1.31	1.48
140	(42.7)	1.09	1.36	1.52
160	(48.8)	1.13	1.39	1.55
180	(54.9)	1.17	1.43	1.58
200	(61.0)	1.20	1.46	1.61
250	(76.2)	1.28	1.53	1.68
300	(91.4)	1.35	1.59	1.73
350	(106.7)	1.41	1.64	1.78
400	(121.9)	1.47	1.69	1.82
450	(137.2)	1.52	1.73	1.86
500	(152.4)	1.56	1.77	1.89

Notes:

1. The velocity pressure exposure coefficient K_z may be determined from the following formula:

   For 15 ft. $\leq z \leq z_g$ $\quad$ $K_z = 2.01\ (z/z_g)^{2/\alpha}$

   For $z < 15$ ft. $\quad$ $K_z = 2.01\ (15/z_g)^{2/\alpha}$

2. α and z_g are tabulated in Table 26.9.1.
3. Linear interpolation for intermediate values of height z is acceptable.
4. Exposure categories are defined in Section 26.7.

Attachment D

Surface Roughness B: Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger.

Surface Roughness C: Open terrain with scattered obstructions having heights generally less than 30 ft (9.1 m). This category includes flat open country and grasslands.

Surface Roughness D: Flat, unobstructed areas and water surfaces. This category includes smooth mud flats, salt flats, and unbroken ice.

26.7.3 Exposure Categories

Exposure B: For buildings with a mean roof height of less than or equal to 30 ft (9.1 m), Exposure B shall apply where the ground surface roughness, as defined by Surface Roughness B, prevails in the upwind direction for a distance greater than 1,500 ft (457 m). For buildings with a mean roof height greater than 30 ft (9.1 m), Exposure B shall apply where Surface Roughness B prevails in the upwind direction for a distance greater than 2,600 ft (792 m) or 20 times the height of the building, whichever is greater.

Exposure C: Exposure C shall apply for all cases where Exposures B or D do not apply.

Exposure D: Exposure D shall apply where the ground surface roughness, as defined by Surface Roughness D, prevails in the upwind direction for a distance greater than 5,000 ft (1,524 m) or 20 times the building height, whichever is greater. Exposure D shall also apply where the ground surface roughness immediately upwind of the site is B or C, and the site is within a distance of 600 ft (183 m) or 20 times the building height, whichever is greater, from an Exposure D condition as defined in the previous sentence.

For a site located in the transition zone between exposure categories, the category resulting in the largest wind forces shall be used.

EXCEPTION: An intermediate exposure between the preceding categories is permitted in a transition zone provided that it is determined by a rational analysis method defined in the recognized literature.

26.7.4 Exposure Requirements.

26.7.4.1 Directional Procedure (Chapter 27)

For each wind direction considered, wind loads for the design of the MWFRS of enclosed and partially enclosed buildings using the Directional Procedure of Chapter 27 shall be based on the exposures as defined in Section 26.7.3. Wind loads for the design of open buildings with monoslope, pitched, or troughed free roofs shall be based on the exposures, as defined in Section 26.7.3, resulting in the highest wind loads for any wind direction at the site.

26.7.4.2 Envelope Procedure (Chapter 28)

Wind loads for the design of the MWFRS for all low-rise buildings designed using the Envelope Procedure of Chapter 28 shall be based on the exposure category resulting in the highest wind loads for any wind direction at the site.

26.7.4.3 Directional Procedure for Building Appurtenances and Other Structures (Chapter 29)

Wind loads for the design of building appurtenances (such as rooftop structures and equipment) and other structures (such as solid freestanding walls and freestanding signs, chimneys, tanks, open signs, lattice frameworks, and trussed towers) as specified in Chapter 29 shall be based on the appropriate exposure for each wind direction considered.

26.7.4.4 Components and Cladding (Chapter 30)

Design wind pressures for components and cladding shall be based on the exposure category resulting in the highest wind loads for any wind direction at the site.

26.8 TOPOGRAPHIC EFFECTS

26.8.1 Wind Speed-Up over Hills, Ridges, and Escarpments

Wind speed-up effects at isolated hills, ridges, and escarpments constituting abrupt changes in the general topography, located in any exposure category, shall be included in the determination of the wind loads when buildings and other site conditions and locations of structures meet all of the following conditions:

1. The hill, ridge, or escarpment is isolated and unobstructed upwind by other similar topographic features of comparable height for 100 times the height of the topographic feature ($100H$) or 2 mi (3.22 km), whichever is less. This distance shall be measured horizontally from the point at which the height H of the hill, ridge, or escarpment is determined.
2. The hill, ridge, or escarpment protrudes above the height of upwind terrain features within a 2-mi (3.22-km) radius in any quadrant by a factor of two or more.
3. The structure is located as shown in Fig. 26.8-1 in the upper one-half of a hill or ridge or near the crest of an escarpment.

Attachment E, 1 of 3

4. $H/L_h \geq 0.2$.
5. H is greater than or equal to 15 ft (4.5 m) for Exposure C and D and 60 ft (18 m) for Exposure B.

26.8.2 Topographic Factor

The wind speed-up effect shall be included in the calculation of design wind loads by using the factor K_{zt}:

$$K_{zt} = (1 + K_1K_2K_3)^2 \qquad (26.8\text{-}1)$$

where K_1, K_2, and K_3 are given in Fig. 26.8-1.

If site conditions and locations of buildings and other structures do not meet all the conditions specified in Section 26.8.1 then $K_{zt} = 1.0$.

26.9 GUST-EFFECTS

26.9.1 Gust-Effect Factor: The gust-effect factor for a rigid building or other structure is permitted to be taken as 0.85.

26.9.2 Frequency Determination

To determine whether a building or other structure is rigid or flexible as defined in Section 26.2, the fundamental natural frequency, n_1, shall be established using the structural properties and deformational characteristics of the resisting elements in a properly substantiated analysis. Low-Rise Buildings, as defined in 26.2, are permitted to be considered rigid.

26.9.2.1 Limitations for Approximate Natural Frequency

As an alternative to performing an analysis to determine n_1, the approximate building natural frequency, n_a, shall be permitted to be calculated in accordance with Section 26.9.3 for structural steel, concrete, or masonry buildings meeting the following requirements:

1. The building height is less than or equal to 300 ft (91 m), and
2. The building height is less than 4 times its effective length, L_{eff}.

The effective length, L_{eff}, in the direction under consideration shall be determined from the following equation:

$$L_{eff} = \frac{\sum_{i=1}^{n} h_i L_i}{\sum_{i=1}^{n} h_i} \qquad (26.9\text{-}1)$$

The summations are over the height of the building where

h_i is the height above grade of level i
L_i is the building length at level i parallel to the wind direction

26.9.3 Approximate Natural Frequency

The approximate lower-bound natural frequency (n_a), in Hertz, of concrete or structural steel buildings meeting the conditions of Section 26.9.2.1, is permitted to be determined from one of the following equations:

For structural steel moment-resisting-frame buildings:

$$n_a = 22.2/h^{0.8} \qquad (26.9\text{-}2)$$

For concrete moment-resisting frame buildings:

$$n_a = 43.5/h^{0.9} \qquad (26.9\text{-}3)$$

For structural steel and concrete buildings with other lateral-force-resisting systems:

$$n_a = 75/h \qquad (26.9\text{-}4)$$

For concrete or masonry shear wall buildings, it is also permitted to use

$$n_a = 385(C_w)^{0.5}/h \qquad (26.9\text{-}5)$$

where

$$C_w = \frac{100}{A_B}\sum_{i=1}^{n}\left(\frac{h}{h_i}\right)^2 \frac{A_i}{\left[1+0.83\left(\frac{h_i}{D_i}\right)^2\right]}$$

where

h = mean roof height (ft)
n = number of shear walls in the building effective in resisting lateral forces in the direction under consideration
A_B = base area of the structure (ft^2)
A_i = horizontal cross-section area of shear wall "i" (ft^2)
D_i = length of shear wall "i" (ft)
h_i = height of shear wall "i" (ft)

26.9.4 Rigid Buildings or Other Structures

For rigid buildings or other structures as defined in Section 26.2, the gust-effect factor shall be taken as 0.85 or calculated by the formula:

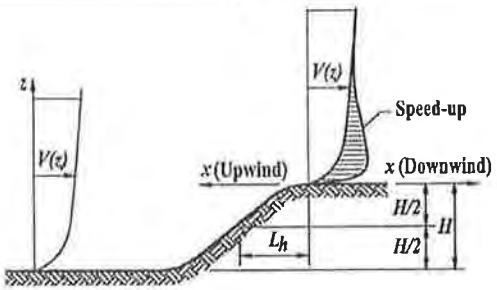
$$G = 0.925\left(\frac{1+1.7g_Q I_{\bar{z}} Q}{1+1.7g_v I_{\bar{z}}}\right) \qquad (26.9\text{-}6)$$

$$I_{\bar{z}} = c\left(\frac{33}{\bar{z}}\right)^{1/6} \qquad (26.9\text{-}7)$$

Attachment E, 2 of 3

Topographic Factor, K_{zt}

Figure 26.8-1



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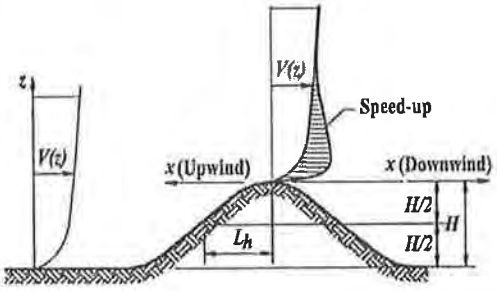

2-D RIDGE OR 3-D AXISYMMETRICAL HILL

Topographic Multipliers for Exposure C

H/L_h	K_1 Multiplier			x/L_h	K_2 Multiplier		z/L_h	K_3 Multiplier		
	2-D Ridge	2-D Escarp.	3-D Axisym. Hill		2-D Escarp.	All Other Cases		2-D Ridge	2-D Escarp.	3-D Axisym. Hill
0.20	0.29	0.17	0.21	0.00	1.00	1.00	0.00	1.00	1.00	1.00
0.25	0.36	0.21	0.26	0.50	0.88	0.67	0.10	0.74	0.78	0.67
0.30	0.43	0.26	0.32	1.00	0.75	0.33	0.20	0.55	0.61	0.45
0.35	0.51	0.30	0.37	1.50	0.63	0.00	0.30	0.41	0.47	0.30
0.40	0.58	0.34	0.42	2.00	0.50	0.00	0.40	0.30	0.37	0.20
0.45	0.65	0.38	0.47	2.50	0.38	0.00	0.50	0.22	0.29	0.14
0.50	0.72	0.43	0.53	3.00	0.25	0.00	0.60	0.17	0.22	0.09
				3.50	0.13	0.00	0.70	0.12	0.17	0.06
				4.00	0.00	0.00	0.80	0.09	0.14	0.04
							0.90	0.07	0.11	0.03
							1.00	0.05	0.08	0.02
							1.50	0.01	0.02	0.00
							2.00	0.00	0.00	0.00

Notes:

1. For values of H/L_h, x/L_h and z/L_h other than those shown, linear interpolation is permitted.
2. For $H/L_h > 0.5$, assume $H/L_h = 0.5$ for evaluating K_1 and substitute $2H$ for L_h for evaluating K_2 and K_3.
3. Multipliers are based on the assumption that wind approaches the hill or escarpment along the direction of maximum slope.
4. Notation:
   - H: Height of hill or escarpment relative to the upwind terrain, in feet (meters).
   - L_h: Distance upwind of crest to where the difference in ground elevation is half the height of hill or escarpment, in feet (meters).
   - K_1: Factor to account for shape of topographic feature and maximum speed-up effect.
   - K_2: Factor to account for reduction in speed-up with distance upwind or downwind of crest.
   - K_3: Factor to account for reduction in speed-up with height above local terrain.
   - x: Distance (upwind or downwind) from the crest to the building site, in feet (meters).
   - z: Height above ground surface at building site, in feet (meters).
   - μ: Horizontal attenuation factor.
   - γ: Height attenuation factor.

Attachment E, 3 of 3

TABLE 1609.6.2
NET PRESSURE COEFFICIENTS, C_{net} [a, b]

STRUCTURE OR PART THEREOF	DESCRIPTION		C_{net} FACTOR			
			Enclosed		Partially enclosed	
	Walls:		+ Internal pressure	- Internal pressure	+ Internal pressure	- Internal pressure
	Windward wall		0.43	0.73	0.11	1.05
	Leeward wall		-0.51	-0.21	-0.83	0.11
	Sidewall		-0.66	-0.35	-0.97	-0.04
	Parapet wall	Windward	1.28		1.28	
		Leeward	-0.85		-0.85	
	Roofs:		Enclosed		Partially enclosed	
	Wind perpendicular to ridge		+ Internal pressure	- Internal pressure	+ Internal pressure	- Internal pressure
	Leeward roof or flat roof		-0.66	-0.35	-0.97	-0.04
	Windward roof slopes:					
	Slope < 2:12 (10°)	Condition 1	-1.09	-0.79	-1.41	-0.47
		Condition 2	-0.28	0.02	-0.60	0.34
	Slope = 4:12 (18°)	Condition 1	-0.73	-0.42	-1.04	-0.11
		Condition 2	-0.05	0.25	-0.37	0.57
	Slope = 5:12 (23°)	Condition 1	-0.58	-0.28	-0.90	0.04
		Condition 2	0.03	0.34	-0.29	0.65
1. Main windforce-resisting frames and systems	Slope = 6:12 (27°)	Condition 1	-0.47	-0.16	-0.78	0.15
		Condition 2	0.06	0.37	-0.25	0.68
	Slope = 7:12 (30°)	Condition 1	-0.37	-0.06	-0.68	0.25
		Condition 2	0.07	0.37	-0.25	0.69
	Slope = 9:12 (37°)	Condition 1	-0.27	0.04	-0.58	0.35
		Condition 2	0.14	0.44	-0.18	0.76
	Slope = 12:12 (45°)		0.14	0.44	-0.18	0.76
	Wind parallel to ridge and flat roofs		-1.09	-0.79	-1.41	-0.47
	Nonbuilding Structures: Chimneys, Tanks and Similar Structures:					
			h/D			
			1	7	25	
	Square (Wind normal to face)		0.99	1.07	1.53	
	Square (Wind on diagonal)		0.77	0.84	1.15	
	Hexagonal or Octagonal		0.81	0.97	1.13	
	Round		0.65	0.81	0.97	
	Open signs and lattice frameworks		Ratio of solid to gross area			
			< 0.1	0.1 to 0.29	0.3 to 0.7	
	Flat		1.45	1.30	1.16	
	Round		0.87	0.94	1.08	

(continued)

Attachment F

EXCEPTIONS:

a. Where the inclusion of storage loads adds no more than 5% to the effective seismic weight at that level, it need not be included in the effective seismic weight.
b. Floor live load in public garages and open parking structures need not be included.

2. Where provision for partitions is required by Section 4.2.2 in the floor load design, the actual partition weight or a minimum weight of 10 psf (0.48 kN/m^2) of floor area, whichever is greater.
3. Total operating weight of permanent equipment.
4. Where the flat roof snow load, P_f, exceeds 30 psf (1.44 kN/m^2), 20 percent of the uniform design snow load, regardless of actual roof slope.
5. Weight of landscaping and other materials at roof gardens and similar areas.

12.7.3 Structural Modeling

A mathematical model of the structure shall be constructed for the purpose of determining member forces and structure displacements resulting from applied loads and any imposed displacements or P-delta effects. The model shall include the stiffness and strength of elements that are significant to the distribution of forces and deformations in the structure and represent the spatial distribution of mass and stiffness throughout the structure.

In addition, the model shall comply with the following:

a. Stiffness properties of concrete and masonry elements shall consider the effects of cracked sections.
b. For steel moment frame systems, the contribution of panel zone deformations to overall story drift shall be included.

Structures that have horizontal structural irregularity Type 1a, 1b, 4, or 5 of Table 12.3-1 shall be analyzed using a 3-D representation. Where a 3-D model is used, a minimum of three dynamic degrees of freedom consisting of translation in two orthogonal plan directions and rotation about the vertical axis shall be included at each level of the structure. Where the diaphragms have not been classified as rigid or flexible in accordance with Section 12.3.1, the model shall include representation of the diaphragm's stiffness characteristics and such additional dynamic degrees of freedom as are required to account for the participation of the diaphragm in the structure's dynamic response.

EXCEPTION: Analysis using a 3-D representation is not required for structures with flexible diaphragms that have Type 4 horizontal structural irregularities.

12.7.4 Interaction Effects

Moment-resisting frames that are enclosed or adjoined by elements that are more rigid and not considered to be part of the seismic force-resisting system shall be designed so that the action or failure of those elements will not impair the vertical load and seismic force-resisting capability of the frame. The design shall provide for the effect of these rigid elements on the structural system at structural deformations corresponding to the design story drift (Δ) as determined in Section 12.8.6. In addition, the effects of these elements shall be considered where determining whether a structure has one or more of the irregularities defined in Section 12.3.2.

12.8 EQUIVALENT LATERAL FORCE PROCEDURE

12.8.1 Seismic Base Shear

The seismic base shear, V, in a given direction shall be determined in accordance with the following equation:

$$V = C_s W \qquad (12.8\text{-}1)$$

where

C_s = the seismic response coefficient determined in accordance with Section 12.8.1.1
W = the effective seismic weight per Section 12.7.2

12.8.1.1 Calculation of Seismic Response Coefficient

The seismic response coefficient, C_s, shall be determined in accordance with Eq. 12.8-2.

$$C_s = \frac{S_{DS}}{\left(\frac{R}{I_e}\right)} \qquad (12.8\text{-}2)$$

where

S_{DS} = the design spectral response acceleration parameter in the short period range as determined from Section 11.4.4 or 11.4.7
R = the response modification factor in Table 12.2-1
I_e = the importance factor determined in accordance with Section 11.5.1

The value of C_s computed in accordance with Eq. 12.8-2 need not exceed the following:

$$C_s = \frac{S_{D1}}{T\left(\frac{R}{I_e}\right)} \quad \text{for} \quad T \le T_L \qquad (12.8\text{-}3)$$

$$C_s = \frac{S_{D1}T_L}{T^2\left(\frac{R}{I_e}\right)} \quad \text{for} \quad T > T_L \qquad (12.8\text{-}4)$$

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15.3.2 Greater Than or Equal to 25 Percent Combined Weight Condition

For the condition where the weight of the nonbuilding structure is equal to or greater than 25 percent of the combined effective seismic weights of the nonbuilding structure and supporting structure, an analysis combining the structural characteristics of both the nonbuilding structure and the supporting structures shall be performed to determine the seismic design forces as follows:

1. Where the fundamental period, T, of the nonbuilding structure is less than 0.06 s, the nonbuilding structure shall be considered a rigid element with appropriate distribution of its effective seismic weight. The supporting structure shall be designed in accordance with the requirements of Chapter 12 or Section 15.5 as appropriate, and the R value of the combined system is permitted to be taken as the R value of the supporting structural system. The nonbuilding structure and attachments shall be designed for the forces using the procedures of Chapter 13 where the value of R_p shall be taken as equal to the R value of the nonbuilding structure as set forth in Table 15.4-2, and a_p shall be taken as 1.0.
2. Where the fundamental period, T, of the nonbuilding structure is 0.06 s or greater, the nonbuilding structure and supporting structure shall be modeled together in a combined model with appropriate stiffness and effective seismic weight distributions. The combined structure shall be designed in accordance with Section 15.5 with the R value of the combined system taken as the lesser R value of the nonbuilding structure or the supporting structure. The nonbuilding structure and attachments shall be designed for the forces determined for the nonbuilding structure in the combined analysis.

15.3.3 Architectural, Mechanical, and Electrical Components

Architectural, mechanical, and electrical components supported by nonbuilding structures shall be designed in accordance with Chapter 13 of this standard.

15.4 STRUCTURAL DESIGN REQUIREMENTS

15.4.1 Design Basis

Nonbuilding structures having specific seismic design criteria established in reference documents shall be designed using the standards as amended herein. Where reference documents are not cited herein, nonbuilding structures shall be designed in compliance with Sections 15.5 and 15.6 to resist minimum seismic lateral forces that are not less than the requirements of Section 12.8 with the following additions and exceptions:

1. The seismic force-resisting system shall be selected as follows:
   a. For nonbuilding structures similar to buildings, a system shall be selected from among the types indicated in Table 12.2-1 or Table 15.4-1 subject to the system limitations and limits on structural height, h_n, based on the seismic design category indicated in the table. The appropriate values of R, Ω_0, and C_d indicated in the selected table shall be used in determining the base shear, element design forces, and design story drift as indicated in this standard. Design and detailing requirements shall comply with the sections referenced in the selected table.
   b. For nonbuilding structures not similar to buildings, a system shall be selected from among the types indicated in Table 15.4-2 subject to the system limitations and limits on structural height, h_n, based on seismic design category indicated in the table. The appropriate values of R, Ω_o, and C_d indicated in Table 15.4-2 shall be used in determining the base shear, element design forces, and design story drift as indicated in this standard. Design and detailing requirements shall comply with the sections referenced in Table 15.4-2.
   c. Where neither Table 15.4-1 nor Table 15.4-2 contains an appropriate entry, applicable strength and other design criteria shall be obtained from a reference document that is applicable to the specific type of nonbuilding structure. Design and detailing requirements shall comply with the reference document.
2. For nonbuilding systems that have an R value provided in Table 15.4-2, the minimum specified value in Eq. 12.8-5 shall be replaced by

$$C_s = 0.044 S_{DS} I_e \qquad (15.4\text{-}1)$$

The value of C_s shall not be taken as less than 0.03.

And for nonbuilding structures located where $S_1 \geq 0.6g$, the minimum specified value in Eq. 12.8-6 shall be replaced by

$$C_s = 0.8 S_1/(R/I_e) \qquad (15.4\text{-}2)$$

EXCEPTION: Tanks and vessels that are designed to AWWA D100, AWWA D103, API

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Table 15.4-2 (*Continued*)

Nonbuilding Structure Type	Detailing Requirements[c]	R	Ω_0	C_d	Structural System and Structural Height, h_n, Limits (ft)[a,d] A & B	C	D	E	F
All steel and reinforced concrete distributed mass cantilever structures not otherwise covered herein including stacks, chimneys, silos, skirt-supported vertical vessels. Single pedestal or skirt supported	15.6.2								
Welded steel	15.7.10	2	2[b]	2	NL	NL	NL	NL	NL
Welded steel with special detailing[e]	15.7.10 & 15.7.10.5 a and b	3	2[b]	2	NL	NL	NL	NL	NL
Prestressed or reinforced concrete	15.7.10	2	2[b]	2	NL	NL	NL	NL	NL
Prestressed or reinforced concrete with special detailing	15.7.10 and 14.2.3.6	3	2[b]	2	NL	NL	NL	NL	NL
Trussed towers (freestanding or guyed), guyed stacks, and chimneys	15.6.2	3	2	2.5	NL	NL	NL	NL	NL
Cooling towers									
Concrete or steel		3.5	1.75	3	NL	NL	NL	NL	NL
Wood frames		3.5	3	3	NL	NL	NL	50	50
Telecommunication towers	15.6.6								
Truss: Steel		3	1.5	3	NL	NL	NL	NL	NL
Pole: Steel		1.5	1.5	1.5	NL	NL	NL	NL	NL
Wood		1.5	1.5	1.5	NL	NL	NL	NL	NL
Concrete		1.5	1.5	1.5	NL	NL	NL	NL	NL
Frame: Steel		3	1.5	1.5	NL	NL	NL	NL	NL
Wood		1.5	1.5	1.5	NL	NL	NL	NL	NL
Concrete		2	1.5	1.5	NL	NL	NL	NL	NL
Amusement structures and monuments	15.6.3	2	2	2	NL	NL	NL	NL	NL
Inverted pendulum type structures (except elevated tanks, vessels, bins, and hoppers)	12.2.5.3	2	2	2	NL	NL	NL	NL	NL
Signs and billboards		3.0	1.75	3	NL	NL	NL	NL	NL
All other self-supporting structures, tanks, or vessels not covered above or by reference standards that are not similar to buildings		1.25	2	2.5	NL	NL	50	50	50

[a]NL = no limit and NP = not permitted.
[b]See Section 15.7.3a for the application of the overstrength factors, Ω_0, for tanks and vessels.
[c]If a section is not indicated in the Detailing Requirements column, no specific detailing requirements apply.
[d]For the purpose of height limit determination, the height of the structure shall be taken as the height to the top of the structural frame making up the primary seismic force-resisting system.
[e]Sections 15.7.10.5a and 15.7.10.5b shall be applied for any Risk Category.
[f]Detailed with an essentially complete vertical load carrying frame.

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650 Appendix E, and API 620 Appendix L as modified by this standard, and stacks and chimneys that are designed to ACI 307 as modified by this standard, shall be subject to the larger of the minimum base shear value defined by the reference document or the value determined by replacing Eq. 12.8-5 with the following:

$$C_s = 0.044 S_{DS} I_e \qquad (15.4\text{-}3)$$

The value of C_s shall not be taken as less than 0.01.

And for nonbuilding structures located where $S_1 \geq 0.6g$, the minimum specified value in Eq. 12.8-6 shall be replaced by

$$C_s = 0.5 S_1/(R/I_e) \qquad (15.4\text{-}4)$$

Minimum base shear requirements need not apply to the convective (sloshing) component of liquid in tanks.

3. The importance factor, I_e, shall be as set forth in Section 15.4.1.1.
4. The vertical distribution of the lateral seismic forces in nonbuilding structures covered by this section shall be determined:
   a. Using the requirements of Section 12.8.3, or
   b. Using the procedures of Section 12.9, or
   c. In accordance with the reference document applicable to the specific nonbuilding structure.
5. For nonbuilding structural systems containing liquids, gases, and granular solids supported at the base as defined in Section 15.7.1, the minimum seismic design force shall not be less than that required by the reference document for the specific system.
6. Where a reference document provides a basis for the earthquake resistant design of a particular type of nonbuilding structure covered by Chapter 15, such a standard shall not be used unless the following limitations are met:
   a. The seismic ground accelerations, and seismic coefficients, shall be in conformance with the requirements of Section 11.4.
   b. The values for total lateral force and total base overturning moment used in design shall not be less than 80 percent of the base shear value and overturning moment, each adjusted for the effects of soil–structure interaction that is obtained using this standard.
7. The base shear is permitted to be reduced in accordance with Section 19.2.1 to account for the effects of soil–structure interaction. In no case shall the reduced base shear be less than $0.7V$.
8. Unless otherwise noted in Chapter 15, the effects on the nonbuilding structure due to gravity loads and seismic forces shall be combined in accordance with the factored load combinations as presented in Section 2.3.
9. Where specifically required by Chapter 15, the design seismic force on nonbuilding structures shall be as defined in Section 12.4.3.

15.4.1.1 Importance Factor

The importance factor, I_e, and risk category for nonbuilding structures are based on the relative hazard of the contents and the function. The value of I_e shall be the largest value determined by the following:

a. Applicable reference document listed in Chapter 23.
b. The largest value as selected from Table 1.5-2.
c. As specified elsewhere in Chapter 15.

15.4.2 Rigid Nonbuilding Structures

Nonbuilding structures that have a fundamental period, T, less than 0.06 s, including their anchorages, shall be designed for the lateral force obtained from the following:

$$V = 0.30 S_{DS} W I_e \qquad (15.4\text{-}5)$$

where

V = the total design lateral seismic base shear force applied to a nonbuilding structure
S_{DS} = the site design response acceleration as determined from Section 11.4.4
W = nonbuilding structure operating weight
I_e = the importance factor determined in accordance with Section 15.4.1.1

The force shall be distributed with height in accordance with Section 12.8.3.

15.4.3 Loads

The seismic effective weight W for nonbuilding structures shall include the dead load and other loads as defined for structures in Section 12.7.2. For purposes of calculating design seismic forces in nonbuilding structures, W also shall include all normal operating contents for items such as tanks, vessels, bins, hoppers, and the contents of piping. W shall include snow and ice loads where these loads constitute 25 percent or more of W or where required by the authority having jurisdiction based on local environmental characteristics.

15.4.4 Fundamental Period

The fundamental period of the nonbuilding structure shall be determined using the structural

C_s shall not be less than

$$C_s = 0.044 S_{DS} I_e \geq 0.01 \qquad (12.8\text{-}5)$$

In addition, for structures located where S_1 is equal to or greater than $0.6g$, C_s shall not be less than

$$C_s = 0.5 S_1 / (R/I_e) \qquad (12.8\text{-}6)$$

where I_e and R are as defined in Section 12.8.1.1 and

S_{D1} = the design spectral response acceleration parameter at a period of 1.0 s, as determined from Section 11.4.4 or 11.4.7

T = the fundamental period of the structure(s) determined in Section 12.8.2

T_L = long-period transition period(s) determined in Section 11.4.5

S_1 = the mapped maximum considered earthquake spectral response acceleration parameter determined in accordance with Section 11.4.1 or 11.4.7

12.8.1.2 Soil Structure Interaction Reduction

A soil structure interaction reduction is permitted where determined using Chapter 19 or other generally accepted procedures approved by the authority having jurisdiction.

12.8.1.3 Maximum S_s *Value in Determination of* C_s

For regular structures five stories or less above the base as defined in Section 11.2 and with a period, T, of 0.5 s or less, C_s is permitted to be calculated using a value of 1.5 for S_S.

12.8.2 Period Determination

The fundamental period of the structure, T, in the direction under consideration shall be established using the structural properties and deformational characteristics of the resisting elements in a properly substantiated analysis. The fundamental period, T, shall not exceed the product of the coefficient for upper limit on calculated period (C_u) from Table 12.8-1 and the approximate fundamental period, T_a, determined in accordance with Section 12.8.2.1. As an alternative to performing an analysis to determine the fundamental period, T, it is permitted to use the approximate building period, T_a, calculated in accordance with Section 12.8.2.1, directly.

12.8.2.1 Approximate Fundamental Period

The approximate fundamental period (T_a), in s, shall be determined from the following equation:

$$T_a = C_t h_n^x \qquad (12.8\text{-}7)$$

where h_n is the structural height as defined in Section 11.2 and the coefficients C_t and x are determined from Table 12.8-2.

Alternatively, it is permitted to determine the approximate fundamental period (T_a), in s, from the following equation for structures not exceeding 12 stories above the base as defined in Section 11.2 where the seismic force-resisting system consists

Table 12.8-1 Coefficient for Upper Limit on Calculated Period

Design Spectral Response Acceleration Parameter at 1 s, S_{D1}	Coefficient C_u
≥ 0.4	1.4
0.3	1.4
0.2	1.5
0.15	1.6
≤ 0.1	1.7

Table 12.8-2 Values of Approximate Period Parameters C_t and x

Structure Type	C_t	x
Moment-resisting frame systems in which the frames resist 100% of the required seismic force and are not enclosed or adjoined by components that are more rigid and will prevent the frames from deflecting where subjected to seismic forces:		
Steel moment-resisting frames	0.028 (0.0724)[a]	0.8
Concrete moment-resisting frames	0.016 (0.0466)[a]	0.9
Steel eccentrically braced frames in accordance with Table 12.2-1 lines B1 or D1	0.03 (0.0731)[a]	0.75
Steel buckling-restrained braced frames	0.03 (0.0731)[a]	0.75
All other structural systems	0.02 (0.0488)[a]	0.75

[a]Metric equivalents are shown in parentheses.

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entirely of concrete or steel moment resisting frames and the average story height is at least 10 ft (3 m):

$$T_a = 0.1N \qquad (12.8\text{-}8)$$

where N = number of stories above the base.

The approximate fundamental period, T_a, in s for masonry or concrete shear wall structures is permitted to be determined from Eq. 12.8-9 as follows:

$$T_a = \frac{0.0019}{\sqrt{C_w}} h_n \qquad (12.8\text{-}9)$$

where C_w is calculated from Eq. 12.8-10 as follows:

$$C_w = \frac{100}{A_B} \sum_{i=1}^{x} \left(\frac{h_n}{h_i} \right)^2 \frac{A_i}{\left[1 + 0.83 \left(\frac{h_i}{D_i} \right)^2 \right]} \qquad (12.8\text{-}10)$$

where

A_B = area of base of structure, ft^2
A_i = web area of shear wall i in ft^2
D_i = length of shear wall i in ft
h_i = height of shear wall i in ft
x = number of shear walls in the building effective in resisting lateral forces in the direction under consideration

12.8.3 Vertical Distribution of Seismic Forces

The lateral seismic force (F_x) (kip or kN) induced at any level shall be determined from the following equations:

$$F_x = C_{vx} V \qquad (12.8\text{-}11)$$

and

$$C_{vx} = \frac{w_x h_x^k}{\sum_{i=1}^{n} w_i h_i^k} \qquad (12.8\text{-}12)$$

where

C_{vx} = vertical distribution factor
V = total design lateral force or shear at the base of the structure (kip or kN)
w_i and w_x = the portion of the total effective seismic weight of the structure (W) located or assigned to Level i or x
h_i and h_x = the height (ft or m) from the base to Level i or x
k = an exponent related to the structure period as follows:
for structures having a period of 0.5 s or less, k = 1
for structures having a period of 2.5 s or more, k = 2
for structures having a period between 0.5 and 2.5 s, k shall be 2 or shall be determined by linear interpolation between 1 and 2

12.8.4 Horizontal Distribution of Forces

The seismic design story shear in any story (V_x) (kip or kN) shall be determined from the following equation:

$$V_x = \sum_{i=x}^{n} F_i \qquad (12.8\text{-}13)$$

where F_i = the portion of the seismic base shear (V) (kip or kN) induced at Level i.

The seismic design story shear (V_x) (kip or kN) shall be distributed to the various vertical elements of the seismic force-resisting system in the story under consideration based on the relative lateral stiffness of the vertical resisting elements and the diaphragm.

12.8.4.1 Inherent Torsion

For diaphragms that are not flexible, the distribution of lateral forces at each level shall consider the effect of the inherent torsional moment, M_t, resulting from eccentricity between the locations of the center of mass and the center of rigidity. For flexible diaphragms, the distribution of forces to the vertical elements shall account for the position and distribution of the masses supported.

12.8.4.2 Accidental Torsion

Where diaphragms are not flexible, the design shall include the inherent torsional moment (M_t) resulting from the location of the structure masses plus the accidental torsional moments (M_{ta}) caused by assumed displacement of the center of mass each way from its actual location by a distance equal to 5 percent of the dimension of the structure perpendicular to the direction of the applied forces.

Where earthquake forces are applied concurrently in two orthogonal directions, the required 5 percent displacement of the center of mass need not be applied in both of the orthogonal directions at the same time, but shall be applied in the direction that produces the greater effect.

12.8.4.3 Amplification of Accidental Torsional Moment

Structures assigned to Seismic Design Category C, D, E, or F, where Type 1a or 1b torsional irregularity exists as defined in Table 12.3-1 shall have the effects accounted for by multiplying M_{ta} at each level by a torsional amplification factor (A_x) as illustrated in

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for each beam, girder, or truss either directly to its supporting elements or to slabs designed to act as diaphragms. Where the connection is through a diaphragm, the member's supporting element shall also be connected to the diaphragm. The connection shall have the strength to resist a force of 5 percent of the unfactored dead load plus live load reaction imposed by the supported member on the supporting member.

1.4.5 Anchorage of Structural Walls

Walls that provide vertical load bearing or lateral shear resistance for a portion of the structure shall be anchored to the roof and all floors and members that provide lateral support for the wall or that are supported by the wall. The anchorage shall provide a direct connection between the walls and the roof or floor construction. The connections shall be capable of resisting a strength level horizontal force perpendicular to the plane of the wall equal to 0.2 times the weight of the wall tributary to the connection, but not less than 5 psf (0.24 kN/m^2).

1.4.6 Extraordinary Loads and Events

When considered, design for resistance to extraordinary loads and events shall be in accordance with the procedures of Section 2.5.

1.5 CLASSIFICATION OF BUILDINGS AND OTHER STRUCTURES

1.5.1 Risk Categorization

Buildings and other structures shall be classified, based on the risk to human life, health, and welfare associated with their damage or failure by nature of their occupancy or use, according to Table 1.5-1 for the purposes of applying flood, wind, snow, earthquake, and ice provisions. Each building or other structure shall be assigned to the highest applicable risk category or categories. Minimum design loads for structures shall incorporate the applicable importance factors given in Table 1.5-2, as required by other sections of this Standard. Assignment of a building or other structure to multiple risk categories based on the type of load condition being evaluated (e.g., snow or seismic) shall be permitted.

When the building code or other referenced standard specifies an Occupancy Category, the Risk Category shall not be taken as lower than the Occupancy Category specified therein.

1.5.2 Multiple Risk Categories

Where buildings or other structures are divided into portions with independent structural systems, the classification for each portion shall be permitted to be determined independently. Where building systems, such as required egress, HVAC, or electrical power, for a portion with a higher risk category pass through or depend on other portions of the building or other structure having a lower risk category, those portions shall be assigned to the higher risk category.

1.5.3 Toxic, Highly Toxic, and Explosive Substances

Buildings and other structures containing toxic, highly toxic, or explosive substances are permitted to be classified as Risk Category II structures if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as part of an overall risk management plan (RMP) that a release of the toxic, highly toxic, or explosive substances is not sufficient to pose a threat to the public.

To qualify for this reduced classification, the owner or operator of the buildings or other structures

Table 1.5-2 Importance Factors by Risk Category of Buildings and Other Structures for Snow, Ice, and Earthquake Loads[a]

Risk Category from Table 1.5-1	Snow Importance Factor, I_s	Ice Importance Factor—Thickness, I_i	Ice Importance Factor—Wind, I_w	Seismic Importance Factor, I_e
I	0.80	0.80	1.00	1.00
II	1.00	1.00	1.00	1.00
III	1.10	1.25	1.00	1.25
IV	1.20	1.25	1.00	1.50

[a]The component importance factor, I_p, applicable to earthquake loads, is not included in this table because it is dependent on the importance of the individual component rather than that of the building as a whole, or its occupancy. Refer to Section 13.1.3.

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USGS Design Maps Summary Report

User-Specified Input

Report Title Gardena Sumps
Tue November 12, 2013 18:03:47 UTC

Building Code Reference Document ASCE 7-10 Standard
(which utilizes USGS hazard data available in 2008)

Site Coordinates 33.88835°N, 118.30896°W

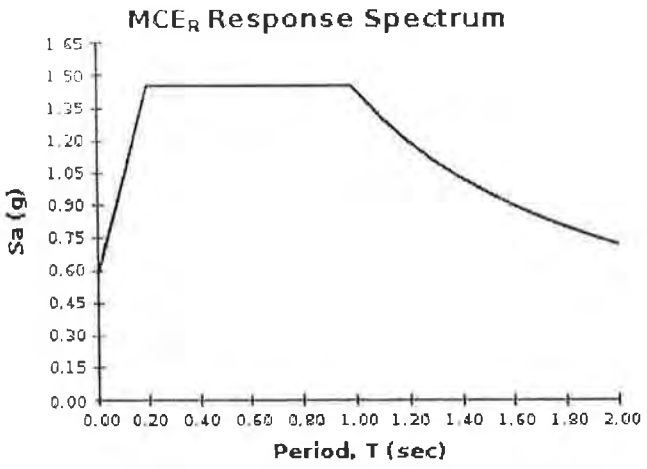
Site Soil Classification Site Class E – "Soft Clay Soil"

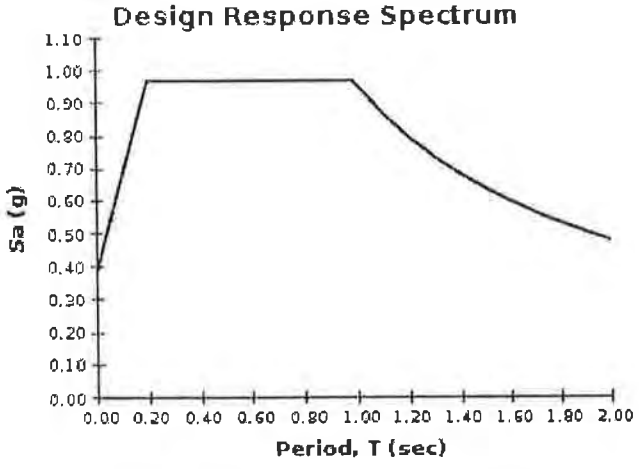
Risk Category I/II/III

USGS-Provided Output

S_S =	1.616 g	S_{MS} =	1.454 g	S_{DS} =	0.969 g
S_1 =	0.597 g	S_{M1} =	1.433 g	S_{D1} =	0.956 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

Attachment H

$$q_{ult} = \tfrac{1}{2}\rho_b g B N_\gamma + \rho_b g D_f N_q \quad \text{[SI]} \quad 36.14(a)$$

$$q_{ult} = \tfrac{1}{2}\gamma_b B N_\gamma + \gamma_b D_f N_q \quad \text{[U.S.]} \quad 36.14(b)$$

(c) When the water table is between the base of the footing and the surface, linear interpolation is used between cases (a) and (b). This is equivalent to using the submerged density in the first term as in (a) above, and calculating the third term in Eq. 36.1 as

$$\left(\rho_d g D_w + \left(\rho_d - 1000\ \frac{\text{kg}}{\text{m}^3}\right) g(D_f - D_w)\right) N_q = \left(\rho_d g D_f + \left(1000\ \frac{\text{kg}}{\text{m}^3}\right) g(D_w - D_f)\right) N_q \quad \text{[SI]} \quad 36.15(a)$$

$$\left(\gamma_d D_w + \left(\gamma_d - 62.4\ \frac{\text{lbf}}{\text{ft}^3}\right)(D_f - D_w)\right) N_q = \left(\gamma_d D_f + \left(62.4\ \frac{\text{lbf}}{\text{ft}^3}\right)(D_w - D_f)\right) N_q \quad \text{[U.S.]} \quad 36.15(b)$$

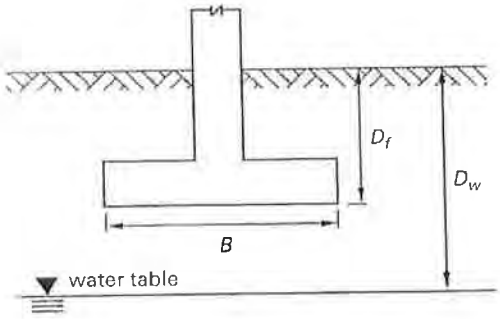
General Principle 3: For sand, if the water table depth, D_w, is greater than $D_f + B$ (i.e., more than a distance B below the base of the footing), the bearing capacity is not affected. Calculate the bearing capacity from Eq. 36.1 as if there was no water table.

$$q_{ult} = \tfrac{1}{2}\rho_d g B N_\gamma + \rho_d g D_f N_q \quad \text{[SI]} \quad 36.16(a)$$

$$q_{ult} = \tfrac{1}{2}\gamma_d B N_\gamma + \gamma_d D_f N_q \quad \text{[U.S.]} \quad 36.16(b)$$

General Principle 4: For sand, if the water table depth, D_w, is between D_f and $D_f + B$, the bearing capacity is calculated using the drained density in the $D_f N_q$ term, and a weighted average of the drained and submerged densities in the BN_γ term.

Figure 36.5 *Water Table Beneath a Footing*



10. ECCENTRIC LOADS ON RECTANGULAR FOOTINGS

If a rectangular footing carries a moment in addition to its vertical load, an eccentric loading situation is created. Under these conditions, the footing bearing capacity should be analyzed assuming an area in which the size is reduced by twice the eccentricity.

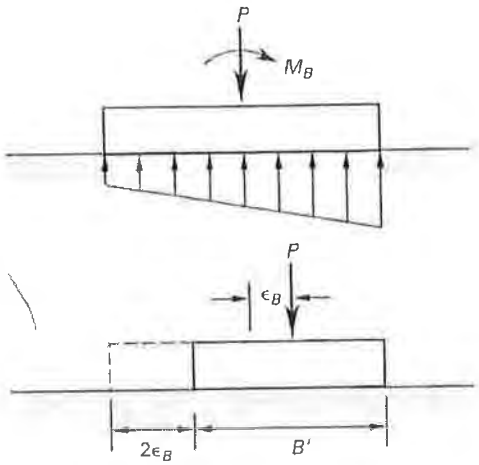
$$e_B = \frac{M_B}{P};\ e_L = \frac{M_L}{P} \quad 36.17$$

$$L' = L - 2e_L;\ B' = B - 2e_B \quad 36.18$$

$$A' = L'B' \quad 36.19$$

This area reduction places the equivalent force at the centroid of the reduced area. The equivalent width B' should be used in Eq. 36.1, and both B' and L' should be used in the ratio B'/L' used to determine shape factors. The footing bearing capacity is reduced in two ways. First, a smaller B in Eq. 36.1 results in a smaller q_{ult} and q_a. Second, a smaller q_a results in a smaller allowable load (i.e., $P = q_a B' L'$).

Figure 36.6 *Footing with Overturning Moment*



Although the eccentricity is independent of the footing dimensions, a trial-and-error solution may be necessary when designing footings. Trial and error is not required when analyzing a rectangular footing of known dimensions.

Assuming $M_L = 0$ and $e_B = e$ and disregarding the concrete and overburden weights, the actual soil pressure distribution is given by Eq. 36.20. B' and L' should not be used in Eq. 36.20 because these variables place the load at the centroid of the reduced area, assuming a uniform pressure distribution.

$$p_{max},\ p_{min} = \left(\frac{P}{BL}\right)\left(1 \pm \frac{6e}{B}\right) \quad 36.20$$

If the eccentricity, e, is sufficiently large, a negative soil pressure will result. Since soil cannot carry a tensile stress, such stresses are neglected. This results in a reduced area to carry the load.

If the resultant force is within the middle third of the footing, the contact pressures will be distributed over the entire footing. That is, the maximum eccentricity without incurring a reduction in footing contact area will be $B/6$.

Attachment I

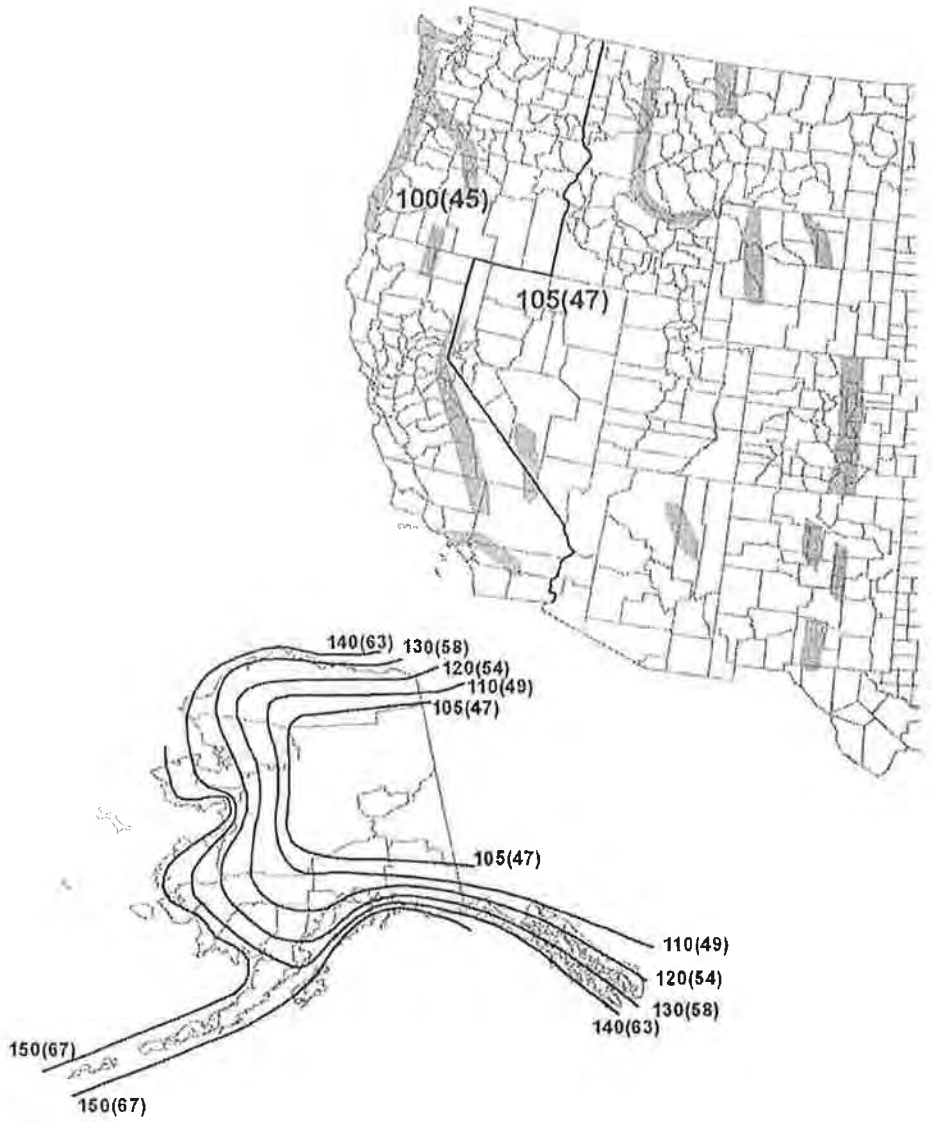


Figure 26.5-1C Basic Wind Speeds for Risk Category I Buildings and Other Structures.

Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.
2. Linear interpolation between contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speeds correspond to approximately a 15% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00333, MRI = 300 Years).

Attachment J

Figure 36.3 Spread Footing Dimensions

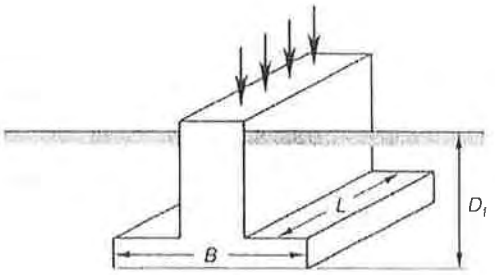


Table 36.4 N_c Bearing Capacity Factor Multipliers for Various Values of B/L

B/L	multiplier
1 (square)	1.25
0.5	1.12
0.2	1.05
0.0	1.00
1 (circular)	1.20

Table 36.5 N_γ Multipliers for Various Values of B/L

B/L	multiplier
1 (square)	0.85
0.5	0.90
0.2	0.95
0.0	1.00
1 (circular)	0.70

Several researchers have recommended corrections to N_c to account for footing depth. (Corrections to N_q for footing depth have also been suggested. No corrections to N_γ for footing depth have been suggested.) There is considerable variation in the method of calculating this correction, if it is used at all. A multiplicative correction factor, d_c, which is used most often, has the form

$$d_c = 1 + \frac{KD_f}{B} \qquad 36.2$$

K is a constant for which values of 0.2 and 0.4 have been proposed. The depth factor correction is applied to N_c along with the shape factor correction in Eq. 36.1.

Once the ultimate bearing capacity is determined, it is corrected by the *overburden*, giving the *net bearing capacity*. This is the net pressure the soil can support beyond the pressure applied by the existing overburden.

$$q_{\text{net}} = q_{\text{ult}} - \rho g D_f \quad \text{[SI]} \qquad 36.3(a)$$
$$q_{\text{net}} = q_{\text{ult}} - \gamma D_f \quad \text{[U.S.]} \qquad 36.3(b)$$

The *allowable bearing capacity* is determined by dividing the net capacity by a factor of safety. The safety factor accounts for the uncertainties in evaluating soil properties and anticipated loads, and also on the amount of risk involved in building the structure. A safety factor between 2 and 3 (based on q_{net}) is common for average conditions. Smaller safety factors are sometimes used for transient load conditions such as from wind and seismic forces.

$$q_a = \frac{q_{\text{net}}}{F} \qquad 36.4$$

6. BEARING CAPACITY OF CLAY

Clay is often soft and fairly impermeable. When loads are first applied to saturated clay, the pore pressure increases. For a short time, this pore pressure does not dissipate, and the angle of internal friction should be taken as $\phi = 0°$. This is known as the $\phi = 0°$ case or the *undrained case*, which is the critical condition for saturated clays. As discussed in Chap. 35, the undrained shear strength of clays is equal to the cohesion, which is one-half of the unconfined compressive strength.

$$S_u = c = \frac{S_{\text{uc}}}{2} \qquad 36.5$$

If $\phi = 0°$, then $N_\gamma = 0$ and $N_q = 1$. If there is no surface surcharge (i.e., $p_q = 0$), the ultimate bearing capacity is given by Eq. 36.6.

$$q_{\text{ult}} = cN_c + \rho g D_f \quad \text{[SI]} \qquad 36.6(a)$$
$$q_{\text{ult}} = cN_c + \gamma D_f \quad \text{[U.S.]} \qquad 36.6(b)$$
$$q_{\text{net}} = q_{\text{ult}} - \rho g D_f = cN_c \quad \text{[SI]} \qquad 36.7(a)$$
$$q_{\text{net}} = q_{\text{ult}} - \gamma D_f = cN_c \quad \text{[U.S.]} \qquad 36.7(b)$$

The allowable clay loading is based on a factor of safety, which is typically taken as 3 for clay.

$$q_a = \frac{q_{\text{net}}}{F} \qquad 36.8$$

From Eqs. 36.6 and 36.7, it is evident that the cohesion term dominates the bearing capacity in cohesive soil.

Example 36.1

An individual square column footing carries an 83,800 lbf (370 kN) dead load and a 75,400 lbf (335 kN) live load. The unconfined compressive strength of the supporting clay is 0.84 tons/ft^2 (80 kPa), and its specific weight is $\gamma = 115$ lbf/ft^3 ($\rho = 1840$ kg/m^3). $\phi = 0$. The footing is covered by a 6.0 in (0.15 m) thick basement slab whose upper surface is flush with the original grade. The footing thickness is initially unknown. Neglect depth correction factors. Do not design the structural steel. Specify the footing size and thickness.

Attachment K, 1 of 2

5. GENERAL BEARING CAPACITY EQUATION

With *general shear failures*, the soil resists an increased load until a sudden failure occurs. *Local shear failure* occurs in looser, more compressible soils and at high bearing pressures. The boundaries between these types of behavior are not distinct, and the methods of calculating general shear failure are commonly used for most soil conditions.

The *ultimate* (or *gross*) *bearing capacity* for a shallow wall footing is given by Eq. 36.1, which is known as the *Terzaghi-Meyerhof equation*. The equation is valid for both sandy and clayey soils. p_q is an additional surface surcharge, if any.

$$q_{ult} = \tfrac{1}{2}\rho g B N_\gamma + cN_c + (p_q + \rho g D_f)N_q \quad \text{[SI]} \quad 36.1(a)$$

$$q_{ult} = \tfrac{1}{2}\gamma B N_\gamma + cN_c + (p_q + \gamma D_f)N_q \quad \text{[U.S.]} \quad 36.1(b)$$

Various researchers have made improvements on the theory supporting this equation, leading to somewhat different terms and sophistication in evaluating N_γ, N_c, and N_q. The approaches differ in the assumptions made of the shape of the failure zone beneath the footing. However, the general form of the equation is the same in most cases.

Figure 36.2 and Table 36.2 can be used to evaluate the *capacity factors* N_γ, N_c, and N_q in Eq. 36.1. Alternatively, Table 36.3 can be used. The bearing capacity factors in Table 36.2 are based on Terzaghi's 1943 studies. The values in Table 36.3 are based on Meyerhof's 1955 studies and others, and have been widely used. Other values are also in use.

Figure 36.2 *Terzaghi Bearing Capacity Factors*

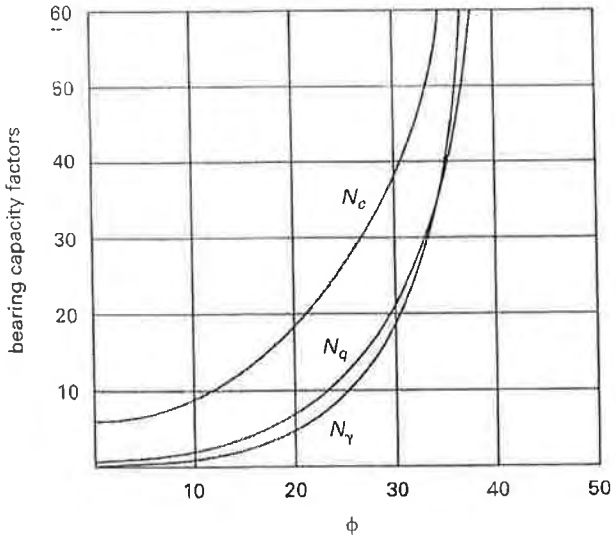


Table 36.2 *Terzaghi Bearing Capacity Factors for General Shear*[a]

ϕ	N_c	N_q	N_γ
0	5.7	1.0	0.0
5	7.3	1.6	0.5
10	9.6	2.7	1.2
15	12.9	4.4	2.5
20	17.7	7.4	5.0
25	25.1	12.7	9.7
30	37.2	22.5	19.7
34	52.6	36.5	35.0
35	57.8	41.4	42.4
40	95.7	81.3	100.4
45	172.3	173.3	297.5
48	258.3	287.9	780.1
50	347.5	415.1	1153.2

[a] Curvilinear interpolation may be used. Do not use linear interpolation.

Table 36.3 *Meyerhof and Vesic Bearing Capacity Factors for General Shear*[a]

ϕ	N_c	N_q	N_γ	N_γ[b]
0	5.14	1.0	0.0	0.0
5	6.5	1.6	0.07	0.5
10	8.3	2.5	0.37	1.2
15	11.0	3.9	1.1	2.6
20	14.8	6.4	2.9	5.4
25	20.7	10.7	6.8	10.8
30	30.1	18.4	15.7	22.4
32	35.5	23.2	22.0	30.2
34	42.2	29.4	31.2	41.1
36	50.6	37.7	44.4	56.3
38	61.4	48.9	64.1	78.0
40	75.3	64.2	93.7	109.4
42	93.7	85.4	139.3	155.6
44	118.4	115.3	211.4	224.6
46	152.1	158.5	328.7	330.4
48	199.3	222.3	526.5	496.0
50	266.9	319.1	873.9	762.9

[a] Curvilinear interpolation (graphical or methods from Ch. 12) may be used. Do not use linear interpolation.
[b] As predicted by the Vesic equation, $N_\gamma = 2(N_q + 1)\tan\phi$.

Equation 36.1 is appropriate for a foundation in a continuous wall footing. Corrections for various footing geometries, called *shape factors*, are presented in Tables 36.4 and 36.5 using the parameters identified in Fig. 36.3. The bearing capacity factors N_c and N_γ are multiplied by the appropriate shape factors when they are used in Eq. 36.1.

Geotechnical

Attachment K, 2 of 2

EXECUTIVE-RT

STERNER EXTRUDED SERIES

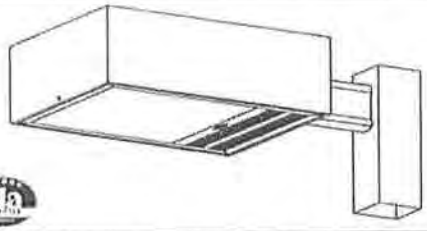
Job Name: _____

Fixture Type: _____

Job Number: _____

Distributor: _____

Distributor P.O.: _____



EXEC - RT21 SPEC SHEET

Dimensions: 16" x 21" x 6.75"
Arm: 2" x 4" x 8"
Tie-Rod Spacing: 3" (9/16" dia. holes)
Weight: 36 lbs

EPA: 1.6 (10 - single)
3.2 (28 - 2@180) (29 - 2@90)
3.3 (39 - 3@90) (32 - 3@120)
4.2 (49 - 4@90)

ORDERING SEQUENCE

HOUSING (1)	STYLE/ SIZE (2)	LAMP WATTAGE (3)	REFLECTOR (4)	VOLTAGE (5)	BALLAST (6)	MOUNTING (7)	SHIELD OPTIONS (8)	GENERAL OPTIONS (9)	HOUSING FINISH (10)	EXI FINISH (if req'd) (11)	POLE SECTION (12)
EXEC	R21	**50PMH** (ED17) **70PMH** (ED17) **100PMH** (ED17) **150PMH** (ED17)* **175PMH** (ED28) **250PMH** (ED28) **50PMH** (ED28) **400PMH** (ED28) **70HPS** (ED23.5) **100HPS** (ED23.5) **150HPS** (ED23.5) **200HPS** (E18) **250HPS** (E18) **310HPS** (E18) **400HPS** (ED18)	**2H**[1] **3H**[1] **5H**[1,4] **2S**[1] **3S**[1] **5S**[1] **4L**[1] **4W**[1]	**120** **208** **240** **277** **347** **480**	**C**	**10** **32**[2] **28** **39** **29** **49**	**SG**[3] **HS**[4] **N**	**WM** **VF** **HF** **PRL** **QTZ**[5] **FL** **EXI**[6] **N**	**Powder** **BK** **BZ** **WH** **AL** **Anodized** **LBZ** **MBZ** **DBZ** **ABK** **AAL** **NS**	**STR** Square Straight **C30** 3.0" dia Round **C35** 3.5" dia Round **C40** 4.0" dia Round **C45** 4.5" dia Round **C50** 5.0" dia Round **C60** 6.0" dia Round

*150PMH requires M102 lamp

Note: First digit denotes fixture quantity per assembly

REFLECTOR

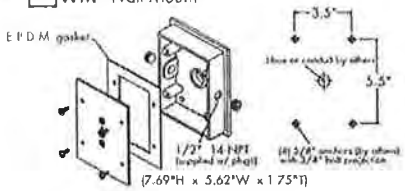
2H Type-II Hydro[1,7]
3H Type-III Hydro[1,7]
5H Type-V Hydro[1,4]
2S Type-II Seg[1]
3S Type-III Seg[1]
5S Type-V Seg[1]
4L Type-IV Long Fabricated[1]
4W Type-IV Wide Seg[1]

SHIELD OPTION

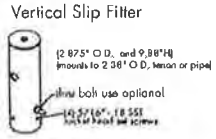
SG Stone Guard[3]
HS House Side Shield[4]
NR Not Required

GENERAL OPTIONS

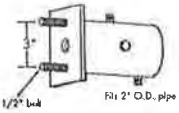
☐ **WM** Wall Mount



☐ **VF** Vertical Slip Fitter



☐ **HF** Horizontal Slip Fitter



☐ **PRL** Photocell Receptacle Luminaire
☐ **QTZ** Quartz Restrike[5]
☐ **FL** Fuse Luminaire
☐ **EXI** Extruded Arm Insert[6]
☐ **N** Not Required

FINISH OPTIONS

Powder	Anodized
☐ **BK** Black	☐ **LBZ** Light Bronze
☐ **BZ** Dark Bronze	☐ **MBZ** Medium Bronze
☐ **WH** White	☐ **DBZ** Dark Bronze
☐ **AL** Natural Aluminum	☐ **ABK** Black
	☐ **AAL** Natural Aluminum

☐ **NS** Not-Standard Finish (consult factory) (provide color chip)

Note:
1) All reflectors (minus the 5H & 5S) are field rotatable without tools.
2) '32' mounting (3@120) only available with round pole or modified pole top fitter.
3) The 'SG' stone guard option is clear polycarbonate and attaches to the door via (2) extrusions.
4) The 'HS' house side shield option is n/a with the '5H' reflector.
5) The 'QTZ' quartz restrike option will have a 2-minute delay, and is only available in150W with DCBAYONET.
6) If the color for the 'EXI' extruded arm insert is not specified, insert will be brushed aluminum.
7) 750 watt max.

STERNER EXTRUDED SERIES

701 Millennium Blvd • Greenville, SC 29607 • TEL 864.678.1000 FAX 864.678.1417 • www.sternerlighting.com

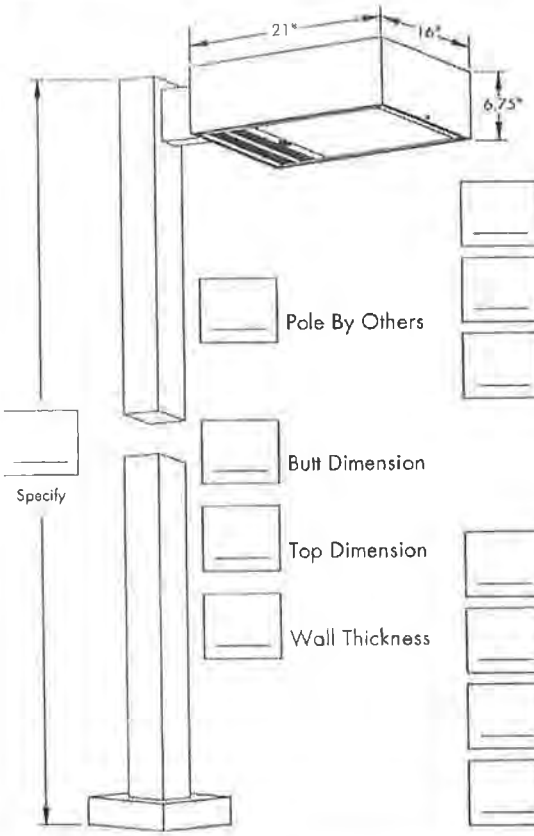
In the interest of continuous product improvement, Sterner Lighting reserves the right to change specifications without notice.

Hubbell Lighting, Inc.

Attachment L, p. 1 of 2

EXECUTIVE-RT

DIMENSIONS, POLE, AND BASE DETAILS



RT21

Round Straight Aluminum (B-Style, C-Style[1], R-Style[1,2])

Round Tapered Aluminum (B-Style, C-Style[1], R-Style[1,2])

Square Straight Aluminum (D-Style, E-Style[1], R-Style[1,2], K-Style[3])

Pole By Others

Butt Dimension

Top Dimension

Wall Thickness

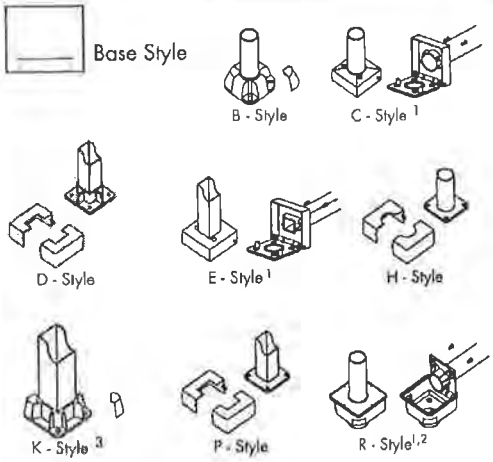
Round Straight Steel (H-Style)

Round Tapered Steel (H-Style)

Square Straight Steel (P-Style)

Square Tapered Steel (P-Style)

Base Style



Note: 1) C, E, & R-Style bases are 20' max for straight & tapered aluminum poles.
2) Contact factory for R-Style base availability.
3) K-Style base only available for 30' SSA poles.

See our pole brochure for sizes, availability, and other details....

SPECIFICATIONS

Housing

The luminaire housing shall be mitre-formed construction from a single piece of aluminum extrusion, with only a single seam located on the back of the box where the arm detail is located. The sidewall extrusion shall incorporate an integral structural rib for additional strength and support that runs the full perimeter of the housing. The luminaire canopy shall be of aluminum sheet that is crowned and crimped directly into a specially designed upper lip of the sidewall extrusion. This lip shall be lined with an isocryl gasket prior to the crimping process to form a fully sealed canopy without the use of silicone or welds.

Door Frame & Lens Assembly

Door frame shall be mitre-cut construction from a single piece of aluminum extrusion and mechanically fastened with no welds. The entire frame assembly is to always be fully anodized in a natural finish. An extruded silicone gasket shall run the entire perimeter of the frame to form a compression seal directly to the housing when shut to create a fully sealed optical chamber. A thermal and impact resistant tempered clear glass lens is set mechanically into the door frame. The entire perimeter of the glass lens is surrounded by a one-piece E.P.D.M gasket that seals directly to the frame and to the reflector assembly to prevent intrusion by moisture, dust, and other contaminants. Door shall open by a tool-less push button in the front of the housing, and shall hinge on aluminum door pins that slide into the housing sidewall. Door shall be self-retained, and catches with a spring-loaded safety latch to prevent accidental dropping before the door hinges completely open. The entire door frame assembly can then be removed without tools by sliding and lifting the assembly from the center of the housing.

Arm Assembly

Single piece extruded aluminum arm is standard with an optional aluminum decorative insert (color/finish to be specified). The arm is fastened to the pole via (2) non-slip tie-rod channels serving as a compression member with (2) 1/2" zinc-plated steel tie-rods and lock nuts in tension between pole and luminaire.

Optical Systems

Reflectors '2H', '3H', and '5H' are precision hydroformed aluminum, chemically brightened, and are anodized to a semi-specular finish. All wire way or socket entrances are gasketed and sealed with a silicone grommet to form a fully sealed optical chamber when the hydroformed reflector seals directly to the glass lens on the door. Reflector '2S', '3S', '4L', '4W', and '5S' are fabricated segmented systems that are manufactured from highly specular aluminum sheet that has been electrochemically brightened and sealed with a clear coat finish. All segmented reflectors are sealed directly to the glass lens on the door, and the housing itself becomes the fully sealed optical chamber when the door is in the closed position. All reflector systems hinge directly on the door and are latched shut in compression via a tool-less clamping wire-form system. Reflectors can be hinged, removed, or rotated directly on the door without the use of any tools for easy cleaning or re-lamping when required.

Electrical

All electrical components are cULus recognized, factory tested, and mounted to an extruded aluminum ballast tray that sits directly on the door assembly. The extruded aluminum ballast tray is finned for heat dissipation and is fastened to the door via a single thumbscrew and slide-catch for tool-less removal. Each high power factor ballast is capable of starting temperatures down to -20° F (-28.90° C). The 600-volt insulated wiring shall be installed between socket and ballast components via electrical quick disconnects. A Sterner designed Primary Electrical Disconnect system (male/female plug system) is mounted to the ballast tray and housing respectively. The primary electrical circuit shall be disconnected as soon as the door drops in the open position, thus eliminating any exposed live electrical connections and possible shock hazard during service. The entire fixture is cULus listed for wet location use.

Finish

Finished parts shall be washed in a multi-stage phosphate processing system and then finished with a standard polyester urethane powder coat paint. The door frame assembly shall always be anodized in a natural finish with the ballast tray being e-coated in black. Optional anodized finishes are available and shall use an electrolytic process to oxidize and colorize the aluminum for a finish that is extremely resistant to flaking, fading, and corrosive environments. Standard powder colors are dark bronze, black, white, and natural aluminum. Standard anodized colors are bronze (light, medium, dark), black, and natural aluminum. Custom powder, anodized, and wet finishes are available (contact factory for availability).

Attachment L, P. 2 of 2

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1 July 2014

Mustapha Guerbaz
Project Manager – Cleanup Program
Cypress Office, Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630

Subject: Response to Comments dated 19 June 2014
Gardena Sumps, Gardena, California

Dear Mr. Guerbaz,

Geosyntec Consultants (Geosyntec), on behalf of the Atlantic Richfield Company (ARC), is pleased to provide this response to Department of Toxic Substances Control's (DTSC) comments on the Final Feasibility Study Report (Final FS). These responses were prepared to address the DTSC comments dated 19 June 2014. The DTSC comments are provided below in italics with ARC's response following. For ease of review, the "No Further Comment" responses are not repeated herein.

COMMENTS

1. Previous comment number 8. The text in section 6.1.2.2, Vapor Control During Construction, was not changed to include protection of off-site receptors as was stated in the RTC.

Noted. The section has been revised as follows: "Additionally, fixed monitoring will be performed around the perimeter of the Site to alert workers when the PEL is detected so work activities can pause and/or be altered to ~~prevent additional releases~~ **minimize impacts to off-site receptors.**"

2. Previous Comment number 25. The text from the RTC dated 27 January 2014 regarding the potential to encounter degraded soil-sludge during construction of the anchor trench for the high-strength geotextile, and therefore generate gas, was no included in Section 7.3.3.5. The following text from that RTC should be included in Section 7.3.3.5. "Based on borings CPB28, CPB29, and CPB30 performed during the Remedial Investigation (RI) between the Haack and Cooper North sumps, degraded soil-sludge was encountered intermittently between the ground

surface and 7 to 8 feet below the ground surface (ft bgs). As a result, degraded soil-sludge may be encountered during both anchor trench excavations in this area. Degraded soil-sludge will be removed as necessary during anchor trench construction and anchor trenches will be backfilled with non-impacted soil. Degraded soil-sludge handling and potential gas generation will be managed in accordance with the Contingency Plan."

Noted. This language has been added to Section 7.3.3.5.

3. Previous comment number 46. The 27 January 2014 RTC states "The high-strength geotextile will be protected by the overlying geocomposite and geomembrane. Landscaping in the form of decorative rock, artificial turf, or planter box-type vegetation structures will limit maintenance and potential impacts to the geomembrane. If necessary, cushion geotextiles may be used above the geomembrane where geocomposite is not present to prevent damage from installed landscaping." This text should be included in Section 6.1.2.3 Optional final Cover Configurations (No Retaining Wall).

Noted. This language has been added to Section 6.1.2.3.

The updated Final FS will be provided under a separate cover. If you have questions or require additional information, please contact Mr. Kyle Christie with ARC at 714-670-5303.

Sincerely,

Rebecca Oliver, P.E.
Senior Engineer

Gregory T. Corcoran, P.E.
Principal Engineer

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APPENDIX B

Treatability Study

Acid Sludge Characterization and Treatability Study Report - Gardena Sumps

Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

Prepared for:

July 27, 2007

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ACID SLUDGE CHARACTERIZATION AND TREATABILITY STUDY REPORT

GARDENA SUMPS SITE
GARDENA, CALIFORNIA

Prepared for:

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La Palma, California 90623

For Submission to:

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ACRONYMS AND FORMULAS

AOC	areas of concern
API	American Petroleum Institute
ASTM	American Standard Testing Method
BGS	below ground surface
BHHRA	baseline human health risk assessment
BTEX	benzene, toluene, ethylbenzene and xylenes
BTU	British thermal unit
^{o}C	degrees Celcius
$CaCO_3$	calcium carbonate
CaO	calcium oxide
$Ca(OH)_2$	calcium hydroxide
CD	consent decree
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cm	centimeter
cP	centipoises
DRO	diesel range organics
DTSC	Department of Toxic Substances Control
^{o}F	degrees Fahrenheit
FID	flame ionization detector
ft	feet
g	gram
GC	gas chromatograph
GRO	gasoline range organics
H_2S	hydrogen sulfide
kg	kilogram
l	liter
lb	pound
LACDPW	Los Angeles County Department of Public Works
mm	millimeter
min	minute
OSHA	Occupational Safety and Health Administration
PAH	polynuclear aromatic hydrocarbon
PEL	permissible exposure limit
ppm_v	part-per-million (vapor phase)
psi	pounds per square foot
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RI/FS	remedial investigation/feasibility study
rpm	rotations per minute
sec	second
SO_2	sulfur dioxide
SPLP	synthetic precipitation leachate procedure
SVOC	semi-volatile organic compound
TCLP	toxic characteristic leachate procedure
TPH	total petroleum hydrocarbons
ug	microgram
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
w/w	weight/weight ratio

EXECUTIVE SUMMARY

The Gardena Sumps Site contains sumps that were formerly used for disposal of sludge from Southern California petroleum operations. Treatability testing was performed on sludge collected from three locations on the Site to determine the physical and chemical properties of the sludge and to evaluate potential methods for treatment. The testing showed that the acidity of the sludge ranged from 6.1 to 20.8 percent by weight. The Cooper South Sump had the highest acidity with an average value of 19 percent. The soils below the Cooper North and Cooper South Sumps had a neutral to slightly basic pH, but soil samples collected from the Haack property at 10 feet below grade had a low pH of approximately 3.0. Petroleum sludge with this characteristic is often referred to acid sludge.

The Site sludge is highly viscous, ranging from 1.7×10^6 to 2.5×10^6 centipoises (cP) at a reference temperature of 140 ^{o} F. The sludge softening point ranges from 158 ^{o} F to greater than 210 ^{o} F. The high viscosity and softening point cause the sludge to exhibit solid-like properties. However, it is still subject to gradual deformation and viscoelastic flow when placed under stress, but these properties can be eliminated by solidification treatment. Solidification may be achieved by soil amendment using bituminous stabilization where the sludge serves as a bitumen for cementation of soil particles.

Testing showed that the sludge can be neutralized by treatment using 25 percent treatment reagent addition by weight where the treatment reagent is comprised of 50 percent hydrated lime and 50 percent calcium carbonate fines. Approximately 10 percent water addition was also required to help activate the lime and carbonate reactions. The addition of 50 percent soil by weight during this mixing will also effectively solidify the waste so it is no longer susceptible to viscoelastic deformation. This treatment also fixates metals, such as lead and neutralizes acid gases such as hydrogen sulfide and sulfur dioxide.

Although the treatability testing showed the sludge can be neutralized, it was also determined that: the sludge will release entrained sulfur dioxide (SO_2) and hydrogen sulfide (H_2S) gases when disturbed for solidification treatment. Also, in its current state, the sludge is highly impermeable and solidification treatment will increase its permeability. The cost for treatment is prohibitive due to the need to mitigate vapor emissions of sulfur dioxide and hydrogen sulfide. Similar treatment was evaluated at the McColl Superfund site in Fullerton California and Thomas Ranch Site in Corona California, with similar wastes, and found unsafe and uneconomical because of the extraordinary engineering controls required.

Although treatability testing shows that the sludge can be treated, important considerations must be evaluated before making a decision to treat. The Site sludge has a high potential to release H_2S and SO_2 when disturbed. The release of H_2S and SO_2 as a result of the sludge disturbance presents an unacceptable barrier to treatment, whereas, these gases are stable in the undisturbed sludge. Therefore, the exposure risks associated with treating the sludge exceeds the risk of leaving the sludge in place.

1.0 INTRODUCTION

On behalf of Atlantic Richfield Company (Atlantic Richfield), SECOR International Inc. (SECOR) has prepared this Acid Sludge Characterization and Treatability Study Report to assist in determining the most appropriate remedy for handling and remediation of sludge at the Gardena Sumps Site (the Site) in Gardena, California. The testing was performed to determine the physical and chemical characteristics of sludge and to provide information on the feasibility of stabilization and neutralization of the sludge. The Acid Sludge Characterization and Treatability Study Report describes testing performed as part of the Remedial Investigation/Feasibility Study (RI/FS) response action specified in Section VII-C of the Consent Decree (CD) between Atlantic Richfield and the California Department of Toxic Substances Control (DTSC) signed on June 16, 2004 by Atlantic Richfield. The CD has been entered into the court records of the United States District Court for the Central District of California on November 4, 2004.

The treatability study was performed in accordance with guidelines form "Guide to Conducting Treatability Studies under CERCLA'" (USEPA 1992a). An additional guidance document, "Guidance for Data Quality Assessment" (USEPA 1998) was used for planning data validation as part of the post-Data Quality Objective process outlined in USEPA (1993).

1.1 Site Description

1.1.1 Site Name and Location

The Site is located at the southwest corner of the intersection of Artesia Boulevard and Normandie Avenue, in the City of Gardena, Los Angeles County, California (Figure 1). The Site occupies approximately 5.6 acres and is subdivided into two parcels of approximately 3.0 acres (Cooper Property) and 2.6 acres (Haack Property). The Site (Figure 2) is bordered to the south by a Los Angeles County Department of Public Works (LACDPW) property and the concrete-lined Dominguez Flood Channel, and the west by commercial and residential buildings. Properties surrounding the Cooper Property and Haack Property consist of mixed residential, commercial, and light industrial development areas. Two large sumps containing wastes comprised primarily of a petroleum waste known as "acid sludge" cover approximately 80 percent of the Cooper Property (referred to as the "Cooper North" and "Cooper South" sumps). One covered sludge sump exists on the Haack Property (referred to as the "Haack Sump"). A smaller area, referred to as the Haack Rework Area, is located south of the Haack Sump. These sumps and the Haack Rework Area are the areas of concern (AOC) that are the subject of the RI/FS, and the sludge within the sumps and rework area is the focus of this treatability study. The individual sump locations are shown in Figure 2.

1.1.2 History of Operations

California DTSC files and title records contain information indicating the Site was originally owned by A.H. and Florence Vaughan in the early 1920s and was used for the grazing of cattle. Mr. and Mrs. Vaughan, while retaining ownership, leased to Mr. George McGhee, who in turn lease for stock and royalties the rights to mine clay on the Site to the Moneta Brick Company (a.k.a. Moneta Brickyard or Higgins Brickyard), a local brick manufacturing company during the late 1920s and early 1930s. Moneta excavated clay from three to four pits on the Site. The original total depths of the pits were never documented and were unknown prior to the RI. However, recent remedial investigations by SECOR indicate that the depth of sludge in the

Cooper North and Cooper South Sumps generally extends no deeper than 7 feet below ground surface (BGS) on the Cooper Property.

Between the 1940s and the 1960s, ownership of the property was transferred through a number of parties. By January 1948, S&L Manufacturing Company owned the property. During the late 1950s the Aircraft Magnesium Corporation (currently out-of-business) leased and operated a metal casting facility on the Haack Property. On January 26, 1959, Mr. William Ward acquired the eastern property. In May 1960, Clarence and Genevieve Haack acquired the western 2.6-acre property from the then bankrupt S&L Manufacturing. By November 1962 the parking lot on the Haack property had been substantially enlarged, and additional structures had been constructed by 1965. The Clarence Haack Living Trust currently owns that parcel. In September 1977, Mr. Thomas Cooper acquired from Mr. William Ward the eastern property, which he still owns.

A more detailed explanation of the Site's history can be found in §2.1 of the RI.

1.1.3 Prior Removal and Remediation Activities

The Cooper North and Cooper South Sumps located on the Cooper Property were capped with a geosynthetic liner installed by the OHM Corporation in July 1993 as a part of the DTSC's environmental program at the site.

1.2 Waste Stream Description

1.2.1 Waste Matrix

The primary waste matrix of concern in the sumps is a sludge known as "acid sludge", but for purposes of this report it will be referred to as "sludge". All refineries used sulfuric acid for treatment and purification of petroleum products in the early 1900s. The acid treatment process was largely phased out during the 1940s and was replaced by more efficient processes and solvent extraction techniques. Acid treatment removed impurities from petroleum products such as asphaltines and nitrogen and sulfur-containing compounds. The sludge produced from this process is a heavy asphaltic pitch-like material with acidic properties. The acidity is typically difficult to remove from the pitch-like material as most of the acidity is entrained within the material or is chemically affixed as sulfonated functional groups. Sulfur dioxide (SO_2) gas can become entrained within the sludge from oxidation reactions between residual sulfuric acid and hydrocarbon. When the sludge is disturbed, the SO_2 gas can be released into the air. This is more likely to occur in sludge that has a residual acidity of 10 percent or greater. Entrained hydrogen sulfide (H_2S) gas may also be released from sludge when it is disturbed. This acidic sludge is generally characterized as a tar-like to pitch-like material that exhibits solid-like properties at ambient conditions but that is subject to viscoelastic creeping flow when exposed to elevated temperatures or direct sunlight.

1.2.2 Contaminants of Concern

Previous testing of the sludge indicates that it contains elevated concentrations of semi-volatile organic compounds (SVOCs) and polynuclear aromatic hydrocarbons (PAHs). The sludge has a low pH value ranging from 1.3 to 3.7 standard units. Elevated concentrations of metals were found in some areas of the sludge. Volatile organic compounds (VOCs) were present in low amounts in some sludge samples. The sludge also contained sulfides, residual sulfuric acid, and entrained SO_2 gas. Several compounds or elements were detected in the sludge or surrounding soil included: anthracene, benzene, chromium, copper, H_2S, lead, methyl

anthracene isomers, methyl ethyl benzene, methyl fluorine, nickel, phenanthrene, pyrene, SO_2, toluene, trimethylbenzene, and trimethylnaphthalene isomers.

The principal contaminants associated with potential future risk from exposure to soil and sludge that were identified in the 1995 Baseline Human health Risk Assessment (BHHRA)(Tetra Tech, 1995) were: chrysene, benzo(b)fluoranthene, and benzo(a)pyrene. The potential future risk was based on a scenario where the cap/cover and fencing at the Cooper Property and the concrete/soil cover at the Haack Property are not maintained or are removed.

1.3 Treatment Technology Description

1.3.1 Treatment Process and Scale

This treatability study was performed with the objectives of characterizing the physical and chemical properties of sludge at the Site as well as for evaluation of potential stabilization and neutralization methods for the sludge. Stabilization and neutralization are physical/chemical treatments that are performed for purposes of building strength in the sludge while immobilizing specific contaminants. Stabilization for sludge does not involve pozzolanic treatment (silicate-based fixation), but instead stability of the waste is achieved by bituminous stabilization. Bituminous stabilization refers to the fixation of solids by the addition of a bituminous material. In the case of sludge stabilization, the sludge serves as the bitumen while other additives (usually soil) serve as the solids. Neutralizing reagents such as calcium oxide (CaO), calcium hydroxide [$Ca(OH)_2$], calcium carbonate ($CaCO_3$), or other alkaline reagents are added to neutralize the residual acidity in the sludge while providing chemical fixation for metals. This treatability study was simulated at a bench-scale level to determine an appropriate mix recipe for stabilization and neutralization.

1.3.2 Operating Features

This treatability study did not explore mixing methods and technologies used for combining reagents with the sludge. Since the sludge is pitch-like in consistency at this Site, a blending head chould be attached to an excavator in an attempt to improve the break-down of the sludge during mixing and blending.

Issues of off-gas are a major concern during full-scale treatment of the sludge. In particular, there is a strong potential to release SO_2 and H_2S gases as the sludge is broken apart. This bench-scale treatability study evaluated the potential of the sludge to release SO_2 and H_2S gases.

2.0 TREATABILITY STUDY APPROACH

2.1 Test Objectives and Rationale

The objectives of the treatability testing for the Gardena Sumps site were to define and evaluate the following:

- Physical and chemical characteristics of the sludge;
- Types of chemical reagents and quantity of reagents required to neutralize the sludge;
- How the addition of a stabilizing agent to the sludge affects its properties;
- Potential exposure risks to sulfurous gases by disturbing or heating the sludge;
- Mobility of contaminants from both treated and untreated sludge;
- Long-term effectiveness of treatment with respect to contaminant immobility; and
- Costs associated with treatment.

2.2 Treatability Study Sampling

SECOR collected samples from seven boring locations at the Site during January and February of 2006 for purposes of treatability testing. Three of the sample borings were located within the Cooper North Sump, three were located within the Cooper South Sump, and one boring was located within the Haack Rework Area. The samples were collected using a tracked, lightweight, hydraulic direct-push Rhino™ unit and were shipped inside 1.5-inch diameter acetate liners with each liner having a length of approximately 1.5-feet. The sample locations of the borings are shown in Figure 3. Copies of the Chain of Custody Records are attached in Appendix A.

The acetate liners were sealed at each end, placed inside large zip-lock packaging, and shipped inside coolers to SECOR's Treatability Testing Laboratory in Sylvania, Ohio. The arrival dates for the samples and number of samples received from each boring are summarized below.

- Ten (10) core samples of sludge labeled "CPB15-TS-2" arrived at the treatability testing laboratory on January 26, 2006 from boring CPB15 located in the Cooper South Sump;

- Fourteen (14) core samples of sludge labeled "CPB07-TS-2" arrived at the treatability testing laboratory on February 2, 2006 from boring CPB07 located in the Cooper North Sump;

- Twenty (20) core samples of sludge labeled "CPB02-TS-2" arrived at the treatability testing laboratory on February 23, 2006 from boring CPB02 located in the Cooper North Sump;

- Four (4) samples of soil labeled "CPB02-TS-7" arrived at the treatability testing laboratory on February 23, 2006 from boring CPB02 located in the Cooper North Sump;

- Sixteen (16) core samples of sludge labeled "CPB14-TS-2" arrived at the treatability testing laboratory on February 23, 2006 from boring CPB14 located in the Cooper South Sump;

- Two (2) core samples of soil labeled “CPB14-TS-5” arrived at the treatability testing laboratory on February 23, 2006 from boring CPB14 located in the Cooper South Sump;

- Two (2) core samples of soil labeled “CPB14-TS-7” arrived at the treatability testing laboratory on February 23, 2006 from boring CPB14 located in the Cooper South Sump;

- Twenty-two (22) core samples of sludge labeled “CPB06-TS-2” arrived at the treatability testing laboratory on February 23, 2006 from boring CPB06 located in the Cooper North Sump;

- Four (4) core samples of soil labeled “CPB06-TS-8” arrived at the treatability testing laboratory on February 23, 2006 from boring CPB06 located in the Cooper North Sump;

- Fifteen (15) core samples of sludge labeled “CPB18-TS-2” arrived at the treatability testing laboratory on February 23, 2006 from boring CPB18 located in the Cooper South Sump;

- Four (4) core samples of soil labeled “CPB18-TS-8” arrived at the treatability testing laboratory on February 23, 2006 from boring CPB18 located in the Cooper South Sump;

- Twenty-one (21) core samples of sludge labeld “HPB05-TS-5” arrived at the treatability testing laboratory on March 17, 2006 from boring HPB05 located in the Haack Rework Area; and

- Four (4) core samples of soil labeled “HPB05-TS-10” arrived at the treatability testing laboratory on March 17, 2006 from boring HPB05 located in the Haack Rework Area.

A total number of 138 samples were received from the Site (118 sludge samples and 20 soil samples).

2.3 Experimental Design and Procedures

The procedures used for testing the sludge and soil samples collected from the Site are summarized in the sections below.

2.3.1 Acidity

Sludge and soil samples were collected from the seven different borings for acidity testing using the following procedure:

- A ten gram sample of sludge or soil was placed into a 250-milliliter glass sample jar;
- Ten milliliters of acetone were added to the sample jar if the sample was sludge (acetone was not used for acidity testing of soil samples) and the sample was swirled until the sludge dissolved;

- After dissolving the sample in acetone, any remaining solids were broken apart with a stainless-steel spatula so that no solid piece was larger than 1/8th inch in size;
- 90 milliliters of deionized water were added to the sample jar;
- The sample jar was covered with a Teflon-lined lid and placed in a tumbler for mixing at a tumbling speed of 18 rotations per minute (rpm) for a period of 24 hours to allow for the extraction of the acid;
- After 24 hours of tumbling, the pH was tested and the sample was titrated to a pH of 8.3 using a 0.5 M solution of sodium hydroxide while mixing the sample with a magnetic stir bar;
- The volume of sodium hydroxide used to raise the pH to 8.3 was recorded;
- The sample was mixed for an additional 30 minutes with additional sodium hydroxide added if needed until each sample maintained a pH greater then 8.3 after 30 minutes of mixing; and
- The acidity of each sample was calculated by dividing the mass of the sodium hydroxide added to the sample by the total weight of the sample, using molar mass ratios to convert the alkaline demand into standard terms of acidity in reference to $CaCO_3$.

2.3.2 Wet Density

Wet densities of the sludge samples were determined from each of the seven Site boring locations using a Fann Model 140 mud balance. This instrument is a self-contained measuring device used to determine the density of a material in the range of 52.5 to 180 pounds per cubic foot. The procedure for measuring density of the sludge with the balance is summarized below.

- The balance cup was cleaned with acetone and dried before each test;
- The base of the balance was placed onto a level surface to perform the testing;
- The balance cup was filled with sludge to a mark 1.4 millimeters below the top of the balance cup;
- The lid of the cup was placed onto the cup and pushed into place;
- If the lid did not fit firmly onto the cup, small amounts of sludge were removed until the lid could be pushed onto the cup to create a flat sludge surface in contact with the lid;
- The knife edge of the balance arm was placed onto the fulcrum and the rider was moved along the balance arm until the assembly was balanced on the fulcrum;
- A reading was taken from the side of the rider closest to the balance cup; and
- The sample cup was emptied and cleaned for the next sample analysis.

2.3.3 Moisture

The moisture content of the sludge samples was determined using a modified American Standard Testing Method (ASTM) D 2216 procedure. A summary for this procedure is described below.

- The tare weights of 70-millimeter aluminum weigh boats were recorded;
- Samples of sludge were placed into the aluminum weight boats and the combined weight was recorded;
- The samples were heated in a convection oven at 200 ^{o}F for 24 hours;
- After 24 hours, the samples were removed and allowed to cool;
- The cooled samples were weighed and the final weights were recorded;
- The wet and dry weights of the samples were calculated by subtracting the tare weight of the 70-millimeter aluminum weigh boat from both the initial and final sample weights; and
- The percent moisture (wet basis) was calculated by subtracting the final weight from the initial weight, dividing that value by the initial weight, and multiplying the result by 100.

2.3.4 Viscosity

The resistance that a material exhibits to flow (the ratio of shearing stress to rate of shear) is called viscosity. Materials with a low viscosity require very little shear stress to induce flow, while materials with high viscosity require a great deal of shear stress. Viscosity is typically reported in terms of centipoises (cP). One cP is equivalent to one kg/cm-sec. To put viscosity into perspective, the viscosities of several types of materials are shown below at a reference temperature of 68 ^{o}F.

Water = 1 cP
Kerosene ~ 200 cP
Lubrication oil ~ 1,000 cP
Asphalt ~ 100,000 cP

Materials with a viscosity less than 20,000 cP are generally considered liquids. Materials with viscosities greater than 20,000 cP are often referred to as gels. If a gel has solid-like characteristics but can still be molded, then the material is typically referred to as a viscoelastic fluid. Materials that exhibit no flowable or moldable properties are considered a solid.

Viscosity testing was performed on sludge samples from each Site boring location to better classify the materials with respect to solid-like characteristics, resistance to flow and deformation. Testing was performed on the sludge samples at various temperatures to obtain viscosity data as a function of temperature. Any material that did not deform enough for viscosity testing at a temperature of 200 ^{o}F was classified as a solid. The samples were tested using the following procedure:

- A Model 345060, Extech Instruments Digital Viscotester equipped with a R2 high-viscosity rotor was used to obtain viscosity readings in the range of 10,000 to 400,000 cP;

- The Digital Viscotester was zeroed with the R2 rotor affixed to the instrument;
- One hundred grams of sample were placed into a 250-milliliter beaker and heated in a convection oven to three different temperatures;
- The sample was removed from the oven and immediately mixed with a stainless steel spatula to assure uniformity;
- The R2 rotor from the Viscotester was immersed into the sample to the test line;
- Viscosity readings were recorded for the material at each different temperature, with the sample being mixed with the spatula prior to testing to assure a uniform temperature profile in the sludge;
- Readings were converted from the instrument reporting values of deciPascal-seconds to conventional values of cP by multiplying the readout number by a conversion factor of 100;
- When the sample cooled to 100 ^{o} F, or produced a viscosity over 400,000 cP, the rotor to the Viscotester was removed from the sample; and
- The data was tabulated and plotted onto semi-log graphs to show the viscosity of each sludge sample as a function of temperature.

2.3.5 Softening Point

The softening point of a tarry or bituminous substance is defined as the temperature at which the material takes on flowable properties. Samples of sludge from each of the seven Site boring locations were tested for softening point. The softening point test was performed using ASTM Method D36. This procedure involves shaping the sludge into two horizontal disks for testing. The sludge is heated to 200 ^{o} F and poured into two shouldered brass rings to form the disks, each having a diameter of 20 millimeters and a thickness of 6.4 millimeters. A steel load ball having a mass of 3.5 grams is placed onto each disk, and the disks are then heated inside a bath of distilled water. The softening point is reported as the mean temperature at which the two disks soften enough to allow the ball to penetrate through the disk. The procedure for determining the softening point of the sludge samples is summarized below:

- Two shouldered brass rings were packed with warmed samples of sludge;
- A 800-milliliter Pyrex beaker was filled with 500-milliliters of refrigerated distilled water;
- A brass ring holder and assembly were placed into the beaker and the shouldered brass rings were placed onto the ring holder;
- A glass thermometer was placed into the center of the beaker, supported by the brass ring holder and assembly;
- A 3.5-gram steel load ball was placed onto the center of the sludge sample in each shouldered brass ring using the load ball centering device to center the load;
- The beaker and the immersed brass ring holder assembly were placed on a hot plate and slowly heated at a controlled rate;
- When the sludge softened to the point where the weight of the steel load ball could penetrate the sludge, the temperature of the water bath was recorded; and

- A temperature reading was obtained for both sludge disks and the mean value was recorded as the sample softening point.

2.3.6 Neutralization and Stabilization Testing

After initial waste characterization testing determined the range of acidity in the samples, testing was performed to determine potential mix recipes for neutralization of the sludge. The chemical reagents evaluated for neutralization and stabilization were portland cement, CaO, $Ca(OH)_2$ and $CaCO_3$.

The addition rate of the chemical and the particle size play an important role in the reaction kinetics and final consistency of the neutralized material. The reagent samples used during testing activities were within the particle size range of 5 to 20 mesh to provide a high surface area for reaction with minimal dust problems.

Evaluation of neutralizing agents was conducted as follows:

- 1,500 grams of sludge was crushed and mixed to create a uniform mixture of sludge for testing;
- The sample was divided into 15 zip-lock bags each containing 100 grams of sludge;
- Pre-calculated masses of Portland cement, CaO, $Ca(OH)_2$, and mixtures of $CaCO_3$ with CaO and $Ca(OH)_2$ were added to the zip-lock bags for neutralizing/stabilizing testing based on dosage estimates obtained from the acidity testing;
- The materials were mixed inside each zip-lock bag for no more than 30 seconds to minimize the loss of heat and moisture from reaction;
- The mixtures were each placed into 250-milliliter insulated containers and sealed with insulated lids;
- A digital thermometer was pushed through an opening in the top of the lid so the sensing portion of the thermometer rested firmly in the treated sludge;
- The temperature of the treated sludge was recorded as a function of time to monitor reaction kinetics and heat generation;
- Measurements were recorded at a minimum of one reading per minute; and
- Recording of temperature data was discontinued once the temperature of the material began to decrease inside the insulated container.

After the reaction time data were collected, the samples were allowed to cure inside the insulated container for 24-hours before testing the samples for unconfined compressive strength by penetrometer. The density and volume expansion of the samples were recorded, and the pH of each sample was also tested by EPA Method 9045.

2.3.7 Vapor Evolution

Sulfurous gases can be released from tiny gas pockets within acidic sludge when the sludge is broken apart or when the viscosity of the sludge is substantially reduced through heating. Gases are also released if the sludge is heated above the boiling point of water due to steam stripping of gases from the sludge. In addition, VOCs may be released from the sludge as it is heated during the neutralization reaction. The potential release of sulfurous gases and VOCs as a function of sample temperature was determined as part of this treatability testing.

The vapor evolution testing was conducted using the procedures summarized below:

- 100-gram samples of sludge were placed loosely into 250-milliliter sample jars equipped with Teflon-lined septa caps and 5-gram samples of sludge were placed into 40-ml vials;
- The samples were heated in a water bath to bring the samples to specified temperatures in the range of 60 ^{o}F to 212 ^{o}F;
- After one hour of equilibration, a syringe was used to remove a vapor sample from the septa cap of the vials for analysis of benzene, toluene, ethylbenzene, xylene (BTEX) and total volatile hydrocarbons;
- The headspace in the 250-milliliter sample jars were measured for H_2S and SO_2 using a VRAE Model PGM-7800 multi gas monitor;
- Each sludge was tested at 60°F, 100 ^{o}F, 140 ^{o}F, 180 ^{o}F and 212 ^{o}F; and
- Vapor concentrations for each sludge sample were recorded as a function of sample temperature.

2.3.8 Metal and Organic Mobilization

Metals in sludge can generally be stabilized if the pH of the sludge is adjusted into the pH range of 8 to 11. The optimal pH for treatment is often dependant upon many chemical constituents in the sludge and how they interact with the treatment reagent. To evaluate the optimal treatment pH range, testing was performed by preparing treated sludge samples having pH values within the range of 8 to 11. The testing was performed using the following procedures:

- Four 500-gram samples of sludge were crushed inside one-gallon zip-lock bags;
- The samples were dosed with 24, 25, 26 and 27 percent of the 50/50 weight/weight (w/w) reagent mixture of $Ca(OH)_2/CaCO_3$ and labeled as *Treated Sludge-1, Treated Sludge-2, Treated Sludge-3* and *Treated Sludge-4*, respectively;
- A 10-gram sample of treated sludge was removed from each treated sample for testing by simulated Synthetic Precipitation Leachate Procedure (SPLP) by adding 200 milliliters of SPLP Extraction Fluid #1 to the sample inside a 250-milliliter sample jar and tumbling the sample for 20 hours at 18 rpm;
- The samples were removed from the tumbler and tested for pH to determine if the samples were adequately dosed to provide an SPLP extract pH within the optimal range

of 8 to 11, and samples falling outside this range were slightly adjusted with additional CaO for correction if necessary; and

- The four samples were sent to Merit Laboratories, Inc. for analyses of heavy metals, PAHs, and VOCs by SPLP extract.

In addition to this testing, samples of treated and untreated sludge were analyzed by the Toxic Characteristic Leaching Procedure (TCLP) for Resource Conservation and Recovery Act (RCRA) metals and VOCs.

2.3.9 Long-Term Leaching Analysis

Testing was conducted using a representative composite sludge sample prepared by combining equal amounts of material from the Cooper North and Cooper South Sumps. The treated composite sample was subjected to a long term leaching test to evaluate the long-term stability of the treated sludge with respect to contaminant mobility. The leaching test involved a dynamic extraction test using the following procedure:

- 40 grams of sludge treated with 5 grams of $Ca(OH)_2$ and 5 grams of $CaCO_3$ was placed into a one-liter glass sample jar with Teflon-lined lid with 950 milliliters of SPLP solution;

- The sample jars were tumbled for 24 hours at a rotational speed of 18 rpm at a temperature of approximately 70 degrees F;

- After the samples tumbled for 24-hours**,** they were removed from the tumbler and allowed an additional two hours of contact time and solids settling;

- The water portion of the sample was removed and filtered for analyses and a new 950-gram aliquot of SPLP extract solution was added to the sample;

- For every second extraction, the extract water was sent to Merit Laboratories, Inc. for analyses of heavy metals, PAH's, and VOCs;

- Samples of each second extract were tested for alkalinity by sulfuric acid titration to a pH value of 4.5, and

- The extraction procedure was repeated for ten extraction cycles.

2.3.10 Permeability

Permeability testing was performed using modified ASTM D5084, Method C using a representative composite sample of sludge prepared by combining equal amounts of material from the Cooper North and Cooper South Sumps. This procedure is especially designed for determining the permeability of a disturbed or remolded material. The testing was performed on two composite sludge samples, one treated and one untreated. The procedures for performing sludge permeability are summarized below.

- A sample of untreated sludge was heated to a temperature of approximately 200 ^{o}F in a microwave to quickly soften the sludge sample without dehydrating it so it could be compacted within a permeability cell for testing;

- Two one-inch diameter polyvinyl chloride (PVC) cylinders were filled with treated and untreated sludge to create sludge columns 12 inches in depth, using a ½-inch diameter tamper rod to remove air pockets from the sludge during filling of the cylinders;

- The bottom of the cylinders were covered with a screen mesh and capped with a bushing equipped with a breathable burette to collect infiltration water;

- A five-foot column of water was placed over the intervals of treated and untreated sludge;

- Removable caps with a 1/8-inch drilled breathing hole were placed at the top of the columns to allow the head of water to be maintained at a constant elevation and pressure over time;

- The columns were monitored daily for need of water addition and the burettes were monitored and recorded daily for water accumulation; and

- The permeability of treated and untreated sludge samples were calculated using Darcy's law as shown below.

$$Q = kA(\Delta h/L)$$

Where:

Q = Flow of liquid (cm^3/sec)
k = Hydraulic conductivity (cm/sec)
Δh = Gradient (cm) = 5 ft or 152.4 cm
L = Length of column (cm) = 1 ft or 30.5 cm
A = Cross-sectional area of flow (cm^2) = 5.57 cm^2

2.3.11 Evaluation of a Soil Additive

As part of the bituminous stabilization process, soil can be added to sludge to create a mixture of bitumen and solid that has strength properties. The addition of soil to the neutralized material can make the material more cohesive and manageable with greater strength characteristics and improved density. Testing was conducted to determine whether the addition of native soil to the treatment mixture would improve the quality of the final mix, and to evaluate the volume expansion associated with the soil addition. The testing was performed using the following protocol:

- Three zip-lock bags containing 50, 75, and 100 grams of soil were each filled with 100 grams of sludge;

- A pre-calculated mass of required neutralizing agent (12.5 grams of $Ca(OH)_2$ and 12.5 grams of $CaCO_3$) were added to the samples;

- The samples were mixed for 30 seconds inside the zip-lock bags to minimize heat and moisture loss;

- The materials from each bag were placed into 250-milliliter insulated containers with an insulated lid;

- A digital thermometer was the placed through an opening in the lids of each insulated container so that the measuring point rested firmly inside the treated sludge;

- The temperatures were recorded as a function of time with measurements taken once every minute until a temperature rise was no longer observed in the sample for a period of five minutes;

- The samples were allowed to cure in the closed containers for a period of 24-hours;

- The samples were tested for unconfined compressive strength by penetrometer;

- The pH of each sample was tested using USEPA Method 9045; and

- The samples were placed into an oven to evaluate viscoelastic flow properties as a function of soil addition at a temperature of 220 ^{o} F.

2.3.12 Evaluation for Thermal Treatment

Testing was performed on a representative composite sample of sludge from the Cooper North and Cooper South Sumps to provide data necessary for assessing thermal treatment. Given the high sulfur content of the sludge, thermal treatment could potentially result in high emissions of SO_2 gas. Although initial indicators suggest that thermal treatment will have both high risk and high cost, a sample of the sludge was analyzed for the following parameters:

- Heating Value in BTUs/Pound by calorimeter (ASTM-D240);
- Sulfur Content by ASTM Method D129;
- Diesel Range Organic Compounds (DRO) and Gasoline Range Organic Compounds (GRO) by EPA Method 8015;
- VOCs by EPA Method 8260; and
- SVOCs and Polynuclear Aromatic Hydrocarbons (PAH) by EPA Method 8270.

2.3.13 Evaluation of Moisture/Density Relationship for Treated Sludge

Testing was performed to determine the optimal combination of moisture content and dry density for the stabilized/neutralized sludge. The testing was performed using a representative composite sample of sludge prepared by combining equal amounts of material from the Cooper North and Cooper South Sumps. The testing involved the following procedures:

- Four samples of treated sludge were prepared, each consisting of 1,000 grams of sludge treated with 25 percent of the 50/50 (w/w) $Ca(OH)_2/CaCO_3$ reagent mix and 50 milliliters of water to facilitate the reaction;
- Soil was added to three of the treated sludge samples at ratios of 25%, 50% and 75% of the initial mass of untreated sludge;
- Each sample was compacted inside a standard mold by the drop of a standard weight at different moisture contents;

- After compaction, the samples were weighed and the moisture was determined by oven drying;
- Moisture-density relationships were determined in accordance with ASTM D 698;
- Data from testing were plotted to generate optimal moisture content plots for each sample; and
- The amount of water addition required during treatment was calculated based on the average optimal moisture content of the three samples.

2.3.14 Testing for Asphaltic Qualities

The property that contains the Cooper North and Cooper South Sumps was purchased in 1977 by Mr. Thomas Cooper as a speculative purchase due to the high volume of tar-like sludge located on the Site. Mr. Cooper contracted with a laboratory to perform preliminary testing to determine if the sludge would have acceptable asphaltic cement qualities if it were neutralized with sodium hydroxide. Per the information provided by Mr. Cooper, the results of the testing showed that the material had a flash point greater than 400 ^{o}F, an American Petroleum Institute (API) gravity of approximately 10, and a pour point greater than 150 ^{o}F. Based on these data, Mr. Cooper believes that the material may have commercial value for recycling. Due to the heavy nature of the sludge, its potential uses are likely limited to use as an asphaltic cement or asphaltic roofing material. Therefore, preliminary testing was performed on samples of sludge to determine if the material may have suitable qualities for recycling as asphaltic cement or roofing asphalt. As part of this preliminary evaluation, the sludge was evaluated against the following modified ASTM procedures:

• ASTM D 2493	Standard Viscosity-Temperature Chart for Asphalts
• ASTM D 946	Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
• ASTM D 6154	Standard Specification for Chemically Modified Asphalt Cement for Use in Pavement Construction
• ASTM D 2170	Standard Test Method for Kinematic Viscosity of Asphalts (Bitumens)
• ASTM D 3381	Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
• ASTM D 113	Standard Test Method for Ductility of Bituminous Materials
• ASTM D 36	Standard Test for Softening Point of Bitumen
• ASTM D 5	Test Method for Penetration of Bituminous Materials
• ASTM D 92	Test Method for Flash and Fire Points by Cleveland Open Cup
• ASTM D 2042	Test Method for Solubility of Asphaltic Materials
• ASTM D 312	Standard Specification for Asphalt Used in Roofing

2.4 Equipment and Materials

The following lists are a summary of the equipment, materials and reagents used to conduct the characterization testing:

<u>Equipment and Materials</u>
Laboratory Balance
Laboratory fume hood

70-mm aluminum weigh boats
Stainless-steel spatula
Convection oven
Laboratory tumbler
Harvard compaction unit
Microwave
Magnetic stirrer
Magnetic stir bars
Hot Plate
Refrigerator
VRAE PGM-7800 multi gas monitor
Fann Model 140 mud balance
Whatman No. 2 filter paper
Extech Model 345060 digital Viscotester
ASTM D36 ring and ball Apparatus
800-ml Pyrex beaker
Digital thermometers
Oakton pH meter
Oakton ORP meter
Oakton InfraPro 1 Model 35629-00 infrared thermometer
One-liter glass jars
1-inch diameter PVC permeability cells
Shimadzu Model 9A GC with FID
Water bath
Burettes
Graduated cylinders
40-milliliter unpreserved vials with Teflon-lined septum
Gas-Tight vapor syringes
Two-ounce and four-ounce jars with Teflon-lined lids

Reagents
Distilled water
Acetone
Sodium hydroxide
Phenolphthalein
CaO fines
$Ca(OH)_2$
$CaCO_3$ fines
Portland cement

2.5 Data Management

Data collected during the treatability testing were stored in electronic spreadsheets that were updated throughout the study. The data was backed up daily to avoid loss of data during the study. These data were used at the completion of the study to generate graphs and table for reporting purposes. Data from off-site laboratories were received as electronic files and are included in Appendix B of this report.

2.6 Deviations from the Work Plan

The original work plan did not include testing for asphaltic properties of the sludge. This extra testing was added to evaluate the potential for recycling the sludge as asphalt to provide information to better evaluate the recycling option as part of the feasibility study.

3.0 RESULTS AND DISCUSSION

3.1 Data Analysis and Interpretation

The results of the laboratory testing for characterization and stabilization testing are summarized in the sections below.

3.1.1 Acidity

The results of acidity testing for the 118 sludge and 20 soil samples collected from the Gardena site are provided in Tables 1 through 7. The testing showed that the sludge was very acidic with acidity values ranging from 6.1 to 20.8 percent by weight reported in terms of $CaCO_3$ acidity per EPA Method 305.2. The sludge varied in composition and acid content as a function of sump location, thus indicating that the sludge may have been placed into the sumps at different time frames and that it possibly originated from different sources. The borings from the Cooper South Sump had the highest acidity with values ranging from 18.0 to 20.8 percent expressed in reference to $CaCO_3$ with an average acidity of 19.0 percent. The Cooper North Sump was less acidic, but it still had average boring acidity values ranging from 12.2 to 13.4 percent expressed in reference to $CaCO_3$. Sludge samples collected in the Haack Rework Area had a wide range of acidity values which is likely a result of this area being previously disturbed during development. The average acidity value for the sludge collected from the Haack property was 10.4 percent.

Samples of the soil underlying the sludge were collected at borings CPB02, CPB06, CPB14, CPB18, and HPB05 for acidity and pH testing. The results of the testing are summarized in Tables 1, 2, 4, 6 and 7, respectively. The testing showed that the soil beneath the sludge in the Cooper North and Cooper South Sumps had near neutral to slightly basic pH conditions, thus indicating that the acidity in the sludge in these areas is strongly bound within the sludge by chemically and physically means which makes it largely immobile. The soils on the Haack property, however, were acidic with pH values in the range of 2.94 to 3.35. The average acidity of the soil was 0.4 mg/kg $CaCO_3$.

3.1.2 Wet Density

Samples of sludge from each of the seven borings were tested for density using a Fann mud balance. The results of the testing are summarized in Tables 1 through 7. The densities for the samples ranged from 1.01 g/cc (63 lb/ft^3) to 1.27 g/cc (79 lb/ft^3). The average density of the sludge collected from the Cooper North Sump was 1.05 g/cc (65.7 lb/ft^3) and the average density of the sludge from the Cooper South Sump was more dense at 1.17 g/cc (72.8 lb/ft^3). The sludge collected in the Haack Rework Area had an average density of 1.20 g/cc (74.9 lb/ft^3).

3.1.3 Moisture

The results of moisture testing for the 118 sludge samples and 20 soil samples collected from the Gardena site are attached in Tables 1 through 7. The average moisture of the sludge at the seven boring locations ranged from 9.8 to 22.3 percent on a wet basis. The moisture of the soil below the sludge ranged from 12.1 to 25.6 percent on a wet basis. The soil below the Cooper North Sump was noted to have higher moisture contents (24.2 percent) when compared to the soil below the Haack Rework Area which averaged 14 and 16.9 percent moisture, respectively.

3.1.4 Viscosity

Substances with viscosities greater than 20,000 cP are generally classified as gels because the material is too viscous to pump and transport in typical piping systems. When a deformable material approaches a viscosity of 500,000 cP, it begins to take on solid-like properties. However, if a solid-like material lacks crystal structure, it can still deform under load. Solid-like materials with deformable properties are called viscoelastic materials. The sludge from the Cooper North and Cooper South Sumps is classified as a viscoelastic material. It is a brittle solid when sampled that easily breaks apart into small pieces. However, the pieces generally exhibit viscoelastic flow over time which causes the pieces to slowly gel together to form back into a monolithic solid-like structure.

The viscosities of the sludge samples collected from borings CPB02, CPB06, CPB07, CPB14, CPB15, and CPB18 were tested at different temperatures to determine material viscosity as a function of temperature. The viscosity data were plotted as semi-log graphs to generate trend lines for modeling the viscosity of the sludge as a function of temperature in accordance with ASTM Method D 2493. Using the trend line data, the viscosity of each sludge sample was determined at reference temperatures of 60 ^{o} C and 135 ^{o} C in terms of poise for ease of comparison to typical asphalt standards. The graphs and calculated viscosity values are summarized in Tables 1 through 6.

The results of the testing show that the sludge in the Cooper North Sump had a slightly lower viscosity than the sludge in the Cooper South Sump. The sludge in the Cooper North Sump had an average viscosity of 1,700,000 cP (17,000 poise) at 60 ^{o} C while the viscosity of sludge in the Cooper South Sump averaged 2,500,000 cP (25,000 poise) at 60 ^{o} C. Sludge collected from the Haack property in the Haack Rework Area was heated to 220 ^{o} F but it was still too viscous to test for viscosity, thus indicating the sludge may contain other solids from disruption during development activities in that area.

3.1.5 Softening Point

The softening point test defined in ASTM Method D36 was developed for bitumens and viscoelastic materials that do not have a crystal structure or well-defined melting point. Instead of melting, these materials will slowly soften with temperature. ASTM Method D36 defines the softening point temperature of a material as the point where the substance converts from a solid-like material to a material with some flowable properties. The softening point of sludge samples from borings CPB02, CPB06, CPB07, CPB14, CPB15, CPB18 and HPB05 were tested in accordance with ASTM Method D36. The results of the testing are summarized in Tables 1 through 7.

The results of the testing show that the softening point of the sludge samples from the Cooper property ranged from 158 ^{o} F to 185 ^{o} F. The sludge in the Cooper North Sump had a slightly lower softening point than the sludge in the Cooper South Sump. The sludge in the Cooper North Sump had an average softening point of 159 ^{o} F while the average softening point for the sludge in the Cooper South Sump was 180 ^{o} F. The softening point of the sludge collected in the Haack Rework Area was greater than 210 ^{o} F.

3.1.6 Neutralization and Stabilization Testing

Neutralization and stabilization testing was performing on a composite sample of sludge collected from the Cooper North and Cooper South Sumps using five different reagent mixes. The reagents tested included:

- CaO;
- a 50/50 (w/w) mix of CaO and $CaCO_3$;
- calcium hydroxide [$Ca(OH)_2$];
- a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$; and
- portland cement.

The testing with these reagents evaluated reaction temperatures as a function of time at three different dosages for the composite sludge sample. Ten milliliters of distilled water were added to each test to serve as a wetting solution to stimulate the reaction. The testing was performed inside insulated and sealed reaction containers so the reaction temperature could be monitored with time. Temperature data from the testing are shown in Tables 8 through 12 as a function of time for each reagent mixtures. After the materials had cured for 24 hours, the unconfined compressive strength, density, volume expansion, and pH of the samples were tested. These values are shown in Table 13.

The test results showed that the use of CaO for neutralization created too much heat due to the amounts of reagent needed for neutralization and the associated exothermic release of energy from the reaction of CaO with the acid and moisture in the sludge. The high temperatures caused the sludge to become sticky and it increased the odor and emissions from the sludge during treatment.

Portland cement performed poorly as a treatment reagent with respect to neutralization and stabilization when compared to other reagents. The addition of 40 percent portland cement to the sludge was not enough to neutralize the acidity of the sludge. The portland cement also resulted in a material having less compressive strength than the sludge treated with CaO or $Ca(OH)_2$.

The $Ca(OH)_2$ neutralized the sludge without the production of excessive heat while also producing good strength in the treated material. However, it offered little buffering as a stand-alone reagent so it was difficult to neutralize the sludge without over-dosing or under-dosing with respect to pH. When the $Ca(OH)_2$ was dosed with an equivalent amount of $CaCO_3$, it improved the buffering of the treated material and prevented it from becoming too acidic or too basic as shown in Table 13. Based on these results, the best-suited treatment reagent for the sludge was determined to be a 50/50 (w/w) mixture of $Ca(OH)_2$ and $CaCO_3$. The appropriate amount of this reagent required for treatment of the Cooper North Sump was approximately 21 percent reagent by weight and the appropriate amount of reagent required for treatment of the Cooper South Sump was approximately 29 percent reagent by weight.

3.1.7 Vapor Evolution Testing

The next phase of testing involved the determination of potential rates of off-gas evolution during full-scale mixing operations as a function of temperature. Testing was performed on sludge samples obtained from the Cooper North Sump, the Cooper South Sump and the Haack Rework Area. Headspace analyses were performed on the sludge samples at temperatures of 60 ^{o}F, 100 ^{o}F, 140 ^{o}F, 180 ^{o}F and 212 ^{o}F. A VRAE Model PGM-7800 multi gas monitor was used to monitor H_2S and SO_2 in the samples. The concentration of volatile BTEX and TPH (a combination of GRO and DRO in the headspace) was monitored by GC. The vapor testing results are summarized in Tables 14, 15 and 16. The VOCs detected in the vapor headspace as a function of temperature are shown in Figures 4, 5 and 6 for the Cooper North, Cooper

South and the Haack Rework Area, respectively. A discussion of the VOC results and sulfurous gas emissions (H_2S and SO_2) are summarized below.

3.1.7.1 VOC and TPH Headspace Results

The GC analyses showed that no benzene was emitted from the sludge samples at temperatures ranging from 60 to 212 ^{o} F. Toluene was below the detection limits of 0.5 ppm_v at 60 ^{o} F in the vapor headspace for sludge samples from the Cooper North and Cooper South Sumps. However, as the sludge was heated, toluene was detected in the vapor headspace. The highest concentration observed in the vapor headspace was 21.4 ppm_v in the Cooper South Sump sludge sample at 212 ^{o} F. Ethylbenzene and xylenes were at or near detection limits in the vapor headspace of Cooper North and Cooper South Sump sludge samples at 60 ^{o} F. However, when the sludge was heated to 212 ^{o} F, the concentration of ethylbenzene increased to a high of 5.1 ppm_v and the concentration of xylenes increased to a high of 23.5 ppm_v. These data indicate that BTEX will not present a health and safety issue with respect to construction work since the concentrations are less the Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs). The OSHA PELs for toluene, ethylbenzene and xylenes are 200 ppm_v, 100 ppm_v and 100 ppm_v, respectively.

Total petroleum hydrocarbons (TPH) was monitored in the vapor headspace as a function of temperature, where TPH represents the total concentration of VOCs detected for gasoline range organics (GRO) and diesel range organics (DRO). Initial concentrations of TPH in the vapor headspace were below 12.5 ppm_v in the Cooper North and Sooper South Sump samples at 60 ^{o} F. However, TPH concentrations increased exponentially with increasing temperature. At 212 ^{o} F, the concentrations of TPH in the vapor headspace of samples from the Cooper North and Sooper South Sump were 259 ppm_v and 223 ppm_v, respectively. These data indicate that TPH (as petroleum distillates) will not present a health and safety issue with respect to construction work since the concentrations are less the OSHA PEL of 500 ppm_v for petroleum distillates.

The sludge samples collected from the Haack Rework Area had substantially lower concentrations of BTEX and TPH in the vapor headspace of the samples. Benzene and ethylbenzene were below detection limits of 0.5 ppm_v at all temperature ranges. The concentration of toluene in the vapor headspace of sludge was also below detection limits except at 212 ^{o} F where 0.8 ppm_v was detected in the vapor headspace. Xylenes were also below detection limits except at 212 ^{o} F where 2.5 ppm_v toluene was detected in the vapor headspace. TPH in the headspace was below detection limits at 60 ^{o} F, and increased to a maximum value of 26.6 ppm_v at 212 ^{o} F. These data indicate that the sludge samples collected from the Haack Rework Area on the Haack property are highly weathered. These sludge samples will also likely not present a threat to construction workers since the vapor concentrations of BTEX and TPH are well below the OSHA PELs.

3.1.7.2 H_2S and SO_2 Headspace Results

H_2S and SO_2 were monitored in the headspace of sludge samples at various temperatures. The results showed that these sulfurous gases were readily emitted from disturbed and heated sludge samples in the Cooper North and Cooper South Sumps. The vapor concentrations of SO_2 in equilibrium with sludge samples from both sumps exceeded 150 ppm_v at 60 ^{o} F. The vapor concentration of H_2S was 408 ppm_v for the Cooper North Sump and 471 ppm_v for the Cooper South Sump at 60 ^{o} F, but at higher temperatures it exceeded 500 ppm_v for both sumps. These data show that H_2S and SO_2 will both present an exposure risk to workers and the community if the sludge is disturbed for neutralization and stabilization treatment. The OSHA PELs for H_2S and SO_2 are 10 ppm_v and 2 ppm_v, respectively.

The sludge samples collected from the Haack Rework Area had substantially lower concentrations of H_2S and SO_2 in the vapor headspace. The vapor concentrations of SO_2 in equilibrium with sludge samples ranged from 8 to 71 ppm_v. The vapor concentration of H_2S ranged from 2 to 50 ppm_v. These data show that H_2S and SO_2 emissions from sludge on the Haack property could present an exposure risk to workers and the community if the sludge is disturbed for neutralization and stabilization. However, the sludge appears to be more highly weathered so emissions of H_2S and SO_2 will be much lower than the H_2S and SO_2 emissions that are likely to result from disturbing the sludge on the Cooper property.

3.1.8 Metal and Organic Mobilization

Treated and untreated composite samples of sludge from the Cooper North and Cooper South Sumps were sent to Merit Laboratories, Inc. for analyses of total RCRA metals, VOCs, SVOCs and PAHs and for analyses of leachable RCRA metals and organics by both the TCLP and SPLP. The relevant test results for the untreated sludge sample and treated sludge sample are attached in Table 17 and copies of laboratory analytical data are attached in Appendix B. The significance of the test results are discussed in the sections below.

3.1.8.1 Untreated Sludge Leachate

Analyses showed that the composite sludge sample contained 22.4 mg/kg lead and 1.2 mg/kg barium. The TCLP extract contained 0.24 mg/l lead and 0.06 mg/l barium, thus indicating that the sludge would not be characterized as a hazardous waste under the definitions and exclusions given in 40 CFR Part 21 for lead or barium, even in a final TCLP extract of pH 3.97. The SPLP extract contained 0.31 mg/l lead and less than 0.01 mg/l barium at a final SPLP extract pH of 2.15. Note that the SPLP extract had a lower pH than the TCLP, likely a result of acetate buffering in the TCLP extract. This indicates that the SPLP will be more likely to produce leaching effects in laboratory analyses than the TCLP.

The analyses for total SVOCs, PAHs and VOCs identified the following constituents in the sludge:

- Benzo(a)anthracene 70,000 ug/kg
- Chrysene 160,000 ug/kg
- 2-Methylnaphthalene 30,000 ug/kg
- Phenanthrene 200,000 ug/kg
- Pyrene 60,000 ug/kg
- Ethylbenzene 200 ug/kg
- Toluene 400 ug/kg
- Xylenes 1,000 ug/kg
- 2-methylnapthalene 1,900 ug/kg
- 1,2,4-trimethylbenezene 700 ug/kg
- 1,3,5-trimethylbenzene 500 ug/kg
- 1,2,3-trimethylbenzene 1,100 ug/kg

Despite the presence of these compounds within the sludge itself, no PAHs or SVOCs were identified in the SPLP extract for the untreated sludge above the detection limit of 5 ug/l. This indicates that the SVOCs and PAHs within the sludge are largely immobile. Toluene was detected in the SPLP extract of the untreated sludge at 7 ug/l and 1,2,3-trimethylbenzere was detected in the SPLP extract at 1 ug/l.

Analysis of the sludge for TPH as GRO and DRO showed that the sludge contained 70 mg/kg GRO and 39,000 DRO. This shows that only 3.9 percent of the sludge is comprised of organics in the C_6 to C_{28} hydrocarbon range, thus showing that the majority of organics in the sludge have a very high molecular weight in excess of 400.

3.1.8.2 Treated Sludge Leachate

Samples of composite sludge treated with a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$ at dosage rates of 22, 24, 26 and 28 percent reagent by weight with respect to the original mass of untreated sludge were subjected to SPLP testing. The results showed that the treatment produced non-detectable concentrations of RCRA metals and SVOCs in each of the SPLP extracts, with the exception of barium which was detected at 0.01 mg/l. This shows that the treatment reduced the concentration of leachable lead by the SPLP to less than 0.03 mg/l.

3.1.9 Long-term Leaching

A long-term leaching test was performed on a composite sludge sample from the Cooper North and Cooper South Sumps that was treated at dosage of 25 percent of the 50/50 (w/w) $Ca(OH)_2$ and $CaCO_3$ reagent mix. The sample was subjected to the SPLP extraction procedure daily, with new extract water being added to the sample after each SPLP extraction to evaluate the long-term leaching effects after multiple extractions. The leachate from every other extraction was filtered and sent to Merit Laboratories, Inc. for analyses of PNAs, RCRA metals and VOCs. The extracts were also tested in the laboratory for pH and alkalinity. The results of the analyses are shown in Table 18.

The long-term leach tests produced similar results to the standard SPLP. Barium was detected at 0.01 to 0.02 mg/l in the first six sequential SPLP extracts, but was below detection limits in the eighth and tenth extractions. Ethylbenzene was detected at 0.001 mg/l in all of the sequential SPLP extractions except the tenth extraction which was below detection limits. An initial toluene concentration of 0.007 mg/l was detected in the second and fourth sequential extraction, but concentrations slowly decreased to 0.003 mg/l by the eighth and tenth extraction. The concentrations of 1,2,4-trimethylbenzene and 1,2,3-trimethylbenzene were each in the range of 0.002 to 0.003 mg/l throughout the sequential extraction process. Acetone was detected in most of the extracts at a concentrations ranging from 0.05 to 0.09 mg/l, and 2-methylnaphthalene was detected only in the fourth sequential extraction at a concentration of 0.005 mg/l.

There are three significant observations from the long-term leaching test. First, lead did not leach from the sludge even after ten sequential SPLP extractions, thus indicating that treatment of the sludge with CaO and $CaCO_3$ provides long-term stability for lead. Second, trace concentrations of barium, ethylbenzene, toluene and xylenes leached from the treated sludge, but the concentrations were well below the primary drinking water standards. Finally, trace concentrations of trimethylbenzene isomers, 2-methylnapthalene and acetone leached from the treated sludge, but there are no primary or secondary drinking water standards for these compounds.

Alkalinity analyzes showed that the average alkalinity of the SPLP leachates was 20 mg/l. Therefore, an estimated 0.2 grams of $CaCO_3$ was removed from the treated sludge during the ten sequential extractions compared to the 5 grams of $CaCO_3$ originally added to the sludge. This shows that only 4 percent of the alkalinity was removed from the sludge during the ten

sequential extractions, thus indicating that the many more extractions could have been performed while still maintaining alkaline stability in the treated material.

3.1.10 Permeability

Composite samples of untreated and treated sludge from the Cooper North and Sooper South Sumps were tested for permeability. The treated sample consisted of a composite sludge sample treated with 15 percent calcium hydroxide and 15 percent $CaCO_3$ fines by weight. The testing was performed using disposable permeability to avoid hydrocarbon and acid fouling of the acrylic cylinders and o-rings in a standard permeability cells. The permeability cells contained a remolded sludge cylinder that was 1.048 inches in diameter and one foot in length. A five-foot column of water was placed over the sludge. After the cells were constructed, they were placed into operation and inspected regularly to assure that the head of water on the columns was maintained at five feet. The volume of water collected from the burettes at the bottom of the columns was monitored over time to quantify the flow of water through the column as a function of time. These data were used to calculate the hydraulic conductivity of the sludge using Darcy's Law:

In the cell containing untreated sludge, no water permeated through the cell during four weeks of testing, thus indicating that the permeability is less than 1×10^{-8} cm/sec. For the treated sample of sludge, the material was saturated with water inside the cell prior to testing because the permeability was anticipated to be much higher. When testing was initiated after allowing for 24 hours of equilibrium, testing showed that water flowed through the compacted material at a high flowrate averaging 15 ml/min or 0.25 cm^3/sec. Using Darcy's Law, the hydraulic conductivity of the treated sample was calculated to be 9×10^{-3} cm/sec which is characteristic of silty sand.

3.1.11 Evaluation of a Soil Additive

Four composite samples of sludge were treated with 25 percent reagent comprised of a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$. Prior to adding the reagent, the samples were amended with 0, 25, 50 and 75 percent soil by weight using a composite Site soil sample prepared from borings CPB-2, CPB-6, CPB-14 and CPB-18. The soil was added to determine if it could improve the physical properties of the treated sludge during bituminous stabilization. The reagent was quickly mixed into the samples which were then immediately placed into insulated containers to measure reaction kinetics. After 24 hours of cure time, the samples were tested for compressive strength, density, volume expansion and pH. The results of the tests are summarized in Tables 19 and 20.

The testing showed that the addition of soil to the neutralized sludge improved the density of the treated material and maintained high strength. Because the sludge at the Site is so viscous, it was difficult to assess how the soil additive worked as a stabilization material for bituminous stabilization at ambient temperatures. Therefore, samples of neutralized sludge treated with 0, 25, 50 and 75 percent soil were compacted into cores using a Harvard compaction apparatus and the cores were placed into a convection oven at $220\ ^0$ F to test the stability of the sludge. A photograph of the cores after 24 hours of heating is shown in Figure 7. The testing showed that the neutralized samples containing no soil exhibited viscoelastic flow at $220\ ^o$ F. The samples containing 25 percent soil exhibited minor viscoelastic properties, and the samples containing 50 and 75 percent soil by weight exhibited no viscoelastic properties. These test results show that the addition of 50 percent soil to neutralized sludge by weight converts the sludge into a stable solid material, even at elevated temperatures that exceed the softening point of the sludge.

3.1.12 Evaluation for Thermal Treatment

Sample analysis using EPA Method 8270 detected five SVOCs and/or PAHs in the sludge as summarized in Section 3.1.8.1. The analytical data are summarized in Table 21 and are included in Appendix B. Although the sludge was found to contain approximately 4 percent diesel-range organics, the majority of hydrocarbon in the sludge was comprised of very large-chain hydrocarbons having a molecular weight greater than 400. When the sludge was tested for BTU value, it was found to have a very high heating value of 13,000 BTUs per pound. This confirms that the sludge is comprised primarily of organics. However, the sludge also had an elevated sulfur content of approximately 7 percent. This high sulfur content suggests that incineration or fuel combustion of the sludge is not a viable treatment alternative due to the large amount of SO_2 gas that would be emitted during combustion. Over 1,800 cubic feet (280 pounds) of SO_2 gas could be emitted for each ton of sludge incinerated or combusted. Site-wide, the total mass of SO_2 generated by thermal treatment of the sludge would exceed 2,600 tons. Due to health and safety considerations and the high cost of vapor treatment, incineration is not recommended for the sludge.

3.1.13 Evaluation of Moisture/Density Relationship

Four samples of sludge treated with 25 percent of a 50/50 (w/w) mix of $Ca(OH)_2$ and $CaCO_3$ were tested for moisture/density relationship to determine optimal dry density and moisture content for compaction after treatment. Testing was performed on a sample without soil amendment and on three samples amended with 25, 50 and 75 percent soil by weight with respect to the initial weight of untreated sludge. Samples were amended with differing amounts of water and compacted with the Harvard compaction apparatus to develop a moisture/density relationship for each sample. The results of the analyses are attached in Appendix C.

The test results showed that the neutralized sludge without soil amendment had a very low maximum dry density of 52.3 lb/ft^3 and high optimum moisture content of 46.7 percent. When the neutralized sludge was amended with 25 percent soil, the maximum dry density increased to 64.1 lb/ft^3 and the optimum moisture content decreased to a more reasonable value of 29.5 percent. The neutralized sludge sample amended with 50 percent soil had a maximum dry density of 68.8 lb/ft^3 and an optimum moisture content of 25.7 percent, and the sample amended with 75 percent soil had a maximum dry density of 71.6 lb/ft^3 and an optimum moisture content of 24.4 percent. The Harvard compaction data are summarized in Figure 8. A review of the graph shows the maximum dry density becomes asymptotic near 70 lb/ft^3 and optimum moisture contents approach 25 percent in this range. These values can therefore be used as target values for treatment with soil amendment because they correspond to optimum density and moisture values at soil amendment ratios that also demonstrated stability under thermal stress as described in Section 3.1.11.

3.1.14 Testing for Asphaltic Qualities

In a January 15, 2003 letter to DTSC, Mr. Cooper outlined a remedial alternative for clean-up of the Gardena Sumps. Mr. Cooper stated that sludge in the Cooper North and Cooper South Sumps yielded properties for petroleum characteristics including an API gravity of about ten, a flash point greater than 400 ^{o}F, and a pour point exceeding 150 ^{o}F. In addition, Mr. Cooper noted that the pH around 2.0 was due to a two-phase mixture of oil and water. Mr. Cooper acknowledged slightly elevated levels of certain metals in the sludge, but attributed the presence of lead in the sludge to automobile exhaust emissions (with lead as a component) due to the close proximity of the sumps to the highway. Mr. Cooper estimated the volume of sludge in the Cooper North and Cooper South Sumps to be approximately 15,000 cubic yards (~15,000 tons) based upon a sump depth of four to six feet BGS. Mr. Cooper considered two remedial

option alternatives: (1) recycling by on-site excavation and on-site treatment by heating and mixing with caustic solution to raise pH, followed by off-Site transport; and (2) on-site excavation and off-site transport to a facility for processing to make the material commercially acceptable. To evaluate the potential for the two recycling options, samples of the sludge were tested for comparison purposes to ASTM asphalt standards.

Due to the heavy nature of the sludge, the end use for sludge neutralized with sodium hydroxide would be limited to either (1) asphalt cement for use in pavement construction or (2) roofing asphalt. Both types of asphalt have different grade classifications based largely on viscous properties. Asphalt cement can be classified either by viscosity (AC-2.5, AC-5, AC-10, AC-20, AC-30 or AC-40) with the AC-2.5 being the least viscous (~250 poise) and the AC-40 being the most viscous (~4,000 poise), or it can be classified by penetration (40-50, 60-70, 85-100, 120-150 or 200-300) where the 40-50 asphalt is least penetrable (4 to 5 mm by ASTM D5) and the 200-300 asphalt is most penetrable (20 to 30 mm by ASTM D5). Roofing asphalts are classified as Type I, Type II, Type III or Type IV with the Type I being the least viscous and the Type IV being the most pitch-like. All of these asphalts must meet specific qualifications for marketability. A summary of some of these specifications are shown in Tables 22 to 24.

Historic attempts to recycle this type of material for use in asphalt have failed because the material is generally "inferior in quality."[1] However, testing was performed on the sludge as part of this treatability study to determine if the sludge had suitable characteristics to meet the specifications for any of the asphalt categories described above. The results of the testing are summarized in the sections below.

3.1.14.1 Viscosity Specifications for Asphalt

The resistance that a material exhibits to flow (the ratio of shearing stress to rate of shear) is called viscosity. Materials with a low viscosity require very little shear stress to induce flow, while materials with high viscosity require a great deal of shear stress. Viscosity is typically reported in terms of cP which is equivalent to one kg/cm-sec.

Asphalt cements are named after their viscosity grade. The main asphalt cement grades are AC-2.5, AC-5, AC-10, AC-20, AC-30, AC-40. The viscosity tests are typically performed by measuring the time it takes for a fixed volume of the liquid to flow through a calibrated glass capillary viscometer beneath an accurately reproducible head and at a controlled temperature. However, testing laboratories have determined that sludge is too viscous to be measured by capillary viscometers. Therefore, viscosity testing was performed on samples of sludge from each boring using a viscometer designed for testing of asphalts with high viscosities.

The results of the testing showed that the viscosity of the sludge at 140 ^{0} F ranged from 19,000 to 26,000 poise. Viscosity-graded asphalt specifications fall into the range of 200 to 4,800 poise. Based on these analyses, the sludge appears to be too viscous and pitch-like to meet the specifications for viscosity-graded asphalt cement used in pavement construction. Penetration-graded asphalt cement and roofing asphalt do not have a viscosity specification.

3.1.14.2 Penetration Specifications for Asphalt

Penetration testing is a specification that pertains to asphalt cements in pavement construction and roofing asphalts. This test is performed according to ASTM standards at a temperature of 77 ºF (25 º C). The conventional test involves placing a needle onto the asphalt with a 100-

[1] W.A. Gruse and D.R. Stevens, The Chemical Technology of Petroleum, McGraw-Hill Book Company, 1942, pg 642.

gram weight affixed to the needle. The weighted needle is allowed to penetrate the asphalt for period of five seconds, and the depth of the penetration is then measured in tenths of a millimeter. The asphalt is then graded based on the depth of penetration, with the penetration value corresponding directly to the depth in tenths of a millimeter that the needle punctured the asphalt over the five second time interval.

Penetration testing was performed on samples of sludge using modified ASTM D 5. The testing showed that the sludge had a penetration value of approximately 10 to 15. This value is too low to meet the requirements for asphalt cement used in pavement construction.

The penetration specifications for roofing asphalt are as follows:

- Type I 18 to 60
- Type II 18 to 40
- Type III 15 to 35
- Type IV 12 to 15

The penetration value of the sludge does fall with the penetration value range of the most viscous roofing asphalt (Type IV).

3.1.14.3 Solubility in Specifications for Asphalt

The ASTM testing method D 2042 is a testing method to determine the solubility level of an asphalt specimen with little or no mineral matter. All roofing asphalts and asphalt cements require a solvent solubility of at least 99 percent. The purpose for this test is to determine the active organic cementing constituents (i.e. bitumen) in the asphalt specimen.

This test was modified for use with the sludge using acetone as the solvent. Weighted samples of sludge were dissolved in acetone and were then filtered using Whatman No. 2 filter paper to determine the amount of solids in the sludge. The filter paper was then further flushed with three successive rinses of 50 ml of acetone. The testing showed that the solubility of sludge in solvent was approximately 93 percent with the remaining percentage of non-soluble constituents appearing to be coke fines. These values indicate that the asphalt contains too many coke fines to meet the specifications for asphalt cement or roofing tar.

3.1.14.4 Ductility Specifications for Asphalt

The ductility of a bituminous material is measured by elongating a specimen of the material at a specified temperature and speed, and determining how far it will stretch before it breaks into two separate pieces. This test is generally run at a temperature of 25 ± 0.5 ºC, and at a speed of 5 cm/min ± 5.0%. The ASTM D 113 procedure requires that the sample be heated to a temperature so it is fluid enough to pour into a mold on a brass plate coated with glycerin or some substance to prevent the sample from sticking. The mold holding the sample is then cooled to room temperature for a period of 30 to 40 minutes and placed in a water bath. The sample is completely submerged and maintained at the specified temperature for 30 minutes. The sample is then removed and immediately tested. The distance that the sample stretches in centimeters before the specimen ruptured is its ductility.

Samples of sludge were heated at temperatures in accordance with the thin-film oven test and poured into a clay mold to simulate the dimensions shown in the ASTM D 133 test for ductility. However, when any amount of stress was placed on the specimens, the samples immediately broke apart due to the brittle, pitch-like characteristics of the sludge. Ductility specifications for

asphalt cement are in the range of 10 to 100 cm, and ductility specifications for roofing asphalt are in the range of 1.5 to 10 cm. The Site sludge will not meet these specifications due to its brittle, pitch-like nature.

3.1.14.5 Softening Point Specifications for Asphalt

The softening point of the sludge samples from the Site ranged from 158 to 185 ^{o}F. Asphalt cement used for construction of pavement generally does not have a softening point specification. However, asphalt used for roofing has the following specifications:

- Type I 135 to 151 ^{o}F
- Type II 158 to 176 ^{o}F
- Type III 185 to 205 ^{o}F
- Type IV 210 to 225 ^{o}F

Therefore, the softening point analyses indicate that the sludge would fall into acceptable softening point ranges for a Type II roofing asphalt.

3.1.14.6 API Gravity

The petroleum industry often classifies petroleum products in terms of an API scale rather than in terms of density. The API scale was developed based on the fact that most petroleum hydrocarbon substances have a specific gravity falling into the range of 0.768 to 0.996 grams per cubic centimeter (g/cc). The calculation for API gravity is as follows:

$$\text{API Gravity} = (141.5/\rho) - 131.5$$

The term ρ is the specific gravity of the material at 60 ^{o}F in units of g/cc. Testing showed that the specific gravity of all of the sludge samples exceeded 1.0. Based on these values, the sludge would produce a negative API gravity value. This indicates that the API gravity of the sludge is generally lower than 10 as was reported by previous testing.

3.1.14.7 Summary of Asphalt Testing

Testing of the sludge indicates that it will have low marketability as recycled asphalt, even when neutralized, for the following reasons:

- The sludge is a brittle, glass-like material with little to no ductility;
- The viscosity of the sludge is too high for use as asphalt cement in road construction;
- The sludge contains a high concentration of impurities and suspended solids which causes it to fail to meet the test for asphalt solubility for both asphalt cement and roofing asphalt;
- The sludge has a negative API gravity;
- The softening point falls into acceptable ranges for a Type II roofing asphalt, but the sludge fails to meet most of the remaining specifications for Type II roofing asphalt; and
- Penetration values for the sludge were too low for use as asphalt cement but meet the specifications for Type IV roofing asphalt.

Although the sludge shares the softening point specifications for Type II roofing asphalt and the penetration specifications for Type IV roofing asphalt, it fails to meet the ductility requirements for either of these asphalt grades. The brittle nature of the material gives it undesirable

properties because the material is easily cracked and sheared, thus making it unsuitable for roofing or pavement construction applications.

3.2 Comparison to Test Objectives

The following objectives for the treatability study were achieved:

- The physical characteristics (strength, viscosity, softening point, density, moisture, permeability, ductility and penetration value) and chemical characteristics (acidity, pH, hydrocarbon composition, heating value and solvent solubility) were determined for sludge samples collected from the Site;

- The most suitable chemical reagent mixture for treatment of sludge was determined to be a 50/50 (w/w) mix of $Ca(OH)_2/CaCO_3$ with dosages in the range of 20 to 30 percent reagent to sludge by weight providing effective neutralization of the sludge;

- The stabilization/neutralization testing demonstrated that neutralization of the sludge with the 50/50 (w/w) mix of $Ca(OH)_2/CaCO_3$ and 50 percent soil amendment improved the strength properties of the sludge by eliminating its viscoelastic flow properties and providing for a compacted compressive strength that exceeded 50 pounds per square inch (psi);

- The vapor evolution testing showed that there was a high potential to release sulfurous gases (H_2S and SO_2) by disturbing or heating the sludge;

- SPLP testing showed that lead was partially soluble (0.04 mg/l) in untreated sludge (although largely immobile due to low permeability), and that lead in the treated sludge was immobile due to low solubility (<0.005 mg/l), while all other constituents in the sludge were largely immobile;

- Long-term leaching tests on the treated sludge showed that after multiple extractions, lead was effectively immobilized, PAHs remained immobile, and select VOCs leached from the sludge, but at concentrations below drinking water standards; and

4.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations can be drawn from the results of the treatability testing:

4.1 Conclusions

- The acidity of the sludge ranges from 6.1 to 20.8 percent acidity in reference to $CaCO_3$ acidity per EPA Method 305.2;

- Sludge in the Cooper South Sump has the highest average acidity (19 percent as $CaCO_3$) while the sludge in the Cooper North Sump and Haack Rework Area averaged 12.9 and 10.4 percent, respectively;

- Soil samples collected from below the Cooper North and Cooper South Sumps had a neutral to slightly basic pH, but soil samples collected from 10 feet below grade at the location of the Haack Rework Area had a low pH value around 3.0;

- Density testing showed that the sludge density ranged from 63 to 79 lb/ft^3,

- The moisture in the sludge ranges from 9.8 to 25.6 percent on a wet basis;

- The viscosity of the sludge at 140 ^{o} F ranged from 1,700,000 to 2,500,000 cP, thus showing that the sludge has solid-like properties, but also that the sludge is subject to slow viscoelastic deformation and flow;

- The softening point of the sludge ranged from 158 ^{o} F to greater than 210 ^{o} F;

- The most suitable chemical reagent mixture for treatment of sludge was determined to be a 50/50 (w/w) mix of $Ca(OH)_2/CaCO_3$ with dosages in the range of 20 to 30 percent reagent to sludge by weight providing effective neutralization of the sludge with the addition of 10 percent water to drive the necessary neutralization reactions;

- Disrupting or heating the sludge will result in the release of H_2S and SO_2 gases, but the release of VOCs from the sludge should be *deminimus* unless the sludge is heated;

- SPLP testing produced lower leachate pH values when compared to TCLP extractions;

- The SPLP extracts for untreated sludge contained 0.31 mg/l lead, but lead was below the detection limits of 0.03 mg/l in SPLP extracts for treated sludge;

- Long-term leaching tests showed that the treated sludge maintained sufficient alkalinity over multiple extractions to provide for continued stabilization of lead;

- The permeability of the untreated sludge was less than $1x10^{-8}$ cm/sec due to the monolithic, asphaltic, properties of the untreated sludge, but the permeability of the material increased to $9x10^{-3}$ cm/sec after treatment;

- The addition of 50 percent soil to the sludge during treatment provided bituminous stabilization of the sludge that eliminated the viscoelastic flow properties of the sludge when heated to temperatures as high as 220 ^{o} F;

- The sludge has a high BTU value of 13,000 BTUs/lb, but the high sulfur content of the sludge (7 percent sulfur) would make incineration or use of the sludge as a fuel prohibitively expensive due to sulfur-removal and vapor treatment requirements;

- The target moisture content and dry density for treated sludge are 25 percent moisture content on a dry basis (33 percent wet basis) and 70 lb/ft^3 which can be achieved by the addition of 50 percent soil to the neutralized sludge;

- Testing for asphaltic qualities of the sludge indicates that it will be unsuitable for use as recycled asphalt for road construction or roofing since it has no ductility, high viscosity, and high solids content; and

4.2 Recommendations

The treatability testing shows that sludge at the Site can be treated in a manner that neutralizes acidity, neutralizes acid gases (H_2S and SO_2), fixates lead, and provides long-term strength properties by eliminating viscoelastic deformation. These properties can be accomplished by treating the sludge with a 50/50 (w/w) mix of $Ca(OH)_2/CaCO_3$ at an average dosage of 25 percent reagent to sludge by weight. The addition of water is required (approximately 10 percent by weight) to drive the necessary neutralization reactions, and the addition of 50 percent soil by weight is required for effective solidification.

Although the methodology described above can be used to treat the sludge, disruption of the sludge releases H_2S and SO_2 gas. These gases are stable and safely encapsulated when the sludge is undisturbed. Similar sludge projects like the McColl Superfund Site in Fullerton, California, Thomas Ranch in Corora, California, and the Whitehouse Waste Oil Pits in Whitehouse, Florida are examples of sites that were originally slated for excavation and/or treatment. However, the selected remedies were later changed to capping due to concerns about worker safety, vapor emissions, odors, and/or the effectiveness of treatment versus capping. These factors should be strongly considered for this Site as well since the sludge has a high potential to release H_2S and SO_2 gas. Furthermore, although treatment can provide fixation of contaminants and eliminate viscoelastic deformation, the final treated material will still contain high concentrations of calcium sulfate after treatment. Calcium sulfate is highly hydrophilic which can increase the swelling potential of soils as a function of moisture. This might have implications on future development if the treated material were left in place.

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ASTM D113, Standard Test Method for Ductility of Bituminous Materials

ASTM D129, Standard Test Method for Sulfur in Petroleum Products

ASTM D240, Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter

ASTM D312,Standard Specification for Asphalt Used in Roofing

ASTM D698, Standard Test Method for Laboratory Compaction of Soil Using Standard Effort

ASTM D946, Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction

ASTM D1075, Standard Test Method for Effect of Water on Compressive Strength of Compacted Bituminous Mixtures

ASTM D1754, Standard Test Method for Effects of Heat and Air on Asphaltic Materials

ASTM D2042, Standard Test Method for Solubility of Asphalt Materials in Trichloroethylene

ASTM D2170, Standard Test Method for Kinematic Viscosity of Asphalts (Bitumens)

ASTM D2216, Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock

ASTM D2493, Standard Viscosity-Temperature Chart for Asphalts

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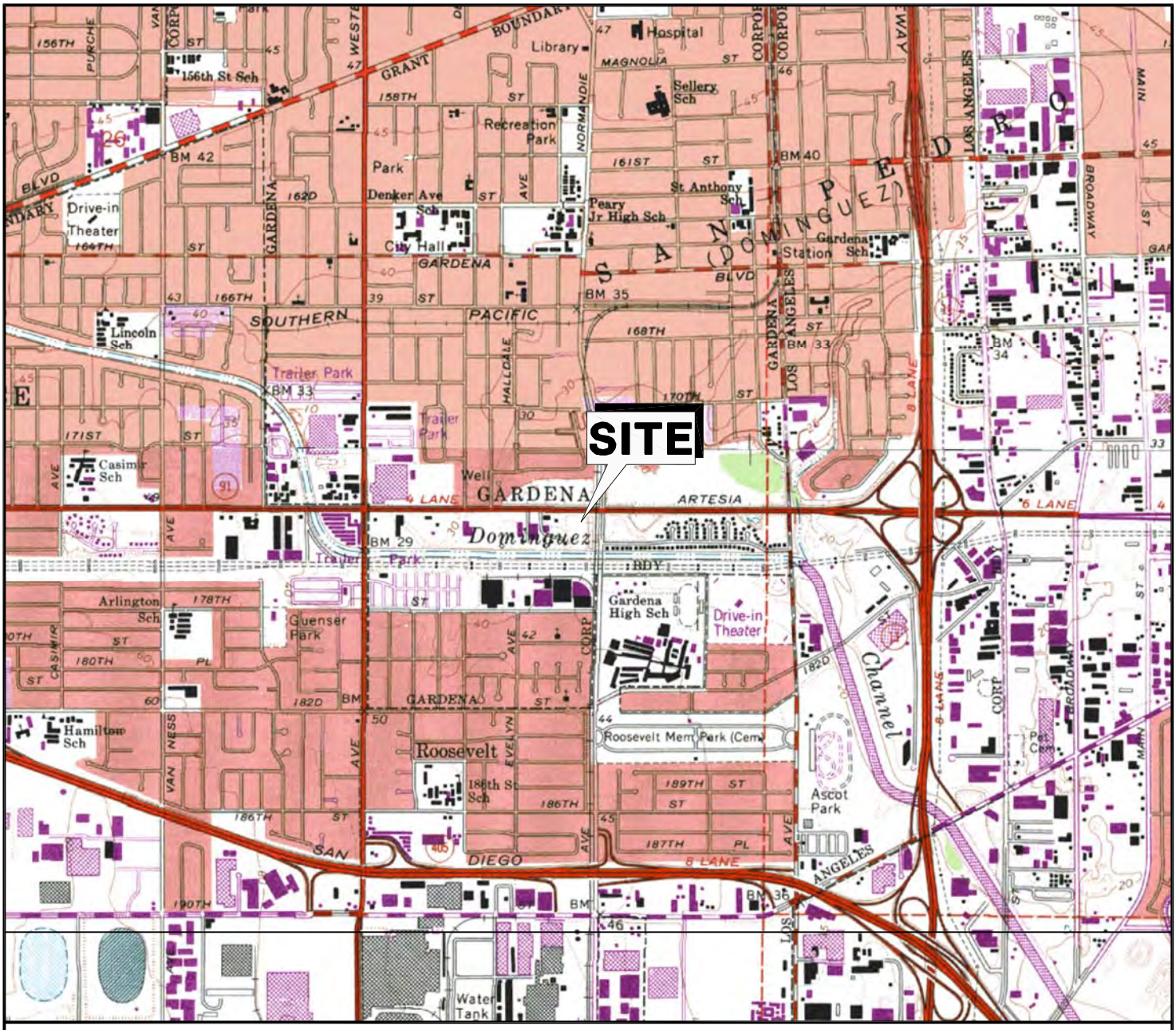
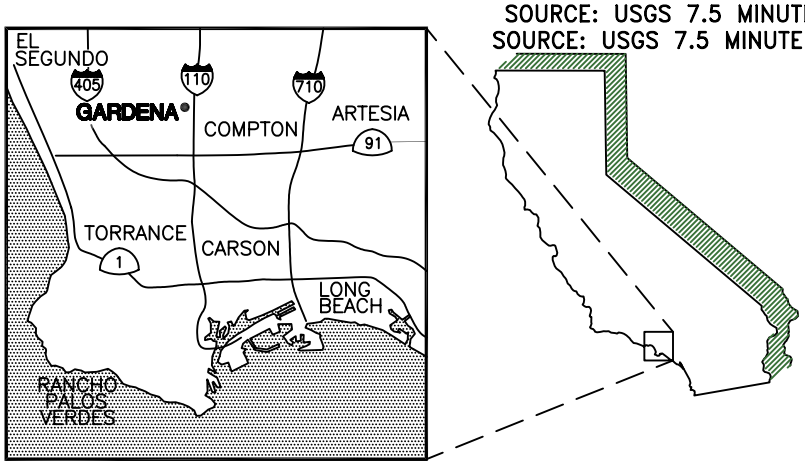
FIGURES





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APPROXIMATE SCALE IN FEET

SECOR
290 CONEJO RIDGE AVE, SUIT 200
THOUSAND OAKS, CALIFORNIA
(805) 230-1266

PREPARED FOR:
ATLANTIC RICHFIELD COMPANY
GARDENA SUMPS
1440 WEST ARTISA BOULEVARD
GARDENA, CALIFORNIA

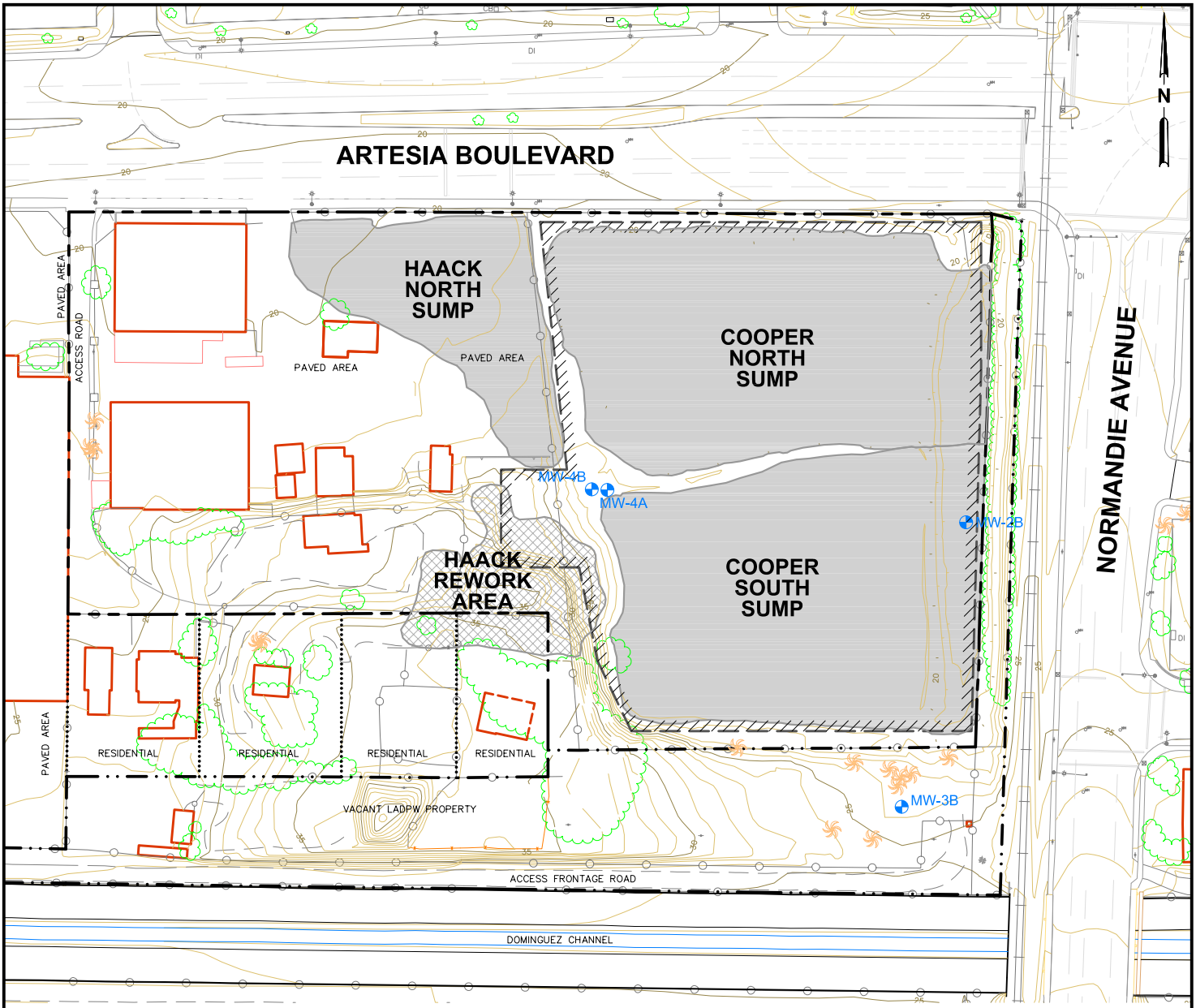
SITE LOCATION MAP

FIGURE: **1**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.00000.08	R. ERDMAN			10/31/03

\\Gardena Sumps\Site Location Map\

Gardena_Sump_SLM



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION OF HAACK REWORK AREA

0 120 240

APPROXIMATE SCALE (FEET)

DRAFT

GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.

APROXIMATE SURFACE AREAS

SURFACE AREA	ACRE	SQ. FEET
COOPER PROPERTY	3.13	136,416
HAACK PROPERTY	2.67	116,241
RESIDENCES	1.07	46,479
COOPER NORTH SUMP	1.26	54,909
COOPER SOUTH SUMP	1.28	55,845
HAACK NORTH SUMP	0.49	21,541
HAACK REWORK AREA	0.29	13,043
GEOSYNTHETIC COVER	2.91	126,588

SECOR
290 Conejo Ridge Avenue, Suite 200
Thousand Oaks, CA 91361
(805) 230-1266/230-1277 (Fax)

FOR:
REMEDIAL INVESTIGATION 2006
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

LOCATION OF SELECTED SITE FEATURES

FIGURE: **2**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP.XB006.06.3236	R. Roman	G. Maurath	P. Kinney	01/25/07

FILEPATH:Q:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2007-Feb\GS-RI_FIGS.dwg | troman | Mar 14, 2007 at 10:56 | Layout: FIG2

DALTON
(APPROXIMATE LOCATION OF MUNICIPAL SUPPLY WELL)

MW-1A
MW-1B

ARTESIA BOULEVARD

G-1

G-2

G-3

N

NORMANDIE AVENUE

W. CASSIDY ST

PAVED AREA

ACCESS ROAD

ACCESS FRONTAGE ROAD

RESIDENTIAL

VACANT LADPW PROPERTY

DOMINGUEZ CHANNEL

UG-CHAN

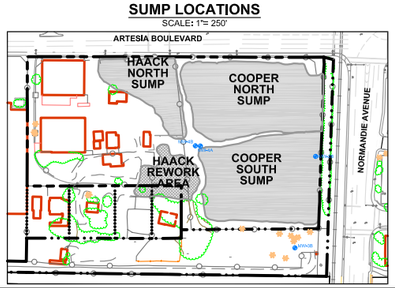
DG-CHAN

MW-4A
MW-4B
MW-2A
MW-2B
MW-3A
MW-3B
G-4

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN-LINK FENCE
- G-4 EPA GROUNDWATER MONITORING WELL
- MW-2A,B CLUSTER WELLS (A&B)
- DG-CHAN SURFACE WATER SAMPLING LOCATION (APPROXIMATE)/(ONLY SAMPLED FIRST QUARTER OF 2006)
- G-1 ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SUMP LOCATIONS
- APPROXIMATE LOCATION OF HAACK REWORK AREA
- CPB01 COOPER PROPERTY SOIL/SLUDGE SAMPLES
- DPW01 LA COUNTY DEPARTMENT OF PUBLIC WORKS SOIL SAMPLES
- HPB01 HACK PROPERTY SOIL/SLUDGE SAMPLE
- RB01 PRIVATE RESIDENTIAL PROPERTY SOIL/SLUDGE SAMPLES
- SV01 SOIL VAPOR SAMPLES
- SV05-AP AIR PERMEABILITY SAMPLES

SUMP LOCATIONS
SCALE: 1"= 250'



GENERAL SITE NOTES:

1. MAP REFERENCES; URS CONSULTANTS, DATED NOVEMBER 1994.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON-SITE AND OFF-SITE WERE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005. VERTICAL DATUM NGVD 29.
4. BORING AND SAMPLE LOCATIONS WERE SURVEYED BY W.M. HOLDINGS INC., ON JANUARY 23, 2006 (CPB AND DPW BORINGS), FEBRUARY 17, 2006 (HPB AND RB BORINGS), AND MARCH 30, 2006 (SV BORINGS).
5. SUPPLIMENTAL BORING AND SAMPLE LOCATIONS; AND GROUND WATER MONITORING WELL LOCATIONS AND ELEVATIONS (MW-04A/B) WERE SURVEYED BY W.M. HOLDING INC. ON MARCH 1, 2007

DRAFT

0 80 160
APPROXIMATE SCALE (FEET)

SECOR
290 Conejo Ridge Avenue, Suite 200
Thousand Oaks, CA 91361
(805) 230-1266/230-1277 (Fax)

FOR: REMEDIAL INVESTIGATION 2006
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

SITE MAP SHOWING LOCATIONS OF CURRENT INVESTIGATIVE CPT LOCATIONS, SOIL AND SUMP BORINGS, AND SOIL VAPOR TEST LOCATIONS

FIGURE: 3

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
37BP,XB006,06,3236	J Wade	G. Maurath	P. Kinney	12/22/06

FILEPATH:O:\CADD-37\Client\Gardena_Sumps\Remedial-Investigation\dwg\2007-Feb\GS-RI_FIGS.dwg | barboza | May 31, 2007 at 13:51 | Layout: FIG10

FIGURE 4
VAPOR EVOLUTION TESTING - NORTHEAST SUMP

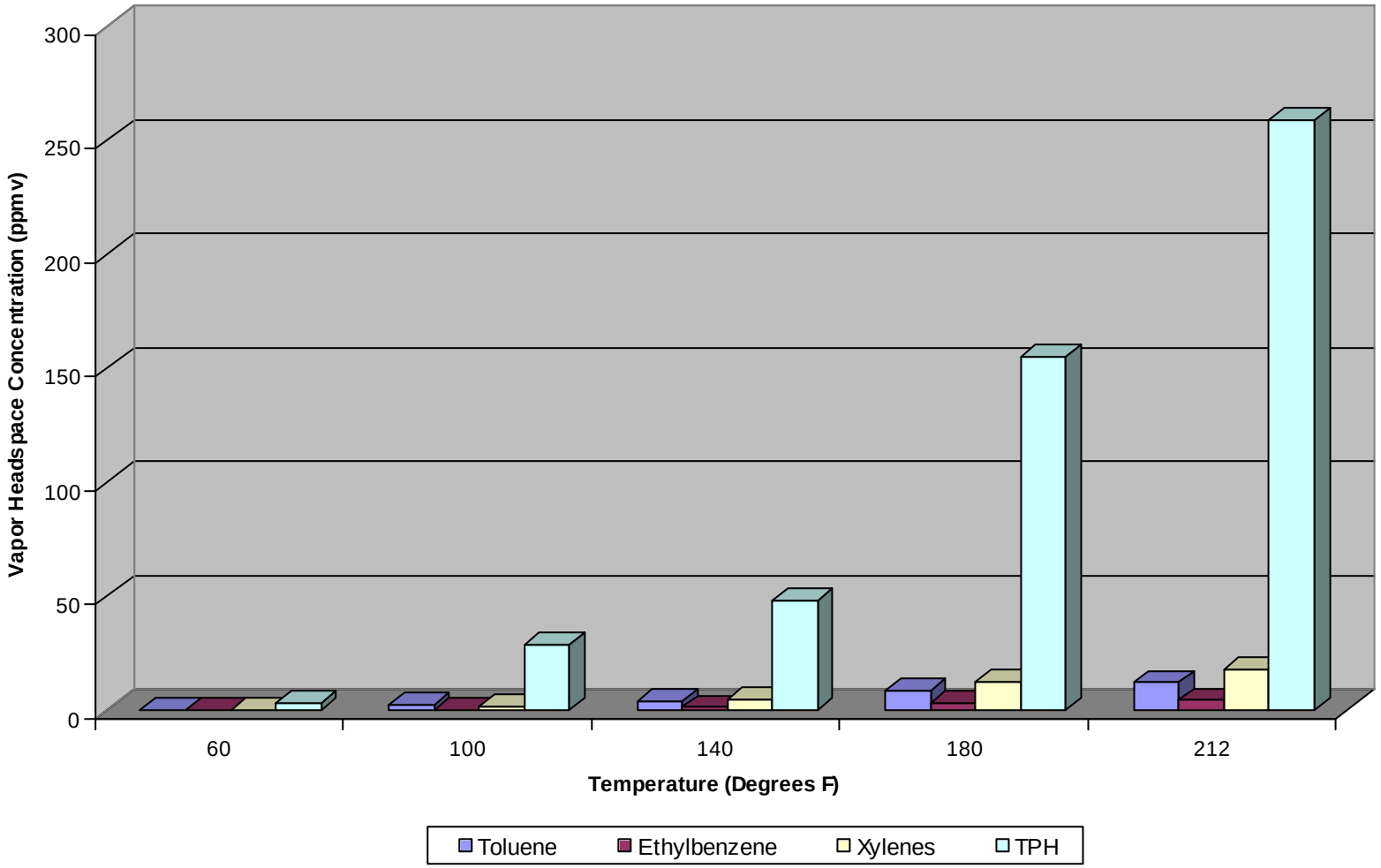


FIGURE 5
VAPOR EVOLUTION TESTING - SOUTHEAST SUMP

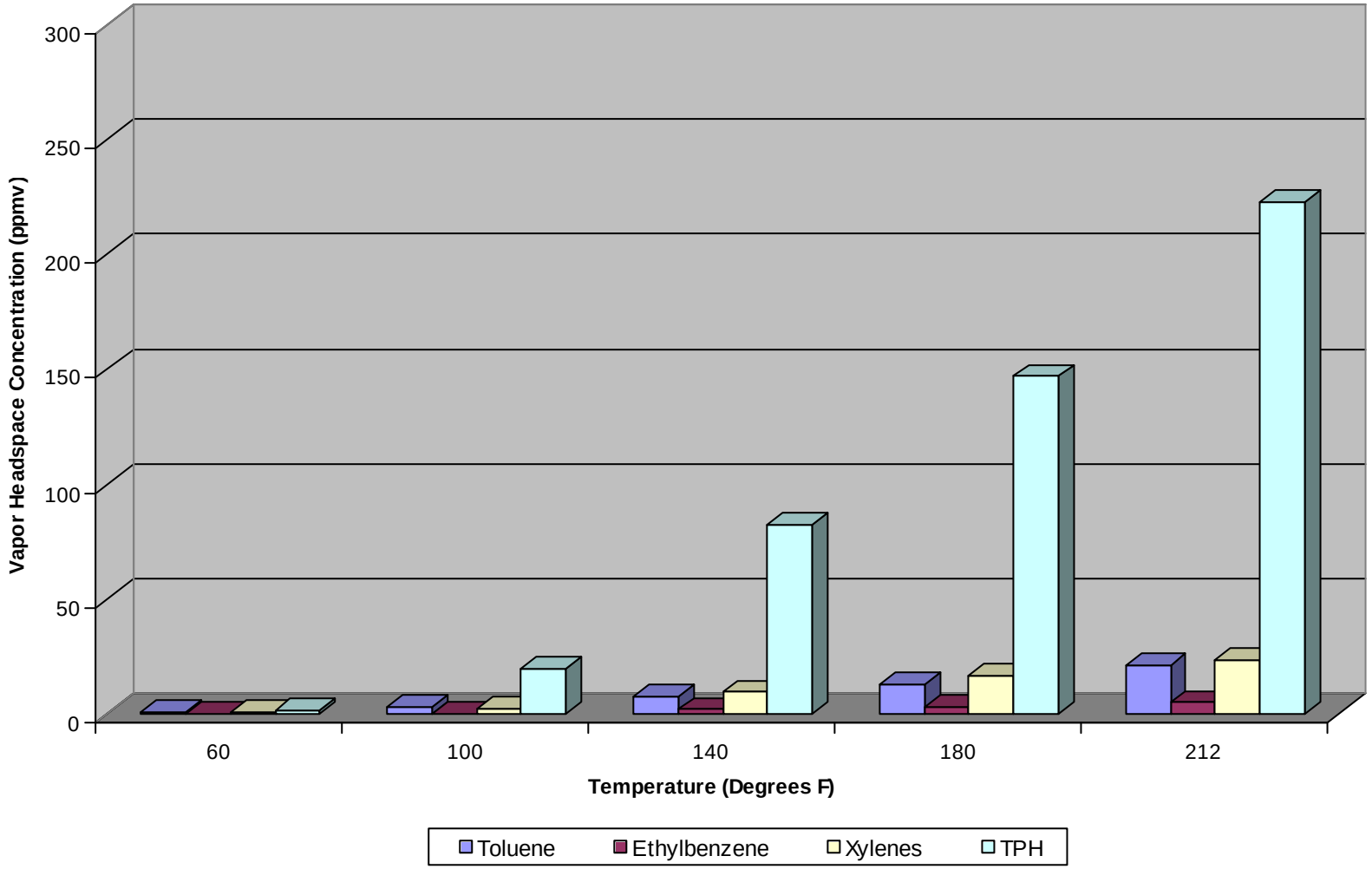


FIGURE 6
VAPOR EVOLUTION TESTING - SMALL CENTRAL SUMP

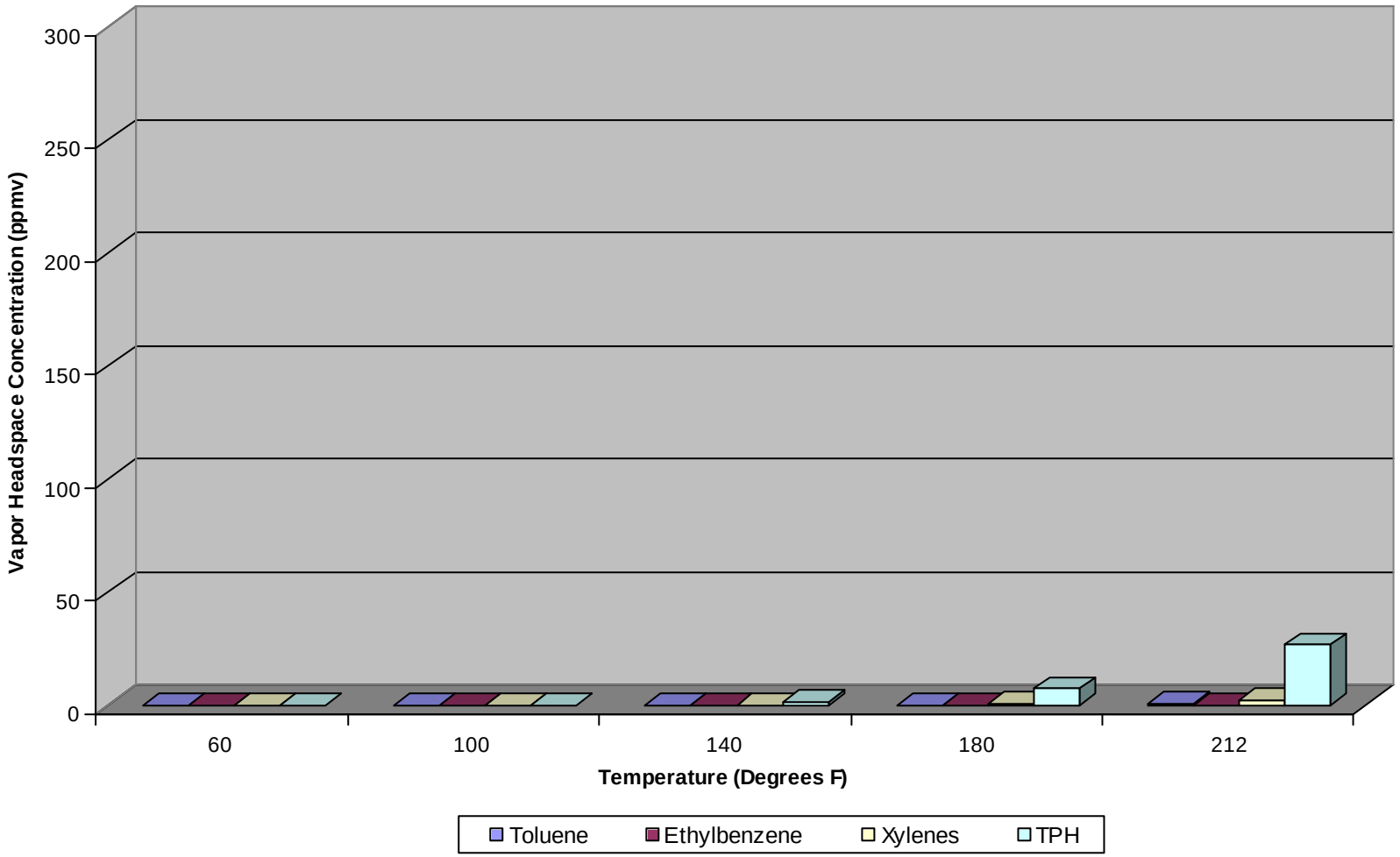
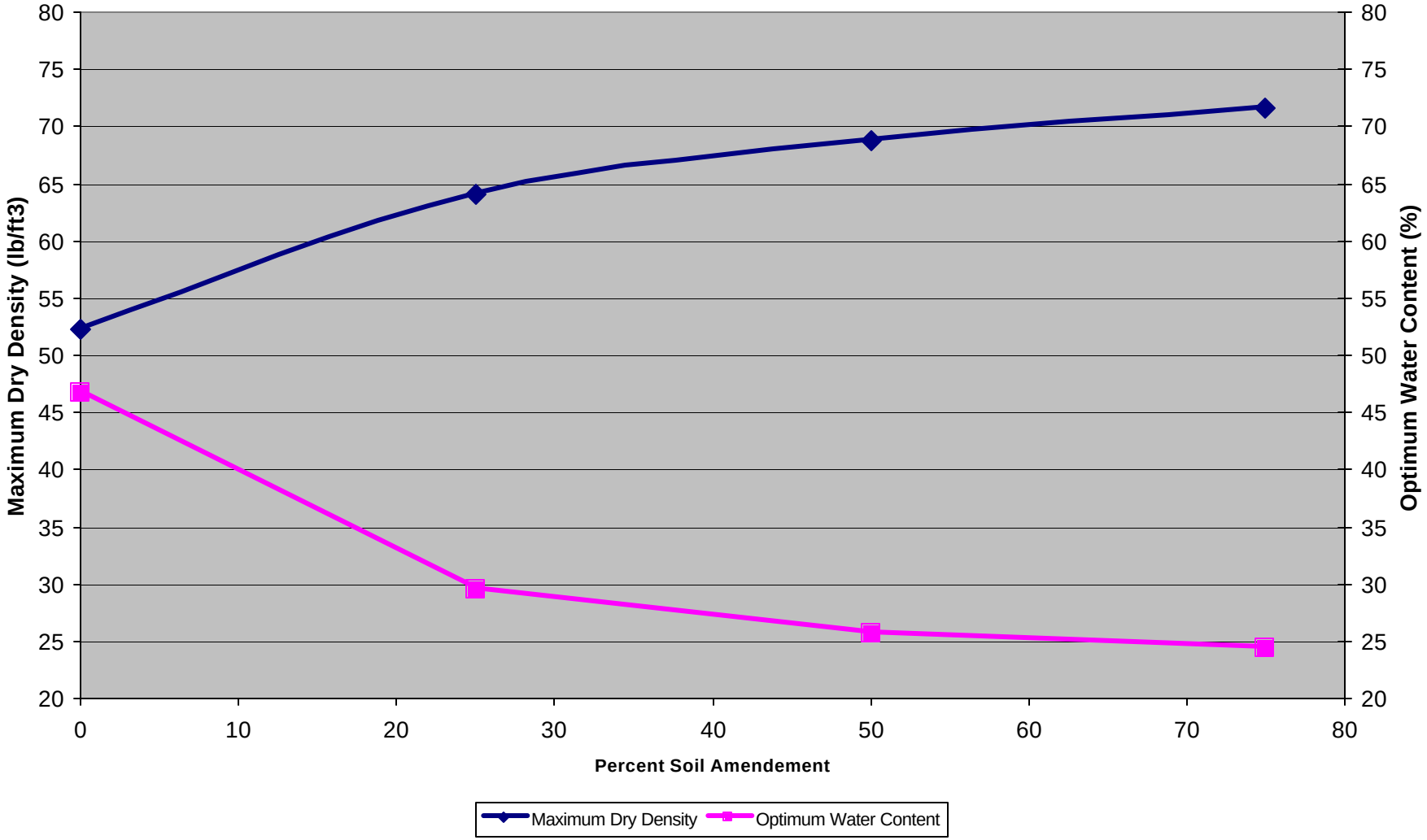


FIGURE 7: PHOTOGRAPH OF TREATED ACID SLUDGE HEATED TO 220 ^{O} F

Figure 8
Harvard Compaction Results



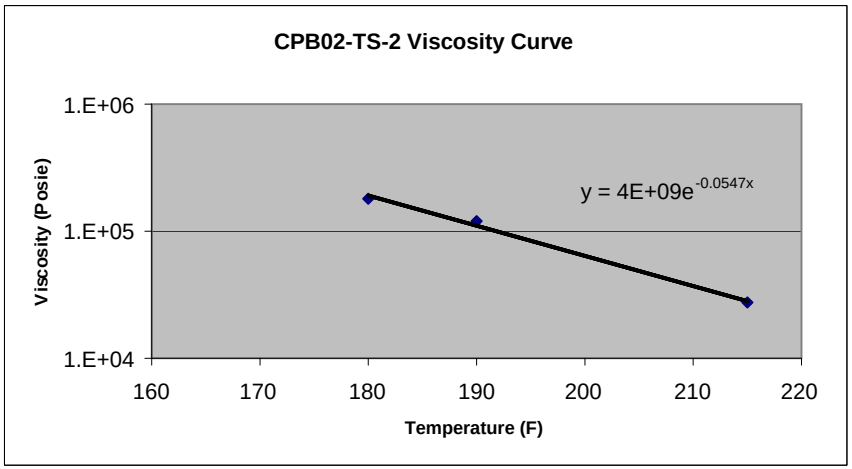
TABLES

TABLE 1: PHYSICAL PROPERTIES OF MATERIALS FROM BORING CPB02

TABLE 1a: Physical Properites of Acid Sludge from CPB02-TS-2			
Sample #	**Moisture %**	**Acidity (% as $CaCO_3$)**	**Density (g/cc)**
1	10.0	9.2	1.06
2	10.9	12.1	1.01
3	8.4	9.6	1.03
4	10.4	11.3	1.04
5	8.5	15.2	1.05
6	7.8	8.8	1.01
7	10.8	14.7	1.02
8	9.6	13.6	1.04
9	7.8	13.0	1.02
10	12.9	12.9	1.04
11	9.2	12.9	1.05
12	11.6	8.9	1.01
13	7.2	11.9	1.02
14	13.6	14.7	1.02
15	9.0	13.5	1.05
16	12.5	10.5	1.05
17	12.5	12.9	1.04
18	7.3	15.1	1.02
19	9.7	9.7	1.02
20	7.1	13.9	1.03
Average	9.8	12.2	1.03

TABLE 1b: Properites of Soil from CPB02-TS-7			
Sample #	**Moisture %**	**Acidity (% as $CaCO_3$)**	**pH**
1	25.6%	0.7	6.35
2	24.5%	<0.1	7.48
3	25.6%	<0.1	8.01
4	23.9%	<0.1	8.11
Average	24.9%	0.2	7.49

Table 1c: Viscosity Data for CPB02-TS-2	
T (F)	**Viscosity (Poise)**
215	2.75E+04
190	1.20E+05
180	1.80E+05



$Y=4E+9e^{-0.0547x}$

Calculated Viscosity Values at 60 C and 135 C

Poise (60 C) = 1.9E+04

Poise (135 C) = 1.2E+01

Avg Softening Point by ASTM D36

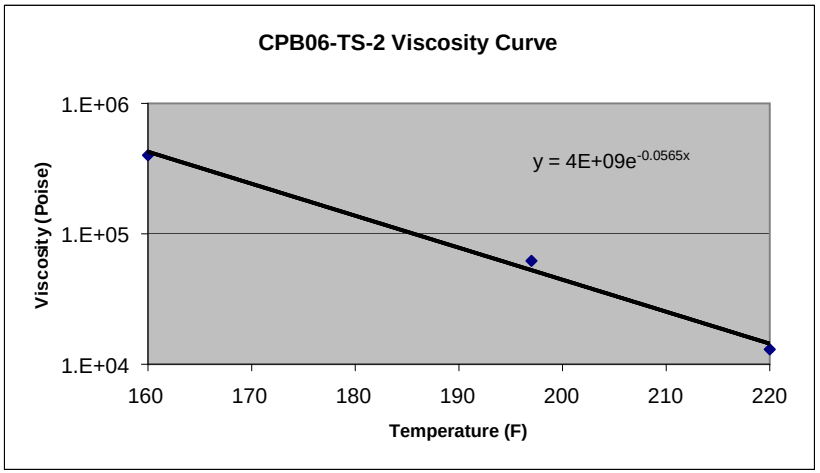
161 F

TABLE 2: PHYSICAL PROPERTIES OF MATERIALS FROM BORING CPB06

TABLE 2a: Physical Properites of Acid Sludge from CPB06-TS-2			
Sample #	**Moisture %**	**Acidity (% as $CaCO_3$)**	**Density (g/cc)**
1	7.8	17.4	1.08
2	12.4	15.1	1.06
3	14.3	12.2	1.03
4	7.5	15.5	1.07
5	13.6	12.4	1.07
6	10.8	10.9	1.06
7	11.4	11.1	1.08
8	10.5	13.8	1.11
9	13.1	14.1	1.05
10	13.4	16.3	1.02
11	9.9	13.5	1.01
12	10.8	10.7	1.07
13	11.8	13.2	1.02
14	8.2	16.3	1.05
15	8.6	11.7	1.11
16	7.3	13.0	1.03
17	9.0	14.9	1.06
18	8.5	14.9	1.01
19	7.1	10.9	1.02
20	12.2	14.2	1.08
21	14.0	13.5	1.04
22	10.8	9.2	1.03
Average	10.6	13.4	1.05

TABLE 2b: Properites of Soil from CPB06-TS-8			
Sample #	**Moisture %**	**Acidity (% as $CaCO_3$)**	**pH**
1	22.6%	0.3	6.79
2	24.1%	<0.1	7.59
3	23.3%	0.2	6.67
4	23.4%	<0.1	7.90
Average	23.4%	0.1	7.24

Table 2c: Viscosity Data for CPB06-TS-2	
T (F)	**Viscosity (Poise)**
220	1.30E+04
197	6.20E+04
160	4.00E+05



$Y=4E+9e^{-0.0569x}$

Calculated Viscosity Values at 60 C and 135 C

Poise (60 C) = 1.5E+04

Poise (135 C) = 7.1E+00

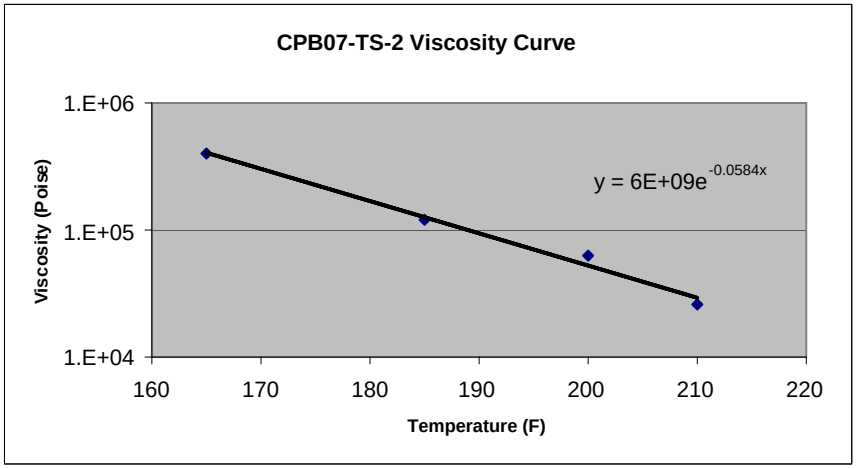
Avg Softening Point by ASTM D36

158 F

TABLE 3: PHYSICAL PROPERTIES OF MATERIALS FROM BORING CPB07

TABLE 3a: Physical Properites of Acid Sludge from CPB07-TS-2			
Sample ID	**Moisture %**	**Acidity (% as $CaCO_3$)**	**Density (g/ml)**
1	15.0	11.7	1.07
2	14.7	16.0	1.04
3	10.5	14.9	1.10
4	12.4	14.5	1.05
5	8.3	14.1	1.11
6	5.8	10.6	1.08
7	11.3	12.2	1.10
8	8.0	11.9	1.13
9	8.1	9.8	1.06
10	10.1	17.1	1.13
11	5.3	10.0	1.05
12	5.6	17.1	1.04
13	13.3	12.6	1.05
14	11.7	10.5	1.10
Average	10.0	13.1	1.08

Table 3b: Viscosity Data for CPB06-TS-2	
T (F)	**Viscosity (Poise)**
210	2.60E+04
200	6.28E+04
185	1.21E+05
165	4.00E+05



$Y=6E+9e^{-0.0584x}$

Calculated Viscosity Values at 60 C and 135 C

Poise (60 C) = 1.8E+04

Poise (135 C) = 7.1E+00

Avg Softening Point by ASTM D36

158 F

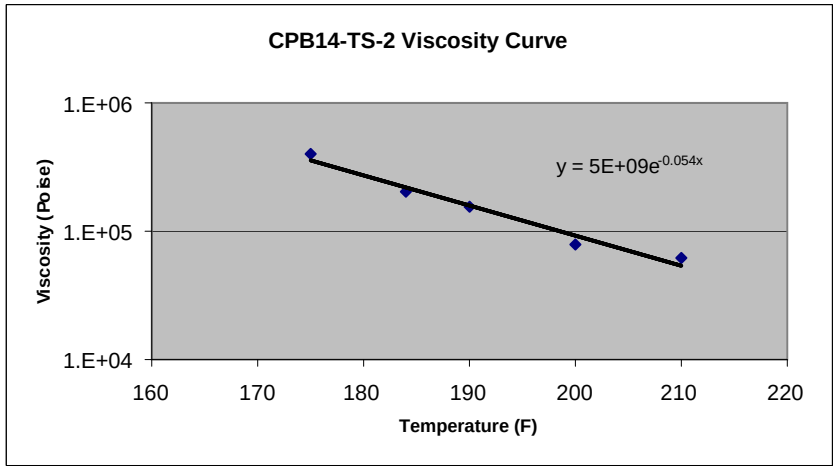
TABLE 4: PHYSICAL PROPERTIES OF MATERIALS FROM BORING CPB14

TABLE 4a: Physical Properites of Acid Sludge from CPB14-TS-2			
Sample #	**Moisture %**	**Acidity (% as $CaCO_3$)**	**Density (g/cc)**
1	12.4	20.9	1.08
2	12.5	15.1	1.10
3	8.7	20.7	1.19
4	7.8	15.8	1.08
5	8.5	18.2	1.12
6	8.7	18.4	1.11
7	7.3	17.5	1.06
8	13.1	19.4	1.12
9	11.8	15.4	1.09
10	7.4	14.6	1.08
11	8.5	20.9	1.19
12	12.9	20.4	1.18
13	7.1	16.1	1.11
14	13.1	19.4	1.12
15	9.2	19.0	1.09
16	9.0	15.4	1.11
Average	9.9	18.0	1.11

TABLE 4b: Properites of Soil from CPB14-TS-5			
Sample #	**Moisture %**	**Acidity (% as $CaCO_3$)**	**pH**
1	15.2%	<0.1	7.52
2	14.2%	<0.1	7.09
Average	14.7%	<0.1	7.31

TABLE 4c: Properites of Soil from CPB14-TS-7			
Sample #	**Moisture %**	**Acidity (% as $CaCO_3$)**	**pH**
1	15.6%	<0.1	7.57
2	14.8%	<0.1	7.70
Average	15.2%	<0.1	7.64

Table 4d: Viscosity Data for CPB14-TS-2	
T (F)	**Viscosity (Poise)**
210	6.20E+04
200	7.89E+04
190	1.55E+05
184	2.03E+05
175	4.00E+05



$Y=5E+09e^{-0.054x}$

Calculated Viscosity Values at 60 C and 135 C

Poise (60 C) = 2.6E+04

Poise (135 C) = 1.8E+01

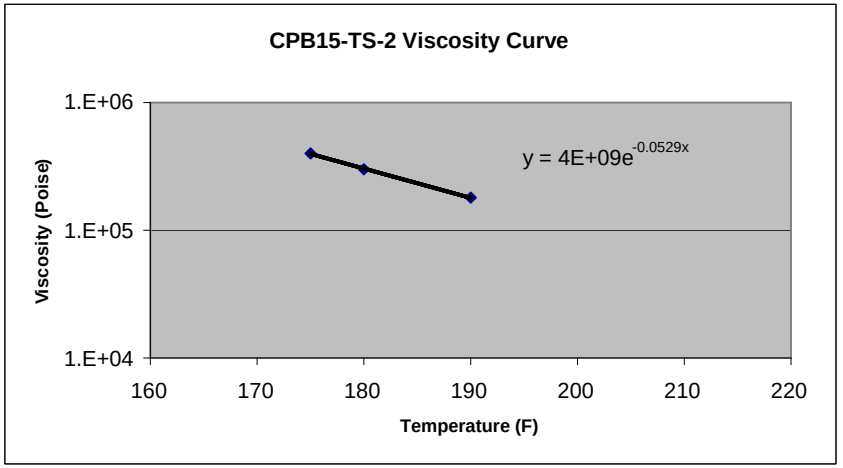
Avg Softening Point by ASTM D36

180 F

TABLE 5: PHYSICAL PROPERTIES OF MATERIALS FROM BORING CPB15

TABLE 5a: Physical Properites of Acid Sludge from CPB15-TS-2			
Sample ID	**Moisture %**	**Acidity (% as $CaCO_3$)**	**Density (g/cc)**
1	11.0	24.0	1.23
2	15.3	16.7	1.24
3	14.5	20.7	1.23
4	7.3	19.5	1.19
5	9.3	24.6	1.27
6	14.8	19.7	1.19
7	9.8	19.0	1.24
8	10.8	20.4	1.27
9	14.5	21.6	1.11
10	14.4	22.0	1.27
Average	12.2	20.8	1.22

Table 5b: Viscosity Data for CPB15-TS-2	
T (F)	**Viscosity (Poise)**
190	1.80E+05
180	3.00E+05
175	4.00E+05



$Y=4E+09e^{-0.0529x}$

Calculated Viscosity Values at 60 C and 135 C

Poise (60 C) = 2.4E+04

Poise (135 C) = 1.9E+01

Avg Softening Point by ASTM D36

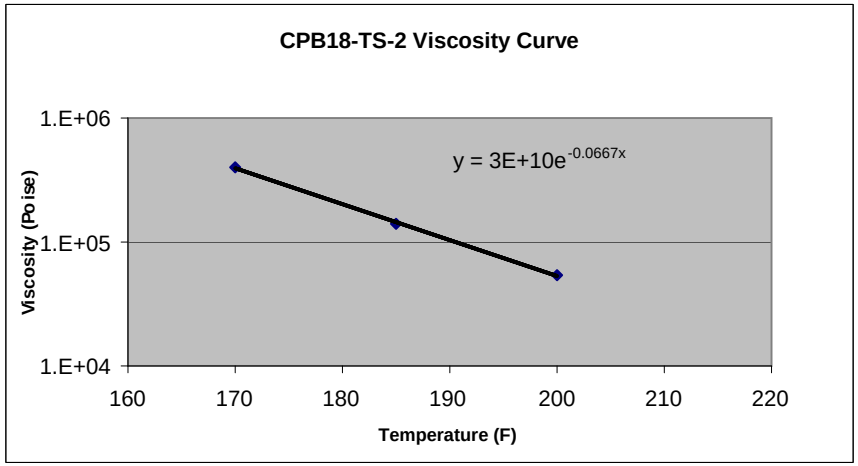
185 F

TABLE 6: PHYSICAL PROPERTIES OF MATERIALS FROM BORING CPB18

TABLE 6a: Physical Properites of Acid Sludge from CPB18-TS-2			
Sample #	**Moisture %**	**Acidity (% as $CaCO_3$)**	**Density (g/cc)**
1	11.1	20.2	1.20
2	11.3	21.2	1.20
3	12.3	19.8	1.12
4	11.5	17.4	1.18
5	8.8	15.7	1.21
6	13.5	14.6	1.22
7	12.9	16.0	1.18
8	8.0	21.2	1.21
9	13.9	16.2	1.11
10	12.9	20.2	1.16
11	10.8	17.9	1.12
12	9.7	16.8	1.11
13	9.5	16.2	1.23
14	8.7	20.1	1.16
15	13.0	21.0	1.16
Average	11.2	18.3	1.17

TABLE 6b: Properites of Soil from CPB18-TS-8			
Sample #	**Moisture %**	**Acidity (% as $CaCO_3$)**	**pH**
1	12.1%	< 0.1	7.77
2	12.8%	<0.1	8.19
3	13.3%	<0.1	7.94
4	13.5%	<0.1	7.68
Average	12.9%	<0.1	7.90

Table 6c: Viscosity Data for CPB15-TS-2	
T (F)	**Viscosity (Poise)**
200	5.40E+04
185	1.40E+05
170	4.00E+05



$Y=3E+10e^{-0.0667x}$

Calculated Viscosity Values at 60 C and 135 C

Poise (60 C) = 2.6E+04

Poise (135 C) = 3.2E+00

Avg Softening Point by ASTM D36

174 F

TABLE 7: PHYSICAL PROPERTIES OF MATERIALS FROM BORING HPB05

TABLE 7a: Physical Properites of Acid Sludge from HPB05-TS-5			
Sample #	**Moisture %**	**Acidity (% as $CaCO_3$)**	**Density (g/cc)**
1	17.6	6.1	1.18
2	29.5	13.6	1.21
3	17.8	13.0	1.24
4	23.9	13.7	1.18
5	16.9	14.2	1.24
6	27.4	7.5	1.25
7	24.7	11.6	1.27
8	28.3	8.9	1.22
9	29.7	6.9	1.16
10	16.6	8.5	1.14
11	24.5	6.6	1.12
12	22.7	12.0	1.20
13	20.0	6.3	1.12
14	18.7	12.1	1.27
15	19.8	13.5	1.14
16	17.1	8.4	1.18
17	23.0	14.6	1.22
18	24.1	8.3	1.23
19	29.0	14.9	1.23
20	18.0	9.8	1.22
21	18.9	8.2	1.14
Average	22.3	10.4	1.20

TABLE 7b: Properites of Soil from HPB-TS-5			
Sample #	**Moisture %**	**Acidity (% as $CaCO_3$)**	**pH**
1	18.4%	0.2	3.32
2	15.5%	0.5	3.14
3	16.0%	0.3	3.35
4	17.6%	0.6	2.94
Average	16.9%	0.4	3.19

Softening Point by ASTM D36 > 210 F

Table 8: Reaction Temperature Data for Stabilization with CaO			
Time	**Temperature (F) for sludge treated with 9% CaO**	**Temperature (F) for sludge treated with 10% CaO**	**Temperature (F) for sludge treated with 11% CaO**
0	70.2	70.2	70.2
1	140.8	196.8	189.8
2	142.8	197.2	200.2
3	144.8	199.7	202.0
4	148.4	200.9	202.2
5	153.7	202.4	202.6
6	167.8	203.5	204.2
7	170.2	204.4	205.4
8	175.9	205.1	207.5
9	180.0	206.0	207.8
10	182.8	206.9	208.2
11	193.8	207.0	208.7
12	207.0	207.7	209.8
13	208.3	208.0	210.7
14	208.4	208.3	209.9
15	208.9	208.6	210.9
16	209.0	209.5	210.9
17	209.2	209.9	211.0
18	209.4	210.1	211.6
19	209.8	210.5	211.5
20	210.3	210.7	211.6
21	211.2	210.9	211.2
22	211.6	211.1	211.3
23	211.6	211.0	211.2
24	211.3	211.2	211.2
25	211.5	211.2	211.2
26	211.1	211.3	211.2
27	211.1	211.2	211.2
28	211.1	211.4	211.2
29	210.9	211.2	211.2
30	210.6	211.2	211.2

Table 9: Reaction Temperature Data for Stabilization with $CaO/CaCO_3$			
Time	**Temperature (F) for sludge treated with 9% CaO/9% $CaCO_3$**	**Temperature (F) for sludge treated with 10% CaO/10% $CaCO_3$**	**Temperature (F) for sludge treated with 11% CaO/11% $CaCO_3$**
0	70.2	70.2	70.2
1	146.2	157.0	156.8
2	201.3	203.0	168.6
3	203.8	204.1	172.8
4	206.1	205.2	176.4
5	207.2	205.6	181.2
6	207.9	206.8	183.7
7	208.8	207.0	186.2
8	209.5	208.1	190.8
9	210.1	208.5	194.5
10	210.4	208.7	196.5
11	210.4	209.6	199.0
12	210.8	209.8	201.5
13	210.8	210.4	203.5
14	211.0	210.8	205.3
15	211.4	210.8	206.6
16	211.6	211.2	208.0
17	211.8	210.9	208.9
18	211.5	211.5	209.9
19	211.6	211.6	210.4
20	211.6	211.8	210.9
21	211.6	211.6	211.4
22	211.6	211.4	211.6
23	211.6	211.4	211.4
24	211.6	211.4	211.6
25	211.6	211.4	211.6
26	211.6	211.4	211.6
27	211.6	211.4	211.6
28	211.6	211.4	211.6
29	211.4	211.4	211.6
30	211.4	211.4	211.6

Table 10: Reaction Temperature Data for Stabilization with $Ca(OH)_2$			
Time	**Temperature (F) for sludge treated with 11% Ca(OH)2**	**Temperature (F) for sludge treated with 12% Ca(OH)2**	**Temperature (F) for sludge treated with 13% Ca(OH)2**
0	70.2	70.2	70.2
1	111.3	112.8	111.7
2	111.5	113.4	112.6
3	113.9	114.5	113.0
4	115.1	114.7	115.2
5	116.4	115.0	119.2
6	117.5	116.6	121.1
7	118.4	118.0	121.5
8	119.1	120.3	122.3
9	120.2	120.8	122.7
10	121.1	121.4	123.1
11	121.4	122.3	123.3
12	122.1	123.6	124.3
13	122.7	124.6	124.9
14	123.0	124.0	125.0
15	123.4	125.3	125.5
16	124.3	125.5	125.6
17	124.7	125.8	125.8
18	125.0	126.4	126.0
19	125.4	126.7	126.4
20	125.6	127.0	126.9
21	125.9	127.0	128.0
22	126.1	127.2	128.4
23	126.1	127.2	128.4
24	126.3	127.2	128.4
25	126.5	127.4	128.4
26	126.6	127.2	128.2
27	126.6	127.2	128.2
28	126.8	127.2	128.2
29	126.7	127.2	128.2
30	126.8	127.4	128.1
31	126.8	127.4	128.2
32	127.0	127.4	128.2
33	127.0	127.4	128.2
34	127.0	127.4	128.1
35	127.0	127.4	128.2

Table 11: Reaction Temperature Data for Stabilization with $Ca(OH)_2/CaCO_3$			
Time	**Temperature (F) for sludge treated with 11% $Ca(OH)_2$/11% $CaCO_3$**	**Temperature (F) for sludge treated with 12% $Ca(OH)_2$/12% $CaCO_3$**	**Temperature (F) for sludge treated with 13% $Ca(OH)_2$/13% $CaCO_3$**
0	70.2	70.2	70.2
1	107.6	115.0	117.5
2	112.1	115.3	120.0
3	114.6	115.7	122.0
4	116.7	117.0	123.8
5	118.0	117.6	125.0
6	118.7	118.3	125.9
7	119.6	119.0	126.8
8	120.5	120.3	128.1
9	121.1	121.0	129.0
10	121.4	121.4	129.3
11	121.6	122.7	129.9
12	122.0	123.6	130.4
13	122.1	124.4	130.8
14	122.3	125.0	131.1
15	122.7	125.3	131.5
16	122.9	125.7	132.2
17	123.3	125.8	132.4
18	123.0	126.6	132.6
19	123.2	126.7	132.8
20	123.4	127.0	132.9
21	123.4	127.0	133.1
22	123.6	127.0	133.3
23	123.6	127.0	133.3
24	123.6	127.0	133.3
25	123.6	127.2	133.3
26	123.6	127.2	133.3
27	123.6	127.2	133.3
28	123.6	127.2	133.3
29	123.6	127.2	133.3
30	123.6	127.2	133.1
31	123.4	127.2	133.0
32	123.4	127.2	133.0
33	123.4	127.2	133.0
34	123.4	127.2	133.0
35	123.4	127.2	133.0

Table 12: Reaction Temperature Data for Stabilization with Portland Cement			
Time	Temperature (F) for sludge treated with 20% Portland Cement	Temperature (F) for sludge treated with 30% Portland Cement	Temperature (F) for sludge treated with 40% Portland Cement
0	70.2	70.2	70.2
1	108.6	117.0	109.3
2	109.2	118.2	111.8
3	110.4	120.0	114.5
4	110,8	120.9	115.8
5	111.0	121.6	117.2
6	112.7	122.0	118.9
7	113.6	122.3	119.3
8	114.0	122.7	120.4
9	114.4	123.7	122.0
10	114.5	123.2	122.3
11	114.6	123.6	122.9
12	115.0	123.8	124.1
13	115.0	123.9	124.3
14	115.5	124.1	124.6
15	115.7	124.1	125.3
16	115.9	124.1	125.5
17	116.3	124.5	125.8
18	117.6	124.7	126.0
19	117.6	124.8	126.1
20	117.7	124.8	126.2
21	117.9	125.0	126.2
22	118.2	125.0	126.2
23	118.2	125.2	126.2
24	118.2	125.2	126.2
25	118.2	125.4	126.2
26	118.2	125.4	126.2
27	118.2	125.4	126.0
28	118.2	125.4	126.0
29	118.2	125.4	126.0
30	118.2	125.4	126.0
31	118.4	125.2	126.0
32	118.4	125.2	126.0
33	118.4	125.2	126.0
34	118.4	125.2	126.0
35	118.4	125.2	126.0

Table 13: Physical Properites of Stabilized Sludge Samples				
Sample	**Strength (psi)**	**Density (lb/ft^3)**	**Volume Expansion (%)**	**pH**
9% CaO	55	77.6	7	3.72
10% CaO	55	77.8	7	9.38
11% CaO	55	77.8	7	11.69
9% CaO/9% $CaCO_3$	55	80.6	11	5.93
10% CaO/10% $CaCO_3$	55	80.7	12	9.88
11% CaO/11% $CaCO_3$	55	81.9	12	11.38
11% $Ca(OH)_2$	55	77.5	7	4.56
12% $Ca(OH)_2$	55	77.4	7	10.34
13% $Ca(OH)_2$	55	77.8	7	11.73
11% $Ca(OH)_2$/11% $CaCO_3$	55	80.2	12	6.20
12% $Ca(OH)_2$/12% $CaCO_3$	55	81.0	12	8.84
13% $Ca(OH)_2$/13% $CaCO_3$	55	80.2	13	11.28
20% Portland Cement	52	79.6	12	3.92
30% Portland Cement	52	81.0	14	4.88
40% Portland Cement	47	81.4	20	5.38

TABLE 14: VAPOR EVOLUTION RESULTS FOR NORTHEAST SUMP							
Temperature (^{o}F)	Benzene (ppm_v)	Toluene (ppm_v)	Ethylbenzene (ppm_v)	Total Xylenes (ppm_v)	TPH (ppm_v)	SO_2 (ppm_v)	H_2S (ppm_v)
60	BDL	BDL	BDL	BDL	3.0	>150	408
100	BDL	1.9	BDL	1.5	28.6	>150	>500
140	BDL	3.6	0.9	4.3	47.7	>150	>500
180	BDL	8.4	2.9	12.4	155	>150	>500
212	BDL	11.8	4.1	17.5	259	>150	>500
BDL = Below Analytical Detection Limits (0.5 ppm_v)							

5 grams of sludge placed in 40 ml VOA and allowed to equilibrate in a waterbath at the designated temperature for 1 hour.
Sample analysis performed by direct injection of vapor headspace in GC equipped with an FID.

TABLE 15: VAPOR EVOLUTION RESULTS FOR SOUTHEAST SUMP							
Temperature (^{o}F)	Benzene (ppm_v)	Toluene (ppm_v)	Ethylbenzene (ppm_v)	Total Xylenes (ppm_v)	TPH (ppm_v)	SO_2 (ppm_v)	H_2S (ppm_v)
60	BDL	1	BDL	0.8	1.8	>150	471
100	BDL	2.9	BDL	2.3	19.7	>150	>500
140	BDL	7.8	1.9	9.5	82.2	>150	>500
180	BDL	12.9	3.3	16.7	147	>150	>500
212	BDL	21.4	5.1	23.5	223	>150	>500
BDL = Below Analytical Detection Limits (0.5 ppm_v)							

5 grams of sludge placed in 40 ml VOA and allowed to equilibrate in a waterbath at the designated temperature for 1 hour.
Sample analysis performed by direct injection of vapor headspace in GC equipped with an FID.

TABLE 16: VAPOR EVOLUTION RESULTS FOR SMALL CENTRAL SUMP							
Temperature (^{o}F)	Benzene (ppm_v)	Toluene (ppm_v)	Ethylbenzene (ppm_v)	Total Xylenes (ppm_v)	TPH (ppm_v)	SO_2 (ppm_v)	H_2S (ppm_v)
60	BDL	BDL	BDL	BDL	BDL	8	2
100	BDL	BDL	BDL	BDL	BDL	12	7
140	BDL	BDL	BDL	BDL	1.8	27	11
180	BDL	BDL	BDL	1.1	7.4	45	32
212	BDL	0.8	BDL	2.5	26.7	71	50
BDL = Below Analytical Detection Limits (0.5 ppm_v)							

5 grams of sludge placed in 40 ml VOA and allowed to equilibrate in a waterbath at the designated temperature for 1 hour.
Sample analysis performed by direct injection of vapor headspace in GC equipped with an FID.

Table 17: Untreated and Treated Acid Sludge Analyses				
	Sludge Composition	Untreated Sludge Extracts		Treated
Compound	Total (mg/kg)	TCLP (mg/l)	SPLP (mg/l)	SPLP (mg/l)
Barium	1.2	0.06	<0.01	<0.01 to 0.02
Lead	22.4	0.24	0.31	<0.03
Toluene	0.4	NA	0.007	0.003 to 0.007
Ethylbenzene	0.2	NA	<0.001	0.001
Total xylenes	1.0	NA	<0.003	0.007 to 0.010
1,2,4-trimethylbenzene	0.7	NA	<0.001	0.002 to 0.003
1,3,5-trimethylbenzene	0.5	NA	<0.001	<0.001
1,2,3-trimethylbenzene	1.1	NA	<0.001	0.003
2-methylnaphthalene	1.9	NA	<0.005	<0.005 to 0.005
Acetone	<3	NA	0.19	0.05 to 0.09
Methyl ethyl ketone	<2	NA	0.12	<0.03

NA = Not Analyzed - Compounds are not on the RCRA TCLP list for VOCs

Table 18: Treated Sludge Long-Term Leach Analyses					
Compound	**Extract #2 (mg/l)**	**Extract #4 (mg/l)**	**Extract #6 (mg/l)**	**Extract #8 (mg/l)**	**Extract #10 (mg/l)**
pH	8.31	8.45	8.22	8.16	7.93
Alkalinity	25	20	20	15	15
Barium	0.0	0.02	0.02	<0.01	<0.01
Ethylbenzene	0.001	0.001	0.001	0.001	<0.001
Toluene	0.007	0.007	0.005	0.003	0.003
Total xylenes	0.008	0.010	0.008	0.007	0.006
1,2,4-trimethylbenzene	0.002	0.003	0.003	0.002	0.003
1,2,3-trimethylbenzene	0.003	0.003	0.003	0.003	0.003
Acetone	0.060	0.060	0.090	0.050	<0.050
2-methylnapthalene	<0.005	0.005	<0.005	<0.005	<0.005

Table 19: ReactionTemperature Data for Stabilization with 50/50 $Ca(OH)_2/CaCO_3$ and Soil							
Time (min)	Temperature (F) of sludge treated with neutralizing reagent and 25 g soil	Temperature (F) of sludge treated with neutralizing reagent and 50 g soil	Temperature (F) of sludge treated with neutralizing reagent and 75 g soil	Time (min)	Temperature (F) of sludge treated with neutralizing reagent and 25 g soil	Temperature (F) of sludge treated with neutralizing reagent and 50 g soil	Temperature (F) of sludge treated with neutralizing reagent and 75 g soil
1	86.3	81.3	77.9	51	92.8	88.5	86.1
2	89.7	85.1	81.1	52	92.8	88.5	86.1
3	91	85.8	82	53	92.7	88.5	86.1
4	91.4	86	82.4	54	92.7	88.5	86.1
5	91.7	86	82.7	55	92.6	88.5	86.1
6	91.9	86.1	82.9	56	92.6	88.5	86.1
7	92.1	86.1	83.3	57	92.6	88.6	86.2
8	92.3	86.3	83.4	58	92.5	88.6	86.2
9	92.4	86.3	83.6	59	92.5	88.6	86.2
10	92.6	86.3	83.6	60	92.4	88.7	86.3
11	92.6	86.4	83.8	61	92.4	88.7	86.3
12	92.6	86.5	83.9	62	92.4	88.7	86.3
13	92.6	86.5	84	63	92.4	88.7	86.3
14	92.6	86.5	84.1	64	92.4	88.7	86.3
15	92.7	86.7	84.2	65	92.4	88.7	86.3
16	92.8	86.8	84.2	66	92.4	88.7	86.3
17	92.8	86.9	84.3	67	92.3	88.7	86.3
18	92.9	86.9	84.4	68	92.2	88.7	86.3
19	92.9	87	84.5	69	92.2	88.7	86.3
20	93	87	84.5	70	92.1	88.7	86.3
21	93	87.1	84.6	71	92.1	88.7	86.3
22	93	87.2	84.7	72	92.1	88.7	86.3
23	93	87.3	84.8	73	92	88.7	86.3
24	93	87.3	85	74	92	88.7	86.3
25	93	87.4	85.1	75	91.9	88.7	86.3
26	93	87.5	85.2	76	91.9	88.6	86.3
27	93	87.6	85.3	77	91.9	88.6	86.3
28	93	87.7	85.3	78	91.8	88.6	86.3
29	93	87.8	85.3	79	91.8	88.6	86.3
30	93	87.8	85.4	80	91.7	88.5	86.3
31	93	87.8	85.4	81	91.7	88.5	86.3
32	93	87.8	85.4	82	91.7	88.5	86.3
33	93	87.9	85.5	83	91.7	88.5	86.3
34	93	87.9	85.5	84	91.7	88.5	86.3
35	93	87.9	85.6	85	91.6	88.5	86.3
36	93	87.9	85.7	86	91.6	88.5	86.3
37	93	88	85.8	87	91.5	88.5	86.3
38	93	88	85.8	88	91.5	88.5	86.3
39	93	88	85.9	89	91.5	88.5	86.3
40	93	88.1	86	90	91.4	88.5	86.3
41	93	88.1	86	91	91.3	88.5	86.3
42	92.9	88.1	86	92	91.2	88.4	86.3
43	92.9	88.2	86	93	91.1	88.4	86.3
44	92.9	88.2	86	94	91.1	88.4	86.3
45	92.8	88.3	86	95	91	88.3	86.3
46	92.8	88.4	86	96	91	88.3	86.3
47	92.8	88.4	86	97	91	88.3	86.2
48	92.8	88.4	86	98	90.9	88.3	86.2
49	92.8	88.4	86	99	90.9	88.3	86.1
50	92.8	88.5	86.1	100	90.8	88.3	86.1

Table 20: Physical Properites of Stabilized Sludge Sample with Soil Amendment				
Sample	Strength (psi)	Density (lb/ft^3)	Volume Expansion (%)	pH
12% $Ca(OH)_2$/12% $CaCO_3$/25% Soil	55	83.3	48	8.73
12% $Ca(OH)_2$/12% $CaCO_3$/50% Soil	55	87.2	69	8.84
12% $Ca(OH)_2$/12% $CaCO_3$/75% Soil	55	89.5	92	9.17

Table 21: Table for Evaluation of Thermal Treatment Properites	
Testing Parameter	**Result**
Heating Value (BTUs/lb)	13,000
Sulfur Content (%)	7.06
Diesel Range Organics (mg/kg)	39,000
Gasoline Range Organics (mg/kg)	70
VOCs by 8260 (mg/kg)	5.8
SVOCs by 8270 (mg/kg)	30
PAHs by 8270 (mg/kg)	490

Table 22: Specifications for Penetration Grade Asphalt Cement					
	Penetration Grade				
	40-50	60-70	85-100	120-150	200-300
Penetration, 77ºF (25 ºC), 100g, 5s, min	40-50	60-70	85-100	120-150	200-300
Flash Point, ºF (Cleveland Open Cup)	450	450	450	425	350
Solubility in Solvent, %	99	99	99	99	99

Table 23: Specifications for Viscosity Grade Asphalt Cement						
	Viscosity Grade					
	AC-2.5	AC-5	AC-10	AC-20	AC-30	AC-40
Viscosity, 140 ºF (60 ºC), P	250 ± 50	500 ± 100	1000 ± 200	2000 ± 400	3000 ± 600	4000 ± 800
Viscosity, 275 ºF (135 ºC), min, cSt	125	175	250	300	350	400
Penetration, 77ºF (25 ºC), 100g, 5s, min	220	140	80	60	50	40
Flash Point, Cleveland open cup, min, ºF (ºC)	325 (163)	350 (177)	425 (219)	450 (232)	450 (232)	450 (232)
Solubility in solvent, min %	99	99	99	99	99	99

Table 24: Specifications for Roofing Asphalt					
	Type I Range	**Type II Range**	**Type III Range**	**Type IV Range**	**Test Method**
Softening Point (ºF)	135-151	158-176	185-205	210-225	ASTM D36
Flash Point (ºF)	475	475	475	475	ASTM D92
Penetration Units at 77 ºF	18-60	18-40	15-35	12.0-25	ASTM D5
Ductility at 77 ºF, cm	10	3	2.5	1.5	ASTM D113
Solubility in solvent %	99	99	99	99	ASTM D2042

APPENDIX A

CHAIN OF CUSTODY RECORDS

Chain of Custody Record

Project Name: TREATABILITY SAMPLING
BP BU/AR Region/Enfos Segment: OBC Non-Mining
State or Lead Regulatory Agency: DTSC
Requested Due Date: Standard TAT

On-site Time:	Temp:
Off-site Time:	Temp:
Sky Conditions:	
Meteorological Events:	
Wind Speed:	Direction:

Lab Name:	SECOR International, Inc.
Address:	4035 King Road, Suite D
	Sylvaina, Ohio 43560
Lab PM:	Dan Oberle
Tele/Fax:	(419) 841-2731
BP/AR PM Contact:	Mike Mc Anulty
Address:	6 Centerpointe Dr. LPR6-168
	La Palma, California 90623
Tele/Fax:	(714) 226 - 6709

BP/AR Facility No.:	Gardena Sumps
BP/AR Facility Address:	SW Corner Artesia & Normandie
Site Lat/Long:	
California Global ID No.:	
Enfos Project No.:	
Provision or RCOP (circle one)	
Phase/WBS:	
Sub Phase/Task:	Analytical
Cost Element:	Sub Contracted Cost

Consultant/Contractor:	SECOR International, Inc.
Address:	290 Conejo Ridge Avenue
	Thousand Oaks, CA 91361
Consultant/Contractor Project No.:	37BP.XB046.06
Consultant/Contractor PM:	Phillip Kinney
Tele/Fax:	805-230-1266 / 805-230-1277
Report Type & QC Level:	Standard
E-mail EDD To:	
Invoice to: Consultant or BP or Atlantic Richfield Co. (Circle one)	

Lab Bottle Order No:

Item No.	Sample Description	Time	Date	Matrix: Soil/Solid	Matrix: Water/Liquid	Matrix: Air	Laboratory No.	No. of Containers	Preservative: Unpreserved	Preservative: H_2SO_4	Preservative: HNO_3	Preservative: HCl	Preservative: Methanol	Requested Analysis: Treatability Study	Sample Point Lat/Long and Comments
1	CPB02-TS-2	1055	02/13/06	X				20	X					X	Approx. 20 Linear ft.
2	CPB02-TS-7	1145	02/13/06	X				4	X					X	Approx. 8 Linear ft.
3															
4															
5															
6															
7															
8															
9															
10															

Sampler's Name:	Mark Mason
Sampler's Company:	SECOR International Inc.
Shipment Date:	
Shipment Method:	
Shipment Tracking No:	

Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
[signature] SECOR INT. INC	2/14/06	1600			

Special Instructions:

Custody Seals In Place Yes No Temp Blank Yes No Cooler Temperature on Receipt ____ °F/C Trip Blank Yes No

Distribution: White Copy - Laboratory / Yellow Copy - BP/Atlantic Richfield Co. / Pink Copy - Consultant/Contractor

BP COC Rev. 4 10/1/04

APR-4-2006 03:32P FROM: TO:15173496863 P:1/6

Chain of Custody Record

bp

Project Name:	TREATABILITY SAMPLING
BP BU/AR Region/Enfos Segment:	OBC Non-Mining
State or Lead Regulatory Agency:	DTSC
Requested Due Date:	Standard TAT

On-site Time:	Temp:
Off-site Time:	Temp:
Sky Conditions:	
Meteorological Events:	
Wind Speed:	Direction:

Lab Name:	SECOR International, Inc.	BP/AR Facility No.:	Gardena Sumps	Consultant/Contractor:	SECOR International, Inc.
Address:	4015 King Road, Suite O	BP/AR Facility Address:	SW Corner Artesia & Normandie	Address:	290 Conejo Ridge Avenue
	Sylvania, Ohio 43560	Site Lat/Long:			Thousand Oaks, CA 91361
Lab PM:	Dan Oberle	California Global ID No.:		Consultant/Contractor Project No.:	37BP.XB006.06
Tele/Fax:	(419) 841-2731	Enfos Project No.:		Consultant/Contractor PM:	Philip Kinney
BP/AR PM Contact:	Mike Mc Anulty	Provision or RCOP (circle one)		Tele/Fax:	805-230-1266 / 805-230-1277
Address:	6 Centerpointe Dr. LPR6-166	Phase/WBS:		Report Type & QC Level:	Standard
	La Palma, California 90623	Sub Phase/Task:	Analytical	E-mail EDD To:	
Tele/Fax:	(714) 226 - 6709	Cost Element:	Sub Contracted Cost	Invoice to: Consultant or BP or Atlantic Richfield Co. (circle one)	

Item No.	Sample Description	Time	Date	Matrix: Soil/Solid	Matrix: Water/Liquid	Matrix: Air	Laboratory No.	No. of Containers	Preservative: Unpreserved	Preservative: H_2SO_4	Preservative: HNO_3	Preservative: HCl	Preservative: Methanol	Requested Analysis: Treatability Study	Sample Point Lat/Long and Comments
1	CPB06-TS-2	1455	02/13/06	X				23	X					X	Approx. 20 Linear ft.
2	CPB06-TS-8	1545	02/13/06	X				4	X					X	Approx. 6 Linear ft.
3															
4															
5															
6															
7															
8															
9															
10															

Sampler's Name:	Mark Mason	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Company:	SECOR International Inc.	[signature] SECOR Int. Inc	2/14/06	1600			
Shipment Date:							
Shipment Method:							
Shipment Tracking No:							

Special Instructions:

Custody Seals In Place Yes ___ No ___ Temp Blank Yes ___ No ___ Cooler Temperature on Receipt ___ °F/C Trip Blank Yes ___ No ___

Distribution: White Copy - Laboratory / Yellow Copy - BP/Atlantic Richfield Co. / Pink Copy - Consultant/Contractor

BP COC Rev. 4 10/1/04

APR-4-2006 03:32P FROM: TO:15173996863 P:2/6

bp

Chain of Custody Record

Project Name: Treatability Study
BP BU/AR Region/Enfos Segment: ORC Non-Mining
State or Lead Regulatory Agency: DTSC
Requested Due Date (mm/dd/yy):

On-site Time:	Temp:
Off-site Time:	Temp:
Sky Conditions:	
Meteorological Events:	
Wind Speed:	Direction:

Lab Name:	
Address:	
Lab PM:	
Tele/Fax:	
BP/AR PM Contact:	Mike McAnally
Address:	c/o Centerpointe Dr. MPR6-1666 La Palma, California 90623
Tele/Fax:	(714) 888-6709
Lab Bottle Order No:	

BP/AR Facility No.:	Gardena Sumps
BP/AR Facility Address:	SW corner Artesia & Normandie
Site Lat/Long:	
California Global ID No.:	Sumps
Enfos Project No.:	
Provision for RCOP (circle one)	
Phase/WBS:	
Sub Phase/Task:	Analytical
Cost Element:	

Consultant/Contractor:	SECOR International, Inc.
Address:	290 Conejo Ridge Ave Ri Thousand Oaks, CA 91361
Consultant/Contractor Project No.:	37BP.XB006.04
Consultant/Contractor PM:	Philip Kinney
Tele/Fax:	(805) 230-1266 / (805) 230-1277
Report Type & QC Level:	Standard
E-mail EDD To:	pkinney@secor.com
Invoice to:	Consultant or BP or Atlantic Richfield Co. (circle one)

Item No.	Sample Description	Time	Date	Matrix: Soil/Solid	Water/Liquid	Air	Laboratory No.	No. of Containers	Preservative: Unpreserved	H_2SO_4	HNO_3	HCl	Methanol	Requested Analysis: BTEX 8021	BTEX/TTH	BTEX/Oxy/TPH	EPA 8260	EPA 8270	Treatability Study	Sample Point Lat/Long and Comments
1	CP807-TS-2	~~1345~~ 1343	1/16/06	X					X											
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Name:	[signature]					
Sampler's Company:	[signature] / SECOR	1/16/06				
Shipment Date:						
Shipment Method:						
Shipment Tracking No:						

Special Instructions:

Custody Seals In Place Yes No Temp Blank Yes No Cooler Temperature on Receipt °F/C Trip Blank Yes No

Distribution: White Copy - Laboratory / Yellow Copy - BP/Atlantic Richfield Co. / Pink Copy - Consultant/Contractor

BP COC Rev. 4 10/1/04

APR-4-2006 03:33P FROM: TO:15173496063 P:3/6

Page 1 of 1

Chain of Custody Record

bp

Project Name: TREATABILITY SAMPLING
BP BU/AR Region/Enfos Segment: OBC Non-Mining
State or Lead Regulatory Agency: DTSC
Requested Due Date: Standard TAT

On-site Time:	Temp:
Off-site Time:	Temp:
Sky Conditions:	
Meteorological Events:	
Wind Speed:	Direction:

Lab Name:	SECOR International, Inc.	BP/AR Facility No.:	Gardena Sumps	Consultant/Contractor:	SECOR International, Inc.
Address:	4035 King Road, Suite D	BP/AR Facility Address:	SW Corner Artesia & Normandie	Address:	290 Conejo Ridge Avenue
	Sylvaina, Ohio 43560	Site Lat/Long:			Thousand Oaks, CA 91361
Lab PM:	Dan Oberle	California Global ID No.:		Consultant/Contractor Project No.:	37BP.XB006.06
Tele/Fax:	(419) 841-2731	Enfos Project No.:		Consultant/Contractor PM:	Philip Kinney
BP/AR PM Contact:	Mike Mc Anulty	Provision or RCOP (circle one)		Tele/Fax:	805-230-1266 / 805-230-1277
Address:	6 Centerpointe Dr. LPR6-166	Phase/WBS:		Report Type & QC Level:	Standard
	La Palma, California 90623	Sub Phase/Task:	Analytical	E-mail EDD To:	
Tele/Fax:	(714) 228 - 6709	Cost Element:	Sub Contracted Cost	Invoice to: Consultant or BP or Atlantic Richfield Co. (circle one)	

Lab Bottle Order No:

Item No.	Sample Description	Time	Date	Matrix: Soil/Solid	Matrix: Water/Liquid	Matrix: Air	Laboratory No.	No. of Containers	Preservative: Unpreserved	Preservative: H_2SO_4	Preservative: HNO_3	Preservative: HCl	Preservative: Methanol	Requested Analysis: Treatability Study	Sample Point Lat/Long and Comments
1	CPB14-TS-5	1445	02/10/06	X				16	X					X	Approx. 20 Linear ft.
2	CPB14-TS-7	1455	02/10/06	X				4	X					X	Approx. 6 Linear ft.
3															
4															
5															
6															
7															
8															
9															
10															

		Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Name:	Mark Mason						
Sampler's Company:	SECOR International Inc.	Randy J. Coalane	2/16/06	1600			
Shipment Date:		SECOR INT. INC.					
Shipment Method:							
Shipment Tracking No:							

Special Instructions:

Custody Seals In Place Yes No Temp Blank Yes No Cooler Temperature on Receipt ____ °F/C Trip Blank Yes No

Distribution: White Copy - Laboratory / Yellow Copy - BP/Atlantic Richfield Co. / Pink Copy - Consultant/Contractor

BP COC Rev. 4 10/1/04

Page 1 of 1

bp

Chain of Custody Record

Project Name: Sc Treatability Study
BP BU/AR Region/Enfos Segment: OBC Non Mining
State or Lead Regulatory Agency: DTSC
Requested Due Date (mm/dd/yy):

On-site Time:	Temp:
Off-site Time:	Temp:
Sky Conditions:	
Meteorological Events:	
Wind Speed:	Direction:

Lab Name:	BP/AR Facility No.:	Consultant/Contractor:
Address:	BP/AR Facility Address:	Address:
	Site Lat/Long:	
Lab PM:	California Global ID No.:	Consultant/Contractor Project No.:
Tele/Fax:	Enfos Project No.:	Consultant/Contractor PM:
BP/AR PM Contact:	Provision or RCOP (circle one)	Tele/Fax:
Address:	Phase/WBS:	Report Type & QC Level:
	Sub Phase/Task:	E-mail EDD To:
Tele/Fax:	Cost Element:	Invoice to: Consultant or BP or Atlantic Richfield Co. (circle one)
Lab Bottle Order No:		

Item No.	Sample Description	Time	Date	Matrix: Soil/Solid	Matrix: Water/Liquid	Matrix: Air	Laboratory No.	No. of Containers	Preservative: Unpreserved	Preservative: H_2SO_4	Preservative: HNO_3	Preservative: HCl	Preservative: Methanol	Requested Analysis: BTEX 8021	Requested Analysis: BTEX/TPH	Requested Analysis: BTEX/Oxy/TPH	Requested Analysis: EPA 8260	Requested Analysis: EPA 8270	Requested Analysis: Treatability Study	Sample Point Lat/Long and Comments
1	CPB15-TS-2	1530	1/16/06	X				10	X											~14 linear ft. ph>1 (Rebd te
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Name: [signature]	[signature]	1/16/06	1640			
Sampler's Company: SECOR						
Shipment Date:						
Shipment Method:						
Shipment Tracking No:						

Special Instructions:

Custody Seals In Place Yes No Temp Blank Yes No Cooler Temperature on Receipt °F/C Trip Blank Yes No

BP COC Rev. 4 10/1/04

Distribution: White Copy - Laboratory / Yellow Copy - BP/Atlantic Richfield Co. / Pink Copy - Consultant/Contractor

Chain of Custody Record

Project Name: TREATABILITY SAMPLING
BP BU/AR Region/Enfos Segment: OBC Non-Mining
State or Lead Regulatory Agency: DTSC
Requested Due Date: Standard TAT

On-site Time:	Temp:
Off-site Time:	Temp:
Sky Conditions:	
Meteorological Events:	
Wind Speed:	Direction:

Lab Name:	SECOR International, Inc.
Address:	4035 King Road, Suite D
	Sylvaine, Ohio 43560
Lab PM:	Dan Oberle
Tele/Fax:	(419) 841-2731
BP/AR PM Contact:	Mike Mc Anulty
Address:	6 Centerpointe Dr. LPR6-166
	La Palma, California 90623
Tele/Fax:	(714) 228 - 6709

BP/AR Facility No.:	Gardena Sumps
BP/AR Facility Address:	SW Corner Artesia & Normandie
Site Lat/Long:	
California Global ID No.:	
Enfos Project No.:	
Provision or RCOP (circle one)	
Phase/WBS:	
Sub Phase/Task:	Analytical
Cost Element:	Sub Contracted Cost

Consultant/Contractor:	SECOR International, Inc.
Address:	290 Conejo Ridge Avenue
	Thousand Oaks, CA 91361
Consultant/Contractor Project No.:	37BP.XB006.06
Consultant/Contractor PM:	Philip Kinney
Tele/Fax:	805-230-1266 / 805-230-1277
Report Type & QC Level:	Standard
E-mail EDD To:	
Invoice to: Consultant or BP or Atlantic Richfield Co. (circle one)	

Lab Bottle Order No:

Item No.	Sample Description	Time	Date	Matrix: Soil/Solid	Matrix: Water/Liquid	Matrix: Air	Laboratory No.	No. of Containers	Preservative: Unpreserved	Preservative: H_2SO_4	Preservative: HNO_3	Preservative: HCl	Preservative: Methanol	Requested Analysis: Treatability Study	Sample Point Lat/Long and Comments
1	CPB18-TS-2	0920	02/13/06	X				15	X					X	Approx. 20 Linear ft.
2	CPB18-TS-6	1000	02/13/06	X				4	X					X	Approx. 6 Linear ft.
3															
4															
5															
6															
7															
8															
9															
10															

Sampler's Name:	Mark Mason
Sampler's Company:	SECOR International Inc.
Shipment Date:	
Shipment Method:	
Shipment Tracking No:	

Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
[signature] SECOR INT. INC.		1600			

Special Instructions:

Custody Seals In Place Yes ___ No ___ Temp Blank Yes ___ No ___ Cooler Temperature on Receipt ___ °F/C Trip Blank Yes ___ No ___

Distribution: White Copy - Laboratory / Yellow Copy - BP/Atlantic Richfield Co. / Pink Copy - Consultant/Contractor

BP COC Rev. 4 10/1/04

APR-4-2006 03:34P FROM: TO:15173496863 P:6/6

Merit Laboratories, Inc.

2680 East Lansing Dr., East Le[illegible], MI 48823
Phone (517) 332-0167 Fax (517) 332-0333
www.meritlabs.com

C.O.C. PAGE # 1 OF 1

032507

CHAIN OF CUSTODY RECORD

REPORT TO

CONTACT NAME: Dan Oberle
COMPANY: SECOR International Inc.
ADDRESS: 4035 King Road, Suite D
CITY: Sylvania STATE: OH ZIP CODE: 43560
PHONE NO.: 419-841-2731 FAX NO.: 419-843-1571 P.O. NO.: 37BP.XB006.05
E-MAIL ADDRESS: DOberle QUOTE NO.:

INVOICE TO

CONTACT NAME: Kim Weston ☐ SAME
COMPANY: SECOR International Inc.
ADDRESS: 2321 Club Meridian Drive, Suite E
CITY: Okemos STATE: MI ZIP CODE: 48864
PHONE NO.: 517-349-9499 FAX NO.: 517-349-6863 P.O. NO.: 37BP.XB006.05

PROJECT NO./NAME: 37BP.XB006.05 SAMPLER(S) - PLEASE PRINT/SIGNATURE: Daniel Oberle

TURNAROUND TIME REQUIRED: ☐ 24 HR ☐ 48 HR ☐ 72 HR ☒ STANDARD ☐ OTHER

DELIVERABLES REQUIRED: ☐ STANDARD ☒ LEVEL II ☐ LEVEL III ☐ OTHER

MATRIX CODE: GW-GROUNDWATER SL-SLUDGE WW-WASTEWATER O-OIL S-SOIL A-AIR L-LIQUID W-WASTE SD-SOLID M-MISC

ANALYSIS (ATTACH LIST IF MORE SPACE REQUIRED)

MERIT LAB NO.	YEAR DATE	YEAR TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives: NONE	HCL	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	GRO/DRO-Jetsen	PAHs/SVOCs	RCRA Metals	VOCs	Total Sulfur	SPLP VOCs	SPLP RCRA Metals	SPLP PAHs	BTUs-ASTM D240	TCLP RCRA Metals	SPECIAL INSTRUCTIONS/NOTES
25980.01	2/27/06		Untreated Sludge Composite	SL	2	X							X	X	X	X	X	X	X	X		X	Need to report final extract pH values for SPLPs in report.
.02	↓		Treated Sludge - 1	SL	1	X													X	X			
.03			Treated Sludge - 2	SL	1	X													X	X			
.04			Treated Sludge - 3	SL	1	X													X	X			
.05			Treated Sludge - 4	SL	1	X													X	X			
.06			Sludge Composite 2	SL	1	X															X		

Total Sulfur by ASTM-D129

		DATE	TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION	Daniel Oberle / SECOR	2/27/06	10:30
RECEIVED BY: SIGNATURE/ORGANIZATION			
RELINQUISHED BY: SIGNATURE/ORGANIZATION			
RECEIVED BY: SIGNATURE/ORGANIZATION			

		DATE	TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION			
RECEIVED BY: SIGNATURE/ORGANIZATION	[signature]	2-28-06	0945

SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS NOTES: TEMP. ON ARRIVAL 4.1

SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS

PLEASE NOTE: SIGNING ACKNOWLEDGES ACCEPTANCE OF TERMS & CONDITIONS ON REVERSE SIDE

Merit Laboratories, Inc.

2660 East Lansing Dr., East L[illegible]g, MI 48823
Phone (517) 332-0167 Fax (517) 332-6339
www.meritlabs.com

C.O.C. PAGE # 1 OF 1

029271

CHAIN OF CUSTODY RECORD

REPORT TO

CONTACT NAME: Dan Oberle
COMPANY: SECOR International Inc.
ADDRESS: 4035 King Road, Suite D
CITY: Sylvania STATE: OH ZIP CODE: 43560
PHONE NO.: 419-841-2731 FAX NO.: 419-843-1571 P.O. NO.: 378P. xB006.06
E-MAIL ADDRESS: DOberle@secor.com QUOTE NO.:

INVOICE TO

CONTACT NAME: Kim Weston SAME
COMPANY: SECOR International Inc.
ADDRESS: 2321 Club Meridian Drive, Suite E
CITY: Okemos STATE: MI ZIP CODE: 48864
PHONE NO.: 517-349-9499 FAX NO.: 517-349-6863 P.O. NO.: 378P. xB006.06

PROJECT NO./NAME: 378P. xB006.06
SAMPLER: (PLEASE PRINT) NAME: Dan Oberle

TURNAROUND TIME REQUIRED: ☐ 24 HR ☐ 48 HR ☐ 72 HR ☒ STANDARD ☐ OTHER

DELIVERABLES REQUIRED: ☐ STANDARD ☒ LEVEL II ☐ LEVEL III ☐ OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE O=OIL A=AIR W=WATER M=MISC

ANALYSIS (ATTACH LIST IF MORE SPACE REQUIRED)

MERIT LAB NO.	YEAR DATE	YEAR TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# CONTAINERS	# Containers & Preservatives: NONE	HCl	H2SO4	HNO3	NaOH	ZnAc	VOCs	PNAs	RCRA Metals	SPECIAL INSTRUCTIONS/NOTES
76158.01	3/9/06		LTL-2	L	4	1	2	1				X	X	X	
.02	↓		LTL-4	L	4	1	2	1				X	X	X	
.03			LTL-6	L	4	1	2	1				X	X	X	
.04			LTL-8	L	4	1	2	1				X	X	X	
.05			LTL-10	L	4	1	2	1				X	X	X	

	DATE	TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION: Dan Oberle / SECOR	3/9/06	1235
RECEIVED BY: SIGNATURE/ORGANIZATION:		
RELINQUISHED BY: SIGNATURE/ORGANIZATION:		
RECEIVED BY: SIGNATURE/ORGANIZATION:		

	DATE	TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION:		
RECEIVED BY: SIGNATURE/ORGANIZATION: [signature]	3-10-06	1030

SEAL NO. | SEAL INTACT YES ☐ NO ☐ | INITIALS | NOTES: TEMP ON ARRIVAL 3.5
SEAL NO. | SEAL INTACT YES ☐ NO ☐ | INITIALS

PLEASE NOTE: SIGNING ACKNOWLEDGES ACCEPTANCE OF TERMS & CONDITIONS ON REVERSE SIDE

APPENDIX B

LABORATORY ANALYTICAL RESULTS

Analytical Laboratory Report

Report ID: S25980.01(02)
Generated on 03/14/2006

Report to

Attention: Mr. Dan Oberle
SECOR
4035 King Road Suite D
Sylvania, OH 43560

Phone: 419-843-1518 FAX: 419-843-1571

Report produced by

Merit Laboratories
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Report Summary

Lab Sample ID(s): S25980.01-S25980.06
Project: 37BP.XB006.05
Submitted Date/Time: 02/28/2006 09:45
Sampled by: Daniel Oberle
P.O. #: 37BP.XB006.0

Report Notes

Results relate only to items tested as received by the laboratory.
Methods may be modified for improved performance.
Results reported on a dry weight basis where applicable.
"Not detected" indicates that parameter was not found at a level equal to or greater than the RDL.
Report shall not be reproduced except in full, without the written approval of Merit Laboratories.

Violetta F. Murshak

Violetta F. Murshak
Laboratory Director

Merit Laboratories, Inc.

Analytical Laboratory Report

Lab Sample ID: S25980.01
Sample Tag: Untreated Sludge Composite
Collected Date/Time: 02/27/2006
Matrix: Sludge
COC Reference: 032507

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	8oz. Glass	None	Yes	4.1	IR

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Extraction / Prep.								
Acid Rain Zero Headspace Extract	Completed			1312	03/01/06 13:00	LBR		
BNA Extraction	Completed			3550B	03/03/06 15:44	DLR		
DRO Extraction	Completed			3510C	03/03/06 15:45	DLR		
Mercury Digestion	Completed			7471A	03/02/06 10:00	JRT		
Mercury Digestion	Completed			7470A	03/02/06 09:30	JRT		
Mercury Digestion (Replicate 01)	Completed			7470A	03/02/06 09:30	JRT		
Metal Digestion	Completed			3050B	03/08/06 12:00	SLS		
Metal Digestion	Completed			3015A	03/07/06 12:00	SLS		
Metal Digestion (Replicate 01)	Completed			3015A	03/07/06 12:00	SLS		
PNA Extraction	Completed			3510C	03/03/06 10:11	EMR		
SPLP Extraction								
% Solids	100			1312	03/01/06 13:00	LBR		
Sample Used g	100			1312	03/01/06 13:00	LBR		
Final Volume mL	2,000			1312	03/01/06 13:00	LBR		
Final Extract pH	2.15			1312	03/01/06 13:00	LBR		
TCLP Extraction								
% Solids	100			1311	03/01/06 13:00	LBR		
Sample Used g	100			1311	03/01/06 13:00	LBR		
Final Volume mL	2,000			1311	03/01/06 13:00	LBR		
Final Extract pH	3.97			1311	03/01/06 13:00	LBR		
Inorganics								
Sulfur	7.06	%		ASTM D129	03/03/06 12:00	Gary		O
Total Solids	72	%	1	160.3	02/28/06 21:06	LBR		
Metals								
Arsenic	Not detected	mg/kg	0.10	6020	03/10/06 14:24	SLS	7440-38-2	
Barium	1.2	mg/kg	1.0	6020	03/10/06 14:24	SLS	7440-39-3	
Cadmium	Not detected	mg/kg	0.20	6020	03/10/06 14:24	SLS	7440-43-9	
Chromium	Not detected	mg/kg	2.0	6020	03/10/06 14:24	SLS	7440-47-3	
Lead	22.4	mg/kg	1.0	6020	03/10/06 14:24	SLS	7439-92-1	
Mercury	Not detected	mg/kg	0.050	7471	03/02/06 14:27	JRT	7439-97-6	
Selenium	Not detected	mg/kg	0.20	6020	03/10/06 14:24	SLS	7782-49-2	
Silver	Not detected	mg/kg	0.10	6020	03/10/06 14:24	SLS	7440-22-4	
Arsenic, SPLP	Not detected	mg/L	0.01	200.8	03/07/06 14:17	SLS	7440-38-2	
Arsenic, TCLP	Not detected	mg/L	0.01	200.8	03/07/06 14:33	SLS	7440-38-2	
Barium, SPLP	Not detected	mg/L	0.01	200.8	03/07/06 14:17	SLS	7440-39-3	
Barium, TCLP	0.06	mg/L	0.01	200.8	03/07/06 14:33	SLS	7440-39-3	
Cadmium, SPLP	Not detected	mg/L	0.005	200.8	03/07/06 14:17	SLS	7440-43-9	
Cadmium, TCLP	Not detected	mg/L	0.005	200.8	03/07/06 14:33	SLS	7440-43-9	

O-Analysis performed by outside laboratory

Lab Sample ID: S25980.01 (continued)
Sample Tag: Untreated Sludge Composite

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Metals (continued)								
Chromium, SPLP	Not detected	mg/L	0.05	200.8	03/07/06 14:17	SLS	7440-47-3	
Chromium, TCLP	Not detected	mg/L	0.05	200.8	03/07/06 14:33	SLS	7440-47-3	
Lead, SPLP	0.31	mg/L	0.03	200.8	03/07/06 14:17	SLS	7439-92-1	
Lead, TCLP	0.24	mg/L	0.03	200.8	03/07/06 14:33	SLS	7439-92-1	
Mercury, SPLP	Not detected	mg/L	0.0002	245.1M	03/02/06 13:59	JRT	7439-97-6	
Mercury, TCLP	Not detected	mg/L	0.0002	245.1M	03/02/06 13:57	JRT	7439-97-6	
Selenium, SPLP	Not detected	mg/L	0.05	200.8	03/07/06 14:17	SLS	7782-49-2	
Selenium, TCLP	Not detected	mg/L	0.05	200.8	03/07/06 14:33	SLS	7782-49-2	
Silver, SPLP	Not detected	mg/L	0.002	200.8	03/07/06 14:17	SLS	7440-22-4	
Silver, TCLP	Not detected	mg/L	0.002	200.8	03/07/06 14:33	SLS	7440-22-4	
Organics - Semi-Volatiles								
PNAs SPLP								
Acenaphthene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	83-32-9	
Acenaphthylene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	208-96-8	
Anthracene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	120-12-7	
Benzo(a)anthracene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	56-55-3	
Benzo(a)pyrene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	50-32-8	
Benzo(b)fluoranthene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	205-99-2	
Benzo(k)fluoranthene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	207-08-9	
Benzo(ghi)perylene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	191-24-2	
Chrysene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	218-01-9	
Dibenzo(ah)anthracene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	53-70-3	
Fluoranthene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	206-44-0	
Fluorene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	86-73-7	
Indeno(1,2,3-cd)pyrene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	193-39-5	
Naphthalene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	91-20-3	
Phenanthrene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	85-01-8	
Pyrene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	129-00-0	
2-Methylnaphthalene	Not detected	ug/L	5	8270C	03/06/06 12:37	ARH	91-57-6	
Semi-Volatile Organics - MDEQ								
Acenaphthene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	83-32-9	XL
Acenaphthylene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	208-96-8	XL
Anthracene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	120-12-7	XL
Benzo(a)anthracene	70,000	ug/kg	30,000	8270C	03/07/06 15:06	ARH	56-55-3	XL
Benzo(b)fluoranthene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	205-99-2	XL
Benzo(k)fluoranthene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	207-08-9	XL
Benzo(ghi)perylene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	191-24-2	XL
Benzo(a)pyrene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	50-32-8	XL
bis(2-Chloroethoxy)methane	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	111-91-1	XL
bis(2-Chloroethyl)ether	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	111-44-4	XL
bis(2-Chloroisopropyl)ether	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	108-60-1	XL
bis(2-Ethylhexyl)phthalate	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	117-81-7	XL
4-Bromophenyl phenyl ether	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	101-55-3	XL
Butyl benzyl phthalate	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	85-68-7	XL
4-Chloroaniline	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	106-47-8	XL
2-Chloronaphthalene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	91-58-7	XL
4-Chloro-3-methylphenol	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	59-50-7	XL

X-Elevated reporting limit due to matrix interference L-Elevated reporting limit due to low sample amount

Lab Sample ID: S25980.01 (continued)
Sample Tag: Untreated Sludge Composite

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Organics - Semi-Volatiles (continued)								
Semi-Volatile Organics - MDEQ (continued)								
2-Chlorophenol	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	95-57-8	XL
4-Chlorophenyl phenyl ether	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	7005-72-3	XL
Chrysene	160,000	ug/kg	30,000	8270C	03/07/06 15:06	ARH	218-01-9	XL
p,m-Cresol	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	3/4-Cresol	XL
o-Cresol	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	95-48-7	XL
Dibenzo(ah)anthracene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	53-70-3	XL
Dibenzofuran	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	132-64-9	XL
di-n-Butyl phthalate	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	84-74-2	XL
1,2-Dichlorobenzene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	95-50-1	XL
1,3-Dichlorobenzene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	541-73-1	XL
1,4-Dichlorobenzene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	106-46-7	XL
3,3'-Dichlorobenzidine	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	91-94-1	XL
2,4-Dichlorophenol	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	120-83-2	XL
Diethyl phthalate	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	84-66-2	XL
2,4-Dimethylphenol	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	105-67-9	XL
Dimethyl phthalate	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	131-11-3	XL
4,6-Dinitro-2-methylphenol	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	534-52-1	XL
2,4-Dinitrophenol	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	51-28-5	XL
2,4-Dinitrotoluene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	121-14-2	XL
2,6-Dinitrotoluene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	606-20-2	XL
1,2-Diphenylhydrazine	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	122-66-7	XL
di-n-Octyl phthalate	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	117-84-0	XL
Fluoranthene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	206-44-0	XL
Fluorene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	86-73-7	XL
Hexachlorobenzene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	118-74-1	XL
Hexachlorobutadiene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	87-68-3	XL
Hexachlorocyclopentadiene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	77-47-4	XL
Hexachloroethane	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	67-72-1	XL
Indeno(1,2,3-cd)pyrene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	193-39-5	XL
Isophorone	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	78-59-1	XL
2-Methylnaphthalene	30,000	ug/kg	30,000	8270C	03/07/06 15:06	ARH	91-57-6	XL
Naphthalene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	91-20-3	XL
2-Nitroaniline	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	88-74-4	XL
3-Nitroaniline	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	99-09-2	XL
4-Nitroaniline	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	100-01-6	XL
Nitrobenzene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	98-95-3	XL
2-Nitrophenol	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	88-75-5	XL
4-Nitrophenol	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	100-02-7	XL
N-Nitrosodiphenylamine	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	86-30-6	XL
N-Nitrosodi-n-propylamine	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	621-64-7	XL
Pentachlorophenol	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	87-86-5	XL
Phenanthrene	200,000	ug/kg	30,000	8270C	03/07/06 15:06	ARH	85-01-8	XL
Phenol	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	108-95-2	XL
Pyrene	60,000	ug/kg	30,000	8270C	03/07/06 15:06	ARH	129-00-0	XL
1,2,4-Trichlorobenzene	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	120-82-1	XL
2,4,5-Trichlorophenol	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	95-95-4	XL
2,4,6-Trichlorophenol	Not detected	ug/kg	30,000	8270C	03/07/06 15:06	ARH	88-06-2	XL

X-Elevated reporting limit due to matrix interference L-Elevated reporting limit due to low sample amount

Lab Sample ID: S25980.01 (continued)
Sample Tag: Untreated Sludge Composite

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Organics - Semi-Volatiles (continued)								
TPH DRO (C10-C28)								
Diesel	Not detected	ug/kg	6,000,000	SV-8015M	03/07/06 19:07	ARH	68334-30-5	XL
TPH-DRO-Other	39,000,000	ug/kg		SV-8015M	03/07/06 19:07	ARH		
Organics - Volatiles								
Gasoline	70,000	ug/kg	20,000	Vol-8015M	03/12/06 03:51	JGH	8006-61-9	
GC/MS for Volatile Organics								
Benzene	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	71-43-2	Y
Bromodichloromethane	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	75-27-4	Y
Bromoform	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	75-25-2	Y
Bromomethane	Not detected	ug/kg	600	8260B	03/12/06 03:51	JGH	74-83-9	Y
n-Butylbenzene	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	104-51-8	Y
sec-Butylbenzene	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	135-98-8	Y
tert-Butylbenzene	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	98-06-6	Y
Carbon tetrachloride	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	56-23-5	Y
Chlorobenzene	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	108-90-7	Y
Chloroethane	Not detected	ug/kg	700	8260B	03/12/06 03:51	JGH	75-00-3	Y
Chloroform	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	67-66-3	Y
Chloromethane	Not detected	ug/kg	700	8260B	03/12/06 03:51	JGH	74-87-3	Y
Dibromochloromethane	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	124-48-1	Y
1,2-Dichlorobenzene	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	95-50-1	Y
1,3-Dichlorobenzene	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	541-73-1	Y
1,4-Dichlorobenzene	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	106-46-7	Y
1,1-Dichloroethane	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	75-34-3	Y
1,2-Dichloroethane	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	107-06-2	Y
1,1-Dichloroethene	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	75-35-4	Y
cis-1,2-Dichloroethene	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	156-59-2	Y
trans-1,2-Dichloroethene	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	156-60-5	Y
1,2-Dichloropropane	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	78-87-5	Y
cis-1,3-Dichloropropene	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	10061-01-5	Y
trans-1,3-Dichloropropene	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	10061-02-6	Y
Ethylbenzene	200	ug/kg	100	8260B	03/12/06 03:51	JGH	100-41-4	Y
Isopropylbenzene	Not detected	ug/kg	700	8260B	03/12/06 03:51	JGH	98-82-8	Y
p-Isopropyltoluene	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	99-87-6	Y
Methylene chloride	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	75-09-2	Y
Naphthalene	Not detected	ug/kg	900	8260B	03/12/06 03:51	JGH	91-20-3	Y
n-Propylbenzene	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	103-65-1	Y
Styrene	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	100-42-5	Y
1,1,2,2-Tetrachloroethane	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	79-34-5	Y
Tetrachloroethene	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	127-18-4	Y
Toluene	400	ug/kg	300	8260B	03/12/06 03:51	JGH	108-88-3	Y
1,1,1-Trichloroethane	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	71-55-6	Y
1,1,2-Trichloroethane	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	79-00-5	Y
Trichloroethene	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	79-01-6	Y
1,2,4-Trimethylbenzene	700	ug/kg	300	8260B	03/12/06 03:51	JGH	95-63-6	Y
1,3,5-Trimethylbenzene	500	ug/kg	300	8260B	03/12/06 03:51	JGH	108-67-8	Y
Vinyl chloride	Not detected	ug/kg	100	8260B	03/12/06 03:51	JGH	75-01-4	Y

X-Elevated reporting limit due to matrix interference L-Elevated reporting limit due to low sample amount
Y-Elevated reporting limit due to high target concentration

Lab Sample ID: S25980.01 (continued)
Sample Tag: Untreated Sludge Composite

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Organics - Volatiles (continued)								
GC/MS for Volatile Organics (continued)								
o-Xylene	300	ug/kg	100	8260B	03/12/06 03:51	JGH	95-47-6	Y
p,m-Xylene	700	ug/kg	300	8260B	03/12/06 03:51	JGH		Y
Acetone	Not detected	ug/kg	3,000	8260B	03/12/06 03:51	JGH	67-64-1	Y
2-Butanone (MEK)	Not detected	ug/kg	2,000	8260B	03/12/06 03:51	JGH	78-93-3	Y
Carbon disulfide	Not detected	ug/kg	700	8260B	03/12/06 03:51	JGH	75-15-0	Y
2-Hexanone	Not detected	ug/kg	7,000	8260B	03/12/06 03:51	JGH	591-78-6	Y
4-Methyl-2-pentanone (MIBK)	Not detected	ug/kg	7,000	8260B	03/12/06 03:51	JGH	108-10-1	Y
tert-Methyl butyl ether (MTBE)	Not detected	ug/kg	700	8260B	03/12/06 03:51	JGH	1634-04-4	Y
1,1,1,2-Tetrachloroethane	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	630-20-6	Y
1,2,3-Trichlorobenzene	Not detected	ug/kg	900	8260B	03/12/06 03:51	JGH	87-61-6	Y
1,2,3-Trichloropropane	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	96-18-4	Y
1,2,4-Trichlorobenzene	Not detected	ug/kg	900	8260B	03/12/06 03:51	JGH	120-82-1	Y
1,2-Dibromo-3-chloropropane	Not detected	ug/kg	700	8260B	03/12/06 03:51	JGH	96-12-8	Y
1,2-Dibromoethane	Not detected	ug/kg	60	8260B	03/12/06 03:51	JGH	106-93-4	YM
1,4-Dichloro-2-butene	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	764-41-0	Y
2-Methylnaphthalene	1,900	ug/kg	900	8260B	03/12/06 03:51	JGH	91-57-6	Y
Acrylonitrile	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	107-13-1	Y
Bromobenzene	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	108-86-1	Y
Bromochloromethane	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	74-97-5	Y
Dibromomethane	Not detected	ug/kg	700	8260B	03/12/06 03:51	JGH	74-95-3	Y
Dichlorodifluoromethane	Not detected	ug/kg	700	8260B	03/12/06 03:51	JGH	75-71-8	Y
Diethyl ether	Not detected	ug/kg	600	8260B	03/12/06 03:51	JGH	60-29-7	Y
Hexachloroethane	Not detected	ug/kg	800	8260B	03/12/06 03:51	JGH	67-72-1	Y
Methyl iodide	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	74-88-4	Y
Tetrahydrofuran	Not detected	ug/kg	3,000	8260B	03/12/06 03:51	JGH	109-99-9	Y
Trichlorofluoromethane	Not detected	ug/kg	300	8260B	03/12/06 03:51	JGH	75-69-4	Y
1,2,3-Trimethylbenzene	1,100	ug/kg	300	8260B	03/12/06 03:51	JGH	526-73-8	Y
SPLP Volatile Organics								
Benzene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	71-43-2	
Bromodichloromethane	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	75-27-4	
Bromoform	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	75-25-2	
Bromomethane	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	74-83-9	
n-Butylbenzene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	104-51-8	
sec-Butylbenzene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	135-98-8	
tert-Butylbenzene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	98-06-6	
Carbon tetrachloride	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	56-23-5	
Chlorobenzene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	108-90-7	
Chloroethane	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	75-00-3	
Chloroform	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	67-66-3	
Chloromethane	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	74-87-3	
Dibromochloromethane	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	124-48-1	
1,2-Dichlorobenzene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	95-50-1	
1,3-Dichlorobenzene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	106-46-7	
1,1-Dichloroethane	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	75-34-3	
1,2-Dichloroethane	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	107-06-2	

/-Elevated reporting limit due to high target concentration
M-Result reported to MDL not RDL

Lab Sample ID: S25980.01 (continued)
Sample Tag: Untreated Sludge Composite

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Organics - Volatiles (continued)								
SPLP Volatile Organics (continued)								
1,1-Dichloroethene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	75-35-4	
cis-1,2-Dichloroethene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	156-59-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	156-60-5	
1,2-Dichloropropane	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	78-87-5	
cis-1,3-Dichloropropene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	10061-01-5	
trans-1,3-Dichloropropene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	10061-02-6	
Ethylbenzene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	100-41-4	
Isopropylbenzene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	98-82-8	
p-Isopropyltoluene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	99-87-6	
Methylene chloride	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	75-09-2	
Naphthalene	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	91-20-3	
n-Propylbenzene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	103-65-1	
Styrene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	100-42-5	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	79-34-5	
Tetrachloroethene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	127-18-4	
Toluene	7	ug/L	1	1312/8260B	03/12/06 03:33	JGH	108-88-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	71-55-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	79-00-5	
Trichloroethene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	79-01-6	
1,2,4-Trimethylbenzene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	95-63-6	
1,3,5-Trimethylbenzene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	108-67-8	
Vinyl chloride	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	75-01-4	
o-Xylene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	95-47-6	
p,m-Xylene	Not detected	ug/L	2	1312/8260B	03/12/06 03:33	JGH		
Acetone	190	ug/L	30	1312/8260B	03/12/06 03:33	JGH	67-64-1	
2-Butanone (MEK)	120	ug/L	30	1312/8260B	03/12/06 03:33	JGH	78-93-3	
Carbon disulfide	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	75-15-0	
2-Hexanone	Not detected	ug/L	50	1312/8260B	03/12/06 03:33	JGH	591-78-6	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	50	1312/8260B	03/12/06 03:33	JGH	108-10-1	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	1634-04-4	
1,1,1,2-Tetrachloroethane	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	630-20-6	
1,2,3-Trichlorobenzene	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	87-61-6	
1,2,3-Trichloropropane	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	96-18-4	
1,2,4-Trichlorobenzene	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	120-82-1	
1,2-Dibromo-3-chloropropane	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	96-12-8	
1,2-Dibromoethane	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	106-93-4	
1,4-Dichloro-2-butene	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	764-41-0	
2-Methylnaphthalene	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	91-57-6	
Acrylonitrile	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	107-13-1	
Bromobenzene	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	108-86-1	
Bromochloromethane	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	74-97-5	
Dibromomethane	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	74-95-3	
Dichlorodifluoromethane	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	75-71-8	
Diethyl ether	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	60-29-7	
Hexachloroethane	Not detected	ug/L	5	1312/8260B	03/12/06 03:33	JGH	67-72-1	
Methyl iodide	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	74-88-4	
Tetrahydrofuran	Not detected	ug/L	100	1312/8260B	03/12/06 03:33	JGH	109-99-9	
Trichlorofluoromethane	Not detected	ug/L	1	1312/8260B	03/12/06 03:33	JGH	75-69-4	
1,2,3-Trimethylbenzene	1	ug/L	1	1312/8260B	03/12/06 03:33	JGH	526-73-8	

Merit Laboratories, Inc.

Analytical Laboratory Report

Lab Sample ID: S25980.02
Sample Tag: Treated Sludge - 1
Collected Date/Time: 02/27/2006
Matrix: Sludge
COC Reference: 032507

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	8oz. Glass	None	Yes	4.1	IR

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Extraction / Prep.								
Mercury Digestion	Completed			7470A	03/02/06 09:30	JRT		
Metal Digestion	Completed			3015A	03/07/06 12:00	SLS		
PNA Extraction	Completed			3510C	03/03/06 10:11	EMR		
SPLP Extraction								
% Solids	100			1312	03/01/06 13:00	LBR		
Sample Used g	100			1312	03/01/06 13:00	LBR		
Final Volume mL	2,000			1312	03/01/06 13:00	LBR		
Final Extract pH	8.65			1312	03/01/06 13:00	LBR		
Metals								
Arsenic, SPLP	Not detected	mg/L	0.01	200.8	03/07/06 14:20	SLS	7440-38-2	
Barium, SPLP	Not detected	mg/L	0.01	200.8	03/07/06 14:20	SLS	7440-39-3	
Cadmium, SPLP	Not detected	mg/L	0.005	200.8	03/07/06 14:20	SLS	7440-43-9	
Chromium, SPLP	Not detected	mg/L	0.05	200.8	03/07/06 14:20	SLS	7440-47-3	
Lead, SPLP	Not detected	mg/L	0.03	200.8	03/07/06 14:20	SLS	7439-92-1	
Mercury, SPLP	Not detected	mg/L	0.0002	245.1M	03/02/06 14:00	JRT	7439-97-6	
Selenium, SPLP	Not detected	mg/L	0.05	200.8	03/07/06 14:20	SLS	7782-49-2	
Silver, SPLP	Not detected	mg/L	0.002	200.8	03/07/06 14:20	SLS	7440-22-4	
Organics - Semi-Volatiles								
PNAs SPLP								
Acenaphthene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	83-32-9	
Acenaphthylene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	208-96-8	
Anthracene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	120-12-7	
Benzo(a)anthracene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	56-55-3	
Benzo(a)pyrene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	50-32-8	
Benzo(b)fluoranthene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	205-99-2	
Benzo(k)fluoranthene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	207-08-9	
Benzo(ghi)perylene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	191-24-2	
Chrysene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	218-01-9	
Dibenzo(ah)anthracene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	53-70-3	
Fluoranthene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	206-44-0	
Fluorene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	86-73-7	
Indeno(1,2,3-cd)pyrene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	193-39-5	
Naphthalene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	91-20-3	
Phenanthrene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	85-01-8	
Pyrene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	129-00-0	
2-Methylnaphthalene	Not detected	ug/L	5	8270C	03/06/06 12:58	ARH	91-57-6	

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Analytical Laboratory Report

Lab Sample ID: S25980.03
Sample Tag: Treated Sludge - 2
Collected Date/Time: 02/27/2006
Matrix: Sludge
COC Reference: 032507

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	8oz. Glass	None	Yes	4.1	IR

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Extraction / Prep.								
Mercury Digestion	Completed			7470A	03/02/06 09:30	JRT		
Metal Digestion	Completed			3015A	03/07/06 12:00	SLS		
PNA Extraction	Completed			3510C	03/03/06 10:11	EMR		
SPLP Extraction								
% Solids	100			1312	03/01/06 13:00	LBR		
Sample Used g	100			1312	03/01/06 13:00	LBR		
Final Volume mL	2,000			1312	03/01/06 13:00	LBR		
Final Extract pH	8.28			1312	03/01/06 13:00	LBR		
Metals								
Arsenic, SPLP	Not detected	mg/L	0.01	200.8	03/07/06 14:23	SLS	7440-38-2	
Barium, SPLP	0.01	mg/L	0.01	200.8	03/07/06 14:23	SLS	7440-39-3	
Cadmium, SPLP	Not detected	mg/L	0.005	200.8	03/07/06 14:23	SLS	7440-43-9	
Chromium, SPLP	Not detected	mg/L	0.05	200.8	03/07/06 14:23	SLS	7440-47-3	
Lead, SPLP	Not detected	mg/L	0.03	200.8	03/07/06 14:23	SLS	7439-92-1	
Mercury, SPLP	Not detected	mg/L	0.0002	245.1M	03/02/06 14:02	JRT	7439-97-6	
Selenium, SPLP	Not detected	mg/L	0.05	200.8	03/07/06 14:23	SLS	7782-49-2	
Silver, SPLP	Not detected	mg/L	0.002	200.8	03/07/06 14:23	SLS	7440-22-4	
Organics - Semi-Volatiles								
PNAs SPLP								
Acenaphthene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	83-32-9	
Acenaphthylene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	208-96-8	
Anthracene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	120-12-7	
Benzo(a)anthracene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	56-55-3	
Benzo(a)pyrene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	50-32-8	
Benzo(b)fluoranthene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	205-99-2	
Benzo(k)fluoranthene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	207-08-9	
Benzo(ghi)perylene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	191-24-2	
Chrysene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	218-01-9	
Dibenzo(ah)anthracene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	53-70-3	
Fluoranthene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	206-44-0	
Fluorene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	86-73-7	
Indeno(1,2,3-cd)pyrene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	193-39-5	
Naphthalene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	91-20-3	
Phenanthrene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	85-01-8	
Pyrene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	129-00-0	
2-Methylnaphthalene	Not detected	ug/L	5	8270C	03/06/06 13:20	ARH	91-57-6	

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Analytical Laboratory Report

Lab Sample ID: S25980.04
Sample Tag: Treated Sludge - 3
Collected Date/Time: 02/27/2006
Matrix: Sludge
COC Reference: 032507

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	8oz. Glass	None	Yes	4.1	IR

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Extraction / Prep.								
Mercury Digestion	Completed			7470A	03/02/06 09:30	JRT		
Metal Digestion	Completed			3015A	03/07/06 12:00	SLS		
PNA Extraction	Completed			3510C	03/03/06 10:11	EMR		
SPLP Extraction								
% Solids	100			1312	03/01/06 13:00	LBR		
Sample Used g	100			1312	03/01/06 13:00	LBR		
Final Volume mL	2,000			1312	03/01/06 13:00	LBR		
Final Extract pH	8.26			1312	03/01/06 13:00	LBR		
Metals								
Arsenic, SPLP	Not detected	mg/L	0.01	200.8	03/07/06 14:27	SLS	7440-38-2	
Barium, SPLP	0.01	mg/L	0.01	200.8	03/07/06 14:27	SLS	7440-39-3	
Cadmium, SPLP	Not detected	mg/L	0.005	200.8	03/07/06 14:27	SLS	7440-43-9	
Chromium, SPLP	Not detected	mg/L	0.05	200.8	03/07/06 14:27	SLS	7440-47-3	
Lead, SPLP	Not detected	mg/L	0.03	200.8	03/07/06 14:27	SLS	7439-92-1	
Mercury, SPLP	Not detected	mg/L	0.0002	245.1M	03/02/06 14:04	JRT	7439-97-6	
Selenium, SPLP	Not detected	mg/L	0.05	200.8	03/07/06 14:27	SLS	7782-49-2	
Silver, SPLP	Not detected	mg/L	0.002	200.8	03/07/06 14:27	SLS	7440-22-4	
Organics - Semi-Volatiles								
PNAs SPLP								
Acenaphthene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	83-32-9	
Acenaphthylene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	208-96-8	
Anthracene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	120-12-7	
Benzo(a)anthracene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	56-55-3	
Benzo(a)pyrene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	50-32-8	
Benzo(b)fluoranthene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	205-99-2	
Benzo(k)fluoranthene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	207-08-9	
Benzo(ghi)perylene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	191-24-2	
Chrysene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	218-01-9	
Dibenzo(ah)anthracene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	53-70-3	
Fluoranthene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	206-44-0	
Fluorene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	86-73-7	
Indeno(1,2,3-cd)pyrene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	193-39-5	
Naphthalene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	91-20-3	
Phenanthrene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	85-01-8	
Pyrene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	129-00-0	
2-Methylnaphthalene	Not detected	ug/L	5	8270C	03/06/06 13:41	ARH	91-57-6	

Analytical Laboratory Report

Lab Sample ID: S25980.05
Sample Tag: Treated Sludge - 4
Collected Date/Time: 02/27/2006
Matrix: Sludge
COC Reference: 032507

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	8oz. Glass	None	Yes	4.1	IR

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Extraction / Prep.								
Mercury Digestion	Completed			7470A	03/02/06 09:30	JRT		
Metal Digestion	Completed			3015A	03/07/06 12:00	SLS		
PNA Extraction	Completed			3510C	03/03/06 10:11	EMR		
SPLP Extraction								
% Solids	100			1312	03/01/06 13:00	LBR		
Sample Used g	100			1312	03/01/06 13:00	LBR		
Final Volume mL	2,000			1312	03/01/06 13:00	LBR		
Final Extract pH	8.52			1312	03/01/06 13:00	LBR		
Metals								
Arsenic, SPLP	Not detected	mg/L	0.01	200.8	03/07/06 14:30	SLS	7440-38-2	
Barium, SPLP	0.01	mg/L	0.01	200.8	03/07/06 14:30	SLS	7440-39-3	
Cadmium, SPLP	Not detected	mg/L	0.005	200.8	03/07/06 14:30	SLS	7440-43-9	
Chromium, SPLP	Not detected	mg/L	0.05	200.8	03/07/06 14:30	SLS	7440-47-3	
Lead, SPLP	Not detected	mg/L	0.03	200.8	03/07/06 14:30	SLS	7439-92-1	
Mercury, SPLP	Not detected	mg/L	0.0002	245.1M	03/02/06 14:06	JRT	7439-97-6	
Selenium, SPLP	Not detected	mg/L	0.05	200.8	03/07/06 14:30	SLS	7782-49-2	
Silver, SPLP	Not detected	mg/L	0.002	200.8	03/07/06 14:30	SLS	7440-22-4	
Organics - Semi-Volatiles								
PNAs SPLP								
Acenaphthene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	83-32-9	
Acenaphthylene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	208-96-8	
Anthracene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	120-12-7	
Benzo(a)anthracene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	56-55-3	
Benzo(a)pyrene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	50-32-8	
Benzo(b)fluoranthene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	205-99-2	
Benzo(k)fluoranthene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	207-08-9	
Benzo(ghi)perylene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	191-24-2	
Chrysene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	218-01-9	
Dibenzo(ah)anthracene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	53-70-3	
Fluoranthene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	206-44-0	
Fluorene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	86-73-7	
Indeno(1,2,3-cd)pyrene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	193-39-5	
Naphthelene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	91-20-3	
Phenanthrene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	85-01-8	
Pyrene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	129-00-0	
2-Methylnaphthalene	Not detected	ug/L	5	8270C	03/06/06 14:02	ARH	91-57-6	

Analytical Laboratory Report

Lab Sample ID: S25980.06
Sample Tag: Sludge Composite 2
Collected Date/Time: 02/27/2006
Matrix: Sludge
COC Reference: 032507

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	8oz. Glass	None	Yes	4.1	IR

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Inorganics								
BTU	13,000	BTU/lb	1,000	D3286-85 Mod	03/06/06 19:35	LBR		

Analytical Laboratory Report

Report ID: S26158.01(01)
Generated on 03/20/2006

Report to

Attention: Mr. Dan Oberle
SECOR
4035 King Road Suite D
Sylvania, OH 43560

Phone: 419-843-1518 FAX: 419-843-1571
Email: dschroder@secor.com

Report produced by

Merit Laboratories
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Report Summary

Lab Sample ID(s): S26158.01-S26158.05
Project: 37BP.XB006.06
Submitted Date/Time: 03/10/2006 10:30
Sampled by: Dan Oberle
P.O. #: 37BP.XB006.0

Report Notes

Results relate only to items tested as received by the laboratory.
Methods may be modified for improved performance.
Results reported on a dry weight basis where applicable.
"Not detected" indicates that parameter was not found at a level equal to or greater than the RDL.
Report shall not be reproduced except in full, without the written approval of Merit Laboratories.

Violetta F. Murshak

Violetta F. Murshak
Laboratory Director

Analytical Laboratory Report

Lab Sample ID: S26158.01
Sample Tag: LTL-2
Collected Date/Time: 03/09/2006
Matrix: Water
COC Reference: 029271

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	1 L Amber	None	Yes	3.5	IR
1	125ml Plastic	HNO3	Yes	3.5	IR
2	40 ml Glass	HCL	Yes	3.5	IR

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Extraction / Prep.								
Mercury Digestion	Completed			7470A	03/10/06 10:30	JRT		
Metal Digestion	Completed			3015A	03/14/06 12:00	SLS		
PNA Extraction	Completed			3510C	03/13/06 13:46	EMR		
Metals								
Arsenic	Not detected	mg/L	0.001	200.8	03/14/06 14:30	SLS	7440-38-2	
Barium	0.01	mg/L	0.01	200.8	03/14/06 14:30	SLS	7440-39-3	
Cadmium	Not detected	mg/L	0.0005	200.8	03/14/06 14:30	SLS	7440-43-9	
Chromium	Not detected	mg/L	0.005	200.8	03/14/06 14:30	SLS	7440-47-3	
Lead	Not detected	mg/L	0.003	200.8	03/14/06 14:30	SLS	7439-92-1	
Mercury	Not detected	mg/L	0.0002	245.1	03/10/06 14:38	JRT	7439-97-6	
Selenium	Not detected	mg/L	0.005	200.8	03/14/06 14:30	SLS	7782-49-2	
Silver	Not detected	mg/L	0.0002	200.8	03/14/06 14:30	SLS	7440-22-4	
Organics - Semi-Volatiles								
Polynuclear Aromatic Hydrocarbon								
Acenaphthene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	83-32-9	
Acenaphthylene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	208-96-8	
Anthracene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	120-12-7	
Benzo(a)anthracene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	56-55-3	
Benzo(a)pyrene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	50-32-8	
Benzo(b)fluoranthene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	205-99-2	
Benzo(k)fluoranthene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	207-08-9	
Benzo(ghi)perylene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	191-24-2	
Chrysene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	218-01-9	
Dibenzo(ah)anthracene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	53-70-3	
Fluoranthene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	206-44-0	
Fluorene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	86-73-7	
Indeno(1,2,3-cd)pyrene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	193-39-5	
Naphthalene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	91-20-3	
Phenanthrene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	85-01-8	
Pyrene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	129-00-0	
2-Methylnaphthalene	Not detected	ug/L	5	8270C	03/14/06 21:48	ARH	91-57-6	
Organics - Volatiles								
Volatile Organics - DEQ List								
Benzene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	71-43-2	
Bromodichloromethane	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	75-27-4	
Bromoform	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	75-25-2	
Bromomethane	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	74-83-9	
n-Butylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	104-51-8	

Lab Sample ID: S26158.01 (continued)
Sample Tag: LTL-2

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics - DEQ List (continued)								
sec-Butylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	135-98-8	
tert-Butylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	98-06-6	
Carbon tetrachloride	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	56-23-5	
Chlorobenzene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	108-90-7	
Chloroethane	Not detected	ug/L	15	8260B	03/17/06 16:08	JGH	75-00-3	X
Chloroform	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	67-66-3	
Chloromethane	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	74-87-3	
Dibromochloromethane	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	124-48-1	
1,2-Dichlorobenzene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	95-50-1	
1,3-Dichlorobenzene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	106-46-7	
1,1-Dichloroethane	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	75-34-3	
1,2-Dichloroethane	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	107-06-2	
1,1-Dichloroethene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	75-35-4	
cis-1,2-Dichloroethene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	156-59-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	156-60-5	
1,2-Dichloropropane	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	78-87-5	
cis-1,3-Dichloropropene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	10061-01-5	
trans-1,3-Dichloropropene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	10061-02-6	
Ethylbenzene	1	ug/L	1	8260B	03/17/06 16:08	JGH	100-41-4	
Isopropylbenzene	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	98-82-8	
p-Isopropyltoluene	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	99-87-6	
Methylene chloride	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	75-09-2	
Naphthalene	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	91-20-3	
n-Propylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	103-65-1	
Styrene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	100-42-5	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	79-34-5	
Tetrachloroethene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	127-18-4	
Toluene	7	ug/L	1	8260B	03/17/06 16:08	JGH	108-88-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	71-55-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	79-00-5	
Trichloroethene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	79-01-6	
1,2,4-Trimethylbenzene	2	ug/L	1	8260B	03/17/06 16:08	JGH	95-63-6	
1,3,5-Trimethylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	108-67-8	
Vinyl chloride	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	75-01-4	
o-Xylene	3	ug/L	1	8260B	03/17/06 16:08	JGH	95-47-6	
p,m-Xylene	5	ug/L	2	8260B	03/17/06 16:08	JGH		
Acetone	60	ug/L	50	8260B	03/17/06 16:08	JGH	67-64-1	
2-Butanone (MEK)	Not detected	ug/L	30	8260B	03/17/06 16:08	JGH	78-93-3	
Carbon disulfide	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	75-15-0	
2-Hexanone	Not detected	ug/L	50	8260B	03/17/06 16:08	JGH	591-78-6	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	50	8260B	03/17/06 16:08	JGH	108-10-1	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	1634-04-4	
1,1,1,2-Tetrachloroethane	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	630-20-6	
1,2,3-Trichlorobenzene	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	87-61-6	
1,2,3-Trichloropropane	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	96-18-4	
1,2,4-Trichlorobenzene	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	120-82-1	
1,2-Dibromo-3-chloropropane	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	96-12-8	

X=Elevated reporting limit due to matrix interference

Lab Sample ID: S26158.01 (continued)
Sample Tag: LTL-2

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics - DEQ List (continued)								
1,2-Dibromoethane	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	106-93-4	
2-Methylnaphthalene	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	91-57-6	
Acrylonitrile	Not detected	ug/L	2	8260B	03/17/06 16:08	JGH	107-13-1	
Bromobenzene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	108-86-1	
Bromochloromethane	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	74-97-5	
Dibromomethane	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	74-95-3	
Dichlorodifluoromethane	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	75-71-8	
Diethyl ether	Not detected	ug/L	10	8260B	03/17/06 16:08	JGH	60-29-7	
Hexachloroethane	Not detected	ug/L	5	8260B	03/17/06 16:08	JGH	67-72-1	
Methyl iodide	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	74-88-4	
Tetrahydrofuran	Not detected	ug/L	90	8260B	03/17/06 16:08	JGH	109-99-9	
Trichlorofluoromethane	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	75-69-4	
1,2,3-Trimethylbenzene	3	ug/L	1	8260B	03/17/06 16:08	JGH	526-73-8	
trans-1,4-Dichloro-2-butene	Not detected	ug/L	1	8260B	03/17/06 16:08	JGH	110-57-6	

Analytical Laboratory Report

Merit Laboratories, Inc.

Lab Sample ID: S26158.02
Sample Tag: LTL-4
Collected Date/Time: 03/09/2006
Matrix: Water
COC Reference: 029271

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	1 L Amber	None	Yes	3.5	IR
1	125ml Plastic	HNO3	Yes	3.5	IR
2	40 ml Glass	HCL	Yes	3.5	IR

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Extraction / Prep.								
Mercury Digestion	Completed			7470A	03/10/06 10:30	JRT		
Metal Digestion	Completed			3015A	03/14/06 12:00	SLS		
PNA Extraction	Completed			3510C	03/13/06 13:46	EMR		
Metals								
Arsenic	Not detected	mg/L	0.001	200.8	03/14/06 14:34	SLS	7440-38-2	
Barium	0.02	mg/L	0.01	200.8	03/14/06 14:34	SLS	7440-39-3	
Cadmium	Not detected	mg/L	0.0005	200.8	03/14/06 14:34	SLS	7440-43-9	
Chromium	Not detected	mg/L	0.005	200.8	03/14/06 14:34	SLS	7440-47-3	
Lead	Not detected	mg/L	0.003	200.8	03/14/06 14:34	SLS	7439-92-1	
Mercury	Not detected	mg/L	0.0002	245.1	03/10/06 14:40	JRT	7439-97-6	
Selenium	Not detected	mg/L	0.005	200.8	03/14/06 14:34	SLS	7782-49-2	
Silver	Not detected	mg/L	0.0002	200.8	03/14/06 14:34	SLS	7440-22-4	
Organics - Semi-Volatiles								
Polynuclear Aromatic Hydrocarbon								
Acenaphthene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	83-32-9	
Acenaphthylene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	208-96-8	
Anthracene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	120-12-7	
Benzo(a)anthracene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	56-55-3	
Benzo(a)pyrene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	50-32-8	
Benzo(b)fluoranthene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	205-99-2	
Benzo(k)fluoranthene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	207-08-9	
Benzo(ghi)perylene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	191-24-2	
Chrysene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	218-01-9	
Dibenzo(ah)anthracene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	53-70-3	
Fluoranthene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	206-44-0	
Fluorene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	86-73-7	
Indeno(1,2,3-cd)pyrene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	193-39-5	
Naphthalene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	91-20-3	
Phenanthrene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	85-01-8	
Pyrene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	129-00-0	
2-Methylnaphthalene	Not detected	ug/L	5	8270C	03/14/06 22:10	ARH	91-57-6	
Organics - Volatiles								
Volatile Organics - DEQ List								
Benzene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	71-43-2	
Bromodichloromethane	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	75-27-4	
Bromoform	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	75-25-2	
Bromomethane	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	74-83-9	
n-Butylbenzene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	104-51-8	

Lab Sample ID: S26158.02 (continued)
Sample Tag: LTL-4

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics - DEQ List (continued)								
sec-Butylbenzene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	135-98-8	
tert-Butylbenzene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	98-06-6	
Carbon tetrachloride	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	56-23-5	
Chlorobenzene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	108-90-7	
Chloroethane	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	75-00-3	
Chloroform	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	67-66-3	
Chloromethane	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	74-87-3	
Dibromochloromethane	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	124-48-1	
1,2-Dichlorobenzene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	95-50-1	
1,3-Dichlorobenzene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	106-46-7	
1,1-Dichloroethane	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	75-34-3	
1,2-Dichloroethane	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	107-06-2	
1,1-Dichloroethene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	75-35-4	
cis-1,2-Dichloroethene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	156-59-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	156-60-5	
1,2-Dichloropropane	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	78-87-5	
cis-1,3-Dichloropropene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	10061-01-5	
trans-1,3-Dichloropropene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	10061-02-6	
Ethylbenzene	1	ug/L	1	8260B	03/16/06 23:10	JGH	100-41-4	
Isopropylbenzene	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	98-82-8	
p-Isopropyltoluene	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	99-87-6	
Methylene chloride	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	75-09-2	
Naphthalene	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	91-20-3	
n-Propylbenzene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	103-65-1	
Styrene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	100-42-5	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	79-34-5	
Tetrachloroethene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	127-18-4	
Toluene	7	ug/L	1	8260B	03/16/06 23:10	JGH	108-88-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	71-55-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	79-00-5	
Trichloroethene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	79-01-6	
1,2,4-Trimethylbenzene	3	ug/L	1	8260B	03/16/06 23:10	JGH	95-63-6	
1,3,5-Trimethylbenzene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	108-67-8	
Vinyl chloride	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	75-01-4	
o-Xylene	3	ug/L	1	8260B	03/16/06 23:10	JGH	95-47-6	
p,m-Xylene	7	ug/L	2	8260B	03/16/06 23:10	JGH		
Acetone	60	ug/L	50	8260B	03/16/06 23:10	JGH	67-64-1	
2-Butanone (MEK)	Not detected	ug/L	30	8260B	03/16/06 23:10	JGH	78-93-3	
Carbon disulfide	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	75-15-0	
2-Hexanone	Not detected	ug/L	50	8260B	03/16/06 23:10	JGH	591-78-6	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	50	8260B	03/16/06 23:10	JGH	108-10-1	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	1634-04-4	
1,1,1,2-Tetrachloroethane	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	630-20-6	
1,2,3-Trichlorobenzene	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	87-61-6	
1,2,3-Trichloropropane	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	96-18-4	
1,2,4-Trichlorobenzene	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	120-82-1	
1,2-Dibromo-3-chloropropane	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	96-12-8	
1,2-Dibromoethane	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	106-93-4	

Lab Sample ID: S26158.02 (continued)
Sample Tag: LTL-4

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics - DEQ List (continued)								
2-Methylnaphthalene	5	ug/L	5	8260B	03/16/06 23:10	JGH	91-57-6	
Acrylonitrile	Not detected	ug/L	2	8260B	03/16/06 23:10	JGH	107-13-1	
Bromobenzene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	108-86-1	
Bromochloromethane	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	74-97-5	
Dibromomethane	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	74-95-3	
Dichlorodifluoromethane	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	75-71-8	
Diethyl ether	Not detected	ug/L	10	8260B	03/16/06 23:10	JGH	60-29-7	
Hexachloroethane	Not detected	ug/L	5	8260B	03/16/06 23:10	JGH	67-72-1	
Methyl iodide	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	74-88-4	
Tetrahydrofuran	Not detected	ug/L	90	8260B	03/16/06 23:10	JGH	109-99-9	
Trichlorofluoromethane	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	75-69-4	
1,2,3-Trimethylbenzene	3	ug/L	1	8260B	03/16/06 23:10	JGH	526-73-8	
trans-1,4-Dichloro-2-butene	Not detected	ug/L	1	8260B	03/16/06 23:10	JGH	110-57-6	

Analytical Laboratory Report

Merit Laboratories, Inc.

Lab Sample ID: S26158.03
Sample Tag: LTL-6
Collected Date/Time: 03/09/2006
Matrix: Water
COC Reference: 029271

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	1 L Amber	None	Yes	3.5	IR
1	125ml Plastic	HNO3	Yes	3.5	IR
2	40 ml Glass	HCL	Yes	3.5	IR

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Extraction / Prep.								
Mercury Digestion	Completed			7470A	03/10/06 10:30	JRT		
Metal Digestion	Completed			3015A	03/14/06 12:00	SLS		
PNA Extraction	Completed			3510C	03/13/06 13:46	EMR		
Metals								
Arsenic	Not detected	mg/L	0.001	200.8	03/14/06 14:37	SLS	7440-38-2	
Barium	0.02	mg/L	0.01	200.8	03/14/06 14:37	SLS	7440-39-3	
Cadmium	Not detected	mg/L	0.0005	200.8	03/14/06 14:37	SLS	7440-43-9	
Chromium	Not detected	mg/L	0.005	200.8	03/14/06 14:37	SLS	7440-47-3	
Lead	Not detected	mg/L	0.003	200.8	03/14/06 14:37	SLS	7439-92-1	
Mercury	Not detected	mg/L	0.0002	245.1	03/10/06 14:42	JRT	7439-97-6	
Selenium	Not detected	mg/L	0.005	200.8	03/14/06 14:37	SLS	7782-49-2	
Silver	Not detected	mg/L	0.0002	200.8	03/14/06 14:37	SLS	7440-22-4	
Organics - Semi-Volatiles								
Polynuclear Aromatic Hydrocarbon								
Acenaphthene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	83-32-9	
Acenaphthylene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	208-96-8	
Anthracene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	120-12-7	
Benzo(a)anthracene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	56-55-3	
Benzo(a)pyrene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	50-32-8	
Benzo(b)fluoranthene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	205-99-2	
Benzo(k)fluoranthene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	207-08-9	
Benzo(ghi)perylene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	191-24-2	
Chrysene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	218-01-9	
Dibenzo(ah)anthracene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	53-70-3	
Fluoranthene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	206-44-0	
Fluorene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	86-73-7	
Indeno(1,2,3-cd)pyrene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	193-39-5	
Naphthalene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	91-20-3	
Phenanthrene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	85-01-8	
Pyrene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	129-00-0	
2-Methylnaphthalene	Not detected	ug/L	5	8270C	03/14/06 22:31	ARH	91-57-6	
Organics - Volatiles								
Volatile Organics - DEQ List								
Benzene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	71-43-2	
Bromodichloromethane	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	75-27-4	
Bromoform	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	75-25-2	
Bromomethane	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	74-83-9	
n-Butylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	104-51-8	

Lab Sample ID: S26158.03 (continued)
Sample Tag: LTL-6

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics - DEQ List (continued)								
sec-Butylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	135-98-8	
tert-Butylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	98-06-6	
Carbon tetrachloride	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	56-23-5	
Chlorobenzene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	108-90-7	
Chloroethane	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	75-00-3	
Chloroform	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	67-66-3	
Chloromethane	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	74-87-3	
Dibromochloromethane	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	124-48-1	
1,2-Dichlorobenzene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	95-50-1	
1,3-Dichlorobenzene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	106-46-7	
1,1-Dichloroethane	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	75-34-3	
1,2-Dichloroethane	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	107-06-2	
1,1-Dichloroethene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	75-35-4	
cis-1,2-Dichloroethene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	156-59-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	156-60-5	
1,2-Dichloropropane	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	78-87-5	
cis-1,3-Dichloropropene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	10061-01-5	
trans-1,3-Dichloropropene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	10061-02-6	
Ethylbenzene	1	ug/L	1	8260B	03/17/06 16:26	JGH	100-41-4	
Isopropylbenzene	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	98-82-8	
p-Isopropyltoluene	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	99-87-6	
Methylene chloride	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	75-09-2	
Naphthalene	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	91-20-3	
n-Propylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	103-65-1	
Styrene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	100-42-5	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	79-34-5	
Tetrachloroethene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	127-18-4	
Toluene	5	ug/L	1	8260B	03/17/06 16:26	JGH	108-88-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	71-55-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	79-00-5	
Trichloroethene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	79-01-6	
1,2,4-Trimethylbenzene	3	ug/L	1	8260B	03/17/06 16:26	JGH	95-63-6	
1,3,5-Trimethylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	108-67-8	
Vinyl chloride	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	75-01-4	
o-Xylene	2	ug/L	1	8260B	03/17/06 16:26	JGH	95-47-6	
p,m-Xylene	5	ug/L	2	8260B	03/17/06 16:26	JGH		
Acetone	90	ug/L	50	8260B	03/17/06 16:26	JGH	67-64-1	
2-Butanone (MEK)	Not detected	ug/L	30	8260B	03/17/06 16:26	JGH	78-93-3	
Carbon disulfide	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	75-15-0	
2-Hexanone	Not detected	ug/L	50	8260B	03/17/06 16:26	JGH	591-78-6	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	50	8260B	03/17/06 16:26	JGH	108-10-1	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	1634-04-4	
1,1,1,2-Tetrachloroethane	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	630-20-6	
1,2,3-Trichlorobenzene	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	87-61-6	
1,2,3-Trichloropropane	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	96-18-4	
1,2,4-Trichlorobenzene	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	120-82-1	
1,2-Dibromo-3-chloropropane	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	96-12-8	
1,2-Dibromoethane	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	106-93-4	

Lab Sample ID: S26158.03 (continued)
Sample Tag: LTL-6

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics - DEQ List (continued)								
2-Methylnaphthalene	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	91-57-6	
Acrylonitrile	Not detected	ug/L	2	8260B	03/17/06 16:26	JGH	107-13-1	
Bromobenzene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	108-86-1	
Bromochloromethane	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	74-97-5	
Dibromomethane	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	74-95-3	
Dichlorodifluoromethane	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	75-71-8	
Diethyl ether	Not detected	ug/L	10	8260B	03/17/06 16:26	JGH	60-29-7	
Hexachloroethane	Not detected	ug/L	5	8260B	03/17/06 16:26	JGH	67-72-1	
Methyl iodide	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	74-88-4	
Tetrahydrofuran	Not detected	ug/L	90	8260B	03/17/06 16:26	JGH	109-99-9	
Trichlorofluoromethane	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	75-69-4	
1,2,3-Trimethylbenzene	3	ug/L	1	8260B	03/17/06 16:26	JGH	526-73-8	
trans-1,4-Dichloro-2-butene	Not detected	ug/L	1	8260B	03/17/06 16:26	JGH	110-57-6	

Analytical Laboratory Report

Merit Laboratories, Inc.

Lab Sample ID: S26158.04
Sample Tag: LTL-8
Collected Date/Time: 03/09/2006
Matrix: Water
COC Reference: 029271

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	1 L Amber	None	Yes	3.5	IR
1	125ml Plastic	HNO3	Yes	3.5	IR
2	40 ml Glass	HCL	Yes	3.5	IR

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Extraction / Prep.								
Mercury Digestion	Completed			7470A	03/10/06 10:30	JRT		
Metal Digestion	Completed			3015A	03/14/06 12:00	SLS		
PNA Extraction	Completed			3510C	03/13/06 13:46	EMR		
Metals								
Arsenic	Not detected	mg/L	0.001	200.8	03/14/06 14:48	SLS	7440-38-2	
Barium	Not detected	mg/L	0.01	200.8	03/14/06 14:48	SLS	7440-39-3	
Cadmium	Not detected	mg/L	0.0005	200.8	03/14/06 14:48	SLS	7440-43-9	
Chromium	Not detected	mg/L	0.005	200.8	03/14/06 14:48	SLS	7440-47-3	
Lead	Not detected	mg/L	0.003	200.8	03/14/06 14:48	SLS	7439-92-1	
Mercury	Not detected	mg/L	0.0002	245.1	03/10/06 14:44	JRT	7439-97-6	
Selenium	Not detected	mg/L	0.005	200.8	03/14/06 14:48	SLS	7782-49-2	
Silver	Not detected	mg/L	0.0002	200.8	03/14/06 14:48	SLS	7440-22-4	
Organics - Semi-Volatiles								
Polynuclear Aromatic Hydrocarbon								
Acenaphthene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	83-32-9	
Acenaphthylene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	208-96-8	
Anthracene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	120-12-7	
Benzo(a)anthracene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	56-55-3	
Benzo(a)pyrene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	50-32-8	
Benzo(b)fluoranthene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	205-99-2	
Benzo(k)fluoranthene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	207-08-9	
Benzo(ghi)perylene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	191-24-2	
Chrysene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	218-01-9	
Dibenzo(ah)anthracene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	53-70-3	
Fluoranthene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	206-44-0	
Fluorene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	86-73-7	
Indeno(1,2,3-cd)pyrene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	193-39-5	
Naphthalene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	91-20-3	
Phenanthrene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	85-01-8	
Pyrene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	129-00-0	
2-Methylnaphthalene	Not detected	ug/L	5	8270C	03/14/06 22:53	ARH	91-57-6	
Organics - Volatiles								
Volatile Organics - DEQ List								
Benzene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	71-43-2	
Bromodichloromethane	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	75-27-4	
Bromoform	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	75-25-2	
Bromomethane	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	74-83-9	
n-Butylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	104-51-8	

Lab Sample ID: S26158.04 (continued)
Sample Tag: LTL-8

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics - DEQ List (continued)								
sec-Butylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	135-98-8	
tert-Butylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	98-06-6	
Carbon tetrachloride	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	56-23-5	
Chlorobenzene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	108-90-7	
Chloroethane	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	75-00-3	
Chloroform	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	67-66-3	
Chloromethane	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	74-87-3	
Dibromochloromethane	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	124-48-1	
1,2-Dichlorobenzene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	95-50-1	
1,3-Dichlorobenzene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	106-46-7	
1,1-Dichloroethane	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	75-34-3	
1,2-Dichloroethane	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	107-06-2	
1,1-Dichloroethene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	75-35-4	
cis-1,2-Dichloroethene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	156-59-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	156-60-5	
1,2-Dichloropropane	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	78-87-5	
cis-1,3-Dichloropropene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	10061-01-5	
trans-1,3-Dichloropropene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	10061-02-6	
Ethylbenzene	1	ug/L	1	8260B	03/17/06 16:44	JGH	100-41-4	
Isopropylbenzene	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	98-82-8	
p-Isopropyltoluene	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	99-87-6	
Methylene chloride	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	75-09-2	
Naphthalene	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	91-20-3	
n-Propylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	103-65-1	
Styrene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	100-42-5	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	79-34-5	
Tetrachloroethene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	127-18-4	
Toluene	3	ug/L	1	8260B	03/17/06 16:44	JGH	108-88-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	71-55-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	79-00-5	
Trichloroethene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	79-01-6	
1,2,4-Trimethylbenzene	2	ug/L	1	8260B	03/17/06 16:44	JGH	95-63-6	
1,3,5-Trimethylbenzene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	108-67-8	
Vinyl chloride	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	75-01-4	
o-Xylene	2	ug/L	1	8260B	03/17/06 16:44	JGH	95-47-6	
p,m-Xylene	5	ug/L	2	8260B	03/17/06 16:44	JGH		
Acetone	50	ug/L	50	8260B	03/17/06 16:44	JGH	67-64-1	
2-Butanone (MEK)	Not detected	ug/L	30	8260B	03/17/06 16:44	JGH	78-93-3	
Carbon disulfide	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	75-15-0	
2-Hexanone	Not detected	ug/L	50	8260B	03/17/06 16:44	JGH	591-78-6	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	50	8260B	03/17/06 16:44	JGH	108-10-1	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	1634-04-4	
1,1,1,2-Tetrachloroethane	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	630-20-6	
1,2,3-Trichlorobenzene	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	87-61-6	
1,2,3-Trichloropropane	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	96-18-4	
1,2,4-Trichlorobenzene	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	120-82-1	
1,2-Dibromo-3-chloropropane	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	96-12-8	
1,2-Dibromoethane	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	106-93-4	

Lab Sample ID: S26158.04 (continued)
Sample Tag: LTL-8

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics - DEQ List (continued)								
2-Methylnaphthalene	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	91-57-6	
Acrylonitrile	Not detected	ug/L	2	8260B	03/17/06 16:44	JGH	107-13-1	
Bromobenzene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	108-86-1	
Bromochloromethane	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	74-97-5	
Dibromomethane	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	74-95-3	
Dichlorodifluoromethane	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	75-71-8	
Diethyl ether	Not detected	ug/L	10	8260B	03/17/06 16:44	JGH	60-29-7	
Hexachloroethane	Not detected	ug/L	5	8260B	03/17/06 16:44	JGH	67-72-1	
Methyl iodide	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	74-88-4	
Tetrahydrofuran	Not detected	ug/L	90	8260B	03/17/06 16:44	JGH	109-99-9	
Trichlorofluoromethane	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	75-69-4	
1,2,3-Trimethylbenzene	3	ug/L	1	8260B	03/17/06 16:44	JGH	526-73-8	
trans-1,4-Dichloro-2-butene	Not detected	ug/L	1	8260B	03/17/06 16:44	JGH	110-57-6	

Analytical Laboratory Report

Merit Laboratories, Inc.

Lab Sample ID: S26158.05
Sample Tag: LTL-10
Collected Date/Time: 03/09/2006
Matrix: Water
COC Reference: 029271

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	1 L Amber	None	Yes	3.5	IR
1	125ml Plastic	HNO3	Yes	3.5	IR
2	40 ml Glass	HCL	Yes	3.5	IR

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Extraction / Prep.								
Mercury Digestion	Completed			7470A	03/10/06 10:30	JRT		
Metal Digestion	Completed			3015A	03/14/06 12:00	SLS		
PNA Extraction	Completed			3510C	03/13/06 13:46	EMR		
Metals								
Arsenic	Not detected	mg/L	0.001	200.8	03/14/06 14:41	SLS	7440-38-2	
Barium	Not detected	mg/L	0.01	200.8	03/14/06 14:41	SLS	7440-39-3	
Cadmium	Not detected	mg/L	0.0005	200.8	03/14/06 14:41	SLS	7440-43-9	
Chromium	Not detected	mg/L	0.005	200.8	03/14/06 14:41	SLS	7440-47-3	
Lead	Not detected	mg/L	0.003	200.8	03/14/06 14:41	SLS	7439-92-1	
Mercury	Not detected	mg/L	0.0002	245.1	03/10/06 14:46	JRT	7439-97-6	
Selenium	Not detected	mg/L	0.005	200.8	03/14/06 14:41	SLS	7782-49-2	
Silver	Not detected	mg/L	0.0002	200.8	03/14/06 14:41	SLS	7440-22-4	
Organics - Semi-Volatiles								
Polynuclear Aromatic Hydrocarbon								
Acenaphthene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	83-32-9	
Acenaphthylene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	208-96-8	
Anthracene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	120-12-7	
Benzo(a)anthracene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	56-55-3	
Benzo(a)pyrene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	50-32-8	
Benzo(b)fluoranthene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	205-99-2	
Benzo(k)fluoranthene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	207-08-9	
Benzo(ghi)perylene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	191-24-2	
Chrysene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	218-01-9	
Dibenzo(ah)anthracene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	53-70-3	
Fluoranthene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	206-44-0	
Fluorene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	86-73-7	
Indeno(1,2,3-cd)pyrene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	193-39-5	
Naphthalene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	91-20-3	
Phenanthrene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	85-01-8	
Pyrene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	129-00-0	
2-Methylnaphthalene	Not detected	ug/L	5	8270C	03/14/06 23:14	ARH	91-57-6	
Organics - Volatiles								
Volatile Organics - DEQ List								
Benzene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	71-43-2	
Bromodichloromethane	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	75-27-4	
Bromoform	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	75-25-2	
Bromomethane	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	74-83-9	
n-Butylbenzene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	104-51-8	

Lab Sample ID: S26158.05 (continued)
Sample Tag: LTL-10

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics - DEQ List (continued)								
sec-Butylbenzene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	135-98-8	
tert-Butylbenzene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	98-06-6	
Carbon tetrachloride	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	56-23-5	
Chlorobenzene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	108-90-7	
Chloroethane	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	75-00-3	
Chloroform	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	67-66-3	
Chloromethane	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	74-87-3	
Dibromochloromethane	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	124-48-1	
1,2-Dichlorobenzene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	95-50-1	
1,3-Dichlorobenzene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	106-46-7	
1,1-Dichloroethane	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	75-34-3	
1,2-Dichloroethane	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	107-06-2	
1,1-Dichloroethene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	75-35-4	
cis-1,2-Dichloroethene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	156-59-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	156-60-5	
1,2-Dichloropropane	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	78-87-5	
cis-1,3-Dichloropropene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	10061-01-5	
trans-1,3-Dichloropropene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	10061-02-6	
Ethylbenzene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	100-41-4	
Isopropylbenzene	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	98-82-8	
p-Isopropyltoluene	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	99-87-6	
Methylene chloride	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	75-09-2	
Naphthalene	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	91-20-3	
n-Propylbenzene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	103-65-1	
Styrene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	100-42-5	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	79-34-5	
Tetrachloroethene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	127-18-4	
Toluene	3	ug/L	1	8260B	03/17/06 17:02	JGH	108-88-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	71-55-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	79-00-5	
Trichloroethene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	79-01-6	
1,2,4-Trimethylbenzene	3	ug/L	1	8260B	03/17/06 17:02	JGH	95-63-6	
1,3,5-Trimethylbenzene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	108-67-8	
Vinyl chloride	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	75-01-4	
o-Xylene	2	ug/L	1	8260B	03/17/06 17:02	JGH	95-47-6	
p,m-Xylene	4	ug/L	2	8260B	03/17/06 17:02	JGH		
Acetone	Not detected	ug/L	50	8260B	03/17/06 17:02	JGH	67-64-1	
2-Butanone (MEK)	Not detected	ug/L	30	8260B	03/17/06 17:02	JGH	78-93-3	
Carbon disulfide	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	75-15-0	
2-Hexanone	Not detected	ug/L	50	8260B	03/17/06 17:02	JGH	591-78-6	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	50	8260B	03/17/06 17:02	JGH	108-10-1	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	1634-04-4	
1,1,1,2-Tetrachloroethane	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	630-20-6	
1,2,3-Trichlorobenzene	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	87-61-6	
1,2,3-Trichloropropane	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	96-18-4	
1,2,4-Trichlorobenzene	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	120-82-1	
1,2-Dibromo-3-chloropropane	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	96-12-8	
1,2-Dibromoethane	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	106-93-4	

Lab Sample ID: S26158.05 (continued)
Sample Tag: LTL-10

Analysis	Results	Units	RDL	Method	Run Date/Time	Analyst	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics - DEQ List (continued)								
2-Methylnaphthalene	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	91-57-6	
Acrylonitrile	Not detected	ug/L	2	8260B	03/17/06 17:02	JGH	107-13-1	
Bromobenzene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	108-86-1	
Bromochloromethane	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	74-97-5	
Dibromomethane	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	74-95-3	
Dichlorodifluoromethane	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	75-71-8	
Diethyl ether	Not detected	ug/L	10	8260B	03/17/06 17:02	JGH	60-29-7	
Hexachloroethane	Not detected	ug/L	5	8260B	03/17/06 17:02	JGH	67-72-1	
Methyl iodide	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	74-88-4	
Tetrahydrofuran	Not detected	ug/L	90	8260B	03/17/06 17:02	JGH	109-99-9	
Trichlorofluoromethane	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	75-69-4	
1,2,3-Trimethylbenzene	3	ug/L	1	8260B	03/17/06 17:02	JGH	526-73-8	
trans-1,4-Dichloro-2-butene	Not detected	ug/L	1	8260B	03/17/06 17:02	JGH	110-57-6	

APPENDIX C

DENSITY/MOISTURE RELATIONSHIP
TEST RESULTS

SECOR

International Incorporated
Treatability Testing Laboratory
4035 King Road
Suite D
Sylvania, OH 43560

Project:	**Gardena Sumps**
Job No.:	**37BP.XB006.06**
Task:	**3236.0**
Sample ID:	**Neutralized Sludge #1**
Tested By:	**DWO**
Date:	**3/19/2006**

MOISTURE/DENSITY RELATIONS FOR FINE-GRAINED SOILS (ASTM D 698)

Standard Compactive Effort Using the Harvard Miniature Compaction Apparatus

Soil Description:

Neutralized Acid Sludge - No Soil Addition

Harvard Miniature Compaction Test

Initial Soil Data

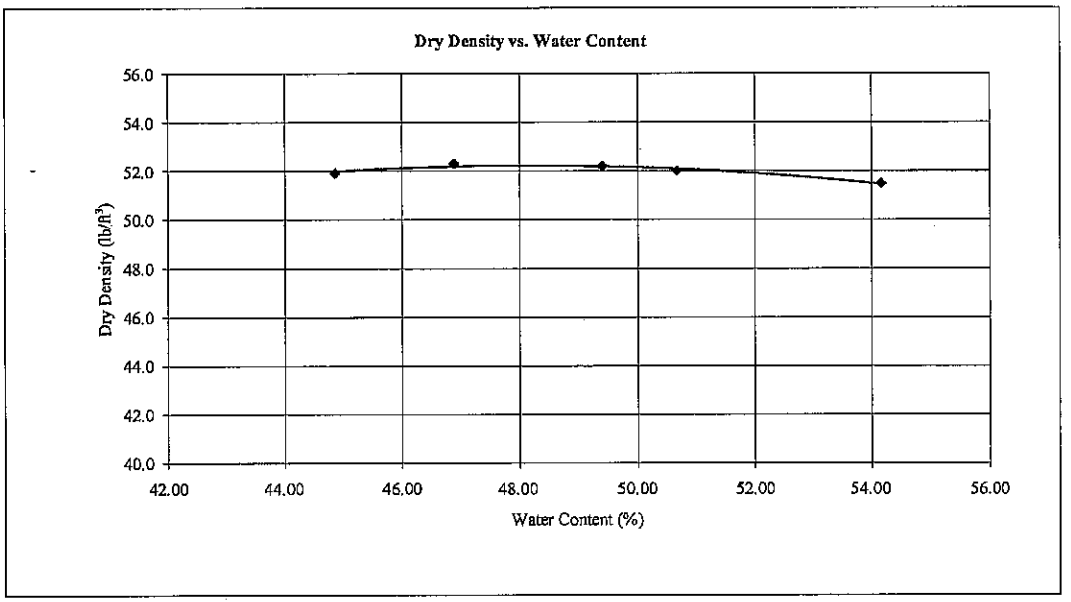
Mass of Tare =	2.03	grams
Mass of $Soil_{Moist}$ =	78.3	grams
Mass of $Soil_{Dry}$ =	54.3	grams
Mass of Water =	24	grams
Initial Water Content =	44.20	%

Compaction Mold Data

Mass of Mold =	185.00	grams
Volume of Mold =	6.24E-05	m^3

Compaction Data

Target ω (%)	Water Added (grams)	Tare Mass (grams)	Tare + $Soil_{wet}$ (grams)	Tare + $Soil_{dry}$ (grams)	Wet Material (grams)	Dry Material (grams)	Actual ω (%)	Wet Density (Mg/m^3)	Dry Density (Mg/m^3)	Dry Density (lb/ft^3)
44	0.0	2.03	77.26	53.96	75.23	51.93	44.87	1.21	0.83	51.9
46	2.0	2.04	78.88	54.35	76.84	52.31	46.89	1.23	0.84	52.3
48	3.0	2.04	80.02	54.23	77.98	52.19	49.42	1.25	0.84	52.2
50	4.0	2.04	80.39	54.04	78.35	52.00	50.67	1.26	0.83	52.0
52	5.0	2.05	81.40	53.52	79.35	51.47	54.17	1.27	0.82	51.5



Maximum Dry Density	
(Mg/m^3)	(lb/ft^3)
0.84	52.3

Optimum Water Content (%)
46.7

Comments:

Analysis was conducted using standard 20 lb. spring with 25 tamps per lift.

SECOR

International Incorporated
Treatability Testing Laboratory
4035 King Road
Suite D
Sylvania, OH 43560

Project:	Gardena Sumps
Job No.:	37BP.XB006.06
Task:	3236.0
Sample ID:	Neutralized Sludge #2
Tested By:	DWO
Date:	3/19/2006

MOISTURE/DENSITY RELATIONS FOR FINE-GRAINED SOILS (ASTM D 698)

Standard Compactive Effort Using the Harvard Miniature Compaction Apparatus

Soil Description:

Neutralized Acid Sludge - 25% Soil Addition

Harvard Miniature Compaction Test

Initial Soil Data

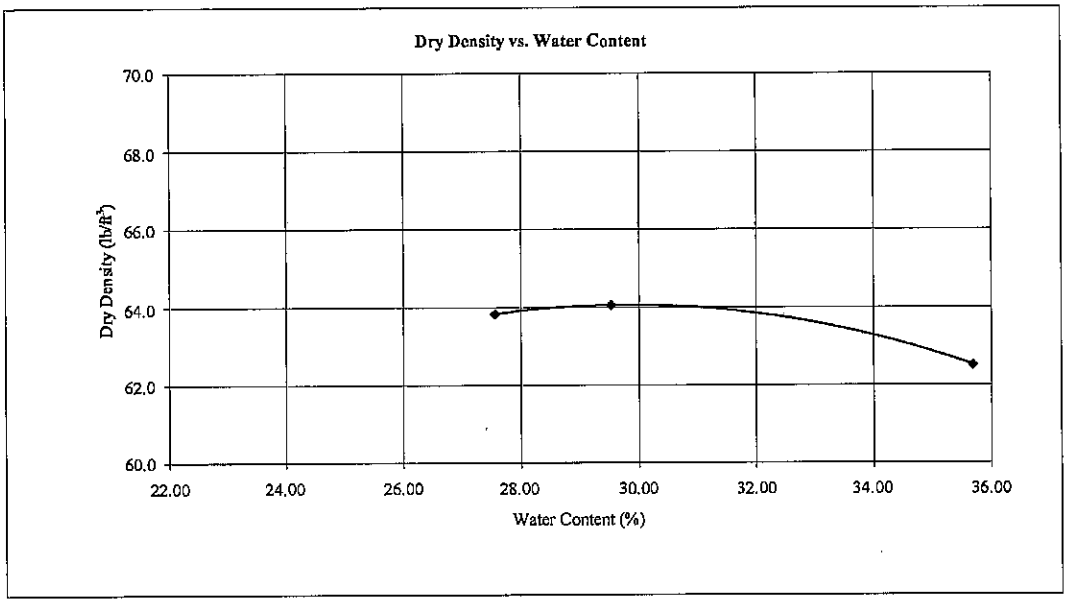
Mass of Tare =	2.06	grams
Mass of $Soil_{Moist}$ =	85.06	grams
Mass of $Soil_{Dry}$ =	66.22	grams
Mass of Water =	18.84	grams
Initial Water Content =	28.45	%

Compaction Mold Data

Mass of Mold =	185.00	grams
Volume of Mold =	6.24E-05	m^3

Compaction Data

Target ω (%)	Water Added (grams)	Tare Mass (grams)	Tare + $Soil_{wet}$ (grams)	Tare + $Soil_{dry}$ (grams)	Wet Material (grams)	Dry Material (grams)	Actual ω (%)	Wet Density (Mg/m^3)	Dry Density (Mg/m^3)	Dry Density (lb/ft^3)
28	0.0	2.05	83.48	65.88	81.43	63.83	27.57	1.30	1.02	63.8
30	2.0	2.07	85.03	66.12	82.96	64.05	29.52	1.33	1.03	64.1
34	5.0	2.03	86.84	64.53	84.81	62.50	35.70	1.36	1.00	62.5



Maximum Dry Density	
(Mg/m^3)	(lb/ft^3)
1.03	64.1

Optimum Water Content (%)
29.5

Comments:

Analysis was conducted using standard 20 lb. spring with 25 tamps per lift.

SECOR
International Incorporated
Treatability Testing Laboratory
4035 King Road
Suite D
Sylvania, OH 43560

Project:	Gardena Sumps
Job No.:	37BP.XB006.06
Task:	3236.0
Sample ID:	Neutralized Sludge #3
Tested By:	DWO
Date:	3/19/2006

MOISTURE/DENSITY RELATIONS FOR FINE-GRAINED SOILS (ASTM D 698)

Standard Compactive Effort Using the Harvard Miniature Compaction Apparatus

Soil Description:

Neutralized Acid Sludge - 50% Soil Addition

Harvard Miniature Compaction Test

Initial Soil Data

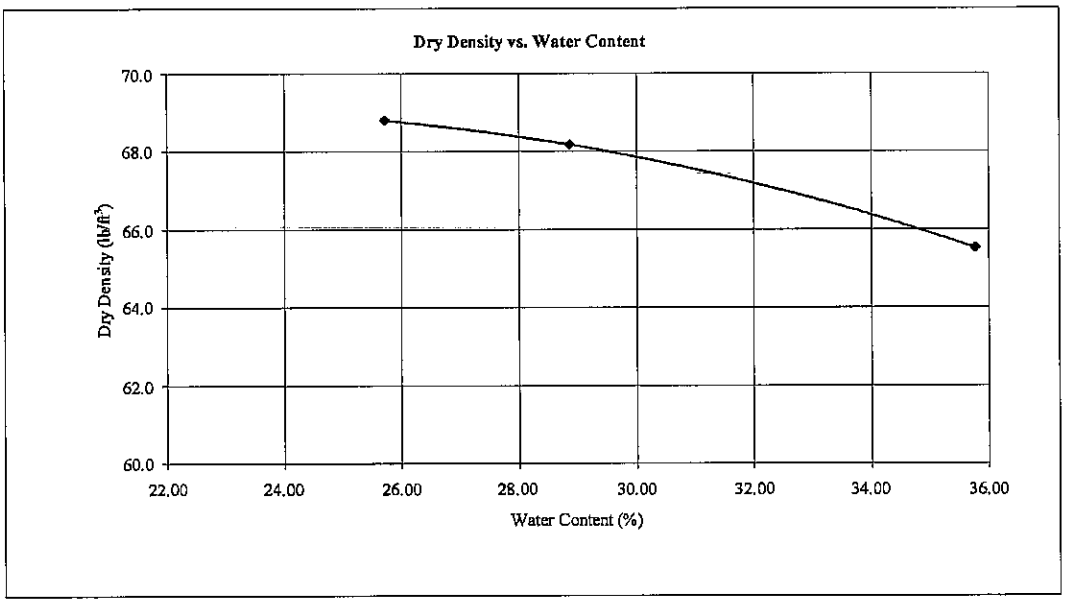
Mass of Tare =	2.04	grams
Mass of $Soil_{Moist}$ =	88.62	grams
Mass of $Soil_{Dry}$ =	70.74	grams
Mass of Water =	17.88	grams
Initial Water Content =	25.28	%

Compaction Mold Data

Mass of Mold =	185.00	grams
Volume of Mold =	6.24E-05	m^3

Compaction Data

Target ω (%)	Water Added (grams)	Tare Mass (grams)	Tare + $Soil_{wet}$ (grams)	Tare + $Soil_{dry}$ (grams)	Wet Material (grams)	Dry Material (grams)	Actual ω (%)	Wet Density (Mg/m^3)	Dry Density (Mg/m^3)	Dry Density (lb/ft^3)
25	0.0	2.05	88.55	70.85	86.50	68.80	25.73	1.39	1.10	68.8
30	2.0	2.02	89.87	70.20	87.85	68.18	28.85	1.41	1.09	68.2
35	5.0	2.03	90.99	67.55	88.96	65.52	35.78	1.43	1.05	65.5



Maximum Dry Density	
(Mg/m^3)	(lb/ft^3)
1.10	68.8

Optimum Water Content (%)
25.7

Comments:

Analysis was conducted using standard 20 lb. spring with 25 tamps per lift.

SECOR

International Incorporated
Treatability Testing Laboratory
4035 King Road
Suite D
Sylvania, OH 43560

Project:	Gardena Sumps
Job No.:	37BP.XB006.06
Task:	3236.0
Sample ID:	Neutralized Sludge #4
Tested By:	DWO
Date:	3/19/2006

MOISTURE/DENSITY RELATIONS FOR FINE-GRAINED SOILS (ASTM D 698)

Standard Compactive Effort Using the Harvard Miniature Compaction Apparatus

Soil Description:

Neutralized Acid Sludge - 75% Soil Addition

Harvard Miniature Compaction Test

Initial Soil Data

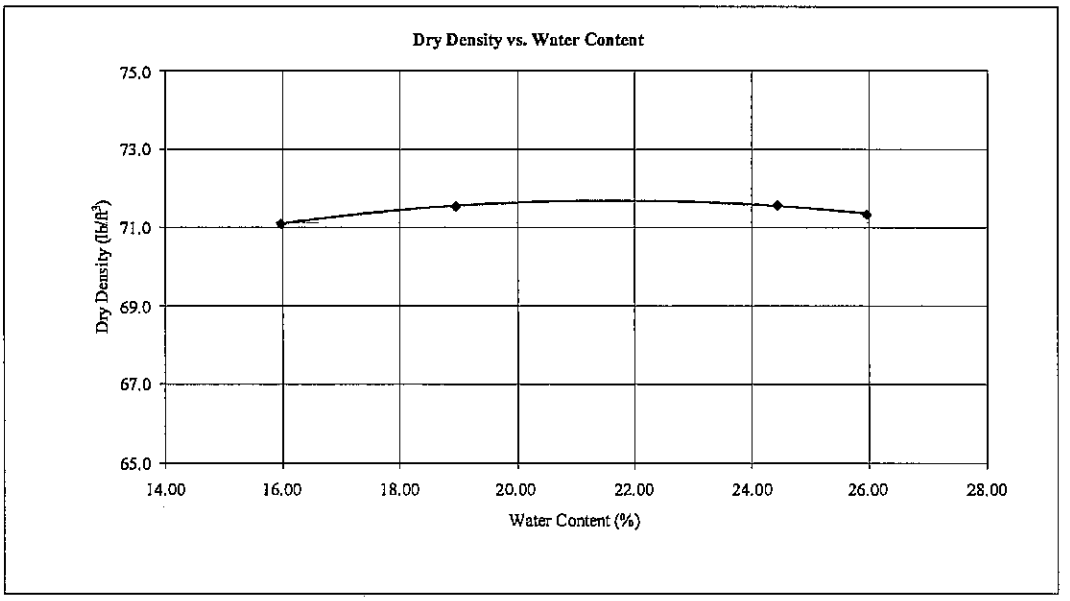
Mass of Tare =	2.04	grams
Mass of $Soil_{Moist}$ =	84.4	grams
Mass of $Soil_{Dry}$ =	72.87	grams
Mass of Water =	11.53	grams
Initial Water Content =	15.82	%

Compaction Mold Data

Mass of Mold =	185.00	grams
Volume of Mold =	6.24E-05	m^3

Compaction Data

Target ω (%)	Water Added (grams)	Tare Mass (grams)	Tare + $Soil_{wet}$ (grams)	Tare + $Soil_{dry}$ (grams)	Wet Material (grams)	Dry Material (grams)	Actual ω (%)	Wet Density (Mg/m^3)	Dry Density (Mg/m^3)	Dry Density (lb/ft^3)
16	0.0	2.05	84.51	73.15	82.46	71.10	15.98	1.32	1.14	71.1
19	2.0	2.04	87.15	73.58	85.11	71.54	18.97	1.36	1.15	71.5
24	4.0	2.07	91.11	73.63	89.04	71.56	24.43	1.43	1.15	71.6
26	6.0	2.07	91.92	73.40	89.85	71.33	25.96	1.44	1.14	71.3



Maximum Dry Density	
(Mg/m^3)	(lb/ft^3)
1.15	71.6

Optimum Water Content (%)
24.4

Comments:

Analysis was conducted using standard 20 lb. spring with 25 tamps per lift.

APPENDIX C

Risk-Based Concentration Derivation

DERIVATION OF RBCS

The results of the Human Health Risk Assessment (HHRA) indicated that areas of the Site may potentially exceed target risk goals (e.g., greater than 1×10^{-4} to 1×10^{-6}) under current and potential future uses. To assist in the Feasibility Study (FS), Site-specific risk-based concentrations (RBC) for the chemicals of concern (COCs) have been derived. The RBCs represent the concentrations of chemicals in the relevant environmental media (e.g., soil, soil gas, and groundwater) that would be considered safe for current and future land uses under conservative (i.e., protective) exposure conditions. RBCs can be used to identify individual sample locations where chemical concentrations exceed the RBC and if any additional actions (e.g., investigation, remediation, engineering controls, or institutional controls) are warranted.

RBCs were developed for each chemical identified as a COC or "risk driver" in the risk characterization of the HHRA (Geosyntec, 2010) based on each receptor group and assuming site-specific soil characteristics. For worker exposures (commercial/industrial and construction worker), chemicals that contributed to a risk greater than 1×10^{-5} were included, for residential and trespasser scenarios a 1×10^{-6} risk threshold was used. RBCs were derived for arsenic, benzo(a)pyrene equivalent (BaP-eq), hexavalent chromium, benzene, and naphthalene in soil; benzene in soil gas; and dibenz(a,h)anthracene in groundwater.

RBCs were derived for commercial/industrial, construction, residential, and trespasser scenarios using the Conceptual Site Model (CSM), exposure algorithms, exposure assumptions and toxicity criteria employed in the quantitative HHRA (Geosyntec, 2010). The RBCs are considered in the selection of Site-specific Action Levels (SSALs) for use in the Feasibility Study. Site-specific action levels are applied to the COCs within each environmental media and can be based on risk assessment (RBCs) or background concentrations. Background concentrations, as discussed in Section 2.2 of the HHRA (Geosyntec, 2010), are selected as the SSAL for chemicals in which RBCs are below background. This is the case for arsenic and BaP-eq for the residential scenario.

The following section presents the methodology used to derive soil, soil gas, and groundwater RBCs for the COCs identified in the HHRA.

1. Methodology

Deriving RBCs for COCs in soil, soil gas, and groundwater requires information regarding the level of human intake of the chemical (exposure assessment), the relationship between intake of the chemical and its toxicity (toxicity assessment), and the acceptable target risk. The sections below present the equations used in the development

of RBCs for soil, soil gas, and groundwater, which is consistent with agency guidance used in the HHRA. The methodology used to derive the RBCs for the selected COCs is based principally on guidance provided by the USEPA (1989; 1991) and the Cal-EPA (1999).

Various demarcations of acceptable risk have been established by regulatory agencies. The USEPA has established acceptable levels of risk at Superfund sites. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 CFR 300) indicates that lifetime incremental cancer risks posed by a site should not exceed a range of one in one million (1×10^{-6}) to one hundred in one million (1×10^{-4}) and noncarcinogenic chemicals should not be present at levels expected to cause adverse health effects (i.e., a Hazard Index [HI] greater than 1). Additional risk management considerations such as technical feasibility, economic, social, political, and legal factors may be part of the final risk management decision. The DTSC considers the 1×10^{-6} risk level as the generally accepted point of departure for unrestricted land use. A target risk level of 1×10^{-5} is frequently used for construction and commercial/industrial exposure scenarios.

A target risk level of 1×10^{-5} and a noncancer hazard index of 1 were used to derive commercial/industrial and construction worker RBCs. The target risk of 1×10^{-5} is the midpoint of the cancer risk range considerable acceptable to USEPA (USEPA, 1991) and the target risk commonly used at commercial/industrial sites under DTSC oversight. For residential and trespasser receptor groups, a risk level of 1×10^{-6} and a noncancer hazard index of 1 were used.

1.1 RBCs for Soil, Soil Gas, and Groundwater: Cancer Health Effects

The equations below describe the relationship between estimated intake, toxicity, and potential risk for cancer health effects (USEPA, 1989).

For COCs in Soil:

$$RBC\_S_C = \frac{TR}{(CSF_{oral})\times(IF_{oral} + IF_{dermal}) + (URF)\times(IF_{inh,s})}$$

For COCs in Soil Gas:

$$RBC\_SG_C = \frac{TR}{(URF)\times(IF_{inh,v})}$$

For COCs in Groundwater:

$$RBC\_GW_C = \frac{TR}{\left(CSF_{oral} \times IF_{dermal,GW}\right)}$$

Where:

RBC_S_C	=	risk-based concentration for soil based on cancer effects (mg/kg);
TR	=	target cancer risk level (unitless);
CSF_{oral}	=	cancer slope factor for oral (ingestion and dermal contact) exposures $(mg/kg \cdot d)^{-1}$;
IF_{oral}	=	intake factor for ingestion (kg soil per kg body weight per day);
IF_{dermal}	=	intake factor for dermal contact (kg soil per kg body weight per day);
URF	=	inhalation unit risk factor $(\mu g/m^3)^{-1}$;
$IF_{inh,s}$	=	intake factor for inhalation of COCs from soil (mg/m^3 per mg/kg);
RBC_SG_C	=	risk-based concentration for soil gas to indoor air based on cancer effects (mg/m^3);
$IF_{inh,v}$	=	intake factor for indoor inhalation of COCs (mg/m^3 per mg/m^3);
RBC_GW_C	=	risk-based concentration for dermal contact with groundwater based on cancer effects (µg/L); and
$IF_{dermal,GW}$	=	intake factor for dermal contact with COCs in groundwater (mg per event per kg body weight per day).

The formulas for developing the soil, soil gas, and groundwater intake factors, the exposure parameters that were used to estimate the intake factors, as well as the oral CSFs and inhalation URFs for COCs were presented in the HHRA. The exposure parameters, emission factors and toxicity factors are reproduced in this document and are presented in **Tables 1, 2** and **3**, respectively. Derivation of the RBCs for carcinogens is presented in **Attachment A**. The vapor intrusion model spreadsheets are presented in **Attachment B**.

1.2 RBCs for Soil, Soil Gas, and Groundwater: Noncancer Health Effects

The equations below describe the relationship between estimated intake, toxicity, and risk for noncancer health effects (USEPA, 1989).

For COCs in Soil:

$$RBC\_S_{NC} = \frac{THI}{\left(\frac{IF_{oral}}{RfD_{oral}}\right) + \left(\frac{IF_{dermal}}{RfD_{oral}}\right) + \left(\frac{IF_{inh,s}}{RfC}\right)}$$

For COCs in Soil Gas:

$$RBC\_SG_{NC} = \frac{THI}{\left(\frac{IF_{inh,v}}{RfC}\right)}$$

For COCs in Groundwater:

$$RBC\_GW_{NC} = \frac{THI}{\left(\frac{IF_{dermal,GW}}{RfD_{oral}}\right)}$$

Where:

RBC_S_{NC}	=	risk-based concentration for soil based on noncancer effects (mg/kg);
THI	=	target noncancer hazard index (unitless);
IF_{oral}	=	intake factor for ingestion (kg soil per kg body weight per day);
RfD_{oral}	=	noncancer reference dose for oral (ingestion and direct-contact) exposures (mg/kg·d);
IF_{dermal}	=	intake factor for dermal contact (kg soil per kg body weight per day);
$IF_{inh,s}$	=	intake factor for inhalation of COCs from soil (mg/m^3 per mg/kg from soil);
RfC	=	noncancer reference concentration for inhalation exposure (mg/m^3);
RBC_SG_{NC}	=	risk-based concentration for soil gas to indoor air based on noncancer effects (mg/m^3);
$IF_{inh,v}$	=	intake factor for indoor inhalation of COCs (mg/m^3 per mg/m^3);
RBC_GW_{NC}	=	risk-based concentration for dermal contact with groundwater based on noncancer effects (µg/L); and
$IF_{dermal,GW}$	=	intake factor for dermal contact with COCs in groundwater (mg per event per kg body weight per day).

The formulas for developing the soil, soil gas, and groundwater intake factors, the exposure parameters that were used to estimate the intake factors, as well as the noncancer oral RfDs and inhalation RfCs for COCs were presented in the HHRA. The exposure parameters, emission factors and toxicity factors are reproduced in this document and are presented in **Tables 1, 2** and **3**, respectively. Derivation of the RBCs for noncarcinogens is presented in **Attachment A**. The vapor intrusion model spreadsheets are presented in **Attachment B**.

2. RBC and SSAL Results

The RBCs for soil are presented in **Table 4**, for soil gas in **Table 5**, and for groundwater in **Table 6**. RBCs are presented for both cancer and noncancer effects; cancer effects generally produce lower RBCs. The selected SSALs, considering background concentrations, are presented in the last column for each receptor group.

For arsenic in soil, the DTSC screening level of 12 mg/kg considered background for southern California sites (Cal-EPA DTSC, 2007) was used as the SSAL for residential receptors because this value is greater than its residential RBC (0.39 mg/kg).

For benzo(a)pyrene equivalents in soil, a concentration of 0.9 mg/kg considered representative of background PAH concentrations in southern California soils was used as the SSAL for residential receptors because this value is greater than the residential RBC for benzo(a)pyrene (0.037 mg/kg).

3. Summary

The soil, soil gas, and groundwater SSALs will be used for comparison to Site COC data to evaluate if they are below their respective SSALs and hence, to assess potential health risks associated with detected compounds at the Site. The results of the comparison will be used to determine if further action may be warranted as a part of the FS process.

4. References

California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC), 1999. Preliminary Endangerment Assessment Guidance Manual. June (First Printing, January 1994).

Cal-EPA DTSC, 2007. Arsenic Strategies. Determination of Arsenic Remediation, Development of Arsenic Cleanup Goals for Proposed and Existing School Sites (March 21, 2007). Prepared by Human and Ecological Risk Division.

Geosyntec Consultants (Geosyntec), 2010. Human Health Risk Assessment. Gardena Sumps Site. Prepared for Atlantic Richfield Company.

United States Environmental Protection Agency (USEPA), 1989. Risk Assessment Guidance for Superfund Manual Part A. Interim Final. OSWER Directive 9285.701A. Office of Solid Waste and Emergency Response, Washington, DC.

USEPA, 1991. Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation Manual. Supplemental Guidance: Standard Default Exposure Factors. Interim Final. OSWER Directive: 9285.6-03. Office of Solid Waste and Emergency Response, March. NTIS PB91-921314.

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Attachment A: RBC Derivation Spreadsheets

Attachment B: Johnson and Ettinger Vapor Intrusion Model Spreadsheets

Table 1
Exposure Parameters
Gardena Sumps Site

Exposure Parameters	Units	Commercial/Industrial Worker Scenario		Construction Worker Scenario		Hypothetical Future Onsite and Current Offsite Residential Scenarios			Tresspasser Scenario	
		Adult	Source	Adult	Source	Adult	Child	Source	Adult	Source
Soil Ingestion Rate (IR-S)	mg/day	100	USEPA 2002	330	USEPA 2002	100	200	USEPA 1991	100	USEPA 2002
Skin Surface Area (SA)	cm^2/day	5,700	USEPA 2004	5,700	USEPA 2004	5,700	2,900	Cal-EPA 2005	4,600	USEPA 2004
Dermal Adsorption Factor (DAF)	unitless	--	chem-specific	--	chem-specific	--	--	chem-specific	--	chem-specific
Soil Adherence Factor (AF)	mg/cm^2	0.07	USEPA 2004	0.3	USEPA 2004	0.07	0.2	USEPA 2004	0.2	USEPA 2004
Fraction of Soil Exposed (FE)	unitless	1.0	Cal-EPA 1999	1.0	Cal-EPA 1999	1.0	1.0	Cal-EPA 1999	1.0	Cal-EPA 1999
Inhalation Rate of Air (IR-A)	m^3/day	14	Cal-EPA 2005	20	USEPA 2002	20	10	USEPA 1991	12.5	Cal-EPA 2005
Exposure Frequency (EF)	days/year	250	USEPA 1991	250	USEPA 2002	350	350	USEPA 1991	12	USEPA 1991
Exposure Duration (ED)	years	25	USEPA 1991	1	Professional Judgment	24	6	USEPA 1991	7	USEPA 1991
Exposure Time (ET)	hours/day	8	Professional Judgment	8	Professional Judgment	24	24	USEPA 1991	4	Professional Judgment
Dermal Conversion Factor (CF-D)	unitless	1.0E-06	--	1.0E-06	--	1.0E-06	1.0E-06	--	1.0E-06	--
Inhalation Conversion Factor (CF-A)	unitless	1.0E-03	--	1.0E-03	--	1.0E-03	1.0E-03	--	1.0E-03	--
Body Weight (BW)	kg	70	USEPA 1991	70	USEPA 1991	70	15	USEPA 1991	53.8	USEPA 1991
Averaging Time for Noncarcinogens (AT_n)	days	9,125	USEPA 1989	365	USEPA 1989	8,760	2,190	USEPA 1989	2,555	USEPA 1989
Averaging Time for Carcinogens (AT_c)	days	25,550	USEPA 1989	25,550	USEPA 1989	25,550	25,550	USEPA 1989	25,550	USEPA 1989

Notes and References:

" -- " not applicable

Cal-EPA 1999. Preliminary Endangerment Assessment Guidance Manual.

Cal-EPA 2005. Human Health Risk Assessment Note. HERD Note #1. Recommended DTSC Default Exposure Factors For Use In Risk Assessment At California Military Facilities.

USEPA 1989. Risk Assessment Guidance for Superfund (RAGS). Volume I: Human Health Evaluation Manual (HHEM), Part A. EPA/540/1-89/002.

USEPA 1991. RAGS. Vol I: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. OSWER 9285.6-03.

USEPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. OSWER 9355.4-24

USEPA 2004. RAGS. Vol I: HHEM (Part E, Supplemental Guidance for Dermal Risk Assessment), Interim Guidance. EPA/540/R-99/005. OSWER 9285.7-02EP.

Table 2
Volatilization and Particulate Emission Factors
Gardena Sumps Site

Parameter	Value	Units	Reference
Water-filled soil porosity (θ_w)	1.48E-01	(Lwater-Lsoil)	Default for soil type: Loam (L)
Total soil porosity (θ_T)	3.99E-01	(Lpore-Lsoil)	Default for soil type: Loam (L)
Air-filled soil porosity (θ_a)	2.51E-01	(Lair-Lsoil)	Default for soil type: Loam (L)
Soil bulk density (Pb)	1.59	g/cm^3	Default for soil type: Loam (L)
Water-filled soil porosity (θ_w)	2.44E-01	(Lwater-Lsoil)	Site-Specific Soil Properties
Total soil porosity (θ_T)	3.89E-01	(Lpore-Lsoil)	Site-Specific Soil Properties
Air-filled soil porosity (θ_a)	1.45E-01	(Lair-Lsoil)	Site-Specific Soil Properties
Soil bulk density (Pb)	1.63	g/cm^3	Site-Specific Soil Properties
Fraction organic carbon in soil (foc)	0.002	unitless	Default (DTSC J&E)
Exposure interval (T_{commW})	7.88E+08	sec	25 year exposure duration
T_{constW}	3.15E+07	sec	one year exposure duration
$T_{resident}$	9.46E+08	sec	30 year exposure duration
$T_{trespasser}$	2.21E+08	sec	7 year exposure duration
Inverse of mean conc, $Q/C_{commW/res/tres}$	68.18	(g/m^2-s per kg/m^3)	Calculated for a 0.5-acre site in Los Angeles (USEPA 2002a)
Q/C_{sa}, volatiles, construction worker	14.31	(g/m^2-s per kg/m^3)	Estimated for a 0.5-acre site, subchronic (eqn E-15, USEPA 2002a)
Q/C_{sr}, particulates, construction worker	23.02	(g/m^2-s per kg/m^3)	Estimated for a 0.5-acre site (eqn E-19, USEPA 2002a)
Fraction of vegetative cover, $G_{commW/res/tres}$	0.5	unitless	Default (USEPA 2002a)
G_{constW}	0	unitless	Professional Judgment
Dispersion correction factor (F_D)	0.188	unitless	assumes 1-yr construction (eqn E-16, USEPA 2002a)
Mean annual windspeed (Um)	4.69	m/s	Default (USEPA 2002a)
Equivalent threshold value of windspeed at 7m (Ut)	11.32	m/s	Default (USEPA 2002a)
Function dependent on Um/Ut (Fx)	1.94E-01	unitless	Default (USEPA 2002a)
Particulate Emission Factor, $PEF_{commW/resident/tress}$	9.9E+08	(m^3/kg)	Estimated for a limited area (0.5-acre)
Default PEF_{constW}	1.0E+06	(m^3/kg)	Cal-EPA 2005 default
Site-specific PEF_{constW}	4.2E+06	(m^3/kg)	Estimated for a limited area (0.5-acre)

Particulate Emission Factors:

$PEF_{commW/res/tres}$ (USEPA 2002a): $PEF = [(Q/C_{commW/res/tres} \times 3600) / (0.036 \times (1-G_{commW/res/tres}) \times (Um/Ut)^3 \times Fx)]$

Site-specific PEF_{constW}:

$$PEF = \left(\frac{(CD_{INTR,HIGH}) \cdot \left(\frac{8\ hr}{8\ hr}\right) \cdot (60\ d) + (CD_{WIND}) \cdot \left(\frac{8\ hr}{8\ hr}\right) \cdot (190\ d)}{250\ d} \right)^{-1}$$

Where $CD_{INTR,HIGH}$ = 1E-06 kg/m^3 = concentration of airborne dust resulting from intrusive soil-handling activities at location of activities

and Where CD_{WIND} (also known as inverse of PEF; USEPA 2002a): $CD_{WIND} = [(0.036 \times (1-G_{constW}) \times (Um/Ut)^3 \times Fx) / (Q/C_{sr} \times 3600)]$

Table 2
Volatilization and Particulate Emission Factors
Gardena Sumps Site

CAS Number	VOCs	Diffusivity in Air (Di)	Henry's Law Constant (H')	Diffusivity in Water (Dw)	Soil organic carbon partition coeff (Koc)	Soil-water partition coefficient (Kd)	Default Apparent Diffusivity (D_A)	Site-specific Apparent Diffusivity (D_A)	Volatilization Factors, VFs (m^3/kg)			
									Based on Site-Specific Soil Properties			
									Commercial/ Industrial Worker	Construction Worker	Hypothetical Onsite and Current Offsite Resident	Tresspasser
71432	Benzene	9.0E-02	2.3E-01	1.0E-05	1.5E+02	2.9E-01	1.9E-03	2.9E-04	6.1E+03	1.4E+03	6.7E+03	3.2E+03
91203	Naphthalene	6.0E-02	1.8E-02	8.4E-06	1.5E+03	3.1E+00	1.3E-05	2.3E-06	6.9E+04	1.5E+04	7.6E+04	3.7E+04

Volatilization Factors:

$VF_{commW/res/tres}$ (USEPA 2002a): $VF = Q/C_{commW/res/tres} \times [(3.14 \times D_A \times T)^{1/2} \times 10^{-4})/(2 \times Pb \times D_A)]$

Where $D_A = [(\theta_a^{3.33} \times D_i H' + \theta_w^{3.33} D_w)/\theta_T^2] / (p_b K_d + \theta_w + \theta_a H')$

VF_{constW} (eqn 5-14, USEPA 2002a) $= 1/F_D \times Q/C_{sa} \times ((3.14 \times D_A \times T_{constW})^{1/2} \times 10^{-4})/(2 \times Pb \times D_A))$

Where F_D = dispersion correction factor (0.188, unitless)

Where Q/C_{sa} for short-term worker = 14.31 for a 0.5-acre site

Table 3
Chronic Toxicity Criteria
Gardena Sumps Site

Chemicals of Concern	CAS Number	% Dermal ABS	% GI ABS	Cancer Toxicity				Noncancer Toxicity					
				Inhalation Unit Risk Factor, URF ($\mu g/m^3)^{-1}$		Oral Cancer Slope Factor, CSF $(mg/kg\text{-}day)^{-1}$		Inhalation RfC or REL (mg/m^3)		Reference Dose, RfD (mg/kg-day)			
				Inhalation	Source	Oral/Dermal	Source	Inhalation	Source	Oral	Source	Dermal	Source
Inorganics													
Arsenic	7440382	3	100	4.3E-03	1	1.5E+00	1	1.5E-05	1,2	3.0E-04	2	3.0E-04	4
Chromium VI	18540299	--	2.5	1.5E-01	1	5.0E-01	2	1.0E-04	2	3.0E-03	2	7.5E-05	4
SVOCs													
Benzo(a)pyrene	50328	13	100	1.1E-03	1	1.2E+01	1	1.1E-01	3,4*	3.0E-02	2*	3.0E-02	4*
Dibenz[a,h]anthracene	53703	13	100	1.2E-03	1	4.1E+00	1	--		--		--	
VOCs													
Benzene	71432	--	100	2.9E-05	1	1.0E-01	1	3.0E-02	2	4.0E-03	2	4.0E-03	4
Naphthalene	91203	13	100	3.4E-05	1	--		3.0E-03	2	2.0E-02	2	2.0E-02	4

Sources:

1. Cal-EPA (2009) OEHHA, Toxicity Criteria Database www.oehha.ca.gov/risk/chemicalDB/index.asp
2. USEPA (2009) Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites RSL www.epa.gov/region09/superfund/prg
3. USEPA Region 9 (2004), Preliminary Remediation Goals (PRGs) www.epa.gov/region09/waste/sfund/prg/index.html
4. Route-to-Route extrapolated values and/or DTSC correspondence

Notes:

" -- " not applicable or not available; " GI " gastrointestinal; " ABS " absorption

* Toxicity values for Pyrene used as a surrogate for Benzo(a)pyrene

Table 4
Summary of Soil SSALs
Gardena Sumps Site

Chemicals of Concern	Site-Specific Action Levels for Soil (mg/kg)											
	Commercial/Industrial			Construction			Residential			Trespasser		
	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL
Inorganics												
Arsenic	2.7E+02	1.7E+01	1.7E+01	6.2E+01	1.2E+02	6.2E+01	2.2E+01	3.9E-01	1.2E+01[1]	3.8E+03	8.5E+01	8.5E+01
Chromium VI	3.0E+03	5.4E+01	5.4E+01	6.1E+02	7.3E+01	7.3E+01	2.3E+02	1.2E+00	1.2E+00	4.9E+04	3.2E+02	3.2E+02
PAHs												
Benzo(a)pyrene	2.0E+04	1.6E+00	1.6E+00	5.5E+03	1.1E+01	1.1E+01	1.7E+03	3.7E-02	9.0E-01[2]	2.2E+05	6.2E+00	6.2E+00
VOCs												
Benzene	6.7E+02	2.4E+01	2.4E+01	1.6E+02	1.4E+02	1.4E+02	1.2E+02	4.8E-01	4.8E-01	1.4E+04	1.8E+02	1.8E+02
Naphthalene	8.5E+02	2.5E+02	2.5E+02	1.9E+02	1.4E+03	1.9E+02	1.8E+02	4.9E+00	4.9E+00	1.8E+04	1.9E+03	1.9E+03

Notes:

SSAL: site-specific action level

RBCnc: risk-based concentration based on noncancer effects

RBCc: risk-based concentration based on cancer effects

Selected SSALs are the lowest between RBCc and RBCnc, or the background concentration for chemicals in which the RBCs were below background (e.g., arsenic and BaP-eq for the residential scenario).

[1] For arsenic, the DTSC screening level of 12 mg/kg (Cal-EPA DTSC, 2007), considered representative of background in southern California soils, was selected as the SSAL.

[2] For benzo(a)pyrene, a concentration of 0.9 mg/kg, considered representative of background PAH concentrations in southern California soils, was selected as the SSAL.

Table 5
Summary of Soil Gas SSALs
Gardena Sumps Site

Chemical of Concern	Site-Specific Action Levels for Soil Gas (µg/L)					
	Commercial/Industrial			Residential		
	RBCnc	RBCc	Selected SSAL	RBCnc	RBCc	Selected SSAL
Benzene						
5-ft bgs	3.2E+02	1.0E+01	1.0E+01	3.8E+01	1.0E-01	1.0E-01
10-ft bgs	5.5E+02	1.8E+01	1.8E+01	6.5E+01	1.8E-01	1.8E-01
12-ft bgs	6.4E+02	2.1E+01	2.1E+01	7.6E+01	2.1E-01	2.1E-01
15-ft bgs	7.8E+02	2.5E+01	2.5E+01	9.3E+01	2.5E-01	2.5E-01

Notes:

Soil gas to indoor air pathway

SSAL: site-specific action level

RBCnc: risk-based concentration based on noncancer effects

RBCc: risk-based concentration based on cancer effects

Selected SSALs are the lowest between RBCc and RBCnc

Soil gas RBCs were derived using default soil properties for soil type loam in the model

Table 6
Summary of Groundwater SSALs
Gardena Sumps Site

Chemical of Concern	Site-Specific Action Levels for Groundwater (µg/L)		
	Construction		
	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL
PAHs			
Dibenz[a,h]anthracene	--	2.0E+00	2.0E+00

Notes:

" -- " not applicable

SSAL: site-specific action level

RBCnc: risk-based concentration based on noncancer effects

RBCc: risk-based concentration based on cancer effects

Selected SSAL is the lowest between RBCc and RBCnc

Table A-1
Estimation of Unit Noncancer Hazard and Unit Cancer Risk
Current Onsite Commercial/Industrial Worker
Ingestion/Dermal Absorption of Soil
Gardena Sumps Site

Exposure Route	Chemical of Potential Concern	Unit Soil EPC (mg/kg)	Noncancer Intake (mg/kg-day)	Oral/Dermal Reference Dose (mg/kg-day)	**Hazard Quotient**	Cancer Intake (mg/kg-day)	Oral/Dermal Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	**Cancer Risk**
Ingestion	**Inorganics**							
	Arsenic	1	9.8E-07	3.0E-04	**3.3E-03**	3.5E-07	1.5E+00	**5.2E-07**
	Chromium VI	1	9.8E-07	3.0E-03	**3.3E-04**	3.5E-07	5.0E-01	**1.7E-07**
	PAHs							
	Benzo(a)pyrene	1	9.8E-07	3.0E-02	**3.3E-05**	3.5E-07	1.2E+01	**4.2E-06**
	VOCs							
	Benzene	1	9.8E-07	4.0E-03	**2.4E-04**	3.5E-07	1.0E-01	**3.5E-08**
	Naphthalene	1	9.8E-07	2.0E-02	**4.9E-05**	3.5E-07	--	**--**
Dermal	**Inorganics**							
	Arsenic	1	1.2E-07	3.0E-04	**3.9E-04**	4.2E-08	1.5E+00	**6.3E-08**
	Chromium VI	1	--	7.5E-05	**--**	--	5.0E-01	**--**
	PAHs							
	Benzo(a)pyrene	1	5.1E-07	3.0E-02	**1.7E-05**	1.8E-07	1.2E+01	**2.2E-06**
	VOCs							
	Benzene	1	--	4.0E-03	**--**	--	1.0E-01	**--**
	Naphthalene	1	5.1E-07	2.0E-02	**2.5E-05**	1.8E-07	--	**--**

Note: " -- " not applicable or not available

Table A-2
Estimation of Unit Noncancer Hazard and Unit Cancer Risk
Current Onsite Commercial/Industrial Worker
Inhalation of Outdoor Soil Vapors/Particulates
Gardena Sumps Site

Exposure Route	Chemical of Potential Concern	Unit Soil EPC (mg/kg)	Outdoor Air EPC (Site-Specific) (mg/m^3)	Reference Concentration (mg/m^3)	Inhalation Unit Risk ($(ug/m^3)^{-1}$)	Site-Specific Soil Properties			
						Noncancer Intake (mg/m^3)	**Hazard Quotient**	Cancer Intake (mg/m^3)	**Cancer Risk**
Inhalation	**Inorganics**								
	Arsenic	1	1.0E-09	1.5E-05	4.3E-03	2.3E-10	**1.5E-05**	8.2E-11	**3.5E-10**
	Chromium VI	1	1.0E-09	1.0E-04	1.5E-01	2.3E-10	**2.3E-06**	8.2E-11	**1.2E-08**
	PAHs								
	Benzo(a)pyrene	1	1.0E-09	1.1E-01	1.1E-03	2.3E-10	**2.2E-09**	8.2E-11	**9.2E-11**
	VOCs								
	Benzene	1	1.6E-04	3.0E-02	2.9E-05	3.7E-05	**1.2E-03**	1.3E-05	**3.8E-07**
	Naphthalene	1	1.4E-05	3.0E-03	3.4E-05	3.3E-06	**1.1E-03**	1.2E-06	**4.0E-08**

Note: " -- " not applicable or not available

Table A-3
Estimation of Unit Noncancer Hazard and Unit Cancer Risk
Construction Worker
Ingestion/Dermal Absorption of Soil
Gardena Sumps Site

Exposure Route	Chemical of Potential Concern	Maximum Soil EPC (mg/kg)	Noncancer Intake (mg/kg-day)	Oral/Dermal Reference Dose (mg/kg-day)	**Hazard Quotient**	Cancer Intake (mg/kg-day)	Oral/Dermal Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	**Cancer Risk**
Ingestion	**Inorganics**							
	Arsenic	1	3.2E-06	3.0E-04	1.1E-02	4.6E-08	1.5E+00	6.9E-08
	Chromium VI	1	3.2E-06	3.0E-03	1.1E-03	4.6E-08	5.0E-01	2.3E-08
	PAHs							
	Benzo(a)pyrene	1	3.2E-06	3.0E-02	1.1E-04	4.6E-08	1.2E+01	5.5E-07
	VOCs							
	Benzene	1	3.2E-06	4.0E-03	8.1E-04	4.6E-08	1.0E-01	4.6E-09
	Naphthalene	1	3.2E-06	2.0E-02	1.6E-04	4.6E-08	--	--
Dermal	**Inorganics**							
	Arsenic	1	5.0E-07	3.0E-04	1.7E-03	7.2E-09	1.5E+00	1.1E-08
	Chromium VI	1	--	7.5E-05	--	--	5.0E-01	--
	PAHs							
	Benzo(a)pyrene	1	2.2E-06	3.0E-02	7.3E-05	3.1E-08	1.2E+01	3.7E-07
	VOCs							
	Benzene	1	--	4.0E-03	--	--	1.0E-01	--
	Naphthalene	1	2.2E-06	2.0E-02	1.1E-04	3.1E-08	--	--

Note: " -- " not applicable or not available

Table A-4
Estimation of Unit Noncancer Hazard and Unit Cancer Risk
Construction Worker
Inhalation of Outdoor Soil Vapors/Particulates
Gardena Sumps Site

Exposure Route	Chemical of Potential Concern	Unit Soil EPC (mg/kg)	Outdoor Air EPC (Site-Specific) (mg/m^3)	Reference Concentration (mg/m^3)	Inhalation Unit Risk $(ug/m^3)^{-1}$	Site-Specific Soil Properties			
						Noncancer Intake (mg/m^3)	**Hazard Quotient**	Cancer Intake (mg/m^3)	**Cancer Risk**
Inhalation	**Inorganics**								
	Arsenic	1	2.4E-07	1.5E-05	4.3E-03	5.5E-08	3.7E-03	7.9E-10	3.4E-09
	Chromium VI	1	2.4E-07	1.0E-04	1.5E-01	5.5E-08	5.5E-04	7.9E-10	1.1E-07
	PAHs								
	Benzo(a)pyrene	1	2.4E-07	1.1E-01	1.1E-03	5.5E-08	5.2E-07	7.9E-10	8.8E-10
	VOCs								
	Benzene	1	7.3E-04	3.0E-02	2.9E-05	1.7E-04	5.6E-03	2.4E-06	6.8E-08
	Naphthalene	1	6.5E-05	3.0E-03	3.4E-05	1.5E-05	4.9E-03	2.1E-07	7.2E-09

Note: " -- " not applicable or not available

Table A-5
Estimation of Unit Noncancer Hazard and Unit Cancer Risk
Hypothetical Future Onsite Resident
Ingestion/Dermal Absorption of Soil
Gardena Sumps Site

Exposure Route	Chemical of Potential Concern	Unit Soil EPC (mg/kg)	Noncancer Intake (mg/kg-day)	Oral/Dermal Reference Dose (mg/kg-day)	**Hazard Quotient**	Cancer Intake (mg/kg-day)	Oral/Dermal Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	**Cancer Risk**
Ingestion	**Inorganics**							
	Arsenic	1	1.3E-05	3.0E-04	**4.3E-02**	1.6E-06	1.5E+00	**2.3E-06**
	Chromium VI	1	1.3E-05	3.0E-03	**4.3E-03**	1.6E-06	5.0E-01	**7.8E-07**
	PAHs							
	Benzo(a)pyrene	1	1.3E-05	3.0E-02	**4.3E-04**	1.6E-06	1.2E+01	**1.9E-05**
	VOCs							
	Benzene	1	1.3E-05	4.0E-03	**3.2E-03**	1.6E-06	1.0E-01	**1.6E-07**
	Naphthalene	1	1.3E-05	2.0E-02	**6.4E-04**	1.6E-06	--	**--**
Dermal	**Inorganics**							
	Arsenic	1	1.1E-06	3.0E-04	**3.7E-03**	1.5E-07	1.5E+00	**2.3E-07**
	Chromium VI	1	--	7.5E-05	**--**	--	5.0E-01	**--**
	PAHs							
	Benzo(a)pyrene	1	4.8E-06	3.0E-02	**1.6E-04**	6.6E-07	1.2E+01	**7.9E-06**
	VOCs							
	Benzene	1	--	4.0E-03	**--**	--	1.0E-01	**--**
	Naphthalene	1	4.8E-06	2.0E-02	**2.4E-04**	6.6E-07	--	**--**

Note: " -- " not applicable or not available

Table A-6
Estimation of Unit Noncancer Hazard and Unit Cancer Risk
Hypothetical Future Onsite Resident
Inhalation of Outdoor Soil Vapors/Particulates
Gardena Sumps Site

Exposure Route	Chemical of Potential Concern	Unit Soil EPC (mg/kg)	Outdoor Air EPC (Site-Specific) (mg/m^3)	Reference Concentration (mg/m^3)	Inhalation Unit Risk $(ug/m^3)^{-1}$	Site-Specific Soil Properties			
						Noncancer Intake (mg/m^3)	**Hazard Quotient**	Cancer Intake (mg/m^3)	**Cancer Risk**
Inhalation	**Inorganics**								
	Arsenic	1	1.0E-09	1.5E-05	4.3E-03	9.7E-10	**6.5E-05**	4.2E-10	**1.8E-09**
	Chromium VI	1	1.0E-09	1.0E-04	1.5E-01	9.7E-10	**9.7E-06**	4.2E-10	**6.1E-08**
	PAHs								
	Benzo(a)pyrene	1	1.0E-09	1.1E-01	1.1E-03	9.7E-10	**9.2E-09**	4.2E-10	**4.6E-10**
	VOCs								
	Benzene	1	1.6E-04	3.0E-02	2.9E-05	1.6E-04	**5.2E-03**	6.7E-05	**1.9E-06**
	Naphthalene	1	1.4E-05	3.0E-03	3.4E-05	1.4E-05	**4.6E-03**	5.9E-06	**2.0E-07**

Note: " -- " not applicable or not available

Table A-7
Estimation of Unit Noncancer Hazard and Unit Cancer Risk
Tresspasser
Ingestion/Dermal Absorption of Soil
Gardena Sumps Site

Exposure Route	Chemical of Potential Concern	Unit Soil EPC (mg/kg)	Noncancer Intake (mg/kg-day)	Oral/Dermal Reference Dose (mg/kg-day)	**Hazard Quotient**	Cancer Intake (mg/kg-day)	Oral/Dermal Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	**Cancer Risk**
Ingestion	**Inorganics**							
	Arsenic	1	6.1E-08	3.0E-04	2.0E-04	6.1E-09	1.5E+00	9.2E-09
	Chromium VI	1	6.1E-08	3.0E-03	2.0E-05	6.1E-09	5.0E-01	3.1E-09
	PAHs							
	Benzo(a)pyrene	1	6.1E-08	3.0E-02	2.0E-06	6.1E-09	1.2E+01	7.3E-08
	VOCs							
	Benzene	1	6.1E-08	4.0E-03	1.5E-05	6.1E-09	1.0E-01	6.1E-10
	Naphthalene	1	6.1E-08	2.0E-02	3.1E-06	6.1E-09	--	--
Dermal	**Inorganics**							
	Arsenic	1	1.7E-08	3.0E-04	5.6E-05	1.7E-09	1.5E+00	2.5E-09
	Chromium VI	1	--	7.5E-05	--	--	5.0E-01	--
	PAHs							
	Benzo(a)pyrene	1	7.3E-08	3.0E-02	2.4E-06	7.3E-09	1.2E+01	8.8E-08
	VOCs							
	Benzene	1	--	4.0E-03	--	--	1.0E-01	--
	Naphthalene	1	7.3E-08	2.0E-02	3.7E-06	7.3E-09	--	--

Note: " -- " not applicable or not available

Table A-8
Estimation of Unit Noncancer Hazard and Unit Cancer Risk
Tresspasser
Inhalation of Outdoor Soil Vapors/Particulates
Gardena Sumps Site

Exposure Route	Chemical of Potential Concern	Unit Soil EPC (mg/kg)	Outdoor Air EPC (Site-Specific) (mg/m^3)	Reference Concentration (mg/m^3)	Inhalation Unit Risk $(ug/m^3)^{-1}$	Site-Specific Soil Properties			
						Noncancer Intake (mg/m^3)	**Hazard Quotient**	Cancer Intake (mg/m^3)	**Cancer Risk**
Inhalation	**Inorganics**								
	Arsenic	1	1.0E-09	1.5E-05	4.3E-03	5.5E-12	**3.7E-07**	5.5E-13	**2.4E-12**
	Chromium VI	1	1.0E-09	1.0E-04	1.5E-01	5.5E-12	**5.5E-08**	5.5E-13	**8.1E-11**
	PAHs								
	Benzo(a)pyrene	1	1.0E-09	1.1E-01	1.1E-03	5.5E-12	**5.3E-11**	5.5E-13	**6.2E-13**
	VOCs								
	Benzene	1	3.1E-04	3.0E-02	2.9E-05	1.7E-06	**5.7E-05**	1.7E-07	**4.9E-09**
	Naphthalene	1	2.7E-05	3.0E-03	3.4E-05	1.5E-07	**5.0E-05**	1.5E-08	**5.1E-10**

Note: " -- " not applicable or not available

Table A-9
Summary of Soil RBCs
Commercial/Industrial Worker Scenario
Gardena Sumps Site

Exposure Pathway	Chemical	Noncancer Hazard					Cancer Risk				
		Ingestion	Dermal	Inhalation	Cumulative Hazard	**Site-Specific RBCnc**	Ingestion	Dermal	Inhalation	Cumulative Risk	**Site-Specific RBCc**
Soil:	**Inorganics**										
Incidental ingestion	Arsenic	3.3E-03	3.9E-04	1.5E-05	3.7E-03	**2.7E+02**	5.2E-07	6.3E-08	3.5E-10	5.9E-07	**1.7E+01**
Dermal contact	Chromium VI	3.3E-04	--	2.3E-06	3.3E-04	**3.0E+03**	1.7E-07	--	1.2E-08	1.9E-07	**5.4E+01**
Outdoor Inhalation	**PAHs**										
	Benzo(a)pyrene	3.3E-05	1.7E-05	2.2E-09	5.0E-05	**2.0E+04**	4.2E-06	2.2E-06	9.2E-11	6.4E-06	**1.6E+00**
	VOCs										
	Benzene	2.4E-04	--	1.2E-03	1.5E-03	**6.7E+02**	3.5E-08	--	3.8E-07	4.2E-07	**2.4E+01**
	Naphthalene	4.9E-05	2.5E-05	1.1E-03	1.2E-03	**8.5E+02**	--	--	4.0E-08	4.0E-08	**2.5E+02**

Note: " -- " not applicable or not available

Table A-10
Summary of Soil RBCs
Construction Worker Scenario
Gardena Sumps Site

Exposure Pathway	Chemical	Noncancer Hazard					Cancer Risk				
		Ingestion	Dermal	Inhalation	Cumulative Hazard	**Site-Specific RBCnc**	Ingestion	Dermal	Inhalation	Cumulative Risk	**Site-Specific RBCc**
Soil:	**Inorganics**										
Incidental ingestion	Arsenic	1.1E-02	1.7E-03	3.7E-03	1.6E-02	**6.2E+01**	6.9E-08	1.1E-08	3.4E-09	8.3E-08	**1.2E+02**
Dermal contact	Chromium VI	1.1E-03	--	5.5E-04	1.6E-03	**6.1E+02**	2.3E-08	--	1.1E-07	1.4E-07	**7.3E+01**
Outdoor Inhalation	**PAHs**										
	Benzo(a)pyrene	1.1E-04	7.3E-05	5.2E-07	1.8E-04	**5.5E+03**	5.5E-07	3.7E-07	8.8E-10	9.3E-07	**1.1E+01**
	VOCs										
	Benzene	8.1E-04	--	5.6E-03	6.4E-03	**1.6E+02**	4.6E-09	--	6.8E-08	7.3E-08	**1.4E+02**
	Naphthalene	1.6E-04	1.1E-04	4.9E-03	5.2E-03	**1.9E+02**	--	--	7.2E-09	7.2E-09	**1.4E+03**

Note: " -- " not applicable or not available

Table A-11
Summary of Soil RBCs
Residential Scenario
Gardena Sumps Site

Exposure Pathway	Chemical	Noncancer Hazard					Cancer Risk				
		Ingestion	Dermal	Inhalation	Cumulative Hazard	**Site-Specific RBCnc**	Ingestion	Dermal	Inhalation	Cumulative Risk	**Site-Specific RBCc**
Soil:	**Inorganics**										
Incidental ingestion	Arsenic	4.3E-02	3.7E-03	6.5E-05	4.6E-02	**2.2E+01**	2.3E-06	2.3E-07	1.8E-09	2.6E-06	**3.9E-01**
Dermal contact	Chromium VI	4.3E-03	--	9.7E-06	4.3E-03	**2.3E+02**	7.8E-07	--	6.1E-08	8.4E-07	**1.2E+00**
Outdoor Inhalation	**PAHs**										
	Benzo(a)pyrene	4.3E-04	1.6E-04	9.2E-09	5.9E-04	**1.7E+03**	1.9E-05	7.9E-06	4.6E-10	2.7E-05	**3.7E-02**
	VOCs										
	Benzene	3.2E-03	--	5.2E-03	8.4E-03	**1.2E+02**	1.6E-07	--	1.9E-06	2.1E-06	**4.8E-01**
	Naphthalene	6.4E-04	2.4E-04	4.6E-03	5.5E-03	**1.8E+02**	--	--	2.0E-07	2.0E-07	**4.9E+00**

Note: " -- " not applicable or not available

Table A-12
Summary of Soil RBCs
Tresspasser Scenario
Gardena Sumps Site

Exposure Pathway	Chemical	Noncancer Hazard					Cancer Risk				
		Ingestion	Dermal	Inhalation	Cumulative Hazard	**Site-Specific RBCnc**	Ingestion	Dermal	Inhalation	Cumulative Risk	**Site-Specific RBCc**
Soil:	**Inorganics**										
Incidental ingestion	Arsenic	2.0E-04	5.6E-05	3.7E-07	2.6E-04	**3.8E+03**	9.2E-09	2.5E-09	2.4E-12	1.2E-08	**8.5E+01**
Dermal contact	Chromium VI	2.0E-05	--	5.5E-08	2.0E-05	**4.9E+04**	3.1E-09	--	8.1E-11	3.1E-09	**3.2E+02**
Outdoor Inhalation	**PAHs**										
	Benzo(a)pyrene	2.0E-06	2.4E-06	5.3E-11	4.5E-06	**2.2E+05**	7.3E-08	8.8E-08	6.2E-13	1.6E-07	**6.2E+00**
	VOCs										
	Benzene	1.5E-05	--	5.7E-05	7.2E-05	**1.4E+04**	6.1E-10	--	4.9E-09	5.5E-09	**1.8E+02**
	Naphthalene	3.1E-06	3.7E-06	5.0E-05	5.7E-05	**1.8E+04**	--	--	5.1E-10	5.1E-10	**1.9E+03**

Note: " -- " not applicable or not available

Table A-13
Derivation of Soil Gas RBCs
Commercial/Industrial Worker Scenario
Inhalation of Indoor Air: Soil Gas
Gardena Sumps Site

Sample Depth (ft bgs)	Chemical of Concern	SG-Indoor Air EPC (mg/m^3)	Reference Concentration (mg/m^3)	Inhalation Unit Risk $(\mu g/m^3)^{-1}$	Default Loam Soil Properties					
					Noncancer Intake (mg/m^3)	Hazard Quotient	**RBCnc (µg/L)**	Cancer Intake (mg/m^3)	Cancer Risk	**RBCc (µg/L)**
	VOCs									
5	Benzene	4.2E-04	3.0E-02	2.9E-05	9.5E-05	3.2E-03	**3.2E+02**	3.4E-05	9.7E-07	**1.0E+01**
10		2.4E-04	3.0E-02	2.9E-05	5.5E-05	1.8E-03	**5.5E+02**	2.0E-05	5.6E-07	**1.8E+01**
12		2.1E-04	3.0E-02	2.9E-05	4.7E-05	1.6E-03	**6.4E+02**	1.7E-05	4.8E-07	**2.1E+01**
15		1.7E-04	3.0E-02	2.9E-05	3.9E-05	1.3E-03	**7.8E+02**	1.4E-05	3.9E-07	**2.5E+01**

Note: " -- " not applicable or not available

Table A-14
Derivation of Soil Gas RBCs
Residential Scenario
Inhalation of Indoor Air: Soil Gas
Gardena Sumps Site

Sample Depth (ft bgs)	Chemical of Concern	SG-Indoor Air EPC (mg/m^3)	Reference Concentration (mg/m^3)	Inhalation Unit Risk $(\mu g/m^3)^{-1}$	Default Loam Soil Properties					
					Noncancer Intake (mg/m^3)	Hazard Quotient	**RBCnc (µg/L)**	Cancer Intake (mg/m^3)	Cancer Risk	**RBCc (µg/L)**
	VOCs									
5	Benzene	8.3E-04	3.0E-02	2.9E-05	8.0E-04	2.7E-02	**3.8E+01**	3.4E-04	9.8E-06	**1.0E-01**
10		4.8E-04	3.0E-02	2.9E-05	4.6E-04	1.5E-02	**6.5E+01**	2.0E-04	5.6E-06	**1.8E-01**
12		4.1E-04	3.0E-02	2.9E-05	3.9E-04	1.3E-02	**7.6E+01**	1.7E-04	4.8E-06	**2.1E-01**
15		3.4E-04	3.0E-02	2.9E-05	3.2E-04	1.1E-02	**9.3E+01**	1.4E-04	4.0E-06	**2.5E-01**

Note: " -- " not applicable or not available

Table A-15
Derivation of Groundwater RBCs
Construction Worker
Dermal Contact with Groundwater
Gardena Sumps Site

Exposure Route	Chemical of Potential Concern	Unit Groundwater Concentration (µg/L)	Water Permeability Coefficients (cm/hour)	Lag Time τ_{event} hour/event	FA	B	Time Steady State, t* hour	Adult DA_{event} cm/event	Noncancer Intake mg/kg-day	Oral/Dermal Reference Dose mg/kg-day	Hazard Quotient	Cancer Intake mg/kg-day	Oral/Dermal Cancer Slope Factor $mg/kg\text{-}day^{-1}$	Cancer Risk	**RBCc (ug/L)**
Dermal Contact with Groundwater	**PAHs** Dibenz[a,h]anthracene	1.0E+00	9.5E-01	3.9E+00	6.0E-01	6.1E+00	1.7E+01	1.6E+00	8.7E-05	NA	--	1.2E-06	4.1E+00	5.1E-06	**2.0E+00**

Notes: " -- " not applicable

" FA ": Fraction absorbed water (chemical-specific, dimensionless)

" B ": Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (chemical-specific, dimensionless)

" DA_{event} ": Absorbed dose per event = $Kp \times t_{event}$ [where t_{event} = Event duration (hr/event)]

DATA ENTRY SHEET
Default Loam Soil Properties

Attachment B
Soil Gas to Indoor Air Pathway - 5' bgs
Commercial/Industrial Scenario
Gardena Sumps Site

SG-ADV
Version 3.1; 02/04

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
71432	1000			Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm2)
			Totals must add up to value of Ls (cell F24)					
15	152.5	24	152.5			L		
	5 ft bgs		5 ft bgs					

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil Parameters				Lookup Soil Parameters				Lookup Soil Parameters			
L	1.59	0.399	0.148	C	1.43	0.459	0.215	C	1.43	0.459	0.215

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	1	5

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	8-feet
70	6	6	350	

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Molecular weight, MW (g/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	
8.8E-02	9.8E-06	5.5E-03	25	7,342	353.24	562.16	78.11	7.8E-06	3.0E-02	Benzene

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	
1.9E+08	137.5	0.251	0.244	0.244	0.257	1.9E-09	0.854	1.6E-09	4,000	1.0E+03	6.8E+04	Benzene

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)	
1.1E+06	5.0E-03	15	7,977	5.3E-03	2.2E-01	1.8E-04	5.5E-03	0.0E+00	0.0E+00	5.5E-03	137.5	Benzene

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	**Infinite source bldg. conc., $C_{building}$ (mg/m^3)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	
15	1.0E+03	1.33	8.3E+01	5.5E-03	5.3E+03	2.1E+12	4.2E-04	4.2E-01	**4.2E-04**	7.8E-06	3.0E-02	Benzene

DATA ENTRY SHEET
Default Loam Soil Properties

Attachment B
Soil Gas to Indoor Air Pathway - 10' bgs
Commercial/Industrial Scenario
Gardena Sumps Site

SG-ADV
Version 3.1; 02/04

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
71432	1000			Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Totals must add up to value of Ls (cell F24) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm2)
15	305	24	305			L		
	10 ft bgs		10 ft bgs					

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
L	1.59	0.399	0.148	C	1.43	0.459	0.215	C	1.43	0.459	0.215

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	1	5

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	2.44E+02
70	6	6	350	

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	
1.9E+08	290	0.251	0.244	0.244	0.257	1.9E-09	0.854	1.6E-09	4,000	1.0E+03	6.8E+04	Benzene

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)	
1.1E+06	5.0E-03	15	7,977	5.3E-03	2.2E-01	1.8E-04	5.5E-03	0.0E+00	0.0E+00	5.5E-03	290	Benzene

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	**Infinite source bldg. conc., $C_{building}$ (mg/m^3)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	
15	1.0E+03	1.33	8.3E+01	5.5E-03	5.3E+03	2.1E+12	2.4E-04	2.4E-01	**2.4E-04**	7.8E-06	3.0E-02	Benzene

DATA ENTRY SHEET
Default Loam Soil Properties

Attachment B
Soil Gas to Indoor Air Pathway - 12' bgs
Commercial/Industrial Scenario
Gardena Sumps Site

SG-ADV
Version 3.1; 02/04

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
71432	1000			Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Totals must add up to value of Ls (cell F24) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm2)
15	366	24	366			L		
	12 ft bgs		12 ft bgs					

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
L	1.59	0.399	0.148	C	1.43	0.459	0.215	C	1.43	0.459	0.215

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	1	5

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	2.44E+02
70	6	6	350	

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	
1.9E+08	351	0.251	0.244	0.244	0.257	1.9E-09	0.854	1.6E-09	4,000	1.0E+03	6.8E+04	Benzene

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)	
1.1E+06	5.0E-03	15	7,977	5.3E-03	2.2E-01	1.8E-04	5.5E-03	0.0E+00	0.0E+00	5.5E-03	351	Benzene

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	**Infinite source bldg. conc., $C_{building}$ (mg/m^3)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	
15	1.0E+03	1.33	8.3E+01	5.5E-03	5.3E+03	2.1E+12	2.1E-04	2.1E-01	**2.1E-04**	7.8E-06	3.0E-02	Benzene

DATA ENTRY SHEET
Default Loam Soil Properties

Attachment B
Soil Gas to Indoor Air Pathway - 15' bgs
Commercial/Industrial Scenario
Gardena Sumps Site

SG-ADV
Version 3.1; 02/04

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
71432	1000			Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Totals must add up to value of Ls (cell F24) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm2)
15	457.5	24	457.5			L		
	15 ft bgs		15 ft bgs					

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
L	1.59	0.399	0.148	C	1.43	0.459	0.215	C	1.43	0.459	0.215

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	1	5

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	6	6	350

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	
1.9E+08	442.5	0.251	0.244	0.244	0.257	1.9E-09	0.854	1.6E-09	4,000	1.0E+03	6.8E+04	Benzene

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)	
1.1E+06	5.0E-03	15	7,977	5.3E-03	2.2E-01	1.8E-04	5.5E-03	0.0E+00	0.0E+00	5.5E-03	442.5	Benzene

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	**Infinite source bldg. conc., $C_{building}$ (mg/m^3)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	
15	1.0E+03	1.33	8.3E+01	5.5E-03	5.3E+03	2.1E+12	1.7E-04	1.7E-01	**1.7E-04**	7.8E-06	3.0E-02	Benzene

DATA ENTRY SHEET
Default Loam Soil Properties

Attachment B
Soil Gas to Indoor Air Pathway - 5' bgs
Residential Scenario
Gardena Sumps Site

SG-ADV
Version 3.1; 02/04

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
71432	1000			Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Totals must add up to value of Ls (cell F24) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm2)
15	152.5	24	152.5			L		
	5 ft bgs		5 ft bgs					

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil Parameters				Lookup Soil Parameters				Lookup Soil Parameters			
L	1.59	0.399	0.148	C	1.43	0.459	0.215	C	1.43	0.459	0.215

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.5	5

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	6	6	350

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	
1.9E+08	137.5	0.251	0.244	0.244	0.257	1.9E-09	0.854	1.6E-09	4,000	1.0E+03	3.4E+04	Benzene

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)	
1.1E+06	5.0E-03	15	7,977	5.3E-03	2.2E-01	1.8E-04	5.5E-03	0.0E+00	0.0E+00	5.5E-03	137.5	Benzene

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	**Infinite source bldg. conc., $C_{building}$ (mg/m^3)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	
15	1.0E+03	1.33	8.3E+01	5.5E-03	5.3E+03	2.1E+12	8.3E-04	8.3E-01	**8.3E-04**	7.8E-06	3.0E-02	Benzene

DATA ENTRY SHEET
Default Loam Soil Properties

Attachment B
Soil Gas to Indoor Air Pathway - 10' bgs
Residential Scenario
Gardena Sumps Site

SG-ADV
Version 3.1; 02/04

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
71432	1000			Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Totals must add up to value of Ls (cell F24) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm2)
15	305	24	305			L		
	10 ft bgs		10 ft bgs					

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
L	1.59	0.399	0.148	C	1.43	0.459	0.215	C	1.43	0.459	0.215

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.5	5

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	6	6	350

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	
1.9E+08	290	0.251	0.244	0.244	0.257	1.9E-09	0.854	1.6E-09	4,000	1.0E+03	3.4E+04	Benzene

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)	
1.1E+06	5.0E-03	15	7,977	5.3E-03	2.2E-01	1.8E-04	5.5E-03	0.0E+00	0.0E+00	5.5E-03	290	Benzene

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	**Infinite source bldg. conc., $C_{building}$ (mg/m^3)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	
15	1.0E+03	1.33	8.3E+01	5.5E-03	5.3E+03	2.1E+12	4.8E-04	4.8E-01	**4.8E-04**	7.8E-06	3.0E-02	Benzene

DATA ENTRY SHEET
Default Loam Soil Properties

Attachment B
Soil Gas to Indoor Air Pathway - 12' bgs
Residential Scenario
Gardena Sumps Site

SG-ADV
Version 3.1; 02/04

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
71432	1000			Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Totals must add up to value of Ls (cell F24) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm2)
15	366	24	366			L		
	12 ft bgs		12 ft bgs					

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
L	1.59	0.399	0.148	C	1.43	0.459	0.215	C	1.43	0.459	0.215

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.5	5

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	6	6	350

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	
1.9E+08	351	0.251	0.244	0.244	0.257	1.9E-09	0.854	1.6E-09	4,000	1.0E+03	3.4E+04	Benzene

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)	
1.1E+06	5.0E-03	15	7,977	5.3E-03	2.2E-01	1.8E-04	5.5E-03	0.0E+00	0.0E+00	5.5E-03	351	Benzene

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	**Infinite source bldg. conc., $C_{building}$ (mg/m^3)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	
15	1.0E+03	1.33	8.3E+01	5.5E-03	5.3E+03	2.1E+12	4.1E-04	4.1E-01	**4.1E-04**	7.8E-06	3.0E-02	Benzene

DATA ENTRY SHEET
Default Loam Soil Properties

Attachment B
Soil Gas to Indoor Air Pathway - 15' bgs
Residential Scenario
Gardena Sumps Site

SG-ADV
Version 3.1; 02/04

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
71432	1000			Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Totals must add up to value of Ls (cell F24) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm2)
15	457.5	24	457.5			L		
	15 ft bgs		15 ft bgs					

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
L	1.59	0.399	0.148	C	1.43	0.459	0.215	C	1.43	0.459	0.215

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.5	5

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	6	6	350

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	
1.9E+08	442.5	0.251	0.244	0.244	0.257	1.9E-09	0.854	1.6E-09	4,000	1.0E+03	3.4E+04	Benzene

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)	
1.1E+06	5.0E-03	15	7,977	5.3E-03	2.2E-01	1.8E-04	5.5E-03	0.0E+00	0.0E+00	5.5E-03	442.5	Benzene

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	**Infinite source bldg. conc., $C_{building}$ (mg/m^3)**	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	
15	1.0E+03	1.33	8.3E+01	5.5E-03	5.3E+03	2.1E+12	3.4E-04	3.4E-01	**3.4E-04**	7.8E-06	3.0E-02	Benzene

APPENDIX D

Calculation Packages

Geosyntec consultants

COMPUTATION COVER SHEET

Client: **Arco** Project: **Gardena Sumps** Project/ Proposal No.: **SC0467** Task No.

Title of Computations: **Determination of High Strength Geotextile Reinforcement**

Computations by:	Signature		1/31/12 Date
	Printed Name	Keaton J. Botelho	
	Title	Engineer	
Assumptions and Procedures Checked by: (peer reviewer)	Signature		1/31/12 Date
	Printed Name	Gregory T. Corcoran	
	Title	Principal Engineer	
Computations Checked by:	Signature		1/31/12 Date
	Printed Name	Gregory T. Corcoran	
	Title	Principal Engineer	
Computations backchecked by: (originator)	Signature		1/31/12 Date
	Printed Name	Keaton J. Botelho	
	Title	Engineer	
Approved by: (pm or designate)	Signature		1/31/12 Date
	Printed Name	Gregory T. Corcoran	
	Title	Principal Engineer	

Approval notes:

Revisions (number and initial all revisions)

No.	Sheet	Date	By	Checked by	Approval

Written by:	K. Botelho	Date:	01/31/12	Reviewed by:	G. Corcoran	Date:	
Client:	Arco	Project:	Gardena Sumps	Project/ Proposal No.:	SC0467	Task No.:	

DETERMINATION OF HIGH STRENGTH GEOTEXTILE REINFORCEMENT

PURPOSE

The purpose of this calculation package is to present the design procedure for selecting the reinforcement tensile strength and strain required for the construction of cover soils over soft, low-permeability sludge using a high-strength geotextile.

PROCEDURE

The method for selecting the high strength geotextile is adopted from the procedure presented by R.D. Espinoza and P.J. Sabatini (Espinoza and Sabatini, 2008). The procedure utilizes the "finger fill soil placement technique" which consists of placing high-strength reinforcement over soft, low permeability sludge and building parallel narrow berms over the reinforcement. This procedure considers the proposed construction sequence, takes advantage of the ability of the high-strength reinforcement to withstand tensile stresses, and considers large vertical displacement due to the applied load. The analysis procedure is presented in Attachment A.

Bearing Capacity Analysis

The bearing failure in the sludge takes place if the average applied pressure (p_{ap}) exerted by the berm and construction equipment is greater than the foundation ultimate bearing capacity (q_u).

$$q_u = cN_c$$

where:

q_u= Foundation ultimate bearing capacity (psf)

c = cohesion of the soil foundation (psf) = 150 psf*

N_c = Bearing capacity coefficient (psf)

* The sludge material is estimated from CPT soundings performed at the site to have an undrained shear strength of approximately 300 psf (Stantec, 2008). A factor of safety of 2 has been applied to the cohesion value of the sludge material for the purposes of this calculation.

An expression for N_c as a function of the ratio between the berm average width, B, and the thickness of the foundation soil layer, D, is given by (Bonaparte et al. 1987).

N_c = 5.14 for B/D < 2

4.41+0.5(B/D) for B/D ≥ 2 (Attachment A, 2 of 8)

The berm width is determined by considering the equivalent length and width of the construction equipment assumed for placement and the lateral spreading angle of the loading through the foundation soil. For the purpose of this calculation, a D6R-LGP dozer was assumed for berm placement. The following properties for the equipment are used for this calculation (Attachment B).

b = Equipment width (blade width) = 13.1 ft

L = Equipment length = 10.7 ft

W = Equipment weight = 45,200 lb

A = Ground contact area = 9,254 in^2

P_{eq} = Equipment pressure = W/A = 4.9 psi or 706 psf

The width of the berm is taken at the bottom of the berm determined by the load distribution through the berm soil.

$$L_b = b + 2h\tan(\alpha)$$

$$L_b = 13.1\,ft + 2 \times 1\,ft \times \tan(26.6) = \mathbf{14.1\,ft}$$

where:

h = Berm thickness (ft) = 1 ft

α = The lateral load spreading angle through the berm (deg) = 26.6 deg.

For a berm width of 14.1 feet and a foundation soil layer thickness (sludge thickness) of 17.5 ft, B/D is less than 2 and a value of 5.14 for N_c is used.

$$q_u = 150\,psf \times 5.14 = \mathbf{771\,psf}$$

Next the average applied pressure created by the berm and construction equipment can be estimated as:

$$P_{ap} = \gamma h + P_{eq}\left[\frac{bL}{(b + 2h\tan\alpha)(L + 2h\tan\alpha)}\right] - \left[\frac{C_r h_c(b + L + 4h\,tan\alpha)}{(b + 2h\tan\alpha))(L + 2h\tan\alpha)}\right]$$

(Attachment A, 3 of 8)

where:

γ = Unit weight of berm soil (pcf) = 120 pcf

h_c = Crust thickness (ft) = 0 ft

C_r = Crust cohesion (psf) = 0 psf

For the purpose of this calculation the sludge is not assumed to have a crust at the surface. Therefore, the average applied pressure becomes:

$$P_{ap} = \gamma h + P_{eq}\left[\frac{bL}{(b + 2h\tan\alpha)(L + 2h\tan\alpha)}\right]$$

$$P_{ap} = (120\ pcf)(1\ ft) + 706\ psf\left[\frac{(13.1\ ft)(10.7\ ft)}{\big(13.1\ ft + 2(1\ ft)\ (\tan 26.6)\big)\big(10.7\ ft + 2(1\ ft)(\tan 26.6)\big)}\right]$$

$$\boldsymbol{P_{ap} = 720\ psf}$$

It is recommended that reinforcement be required if the factor of safety between the average applied pressure, Pap, exerted by the berm construction equipment and the ultimate bearing capacity, q_u is less than 1.25 (Attachment A, 6 of 8). The factor of safety becomes:

$$FS = \frac{q_u}{P_{ap}} = \frac{771\ psf}{720\ psf} = \mathbf{1.07}$$

A high-strength geotextile will be required to provide the additional bearing capacity required to construct the foundation layer for the cover system.

Required Reinforcement

The additional bearing capacity required is provided by the high-strength geotextile under the berm and heave areas. The applied load, i.e. weight of the berm and construction equipment, is supported by the combination of the bearing capacity of the sludge and the high strength geotextile under the berm, q_{gb}. As the sludge is displaced

laterally and "mud waves" are created, the reinforcement outside the loaded area exerts a downward vertical pressure, q_{gh}, on the sludge outside the loaded area. This effect provides additional stabilizing pressure against bearing capacity instability. The ultimate bearing capacity, q_{ur}, of the soil with the high-strength geotextile becomes:

$$q_{ur} = cN_c + q_{gb} + q_{gh}$$ (Attachment A, 4 of 8)

$$q_{gb} = \left(\frac{2J}{L_b}\right)\varepsilon_{gb}\ln\left(\tan\beta_b + \sqrt{1 + tan^2\beta_b}\right)$$

$$q_{gh} = \left(\frac{2J}{L_b}\right)\varepsilon_{gh}\ln\left(\tan\beta_h + \sqrt{1 + tan^2\beta_h}\right)$$

where:

J = The reinforcement elastic modulus (lb/ft)

β_b = The reinforcement angle of deflection at the berm boundary (deg)

ε_{gb} = The constant strain of the reinforcement under the berm (%)

β_h = The reinforcement angle of deflection at the heaved area edges (deg)

ε_{gh} = The constant strain of the reinforcement outside the berm (%)

To determine the required tensile strength and strain of the geotextile the deflection under the applied load and the deflection ratio must be estimated as follows:

$$r_b = \left(\frac{P_{ap}}{E_u}\right)(H_s)$$ (Attachment 8)

$$= \left(\frac{720\ psf}{15{,}000\ psf}\right) \times 17.5\ ft = \mathbf{0.84\ ft}$$

$$E_u = (100)c_{u=}$$

$$= 100 \times 150\ psf = \mathbf{15{,}000\ psf}$$

where:

r_b = Maximum reinforcement vertical displacement (ft)

H_s = Sludge thickness (ft), maximum is 17.5 ft

E_u = Average modulus of deformation for low permeability sludge (psf)

The deflection ratio is then equal to the estimated vertical displacement divided by the width of the berm.

$$\frac{r_b}{l_b} = \frac{0.84\ ft}{14.1 ft} = \mathbf{0.060}$$ (Attachment A)

Next the ratio between the berm width and the spacing between the berms is selected. For the purpose of this calculation the distance between the berms is assumed to be equal to two times the berm width.

$$\rho = \frac{L_h}{L_b} = 2,$$

In order to estimate the additional bearing capacity due to the membrane effect, an assumption of the deformed shape of the reinforcement is made and expressions for the constant reinforcement strains both under the berm and in the heaved areas can be written as follows:

$$\varepsilon_{gb} = \frac{1}{2}\left[\sec\beta_b + \frac{\ln(\tan\beta_b + \sec\beta_b)}{\tan\beta_b}\right] - 1$$ (Attachment A, 5 of 8)

$$\varepsilon_{gh} = \frac{1}{2}\left[\sec\beta_h + \frac{\ln(\tan\beta_h + \sec\beta_h)}{\tan\beta_h}\right] - 1$$

$$\varepsilon_{avg} = \frac{\varepsilon_{gb} + \rho\varepsilon_{gh}}{1+\rho}$$

Where the reinforcement angle of deflection at the berm boundary is determined using the following expression:

$$tan\beta_b = 4\frac{r_b}{l_b}$$

$$tan\beta_b = 4 \times \frac{0.84\ ft}{14.1\ ft} = \mathbf{0.24}$$

$$\boldsymbol{\beta_b = 13.50}$$

And the reinforcement angle of deflection of the heaved area is determined using the following expression:

$$\tan\beta_h = \frac{\tan\beta_b}{\rho^2}$$

$$tan\beta_h = \frac{0.240}{4} = \mathbf{0.06}$$

$$\boldsymbol{\beta_h = 3.43}$$

Therefore;

$$\varepsilon_{gb} = \frac{1}{2}\left[\sec 13.5 + \frac{\ln(\tan 13.5 + \sec 13.5)}{\tan 13.5}\right] - 1 = \mathbf{0.0095 \text{ or } 0.95\%}$$

$$\varepsilon_{gh} = \frac{1}{2}\left[\sec 3.43 + \frac{\ln(\tan 3.43 + \sec 3.43)}{\tan 3.43}\right] - 1 = \mathbf{0.00060 \text{ or } 0.060\%}$$

$$\varepsilon_{avg} = \frac{0.0095 + 2*0.00060}{1+2} = 0.00357 \textbf{ or } \mathbf{0.357\%}$$

Using the average reinforcement strain, the normalized additional bearing capacity pressure can be determined using the following expression:

$$\lambda_q = \frac{q_{avg}}{2J/L_b} = \varepsilon_{avg}\left[\ln(\tan\beta_b + \sec\beta_b) + \frac{1}{\rho}\ln(\tan\beta_h + \sec\beta_h)\right]$$

(Attachment A, 4 of 8)

$$\lambda_q = 0.00357\left[\ln(\tan 13.5 + \sec 13.5) + \frac{1}{2}\ln(\tan 3.43 + \sec 3.43)\right] = \mathbf{0.00096}$$

The average reinforcement strain can then be used to determine the reinforcement elastic modulus necessary. (Since the factor of safety is greater than 1 but less than 1.25, the reinforcement elastic modulus is calculated assuming $P_{ap} - cNc = 1$):

$$J = \left(p_{ap} - cN_c\right)\frac{L_b}{2\lambda_q}$$

$$J = (1)\frac{14.1 \text{ ft}}{2\times 0.00096} = 7{,}344 \text{ lb/ft}$$

The reinforcement average stress is then calculated using the average reinforcement strain and the elastic modulus. A factor of safety is applied to the required strength.

$$T_r = F_s J \varepsilon_{avg}$$

$$T_r = 6.6 \times 7{,}344 \times 0.00357 = \mathbf{173.0\ lb/ft}$$

where:

T_r = The tensile strength required for the high strength geotextile

F_s = Factor of Safety

The factor of safety is determined from the following individual reduction factors for bearing capacity (Koerner 1999, Attachment C):

RF_{ID} = Reduction factor for installation damage = 1.1

RF_{CR} = Reduction factor for creep = 4.0

RF_{CD} = Reduction factor for chemical degradation = 1.5

RF_{BD} = Reduction factor for biological degradation = 1.0

$F_s = 1.1 * 4.0 * 1.5 * 1.0 = 6.6$

Finally, the allowable strain of the high-strength geotextile is limited to five percent. Since the calculated required reinforcement strain is less than 5%, the calculated tensile strength is increased in order to establish the required strength at the low strains.

$$T_{(5\%)} = T_r \frac{0.05}{\varepsilon_r}$$

$$T_{(5\%)} = 173.0 \frac{0.05}{0.00357} = \mathbf{2{,}423\ lb/ft}$$

RESULTS

The required tensile strength for the high-strength geotextile using the method described in this calculation package is equal to 2,423 lb/ft. Geosyntec recommends the use of a Propex Geotex 4 x 4 woven, polypropylene, high-strength geotextile with a wide width

tensile strength of 2,604 lb/ft in the cross-machine direction at a strain of 5%, or equivalent, to support the construction of the soil cover system of the sludge ponds.

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Reinforcement design for construction of cover soil over soft sludge

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ABSTRACT: This paper presents a design procedure for selecting the reinforcement tensile strength and strain that are required for the construction of cover soils over soft low-permeability sludge using the 'finger fill soil placement technique', which consists in placing a high-strength reinforcement over the soft, low-permeability sludge and building parallel narrow berms over the reinforcement. The design procedure described in this paper: (1) considers the proposed construction sequence; (2) takes advantage of the ability of the high-strength reinforcement to withstand tensile stresses; and (3) considers the large vertical displacement due to the applied load. The proposed design procedure allows the design engineer to select the reinforcement characteristics as well as the initial berm thickness and spacing.

KEYWORDS: Geosynthetics, Berm, Reinforcement, Shear strength, Soft sludge, Soil cover, Lateral displacement, Vertical displacement

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1. INTRODUCTION

Residual materials of many manufacturing processes (e.g. paper mill, coal tars) comprise high-moisture, low-permeability, fined-grained sludge by-products that are usually contained in lined lagoons. The undrained shear strength of these materials can be as low as 0.48 to 2.4 kN/m^2, except for the top 0.30 to 0.60 m, which is usually stronger because of desiccation. Because of the low-permeability characteristics of this type of sludge, relatively inexpensive dewatering techniques cannot be used to reduce the sludge moisture content as a means to increase the sludge shear strength. The present methodology is applicable to soft, low-permeability sludge material.

Closure of these lagoons may be accomplished by constructing a soil cover over the sludge surface. Typically this soil cover will include a minimum thickness of 0.46 m of compacted soil and a 0.15 m thickness of vegetative support soil over a 1 mm thick, high-density polyethylene (HDPE) synthetic cover. Depending upon the size of the lagoon, additional fill material under the HDPE synthetic cover, which is several meters thick at its highest point, may be required to provide an adequate slope to allow for surface water drainage.

Because of the soft and weak nature of the sludge foundation materials, unless there is a thick and hard crust, even low ground pressure construction equipment having imposed ground stresses as low as 21 to 35 kPa will cause a bearing capacity failure of the sludge foundation, resulting in excessive vertical displacements and a resulting inability to construct the soil cover system safely. For this reason, special construction techniques must be used during the installation of the soil cover system to avoid (1) sinking of the construction equipment into the sludge and/or (2) using excessive amounts of fill owing to mixing of the fill with the underlying sludge.

A construction technique, sometimes referred to as the 'finger fill soil placement technique', which has been successfully used to build over soft soils, is discussed by Broms (1987) and Andrews and Richardson (1999). This technique consists in placing a high-strength geosynthetic reinforcement (typically woven geotextile) over the lagoon to be covered, and anchoring the reinforcement at the edge of the lagoon. Intermediate parallel narrow berms are then constructed over the reinforcement: these berms are then gradually extended across the lagoon. The intermediate parallel berms may need to be constructed concurrently to provide sufficient lateral support to the adjacent berms. Finally, the berms are widened to cover the entire lagoon. Placement of the geosynthetic reinforcement over the lagoon and construction of the parallel berms may be

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facilitated by the presence of a dry crust at the surface, as it may allow low-pressure equipment and/or workers over the lagoon well before the contribution of the reinforcement is realized. The construction technique is illustrated in Figure 1.

The portion of the applied load (i.e. the weight of the berm and construction equipment) that exceeds the foundation soil bearing capacity is supported via a membrane effect exerted by the high-strength geotextile under the loaded area. In addition, as the soil under the load is displaced laterally and 'mud waves' are created, the reinforcement outside the loaded area is stretched and additional bearing capacity is mobilized. In effect, the high-strength geotextile outside the loaded area induces a vertical force in much the same way as a surcharge pressure outside the loaded area provides additional bearing capacity. The membrane effect is a particular application of plane stress theory to structural elements that cannot withstand bending moments. The stresses that are applied perpendicular to the reinforcement are equilibrated by forces that are tangent to the reinforcement.

Although bearing capacity failure of the soft soil takes place during construction, with the associated large vertical displacements, typical design procedures are based on limit equilibrium theory and assume that the main failure mechanism is slope stability failure or bearing capacity due to the weight of the construction equipment and the berm. Consequently, the observed vertical displacements are neglected in the analysis, and limit equilibrium theory is commonly used to evaluate the high-strength geotextile contribution to the stability of the berm and the construction equipment (Andrews and Richardson 1999). In this paper, the large vertical displacement that is commonly observed during construction over soft soils is considered in the analysis to calculate the reinforcement contribution to stability. A summary of the main assumptions in the analyses presented in this paper and a discussion of their limitations are presented below.

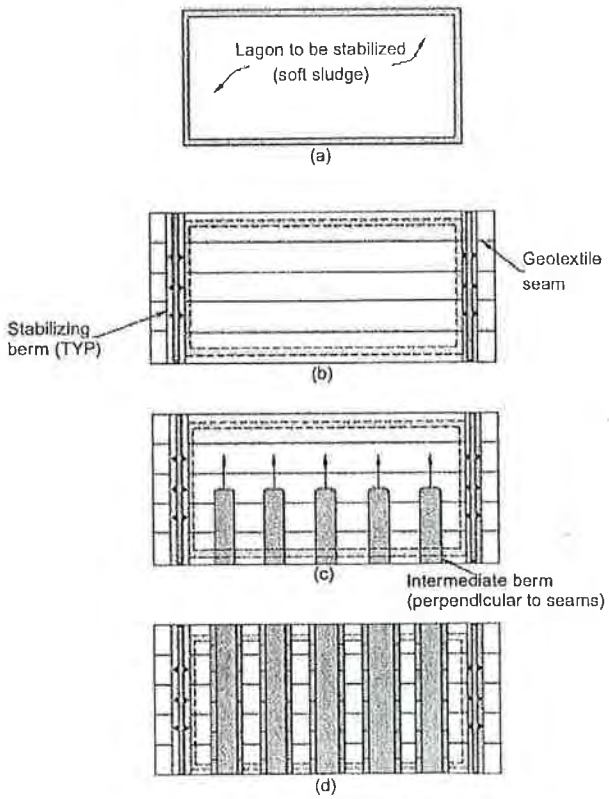

Figure 1. Construction sequencing—soft soil sludge stabilization using high-strength reinforcement geotextiles: (A) lagoon filled with soft sludge; (b) install geotextile over lagoon and place stabilizing berms; (c) construct intermediate berms; (d) widen intermediate berms

- The model is based on two-dimensional plane-strain conditions. Hence the main mode of failure is bearing capacity in the direction perpendicular to the alignment of the berm. This assumption is consistent with the construction technique described above (i.e. symmetrical loading of the soft sludge as the intermediate parallel berms are constructed simultaneously), and with the fact that the equipment is not close to the front edge of the berm.
- The sludge has a relatively low permeability. Hence the analysis considers short-term loading conditions in which lifts of fill are placed on top of the high-strength geotextile over a relatively short period of time (i.e. undrained loading). Thus displacement of sludge by the construction equipment takes place under constant volume.
- Because the undrained shear strength of the soil is relatively low, the analysis considers bearing capacity failure of the sludge due to the loads imposed by the construction equipment together with the lift of soil being placed.
- The edges of the high-strength geotextiles are appropriately anchored to withstand the imposed loads, and fully develop the membrane effect. This contribution is based upon the estimated vertical displacement due to the imposed vertical loads: the weaker the sludge, the higher the membrane contribution.

2. ANALYSIS

In this case, bearing capacity failure takes place if the average applied pressure (p_{ap}) exerted by the berm and construction equipment is greater than the foundation ultimate bearing capacity (q_u). Classical methods can be used to estimate the ultimate bearing capacity of shallow foundations on cohesive soils subject to undrained loading conditions. Thus

$$q_u = cN_c \tag{1}$$

where c is the cohesion of the soil foundation, and N_c is a dimensionless bearing capacity coefficient. An expression for N_c as a function of the ratio between the berm average width, B, and the thickness of the foundation soil layer, D, is given by (Bonaparte *et al.* 1987)

$$N_c = \begin{cases} 5.14 & \text{for } B/D < 2 \\ 4.14 + 0.5(B/D) & \text{for } B/D \geq 2 \end{cases} \tag{2}$$

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The average applied pressure (p_{ap}) created by the berm and construction equipment can be estimated as

$$p_{ap} = \gamma h + p_{eq}\left[\frac{bL}{(b+2h\tan\alpha)(L+2h\tan\alpha)}\right] - \left[\frac{c_r h_c(b+L+4h\tan\alpha)2}{(b+2h\tan\alpha)(L+2h\tan\alpha)}\right] \quad (3)$$

where γ is the unit weight of the berm soil; h and h_c are the berm soil and crust thickness, respectively; p_{eq} is the ground pressure applied by the construction equipment; α is the lateral load spreading angle through the berm; c_r is the crust cohesion; and b and L are the shoe width and length of the construction equipment, respectively. The lateral spreading angle (α) reflects how the load is distributed through the fill,and typically varies from 26.6° (1H:2V) to 45° (1H:1V) (Sellmeijer *et al.* 1982).

As described above, the sludge material being capped may form a crust at its surface as the sludge loses moisture. The presence of a crust without cracks further reduces the load applied to the soft sludge. As the pressure of the construction equipment tries to punch through the crust, shear stresses are developed across the crust thickness. The third term in Equation 3 takes this effect into account.

Bearing capacity failure of relatively soft cohesive materials results in relatively large ground surface settlements of the loaded area. This failure mechanism (i.e. large displacements) can be used advantageously during construction by placing a high-strength reinforcement over the soft soils with a relatively flat surface. As a result of these settlements, the reinforcement is stretched (Figure 2) and hence is subjected to tension. These tensile forces increase as the settlement increases.

The evaluation of the reinforcement contribution to support the applied load is based on the observation that large settlements usually occur during bearing capacity failure on soft soil (Giroud and Noirey 1981; Broms 1987). For the case where a reinforcement is placed over the soft sludge and fill is placed in the form of narrow berms (Figure 1), as the soft sludge is laterally displaced by the intermediate berms sinking into the sludge, the reinforcement under and outside the intermediate berms is gradually stretched and, at the same time, the tension in the reinforcement is gradually increased. The reinforcement stretching results in stabilizing stresses (i.e. membrane effect) that can be viewed as an additional bearing capacity. This additional bearing capacity provided by the reinforcement depends on the depth of penetration of the berm into the sludge, and on the height, width, and spacing of the berms.

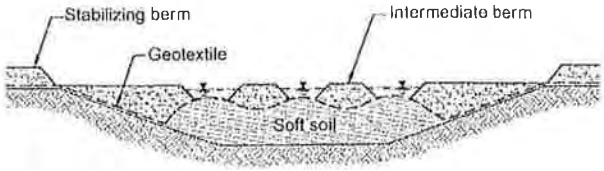

Figure 2. Soft soil stabilization with high-strength geotextiles

The additional bearing capacity results from the high-strength geotextile under the berm and heave areas (Figure 3). The applied load (i.e. the weight of the berm and construction equipment) is partially supported by the bearing capacity of the sludge and the high-strength geotextile under the berm (q_{gb}). As the sludge is displaced laterally and 'mud waves' are created, the reinforcement outside the loaded area is stretched by the mud waves. As a result, the reinforcement exerts a downward vertical pressure (q_{gh}) on the sludge outside the loaded area (Figure 3), reducing its heave potential. This effect provides an additional stabilizing pressure against bearing capacity instability. Thus the ultimate reinforced bearing

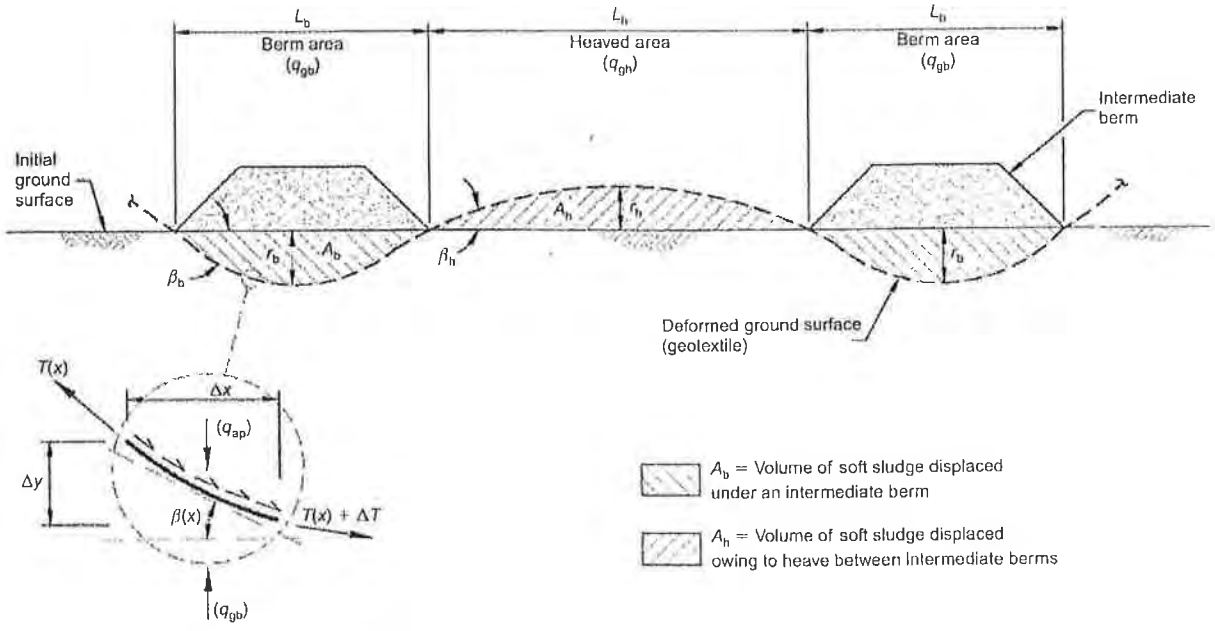

Figure 3. Membrane effect model

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capacity (q_{ur}) of the soil with a high-strength reinforcement that includes the high-strength geotextile of the reinforcement under the berm (q_{gb}), and in the heaved areas (q_{gh}), can be written as (Espinoza and Bray 1995)

$$q_{ur} = cN_c + q_{gb} + q_{gh} \tag{4}$$

where

$$q_{gb} = \frac{1}{L_b}\int_{-L_b/2}^{L_b/2} q_g(x)\mathrm{d}x \tag{5a}$$

$$q_{gh} = \frac{2}{L_h}\int_{L_b/2}^{(L_h/2)+(L_b/2)} q_g(x)\mathrm{d}x \tag{5b}$$

$$q_g(x) = T_h(x)\frac{\mathrm{d}^2 y(x)}{\mathrm{d}x^2} \tag{5c}$$

L_b is the width of the berm; L_h is the separation distance between berms; $q_g(x)$ is a pressure distribution function that describes the contribution to bearing capacity along the length of the high-strength reinforcement due to membrane effect (Espinoza 1994). As depicted in Figure 3, $T_h(x)$ is the horizontal component of the variation of the tensile forces in the reinforcement and $y(x)$ is a function that describes the distribution of vertical displacement along the reinforcement. The limits of the integral in Equation 5b represent the contribution of half the heaved area on one side of the berm. A factor of 2 is used in the numerator of Equation 5b to indicate that the sludge material is displaced from underneath the loaded area to both sides of the berm. Equations 5a, 5b and 5c assume that the high-strength geotextile has been placed taut, and that no slippage has occurred between the high-strength geotextile and the surrounding soil (i.e. the high-strength geotextile elongates as the subgrade deforms). In reality, the contribution of the high-strength geotextile is somewhat reduced by the amount of slack that typically results after installation. This effect can be considered in the design by subtracting the expected slack from the calculated geotextile elongation.

The horizontal component of the tensile forces in the reinforcement can be expressed as

$$T_h(x) = T(x)\cos\beta \tag{6}$$

where $T(x)$ is the tensile forces in the reinforcement and β (which is also a function of x) is the angle that the deformed reinforcement makes with the horizontal line. Figure 3 shows the angles that the deformed high-strength geotextile makes with the horizontal line at the boundaries of the berm and heaved areas, denoted β_b and β_h, respectively. The tensile forces and the angle of the deformed reinforcement can be written as

$$T(x) = J\varepsilon(x) \tag{7a}$$

$$\cos\beta = \frac{1}{\sqrt{1+(\mathrm{d}y/\mathrm{d}x)^2}} \tag{7b}$$

where ε and J are the reinforcement tensile strain and the elastic modulus, respectively. Replacing Equation 6 into Equation 5c, and the resulting expression into Equations 5a and 5b, yields

$$q_{gb} = \frac{1}{L_b}\int_{-L_b/2}^{L_b/2} J\varepsilon(x)\left[1+\left(\frac{\mathrm{d}y}{\mathrm{d}x}\right)^2\right]^{-\frac{1}{2}}\left(\frac{\mathrm{d}^2 y}{\mathrm{d}x^2}\right)\mathrm{d}x \tag{8a}$$

$$q_{gh} = \frac{2}{L_h}\int_{L_b/2}^{(L_b/2)+(L_h/2)} J\varepsilon(x)\left[1+\left(\frac{\mathrm{d}y}{\mathrm{d}x}\right)^2\right]^{-\frac{1}{2}}\left(\frac{\mathrm{d}^2 y}{\mathrm{d}x^2}\right)\mathrm{d}x \tag{8b}$$

An expression for the high-strength geotextile contribution under the soil berm (q_{gb}) and in the heaved areas (q_{gh}) can be obtained by assuming that the strain along the reinforcement is constant and integrating Equation 8a (Espinoza 1994), to give

$$q_{gb} = \left(\frac{2J}{L_b}\right)\varepsilon_{gb}\,ln(tan\beta_b + \sqrt{1+\tan^2\beta_b}) \tag{9}$$

where β_b is the reinforcement angle of deflection at the berm boundary (Figure 3), and ε_{gb} is the assumed constant strain of the reinforcement under the berm. A similar expression can be obtained for the contributions of the reinforcement in the heaved area (q_{gh}) by integrating Equation 8b, assuming that the strain along the reinforcement in the heaved area is constant, to give

$$q_{gh} = \left(\frac{2J}{L_h}\right)\varepsilon_{gh}\,ln(tan\beta_h + \sqrt{1+\tan^2\beta_h}) \tag{10}$$

where β_h is the reinforcement angle of deflection at the heave area edges (Figure 3), and ε_{gh} is the constant strain of the reinforcement outside the berm. Equations 9 and 10 can be used to calculate the additional bearing capacity (q_{avg}) due to membrane effect of the high-strength geotextile reinforcement under the berm and the heaved areas. Hence the additional bearing capacity can be written as the sum of q_{gb} (Equation 9) and q_{gh} (Equation 10):

$$\frac{q_{avg}}{2J/L_b} = \varepsilon_{gb}\ln(\tan\beta_b + \sec\beta_b) + \frac{1}{\rho}\varepsilon_{gh}\ln(\tan\beta_h + \sec\beta_h) \tag{11}$$

where ρ is the berm spacing ratio, given by

$$\rho = \frac{L_h}{L_b} \tag{12}$$

Assuming further that the reinforcement between the berms is pulled towards the berm as it sinks into the sludge, it is reasonable to assume that the elongation along the entire reinforcement is uniform (Giroud and Noirey 1981). Hence the additional average bearing capacity (q_{avg}) due to the contribution of the reinforcement can be written as

$$\frac{q_{avg}}{2J/L_b} = \varepsilon_{avg}\left[\ln(tan\beta_b + \sec\beta_b) + \frac{1}{\rho}\ln(\tan\beta_h + \sec\beta_h)\right] \tag{13}$$

where

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$$\varepsilon_{avg} = \frac{\varepsilon_{gb} + \rho\varepsilon_{gh}}{1+\rho} \tag{14}$$

In order to estimate the additional bearing capacity due to membrane effect using Equation 13, an assumption of the deformed shape of the reinforcement will need to be made. Typically, deformation of reinforcement over soft soils is approximated by parabolas (e.g. Giroud and Noirey 1981; Raumann 1982). With this assumption, expressions for the constant reinforcement strains both under the berm (ε_{gh}) and in the heaved area (ε_{gh}), as a function of the maximum reinforcement vertical displacement (r_b and r_h, respectively) and reinforcement length (L_b and L_h, respectively) are given by (Espinoza 1994)

$$\varepsilon_{gb} = \frac{1}{2}\left[\sec\beta_b + \frac{\ln(\tan\beta_b + \sec\beta_b)}{\tan\beta_b}\right] - 1 \tag{15a}$$

$$\varepsilon_{gh} = \frac{1}{2}\left[\sec\beta_h + \frac{\ln(\tan\beta_h + \sec\beta_h)}{\tan\beta_h}\right] - 1 \tag{15b}$$

where

$$\tan\beta_b = \frac{4\,r_b}{L_b} \tag{16a}$$

$$\tan\beta_h = \frac{4\,r_h}{L_h} \tag{16b}$$

Equations 16a and 16b for $\tan\beta_b$ and $\tan\beta_h$ correspond to the slopes of the deformed shape of the reinforcement (i.e. a parabola) at the edge of the berm (Figure 3).

As construction of the soil cover over the sludge will result in an essentially undrained response, the low-permeability sludge can be assumed to be incompressible during loading. Thus no volume change occurs in the short term, and the volume of subgrade displaced downwards by settlement must be equal to the volume displaced upwards by heave. For plane-strain conditions this corresponds to the area under the berm being equal to the area in the heaved area. Hence a relation between the maximum vertical reinforcement displacement under the berm (r_b) and the reinforcement heave (r_h) is obtained by equating the areas under the parabolas (Figure 3) to give

$$\frac{4}{3}r_b L_b = \frac{4}{3}r_h L_h \tag{17}$$

Using Equations 16a, 16b, and 17, an expression for the angle of deflection of the heaved area (β_h) can be derived as

$$\tan\beta_h = \frac{4r_b}{\rho^2 L_b} = \frac{\tan\beta_b}{\rho^2} \tag{18}$$

Using the equations derived above, the additional average bearing capacity (q_{avg}) due to the contribution of the reinforcement can be obtained. Figure 4 shows the variation of the normalized additional bearing capacity pressure (λ_q) as a function of r_b/L_b and ρ, where λ_q is defined as

$$\lambda_q = \frac{q_{avg}}{2J/L_b} \tag{19}$$

As expected, Figure 4 indicates that for wider berm spacing (i.e. higher values of L_h/L_b) there is less contribution of the reinforcement to the additional bearing capa-

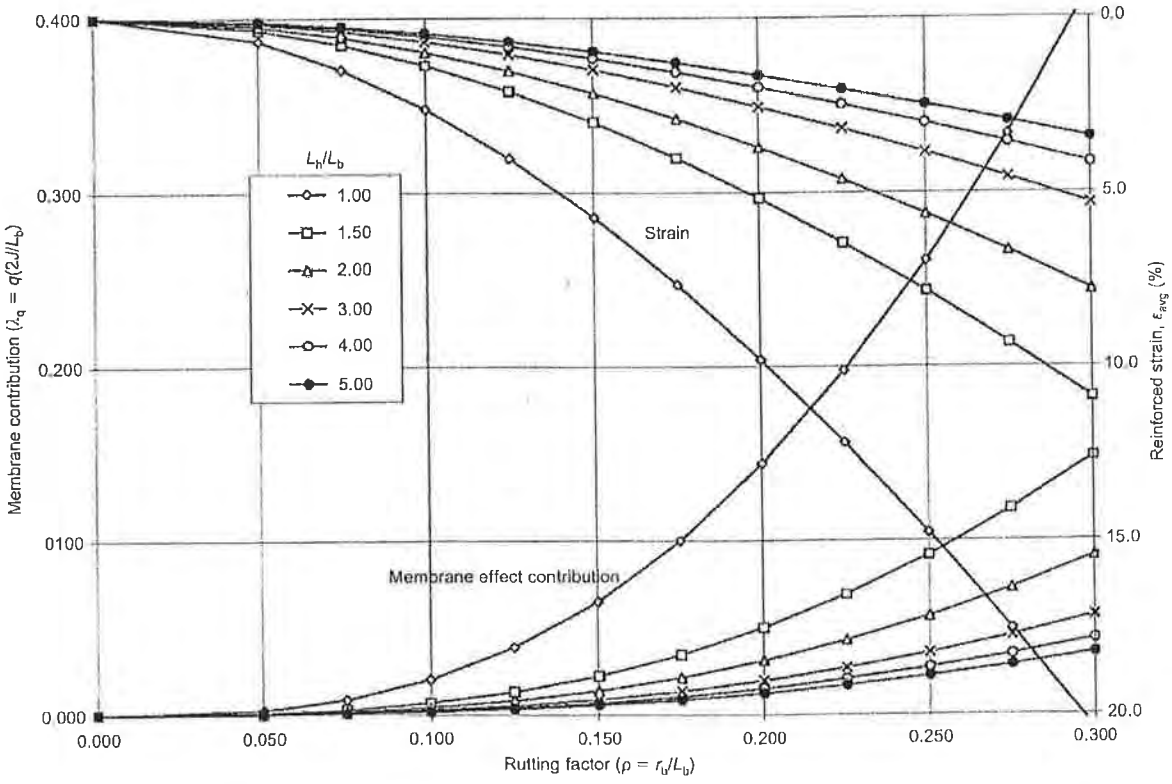

Figure 4. Additional bearing capacity provided by reinforcement

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city pressure and a correspondingly lower value of strain in the high-strength geotextile. Also, Figure 4 shows that the reinforcement contribution decreases significantly when the berm spacing ratio ρ is greater than 1.

The maximum vertical displacement of the berm (r_b) during loading can be initially estimated by relating the applied load, Equation 3, to the average sludge modulus of deformation (E_u) and the minimum of the sludge thickness (H_s) or twice the applied load width using the expression

$$r_b = \left(\frac{p_{ap}}{E_u}\right)\min(H_s, 2b) \tag{20}$$

The average sludge modulus of deformation can be obtained from the empirical correlations for soft clays given by (CGS 1978)

$$E_u = (100 - 500)c_u \tag{21}$$

Equation 21 applies to soft sensitive soils. As noted in Equation 20, to limit the estimated maximum vertical displacement in thick deposits of sludge, the sludge thickness that has an influence in the calculation of vertical displacements is limited to twice the width of the applied load.

3. PROPOSED DESIGN PROCEDURE

The following steps are proposed to apply this procedure for the design of a soil cover over soft low-permeability sludge.

1. Select the berm geometry (thickness and width). A layer 0.30 to 0.6 m thick is recommended. The width shall be at least the width of the equipment to be used.
2. Calculate the average applied pressure (p_{ap}) caused by the berm and construction equipment (Equation 3).
3. Evaluate N_c and calculate the foundation bearing capacity (unreinforced).
4. If the factor of safety against bearing capacity is less than 1.25, calculate the additional capacity to be provided by the reinforcement (i.e. $p_{ap} - cN_c$).
5. Estimate the deflection under the weight of the equipment and lift of soil (r_b) and the deflection ratio (i.e. r_b/L_b).
6. Select the allowable strain to be developed in the reinforcement (ε_a). For high-strength (woven) geotextiles, the ultimate tensile strain varies between 10% and 30%. It is recommended to limit the allowable strain to one-half of the ultimate tensile strain of the reinforcement (i.e. factor of safety against rupture equal to 2).
7. Select the berm spacing ratio $\rho = L_h/L_b$. Start with a spacing ratio of 1.
8. Estimate the expected vertical displacement under the berm using Equation 20, or by other means.
9. Using Figure 4 or Equation 13, estimate the load factor ratio $\lambda_q = q_{avg}L_b/2J$.
10. Calculate the reinforcement modulus (J) required to provide the necessary support as $J = (p_{ap} - cN_c)L_b/2\lambda_q$. If an unreasonably high modulus J is calculated, reduce the spacing between adjacent berms. Also, the berm thickness may be increased to increase the berm vertical displacement, and hence the membrane contribution.
11. Calculate the berm separation using Equation 12.
12. Calculate the reinforcement average strain using Equation 14 and the corresponding average tensile stress (i.e. $J\varepsilon_{avg}$).
13. Calculate the required reinforcement strain ($F_s\varepsilon_{avg}$) and the corresponding required tensile stress (i.e. $F_sJ\varepsilon_{avg}$), where F_s is the factor of safety against rupture.

4. APPLICATION EXAMPLE

Assuming that the sludge thickness is 6.0 m with an undrained shear strength of 0.5 kPa, the bearing capacity analysis and the required reinforcement to allow construction of the final cover system are calculated using the equations derived in this paper for two dozer types (D3C-LGP-5(II) and D4H-LGP(II)), berm vertical displacement, berm widths, sludge shear strength, and berm spacing (Tables 1 and 2). As shown in the tables (first row), applying a 0.30 m lift with a D3C-LGP-5(II) dozer results in a factor of safety against bearing capacity significantly less than 1.0 (i.e. 0.13): hence reinforcement is required.

For the sludge characteristics, a factor of 500 in Equation 21 was considered appropriate to estimate the vertical displacement. The estimated deflection due to pressure applied by the berm and light equipment is 0.5 m, and the corresponding deflection ratio is 0.14. For a berm spacing ratio of 2 (i.e. approximately twice the width of the berm), the required tensile strength with a factor of safety against rupture is 91 kN/m at a 3.8% strain (J = 2373 kN/m). If heavier equipment (i.e. D4H-LGP(II)) is used (see the second row of Tables 1 and 2), larger deflection under the berm (i.e. 0.70 m) would be obtained, and the required tensile strength with a factor of safety against rupture would be 88 kN/m at a 9.7% strain (J = 908 kN/m).

All the parameters for the next two examples (third and fourth rows) are equivalent to the examples described above except for the sludge strength, which is twice as high (i.e. c_u = 1 kPa). As shown in the last column, by doubling the shear strength of the sludge an approximately fourfold reduction of the required reinforcement strength is obtained.

5. SUMMARY AND CONCLUSIONS

A simple methodology for selecting the appropriate reinforcement requirements for construction of a soil cover over a soft sludge using the finger fill soil placement technique has been developed. Unlike limit equilibrium methods, the proposed methodology takes into consideration the expected large settlement due to the weight of the construction equipment and berm. Consequently, the proposed methodology considers not only the tensile strength of the reinforcement but also its stiffness. As shown in the

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Table 1. Evaluation of required tensile strength and strain: equipment and berm characteristics

Equipment	Equipment characteristics								
	Lift thickness (m)	Shoe width (m)	Equipment pressure, p_{eq}		L (m)	b (m)	L_{eq} (m)	b_{eq} (m)	p'_{eq} (kPa)
			(lbf/in^2)	(kPa)					
D3C-LGP-5 (II)	0.30	1.0	2.5	17.4	2.5	3.0	2.8	3.3	14.0
D4H-LGP (II)	0.30	0.8	4.2	29.2	2.6	2.8	2.9	3.1	23.6
D3C-LGP-5 (II)	0.30	1.0	2.5	17.4	2.5	3.0	2.8	3.3	14.0
D4H-LGP (II)	0.30	0.8	4.2	29.2	2.6	2.8	2.9	3.1	23.6

Fill unit weight = 14.0 kN/m^3; thickness of sludge = 6.0 m; load spreading angle (H:V) = 0.5; factor of safety against reinforcement rupture = 2.0; Young's modulus factor = 500.

Table 2. Evaluation of required tensile strength and strain: reinforcement design

Equipment	Unreinforced calculations			Reinforced calculations												
	P_{ap} (kPa)	N_c	c_u (kPa)	F_b[a]	E_u (kPa)	r_b (m)	r_b/L_h	L_h/L_b	λ_q	ε_{gb} (%)	ε_{gh} (%)	ε_{avg} (%)	J (kN/m)	T (5%) (kN/m)	T_r (kN/m)	ε_r (%)
D3C-LGP-5 (II)	18.3	5.14	0.5	0.13	239	0.5	0.14	2.0	0.011	5.1	0.33	1.9	2 373	119	91	3.8
D4H-LGP (II)	27.9	5.14	0.5	0.09	239	0.7	0.23	2.0	0.043	2.8	0.88	4.9	908	45	88	9.7
D3C-LGP-5 (II)	18.3	5.14	1.0	0.27	479	0.2	0.07	2.0	0.001	1.3	0.08	0.5	15 073	754	149	1.0
D4H-LGP (II)	27.9	5.14	1.0	0.18	479	0.4	0.12	2.0	0.006	3.5	0.22	1.3	5 700	285	148	2.6

[a]Factor of safety against bearing capacity (unreinforced).

analysis, and in the design charts developed, the reinforcement stiffness (i.e. modulus) has a significant influence on the reinforcement contribution.

As expected, a larger reinforcement modulus results in a larger reinforcement contribution for the same amount of vertical displacement. Consequently, to optimize the contribution of the reinforcement, both maximum tensile strength and strain (or the modulus) must be specified.

NOTATIONS

Basic SI units are shown in parentheses.

B berm average width (m)
b shoe width of construction equipment (m)
c cohesion of soil foundation (Pa)
c_r crust cohesion (Pa)
c_u undrained soil shear strength (Pa)
D thickness of foundation soil layer (m)
E_u average modulus of deformation of low-permeability sludge (Pa)
F_s factor of safety against rupture (dimensionless)
$F_s J\varepsilon_{avg}$ required tensile stress (Pa)
$F_s\varepsilon_{avg}$ required reinforcement strain (dimensionless)
H_s sludge thickness (m)
h berm soil thickness (m)
h_c berm crust thickness (m)
J elastic modulus times material thickness $[J = (p_{ap} - cN_c)L_b/2l_q]$ (N/m)
$J\varepsilon_{avg}$ average tensile stress (N/m)
L_b width of berm (m)
L_h separation distance between berms (m)
l shoe length of construction equipment (m)
N_c bearing capacity coefficient (dimensionless)
p_{ap} average applied pressure (Pa)
p_{eq} ground pressure applied by construction equipment (Pa)
q_{avg} additional bearing capacity (Pa)
$q_g(x)$ pressure distribution function (Pa)
q_{gb} membrane effect under berm (Pa)
q_{gh} membrane effect in heaved areas (Pa)
q_u ultimate bearing capacity (Pa)
q_{ur} ultimate reinforced bearing capacity (Pa)
r berm spacing ratio ($r = L_h/L_b$) (dimensionless)
r_b maximum reinforcement vertical displacement under berm (m)
r_h maximum reinforcement vertical displacement in heaved area (m)
$T(x)$ tensile force in reinforcement per linear meter (N/m)
$T_h(x)$ horizontal component of variation of tensile forces per linear meter in reinforcement (N/m)
$y(x)$ distribution of vertical displacement along reinforcement (m)
α lateral load spreading angle (degrees)
β angle of geomembrane deformation (degrees)
β_b reinforcement angle of deflection at berm boundary (degrees)
β_h reinforcement angle of deflection at heave area edges (degrees)
γ unit weight of berm soil (N/m^3)

Attachment A 7 of 8

ε reinforcement tensile strain (dimensionless)
ε_a strain developed in reinforcement (dimensionless)
ε_{gb} constant strain of reinforcement under berm (dimensionless)
ε_{gh} constant strain of reinforcement outside berm (dimensionless)
λ_q load factor ratio ($\lambda_q = q_{avg}\ L_b/2J$) (dimensionless)

ABBREVIATIONS

HDPE high-density polyethylene

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Attachment A 8 of 8

MODEL	D6R LGP		D7G		D7R		D7R XR	
Flywheel Power	138 kW	**185 hp**	149 kW	**200 hp**	171 kW	**230 hp**	171 kW	**230**
Operating Weight:*								
Power Shift	20 500 kg	**45,200 lb**	20 094 kg	**44,300 lb**	24 778 kg	**54,600 lb**	25 193 kg	**55,60**
Direct Drive		—	20 502 kg	**45,200 lb**		—		—
Power Shift Differential Steer	20 680 kg	**45,600 lb**		—	25 077 kg	**55,300 lb**	25 492 kg	**56,20**
Engine Model		**3306T**		**3306T**		**3306T**		**3306T**
Rated Engine RPM		**1900**		**2000**		**2100**		**2100**
No. of Cylinders		**6**		**6**		**6**		**6**
Bore	121 mm	**4.75"**	121 mm	**4.75"**	121 mm	**4.75"**	121 mm	**4.7**
Stroke	152 mm	**6"**	152 mm	**6"**	152 mm	**6"**	152 mm	**6"**
Displacement	10.5 L	**638 in³**	10.5 L	**638 in³**	10.5 L	**638 in³**	10.5 L	**638**
Track Rollers (Each Side)		**8**		**6**		**7**		**8**
Width of Standard Track Shoe	915 mm	**3'0"**	508 mm	**1'8"**	560 mm	**1'10"**	610 mm	**2'0**
Length of Track on Ground	3.25 m	**10'8"**	2.72 m	**8'11"**	2.89 m	**9'6"**	3.05 m	**10'**
Ground Contact Area (W/Std. Shoe)	5.93 m²	**9254 in²**	2.76 m²	**4280 in²**	3.24 m²	**5016 in²**	3.72 m²	**5760**
Track Gauge	2.23 m	**7'3"**	1.98 m	**6'6"**	1.98 m	**6'6"**	1.98 m	**6'6**
GENERAL DIMENSIONS:								
Height (Stripped Top)**	2.43 m	**7'7"**	2.27 m	**7'5"**	2.56 m	**8'5"**	2.56 m	**8'5**
Height (To Top of ROPS)	3.24 m	**10'5"**	3.20 m	**10'6"**	3.35 m	**10'11"**	3.35 m	**10'1**
Height (To Top of Cab ROPS)	3.24 m	**10'5"**		—	3.43 m	**11'2"**	3.43 m	**11'2**
Height (To Top of ROPS Canopy)	3.24 m	**10'5"**		—		—		—
Overall Length (With S Blade)		—	5.28 m	**17'4"**	5.69 m	**18'8"**	5.81 mm	**19'1**
(Without Blade)		—	4.19 m	**13'9"**	4.67 m	**15'4"**	4.67 m	**15'4**
Width (Over Trunnion)	3.43 m	**11'3"**		—	2.87 m	**9'5"**	2.87 m	**9'5**
Width (W/O Trunnion — Std. Shoe)	3.14 m	**10'3.6"**	2.55 m	**8'5"**	2.54 m	**8'4"**	2.59 m	**8'6**
Ground Clearance	433 mm	**17"**	347 mm	**13.7"**	416 mm	**16.4"**	416 mm	**16.4**
Blade Types and Widths:								
Straight	3.99 m	**13'1"**	3.66 m	**12'0"**	3.52 m	**11'7"**	3.32 m	**11'7**
Angle		—	4.27 m	**14'0"**	4.50 m	**14'9"**	4.50 m	**14'9**
Angle Straight		—		—		—		—
Full Angle		—		—		—		—
Universal		—		—	3.98 m	**13'1"**	3.98 m	**13'1**
Semi-U		—		—	3.69 m	**12'2"**	3.69 m	**12'2**
Fuel Tank Refill Capacity	383 L	**101 U.S. gal**	435 L	**115 U.S. gal**	479 L	**127 U.S. gal**	479 L	**127 U.S**

*Operating Weight includes ROPS canopy, operator, lubricants, coolant, full fuel tank, hydraulic controls and fluid, straight dozer with tilt, horn, back-up alarm, r hitch and front pull hook.
— D7G includes end track guiding guards.
**Height (stripped top) — without ROPS canopy, exhaust, seat back or other easily removed encumbrances.

Attachment B

TABLE 2.11 RECOMMENDED REDUCTION FACTOR VALUES FOR USE IN EQ. (2.24a)

Application Area	Range of Reduction Factors			
	Installation Damage	Creep*	Chemical Degradation	Biological Degradation
Separation	1.1 to 2.5	1.5 to 2.5	1.0 to 1.5	1.0 to 1.2
Cushioning	1.1 to 2.0	1.2 to 1.5	1.0 to 2.0	1.0 to 1.2
Unpaved roads	1.1 to 2.0	1.5 to 2.5	1.0 to 1.5	1.0 to 1.2
Walls	1.1 to 2.0	2.0 to 4.0	1.0 to 1.5	1.0 to 1.3
Embankments	1.1 to 2.0	2.0 to 3.5	1.0 to 1.5	1.0 to 1.3
Bearing capacity	1.1 to 2.0	2.0 to 4.0	1.0 to 1.5	1.0 to 1.3
Slope stabilization	1.1 to 1.5	2.0 to 3.0	1.0 to 1.5	1.0 to 1.3
Pavement overlays	1.1 to 1.5	1.0 to 2.0	1.0 to 1.5	1.0 to 1.1
Railroads (filter/sep.)	1.5 to 3.0	1.0 to 1.5	1.5 to 2.0	1.0 to 1.2
Flexible forms	1.1 to 1.5	1.5 to 3.0	1.0 to 1.5	1.0 to 1.1
Silt fences	1.1 to 1.5	1.5 to 2.5	1.0 to 1.5	1.0 to 1.1

*The low end of the range refers to applications which have relatively short service lifetimes and/or situations where creep deformations are not critical to the overall system performance.

where

T_{allow} = allowable tensile strength,
T_{ult} = ultimate tensile strength,
RF_{ID} = reduction factor for installation damage,
RF_{CR} = reduction factor for creep,
RF_{CD} = reduction factor for chemical degradation,
RF_{BD} = reduction factor for biological degradation, and
ΠRF = value of cumulative reduction factors.

Note that Eq. (2.24a) could have included additional site-specific terms, such as reduction factors for seams and intentionally made holes. It also could have been formulated with fractional multipliers (values ≤ 1.0) placed in the numerator of the equation or on the opposite side of the equation, as with the *load-factor design method*. It has been put in this form following other studies (e.g., Voskamp and Risseeuw [63]). While the equation indicates tensile strength, it can be applied to burst strength, tear strength, puncture strength, impact strength, and so on.

2.4.2 Flow-Related Problems

For problems dealing with flow through or within a geotextile, such as filtration and drainage applications, the formulation of the allowable values takes the following form. Typical values for reduction factors are given in Table 2.12. Note that these values must be tempered by the site-specific conditions, as in Section 2.4.1. If the laboratory test includes the mechanism listed, it appears in the equation as a value of 1.0.

$$q_{allow} = q_{ult}\left(\frac{1}{RF_{SCB} \times RF_{CR} \times RF_{IN} \times RF_{CC} \times RF_{BC}}\right) \tag{2.25a}$$

Attachment C

Geosyntec
consultants

COMPUTATION COVER SHEET

Client: **Arco** Project: **Gardena Sumps** Project/ Proposal No.: **SC0467** Task No. **01**

Title of Computations: **EVALUATION OF REINFORCEMENT LAYER ANCHOR TRENCH CAPACITY**

Computations by:	Signature		1/31/2012
	Printed Name	Keaton Botelho, P.E.	Date
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Approved by: (pm or designate)	Signature		1/31/12
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	Title	Principal Engineer	

Approval notes:

Revisions (number and initial all revisions)

No.	Sheet	Date	By	Checked by	Approval

Written by:	K. Botelho	Date: 1/31/12	Reviewed by:	G. Corcoran	Date:
Client:	Arco	Project: Gardena Sumps	Project/ Proposal No.:	SC0467	Task No.: 01

EVALUATION OF REINFORCEMENT LAYER ANCHOR TRENCH CAPACITY
GARDENA SUMPS
GARDENA, CALIFORNIA

OBJECTIVE

The project includes the installation of a high-strength geotextile to support the construction of a cover system over soft sludge material at the Gardena Sumps project located in Gardena, California. The objective of this calculation package is to evaluate the tensile strength capacity at the termination of the reinforcement layer anchor system. The anchorage strength is compared to the high strength geotextile tensile strength to evaluate the reinforcement layer pull-out potential. The high-strength geotextile strength calculation is presented in a separate calculation package.

METHOD OF ANALYSIS

Anchor trench capacity is evaluated using methods and equations presented by Koerner et al (2002) and are included as Attachment A.

Koerner et al (2002) presents design equations developed from static equilibrium to evaluate the allowable geosynthetic tension from an anchor trench (see Attachment A). The equation considers frictional resistance due to (i) overburden pressures, (ii) anchor trench side slopes, and (iii) base of the anchor trench. The proposed design equation for determination of the allowable geomembrane tension from an anchor trench is:

$$T = \frac{q_b \times L_{RO} \times \tan\delta + 2\left[K_o \times (\sigma_v)_{avg} \times d_{AT} + \sigma_{vB} \times L_{AT}\right] \tan\delta}{\cos\beta - \sin\beta \tan\delta} \qquad (1)$$

where:

T = Tensile force in the geotextile (lb/ft);

q_b = Surcharge pressure due to cover soil over the geotextile (psf);

$= \gamma_s \times d_{cs}$;

γ_s = Unit weight of cover and backfill soil (pcf);

d_{cs} = Depth of cover soil (ft);

L_{RO} = Runout length subjected to overburden;

δ = minimum friction angle between geotextile and the soil;

K_o = coefficient of earth pressure at rest = 1-sinϕ;

$(\sigma_v)_{ave}$ = average vertical stress in anchor trench;

σ_{vB} = total vertical stress at the bottom of the anchor trench;

ϕ = friction angle of backfill soil in anchor trench;

d_{AT} = depth of the anchor trench;

L_{AT} = width of the anchor trench; and

β =sideslope angle, measured from horizontal.

ANALYSIS

Evaluating Variables

Since tension will develop in the geotextile (see the calculation package "Determination of High Strength Geotextile Reinforcement") due to the construction of the soil cover over the soft sludge material, frictional forces will be mobilized along the geosynthetic and soil interfaces on the side and base of the anchor trench. The maximum anticipated load due to soil cover construction is approximately 2,423 lb/ft (Geosyntec, 2012).

- A friction angle of 30 degrees will be used to represent the interface friction value between the anchor trench backfill and the woven geotextile (GSI, 2007, Attachment B).

- For determination of the surcharge due to soil overburden, q, and the vertical and horizontal overburden stresses, σ_h and σ_v, a unit weight of overburden soil of 120 pounds per cubic foot (pcf) was used based on typical values for the shallow onsite soils. For evaluation of the effective horizontal overburden stress based on the coefficient of earth pressure at rest, a friction angle of 30 degrees was selected based on typical values for the shallow onsite soils.

The following properties for the anchor trench were assumed:

- The depth of cover soil is equal to 1 ft over the run-out length of the geotextiles;
- The run-out length of the geotextile is equal to 15 feet, which is based on the approximate width of the first "finger berm" (see the calculation package "Determination of High Strength Geotextile Reinforcement");
- The width of the anchor trench is 2 ft;
- The depth of the anchor trench is 3 ft; and
- The slope of the reinforcement layer is approximately flat, i.e. $\beta = 0$

Analysis

From Equation (1):

$$T = \frac{q_b \times L_{RO} \times \tan\delta + 2\left[K_o \times (\sigma_v)_{avg} \times d_{AT} + \sigma_{vB} \times L_{AT}\right] \tan\delta}{\cos\beta - \sin\beta \tan\delta}$$

$$q_b = \gamma_s \times d_{cs}$$

$$q_b = 120\ pcf \times 1\ ft = \mathbf{120\ psf}$$

$$K_o = (1 - \sin\emptyset)$$

$$K_o = (1 - \sin 30) = \mathbf{0.5}$$

$$(\sigma_v)_{avg} = \gamma_s(d_{cs} + 0.5 d_{AT})$$

$$(\sigma_v)_{avg} = 120\ pcf(1\ ft + 0.5 \times 3ft) = \mathbf{300\ psf}$$

$$\sigma_{vB} = \gamma_s(d_{cs} + d_{AT})$$

$$(\sigma_v)_{avg} = 120\ pcf(1\ ft + 3ft) = \mathbf{480\ psf}$$

Therefore,

$$T = \frac{120\ psf \times 15\ ft \times \tan 30 + 2[0.5 \times 300\ psf \times 3\ ft + 480\ psf \times 2\ ft] \tan 30}{\cos 0 - \sin 0 \tan 30} = \mathbf{2,667\ lb/ft}$$

T = 2,667 lb/ft > 2,423 lb/ft OK

CONCLUSIONS

The tensile capacity of the anchorage system as calculated herein exceeds the expected tensile loads (from the calculation package entitled "Determination of High Strength Geotextile Reinforcement"). The expected tensile load due to the soil cover construction over soft soils at the site was evaluated to be 2,423 lb/ft (Geosyntec, 2012). The capacity of the proposed anchor trenches is 2,667 lb/ft. Therefore, the anchorage design for the geomembrane is adequate.

REFERENCES

Koerner, R.M., Qian, X., and Gray, D.H. (2002), "*Geotechnical Aspects of Landfill Design and Construction*," Prentice-Hall Inc.: Upper Saddle River, NJ.

Geosyntec Consultants, (Geosyntec, 2012), "*Determination of High Strength Geotextile Reinforcement*," dated 31 January 2012.

Geosynthetic Institute, (GSI, 2007), "GRI White Paper #11, Interpretation(s) of Laboratory Generated Interface Shear Strength Data for Geosynthetic Materials with Emphasis on Adhesion Value," 11 September 2007.

and

$$\sigma_{allow} \cdot t \cdot (\cos\beta - \sin\beta \cdot \tan\delta_C) = \gamma_s \cdot d_{CS} \cdot L_{RO} \cdot \tan\delta_C + (1 - \sin\phi) \cdot \gamma_s \cdot (d_{CS} + 0.5 \cdot d_{AT}) \cdot d_{AT} \cdot (\tan\delta_C + \tan\delta_F)$$

so that

$$\sigma_{allow} \cdot t = (840)(144)(0.060)/12 = 605 \text{ lb/ft } (8.83 \text{ kN/m}) \text{ and } (605)[(\cos 18.4°) - (\sin 18.4°)(\tan 18°)] = (110)(1)(\tan 18°)(L_{RO}) + (0.5)(110)(2)(2)(\tan 18° + \tan 22°$$

or

$$(605)(0.846) = (35.74) \cdot L_{RO} + (220)(0.729) \text{ which yields } 512.83 = (35.74) \cdot L_{RO} + 160.38 \text{ or } L_{RO} = 9.86 \text{ ft } (2.96 \text{ m}$$

Thus, use the runout length $L_{RO} = 10$ ft (3 m).

The geomembrane can also be extended along the trench bottom to increase resistance force, which is called an L-shaped rectangular anchor trench. A typical lay out in an L-shaped rectangular anchor trench, which is widely used in landfill projects is shown in Figure 4.10. In order to establish the static equilibrium equation, two imag inary and frictionless pulleys are assumed at the top edge and the bottom corner of the anchor trench, as shown in Figure 4.10 (Qian, 1995). This assumption again allows the geomembrane to be considered as a continuous member.

The friction force above a runout geomembrane is always neglected in the anchor trench design, since the cover soil probably moves together with the geomem brane as it deforms.

From $\Sigma F_H = 0$

$$T \cdot (\cos\beta) = (F_{RO})_B + (F_{AT})_L + (F_{AT})_R + (F_{AB})_B + (F_{AB})_U \quad (4.23)$$

The friction force between the geomembrane and the underlying soil at the bottom of the anchor trench is

$$(F_{AB})_B = \sigma_{vB} \cdot L_{AT} \cdot \tan\delta_C \quad (4.24)$$

The friction force between the geomembrane and the overlying soil at the bottom of the anchor trench is

$$(F_{AB})_U = \sigma_{vB} \cdot L_{AT} \cdot \tan\delta_F \quad (4.25)$$

Because $\sigma_{vB} = \gamma_s \cdot (d_{CS} + d_{AT})$,

$$(F_{AB})_B = \gamma_s \cdot (d_{CS} + d_{AT}) \cdot L_{AT} \cdot \tan\delta_C \quad (4.26)$$

and

$$(F_{AB})_U = \gamma_s \cdot (d_{CS} + d_{AT}) \cdot L_{AT} \cdot \tan\delta_F \quad (4.27)$$

Substituting Equations 4.15, 4.17, 4.18, 4.26, and 4.27 into Equation 4.23 gives

$$T \cdot (\cos\beta - \sin\beta \cdot \tan\delta_L) = \gamma_s \cdot d_{CS} \cdot L_{RO} \cdot \tan\delta_C + \gamma_s \cdot (\tan\delta_C + \tan\delta_F) [(1 - \sin\phi) \cdot \gamma_s \cdot (d_{CS} + 0.5 \cdot d_{AT}) \cdot d_{AT} + (d_{CS} + d_{AT}) \cdot L_{AT}]$$

Attachment A, 1 of 3

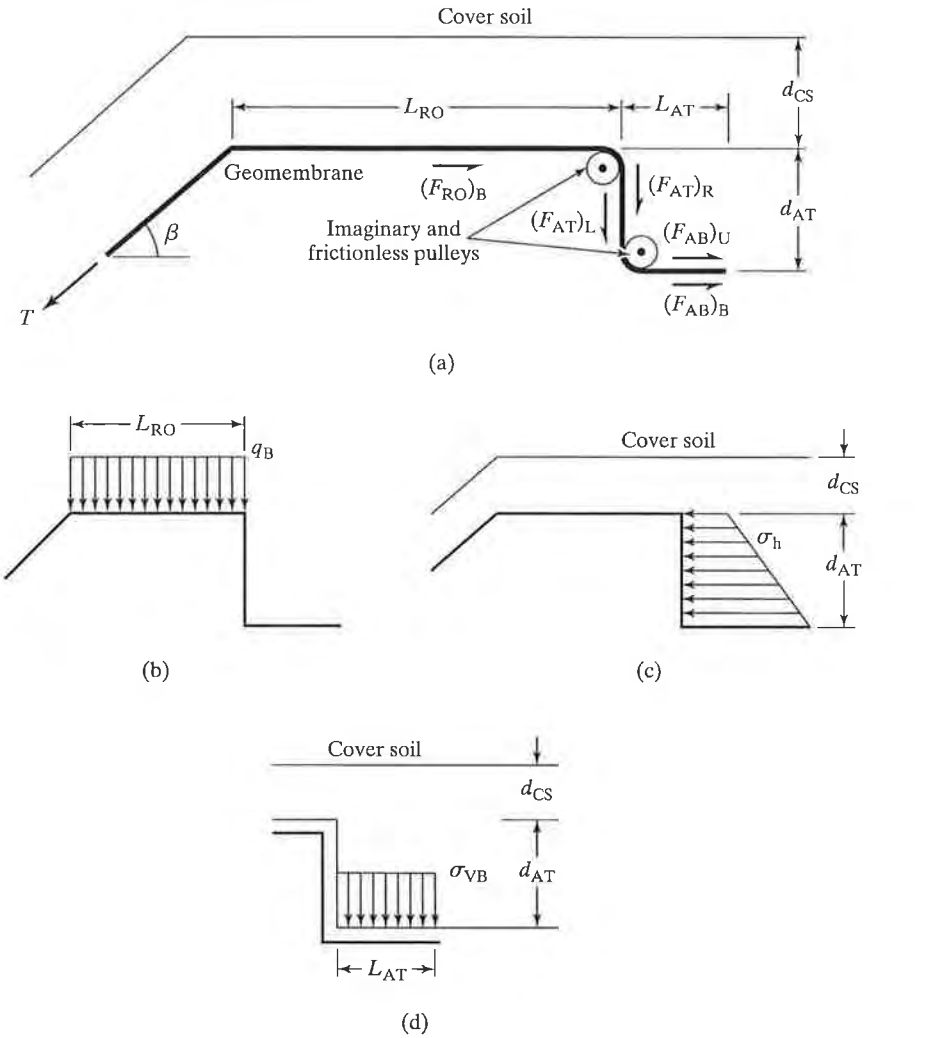


FIGURE 4.10 Cross Section of Geomembrane Runout Section with an L-Shaped Rectangular Anchor Trench and Related Stresses and Forces Involved

which leads to

$$T = \frac{\gamma_s \cdot d_{CS} \cdot L_{RO} \cdot \tan\delta_C + \gamma_s \cdot [(1 - \sin\phi) \cdot \gamma_s \cdot (d_{CS} + 0.5 \cdot d_{AT}) \cdot d_{AT} + (d_{CS} + d_{AT}) \cdot L_{AT}](\tan\delta_C + \tan\delta_F)}{\cos\beta + \sin\beta \cdot \tan\delta_C} \tag{4.28}$$

or

$$T = \frac{q_B \cdot L_{RO} \cdot \tan\delta_C + [K_o \cdot (\sigma_v)_{ave} \cdot d_{AT} + \sigma_{vB} \cdot L_{AT}](\tan\delta_C + \tan\delta_F)}{\cos\beta - \sin\beta \cdot \tan\delta_C} \tag{4.29}$$

Attachment A, 2 OF 3

When $\delta_C = \delta_F = \delta$, Equation 4.28 becomes

$$T = \frac{\gamma_s \cdot d_{CS} \cdot L_{RO} \cdot \tan\delta + 2 \cdot \gamma_s \cdot [(1 - \sin\phi) \cdot \gamma_s \cdot (d_{CS} + 0.5 \cdot d_{AT}) \cdot d_{AT} + (d_{CS} + d_{AT}) \cdot L_{AT}] \cdot \tan}{\cos\beta - \sin\beta \cdot \tan\delta} \quad (4$$

and Equation 4.29 becomes

$$T = \frac{q_B \cdot L_{RO} \cdot \tan\delta + 2 \cdot [K_o \cdot (\sigma_v)_{ave} \cdot d_{AT} + \sigma_{vB} \cdot L_{AT}] \cdot \tan\delta}{\cos\beta - \sin\beta \cdot \tan\delta} \quad (4$$

where T = geomembrane tensile force (i.e., anchor trench resistance force) unit width;
$(F_{RO})_B$ = friction force beneath runout geomembrane;
$(F_{AT})_L$ = friction force between the left side of the geomembrane and the side wall of the anchor trench;
$(F_{AT})_R$ = friction force between the right side of the geomembrane and the side wall of the anchor trench;
$(F_{AB})_B$ = friction force between the geomembrane and the underlying soil the bottom of the anchor trench;
$(F_{AB})_U$ = friction force between the geomembrane and the overlying soil a the bottom of the anchor trench;
$(\sigma_v)_{ave}$ = average vertical stress in anchor trench;
K_o = coefficient of at-rest earth pressure;
L_{RO} = runout length;
d_{CS} = depth of cover soil;
d_{AT} = anchor trench depth;
γ_s = unit weight of cover and backfill soil;
ϕ = friction angle of backfill soil in anchor trench;
δ_C = friction angle between the geomembrane and the underlying soil
δ_F = friction angle between the geomembrane and the backfill soil;
δ = friction angle between the geomembrane and the soil; and
β = sideslope angle, measured from horizontal.

The design of an anchor trench is considered to be adequate if mobilized st lies between the yield stress and allowable stress of the geosynthetic component should be mentioned that many manufacturers specify 1.5-feet- (0.45-m)-deep anc trenches and a 3.0-feet- (0.90-m)-long runout section.

EXAMPLE 4.5

Calculate the resistant capacity of a given geomembrane in a L-shaped rectangular anc trench of known dimensions. The geomembrane is 60-mil (1.5-mm) HDPE with an ultin strength (at yield) 2,100 lb/in^2 (14,500 kN/m^2) and an allowable strength 840 lb/in^2(5,800 kN/

Attachment A, 3 of 3

Table 8. Various geomembranes against geonets (mainly biplanar types) without geotextiles.

Geotextile Type	Peak Friction (deg)	Residual Friction (deg)	Peak Adhesion (kPa)	Residual Adhesion (kPa)
HDPE-smooth	11	9	0	0
HDPE-textured	13	10	0	0
LLDPE-smooth	11	10	0	0
LLDPE-textured	15	11	3.6	0
PVC-smooth	18	16	0.1	0.6
PVC-faille	25	19	0	0
CSPE-R	28	16	0	0

4.6 Geotextiles against Soils

Appendix Figures 8a and 8b present NW-NP geotextiles against granular soils. Peak and residual shear strengths are both 33° and both adhesions are zero. This indicates that the shear plane is being forced into the soil as anticipated with the open structure of NW-NP geotextiles. There are many points in the data set, and the R^2-values are high. For NW-HB geotextiles as seen in Appendix Figures 8c and 8d the response is quite different. Peak and residual friction angles 28° and 16°, respectively, and adhesions are zero. Note that there are very few points in the data set, however the R^2-values are very high. Appendix Figures 8e and 8f give woven slit film geotextile against granular soils. The peak and residual friction angles are a surprisingly high 32° and 29°, respectively, with zero adhesion. The collected data of different geotextiles to granular soils is given in Table 9.

Table 9. Different geotextiles against granular soils.

Geotextile Type	Peak Friction (deg)	Residual Friction (deg)	Peak Adhesion (kPa)	Residual Adhesion (kPa)
Nonwoven, Needle Punched	33	33	0	0
Nonwoven, Heat Bonded	28	16	0	0
Woven, Slit Film	32	29	0	0

The data for these same geotextile types against cohesive soils is now presented. Appendix Figures 9a and 9b show a NW-NP geotextile against cohesive soil with peak and

Attachment B 1 of 2

residual friction angles of 30° and 21°, respectively. The peak has an adhesion of 5 kPa while the residual is zero. There is a reasonable number of data points and reasonable R^2-values in the peak strength response, but the data is not as well behaved in the residual strength responses. For a NW-HB geotextile against cohesive soil the data appears in Appendix Figures 9c and 9d. Peak and residual friction angles are 29° and 10° (somewhat less than with the NW-NP geotextile), with a slight adhesion accompanying the peak response. The data points are sparse. Finally, the woven slit film against cohesive soil is given in Appendix Figures 9e and 9f. Peak and residual friction angles are 29° and 19°, with zero adhesion in both cases. To compare and contrast the different geotextiles against cohesive soils see Table 10.

Table 10. Different geotextile against cohesive soils.

Geotextile Type	Peak Friction (deg)	Residual Friction (deg)	Peak Adhesion (kPa)	Residual Adhesion (kPa)
Nonwoven, Needle Punched	30	21	5.0	0
Nonwoven, Heat Bonded	29	10	0.9	0
Woven, Slit Film	29	19	0	0

4.7 Internal Shear Strength of GCLs

All of the data in this report has been performed according to ASTM D5321; recall Section 3.5 in this regard. In 1998, ASTM released a specific test method for GCLs. It is ASTM D6243, "Standard Test Method for Determination of Internal and Interface Shearing Resistance of a Geosynthetic Clay Liner by the Direct Shear Method". Unfortunately, the status for repeatability, reproducibility and uncertainty are unavailable for this more recent test method. That said, it is assumed that the majority of the GCL tests were performed by suitable modification of ASTM D5321.

Appendix Figures 10a and 10b present peak and residual internal shear strengths of reinforced GCLs. By far, the majority of the data is for needle punched GCLs (rather than the

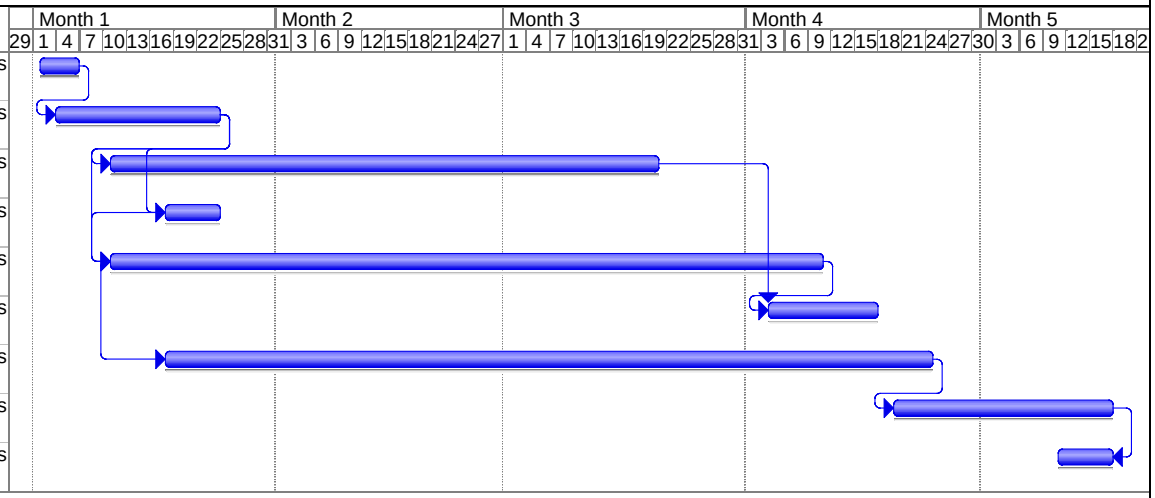
Attachment B 2 of 2

APPENDIX E

Construction Schedules

Alternative 2A
Estimated Construction Duration
Gardena Sumps
Gardena, California

ID	Task Name	Duration
1	Mobilization	5 days
2	Site Preparation	15 days
3	Haack Rework Excavation, Confirmation Sampling, Backfill	50 days
4	Sheet Pile Installation	5 days
5	Cap Installation	65 days
6	Stormwater Controls	10 days
7	Vertical Gas Control Installation	70 days
8	Gas Control Equipment Installation and Start Up	20 days
9	Demobilization	5 days

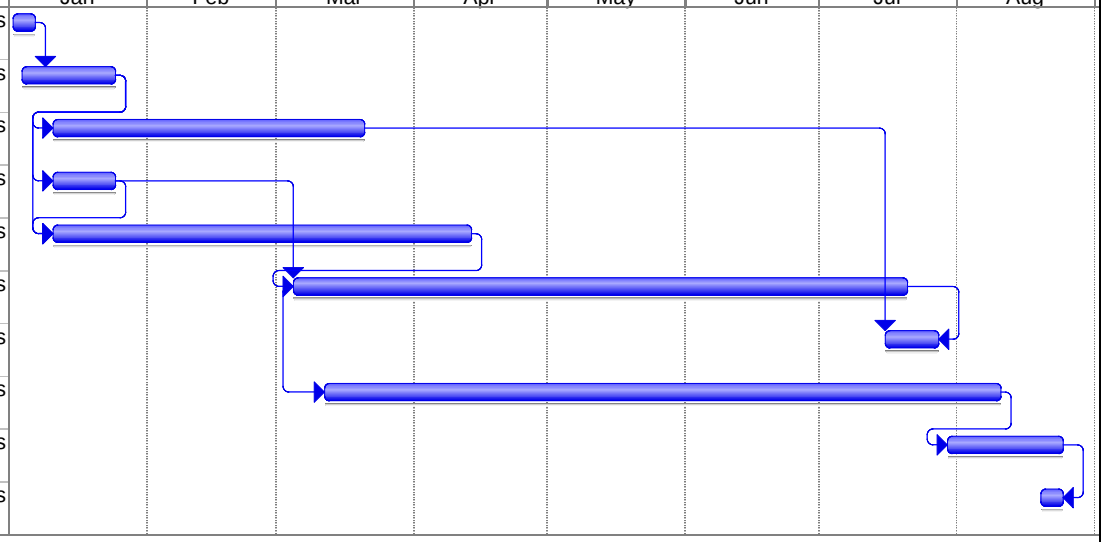


Project: Alt 2A - Haack Offsite Disposa
Date: Thu 9/15/11

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

Alternative 3
Estimated Construction Duration
Gardena Sumps
Gardena, California

ID	Task Name	Duration
1	Mobilization	5 days
2	Site Preparation	15 days
3	Haack Rework Excavation, Confirmation Sampling, Backfill	50 days
4	Sheet Pile Installation	10 days
5	Sludge Stabilzation	68 days
6	Cap Installation	100 days
7	Stormwater Controls	10 days
8	Vertical Gas Control Installation	110 days
9	Gas Control Equipment Installation and Start Up	20 days
10	Demobilization	5 days

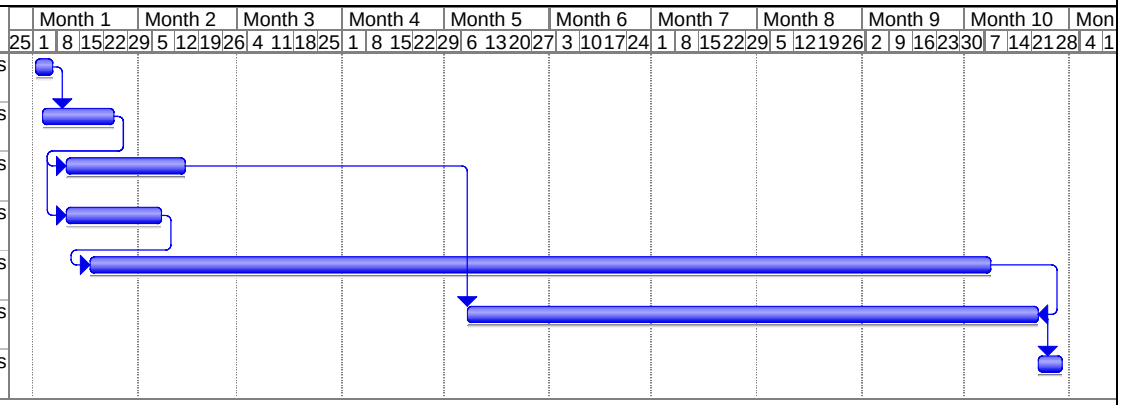


Project: Alt 3 - Stabilization - General
Date: Thu 9/15/11

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

Alternative 4
Estimated Construction Duration
Gardena Sumps
Gardena, California

ID	Task Name	Duration
1	Mobilization	5 days
2	Site Preparation	15 days
3	Haack Rework Excavation - Level D	25 days
4	Sheet Pile Installation	20 days
5	Sludge Stabilzation and Excavation and Confirmation Sampling	189 days
6	Soil Backfill	120 days
7	Demobilization	5 days



Project: Alt 4 - Dig and Haul - General
Date: Thu 9/15/11

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

APPENDIX F

Addendum to the Final Feasibility Study for the Gardena Sumps Site: Optional Alternative 2A Cover

Geosyntec consultants

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www.geosyntec.com

11 November 2013

Mr. Kyle Christie
Remediation Manager
Atlantic Richfield Company
6 Centerpointe Drive
La Palma, California 92048

Subject: **Addendum to the Revised Final Draft Feasibility Study for the Gardena Sumps Site: Optional Alternative 2A Cover**
Gardena Sumps Site
Gardena, California

Dear Mr. Christie,

Geosyntec Consultants, Inc. (Geosyntec) has prepared this Addendum to the Revised Final Draft Feasibility Study (Revised Final Draft FS) in response to comments received from Department of Toxic Substances Control (DTSC) and the City of Gardena (City). The DTSC and City comments on the Revised Final Draft FS were presented in meetings held 11 July, 30 August, and 5 September 2013. The Addendum presents and discusses the changes to Alternative 2A resulting from the comments as well as future Site development concerns. A detailed analysis and ranking of the Optional Alternative 2A Cover will not be performed as the changes associated with the Optional Alternative 2A Cover do not affect the analyses of Alternative 2A presented in the Revised Final Draft FS (Geosyntec, 2013).

OPTIONAL ALTERNATIVE 2A COVER

Introduction

During the meeting on 11 July 2013, the DTSC expressed the City's concerns with the height and appearance of the proposed retaining wall along the northern edge of the Haack Sump and a portion of the Cooper North Sump. In response to this concern, the DTSC request Atlantic Richfield Company (ARC) to evaluate an alternative design that would eliminate the proposed retaining wall. Geosyntec has conceptually redesigned Alternative 2A in this Area. The retaining wall was eliminated and grading in the area affected by the elimination of the retaining wall (the "Optional Alternative 2A Cover") was revised to accommodate a minimum 5 percent (%) slope

draining to the north and terminating at a 6 to 9 inch (in.) concrete curb immediately adjacent to the Artesia Boulevard (Blvd.) sidewalk. The curb will deter unintended light traffic across the slope, act as a water-stop for drainage from the slope, and accommodate the slight variations in the existing Haack Sump concrete slab surface elevation. The modifications necessary to eliminate the retaining wall and allow for the Optional Alternative 2A Cover will require waivers of some requirements in California Code of Regulations, Title 22 (22 CCR). The elements of Optional Alternative 2A Cover are discussed in more detail in the following Sections.

Cap Modifications

The Optional Alternative 2A Cover will be comprised of the same foundation and gas collection layers, and low-hydraulic conductivity layer as described in the Revised Final Draft FS for Alternative 2A. The Optional Alternative 2A Cover foundation layer will have no minimum thickness to accommodate the northern border slope and requires a 30-foot set-back southward from the Artesia Boulevard sidewalk before the cover system has sufficient strength to allow for vehicle traffic. To allow vehicle traffic over the cover to the south, the foundation layer will thicken from north to south at an approximate minimum slope of 2.5 percent until a minimum foundation layer thickness of 0.5 foot (ft) and 1 ft on the Haack and Cooper Sumps, respectively, is achieved. In addition, the erosion protection layer will have no minimum requirement and will thicken southward with an approximate minimum slope of 5 percent until 1 foot of Class II aggregate base is present over the drainage geocomposite. As a result, a 30 ft wide landscaped strip will border the northern Gardena Sumps site where no vehicle traffic will be permitted. The revised grading and cross sections are shown on Figures 1 through 4.

There are no proposed changes to the gas collection layer, high-strength geotextile, or low-hydraulic conductivity layer resulting from this cap modification. Drainage above the low-hydraulic conductivity layer and below the erosion protection layer will be accommodated with the geocomposite drainage layer as described in the Revised Final Draft FS (Geosyntec, 2013).

Drainage

A 6 to 9 in. concrete curb is proposed between the border of the Haack and Cooper North sumps and the Artesia Blvd. sidewalk where drainage would otherwise run off the Site. The curb will minimize the amount of run off flowing from the Site onto the Artesia Blvd. sidewalk as well as support a trench drain or shallow water conveyance feature at the toe of the slope. The variation in height of the curb is proposed due the variable height of the existing Haack Sump concrete slab relative to the sidewalk. The variable height will also support drainage to the east and west. The curb will further prevent inadvertent light traffic, such as foot traffic, bicycles, and/or

wheelchairs, from entering the sloped portion of the cover. The cover slope and concrete curb are shown in Detail 2 on Figure 7.

Monitoring and Control Systems

The Optional Alternative 2A Cover does not affect the gas monitoring and control system or the groundwater monitoring program. The sheet pile cut-off wall is still proposed along the northern edge of the Haack Sump and a portion of the Cooper Sump; however, the wall will not extend above the existing ground surface. As a result, no additional gas extraction wells are proposed in this area. The locations of the gas control system components are shown on Figures 5 and 6 with the Revised Alternative 2A Cover grading.

Land Use Covenants

Institutional controls were discussed in the Revised Final Draft FS; however, the specific land use covenants (LUCs) are described herein. The term "land use covenants" includes written instruments and agreements restricting land uses, easements, servitudes, and land use restrictions. The LUCs entered into or required by DTSC will "run with the land," i.e., are binding on current and subsequent property owners, and remain in effect until they are formally removed or modified (DTSC, 2003). The list of LUCs presented is not all-encompassing; other necessary LUCs may be identified in the future.

LUCs identified for the Site include maintenance requirements, zoning restrictions, limited development above the cover, and limited excavation in and around the cover. Specific LUCs for the property owner(s) and responsible parties (RPs) are listed below:

- The property owner(s) will be responsible for maintenance of a parking lot or other non-structural surface above the Alternative 2A engineered cap such as asphalt paving, concrete, or vegetation;
- The property owner(s) will be responsible for maintaining vegetation and ensuring minimal root depth of vegetation;
- The property owner(s) will be responsible for maintenance of necessary fencing, gates, and walls around the Site;
- The property owner(s) will be responsible for posting and maintaining notification signs within onsite buildings, the RPs will be responsible for posting and maintaining signs within open spaces;

- The property owner(s) will notify the DTSC and RPs of activities within limits of cover such as trenching or filling and not proceed with activities without a written approval of activities;
- The Cooper and Haack properties will be restricted to open space, commercial use, or industrial use;
- Pumping and removal of shallow groundwater beneath the Site will be restricted except for sampling and monitoring purposes;
- Use of the Cooper and Haack properties will be limited to those which will not disturb the integrity of the cap or monitoring systems;
- The property owner(s) will notify the DTSC and RPs of any disturbance of the soil, such as excavation, grading, removal, trenching, mining, or drilling of gas, oil, or water wells on the Properties. Excavation, grading, removal, trenching, mining, and/or drilling will be limited and only as approved by the DTSC and RPs on the capped portions of the Cooper and Haack properties;
- Easements will be granted to the DTSC and RPs for inspection, surveillance, monitoring, maintenance, or other purposes necessary to protect public health or safety;
- Subdivision of the Cooper or Haack Properties will be prohibited;
- Notifications will be required for those purchasing, leasing, subleasing, and/or renting the property stating that residual contamination exists. Notifications will be provided by the RPs or owner, as appropriate;
- Notification to the DTSC of any sale, lease, or other conveyance of the properties by the owner or RPs, as appropriate; and
- Requirement for a deed notice notifying potential purchasers that the properties have been used to manage hazardous waste and that use of the properties is restricted.

The LUCs will be recorded at the county recorder's office so they will be found during a title record search of the property deed.

REGULATORY WAIVERS

A waiver would be necessary from the requirements in 22 CCR in order to remove the minimum foundation and erosion protection material thicknesses presented for the Optional Alternative 2A Cover. The specific requirements that would need to be waived are provided below:

- Foundation Layer

  - Requirement: “A foundation layer shall be provided for the compacted barrier layer of the final cover… …The layer shall be compacted at a moisture content sufficient to achieve the density required to provide adequate support for the nonearthen membrane…” (22 CCR Section 66264.228(e)(4))
  - Discussion: The foundation layer would be reduced to zero at the northern Haack and portion of the Cooper North Sumps property line. The existing concrete slab in the Haack Property and in-place soil in the Cooper North Property will provide support for the gas collection geocomposite and overlying low-hydraulic conductivity layer.
- Cover Soil
  - Requirement: “The owner or operator shall provide a layer of top soil of thickness sufficient to support vegetation for erosion controlled deep enough to prevent root penetration into the filter layer. The top soil shall have characteristics to protect the compacted layer against drying that would lead to cracking, to resist erosion and to support vegetation growth…” (22 CCR Section 66264.228(e)(12))
  - Discussion: The 1-ft. thick cover soil at Site will primarily be Class II Aggregate Base in accordance with the proposed parking lot end use. In the sloped areas, the cover soil will be a vegetative cover soil with a thickness that may be reduced to zero.

Other waivers of requirements in 22 CCR may be required once the final design of Optional Alternative 2A is completed.

The gas collection system and geomembrane will be supported by either the existing concrete slab on the Haack Property or existing in-place soil on the Cooper Property. The geomembrane will be protected by the overlying geocomposite with vegetative cover soil, Class II Aggregate Base, artificial turf, or concrete or other durable materials.

SPECIFIC PLAN COMPLIANCE

The City developed the Artesia Corridor Specific Plan (Specific Plan) which establishes the development vision for the properties on the south side of Artesia Boulevard between Western and Normandie Avenues (TPC, 2006). The Specific Plan designates the vast majority of the Gardena Sumps site for commercial use.

Site Layout

The Alternative 2A conceptual design complies with the City's Specific Plan. Commercial/retail structures up to 80,000 sf in size may be accommodated outside of the Alternative 2A engineered cap portion. Space may be allocated above the capped portions of the property for parking.

Utilities and Lighting

Utilities for the building may be accommodated by trenching outside of the capped portions of the Gardena Sumps site, primarily parallel to the Haack and Cooper boundaries on the west and south. Some electrical conduit may be installed within or above the aggregate base layer of the cover in accordance with the Risk Management Plan discussed in the Revised Final Draft FS (Geosyntec, 2013). Parking lot lighting may be accommodated by installing light poles around the perimeter of the parking lot and/or within the parking lot outside of the cover. Within the capped portion of the Gardena Sumps site, lighting structures with minimal foundations depths would be suitable.

Long Term Monitoring

Long term monitoring at the Gardena Sumps site will include settlement, groundwater, and soil gas monitoring. If development occurs shortly after the remedy is implemented, monitoring locations can be incorporated into the development features such as walkways, vegetative strips, etc. to limit disruption to the commercial activities during monitoring events. If development occurs after monitoring locations have been installed, monitoring locations could be moved to accommodate the development.

Zoning

The Strategic Plan has identified the Gardena Sumps site for commercial development. The Site-Specific Action Levels (SSALs) identified in the Revised Final Draft FS were a derivation of risk-based concentrations for the Gardena Sumps site's constituents of concern (COCs). These SSALs were used to identify areas of the Gardena Sumps site which would require action based on cancer and non-cancer risks for residential receptors, the most conservative receptor. The areas of the Gardena Sumps site in excess of the residential SSALs were addressed in Alternative 2A through capping or select excavation. As a result, the Gardena Sumps site can accommodate the less conservative, commercial receptor development.

CONCLUSIONS

The Optional Alternative 2A Cover does not impact the evaluation and comparison of Alternative 2A to the nine evaluation criteria (USEPA, 1988). Alternative 2A readily meets the criteria of overall protection of human health and the environment and satisfies Applicable or Relevant and Appropriate Requirements (ARARs). When evaluated against the balancing criteria, Alternative 2A provides short-term effectiveness as well as long-term effectiveness and permanence. It is implementable and presents an effective balance of cost against the evaluation criteria. Alternative 2A also would accommodate future potential redevelopment of the Site (Geosyntec, 2013). As a result, Alternative 2A, as revised by this Addendum, is the preferred remedy for the Site.

If you have any questions, please contact Mrs. Rebecca Oliver at (858) 716-2926.

Sincerely,

Rebecca F. Oliver, P.E.
Senior Engineer

Gregory T. Corcoran, P.E.
Principal Engineer

Attachment: Optional Alternative 2A Figures

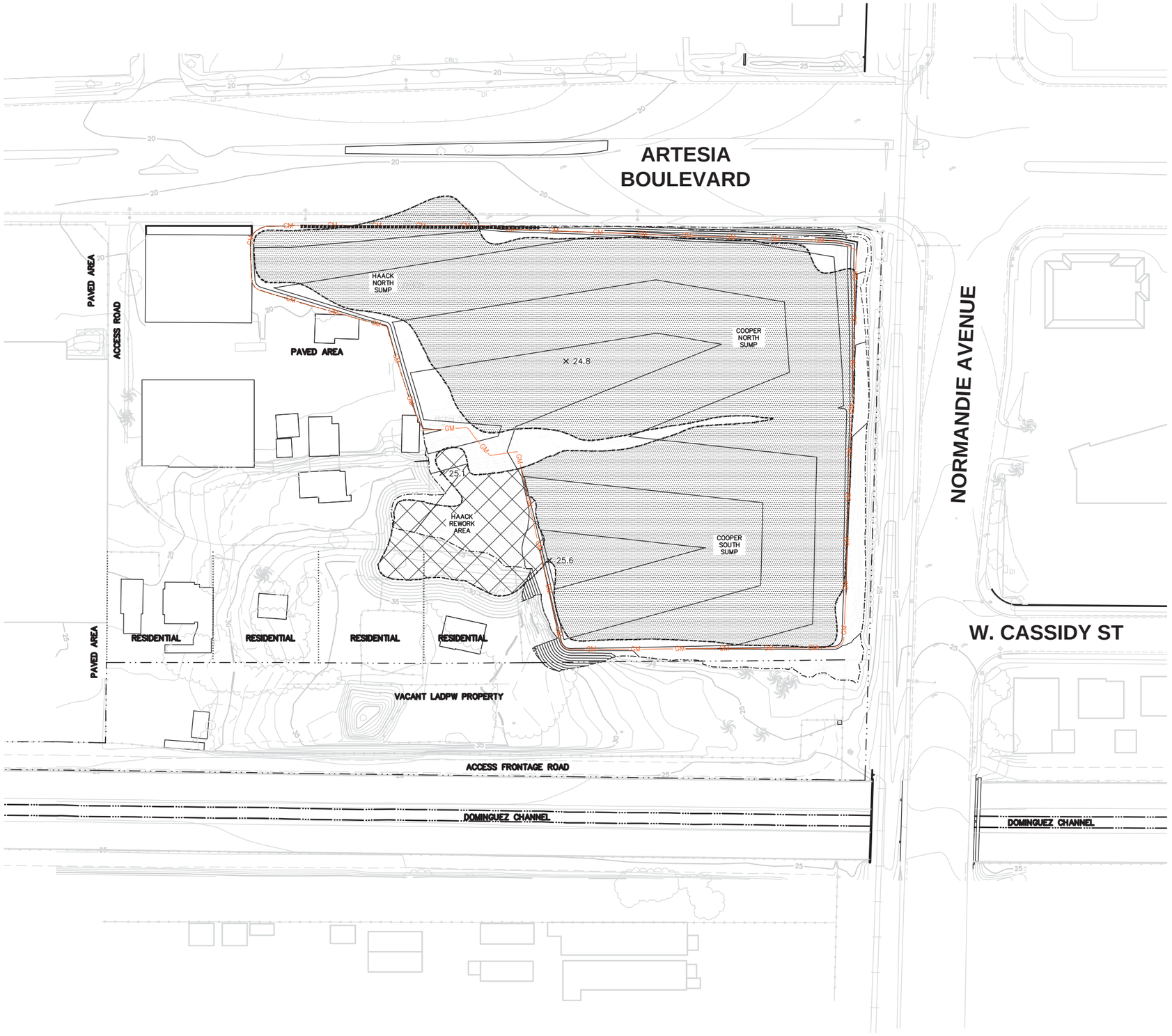
REFERENCES

22 CCR Section 66264.228. Closure and Post Closure Care.

DTSC, 2003. Fact Sheet: Recorded Land Use Covenants (Assembly Bill 2436) and Regulations, April.

Geosyntec, 2013. Revised Final Draft Feasibility Study, Gardena Sumps, Gardena, California, April.

The Planning Center (TPC), 2006. Artesia Corridor Specific Plan, July.



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- LIMIT OF FINAL COVER GEOMEMBRANE
- SHEET PILE CUT OFF WALL (NOTE 4)
- CHAIN–LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- PALM TREE
- APPROXIMATE DISTRIBUTION OF SLUDGE
- HAACK REWORK MATERIAL TO BE REMOVED

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.
4. SHEET PILE CUT OFF WALL WILL NOT EXTEND ABOVE EXISTING GROUND SURFACE.

0 100' 200'

SCALE IN FEET

OPTIONAL ALTERNATIVE 2A FINAL COVER – OVERVIEW
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2013

PROJECT NO. SC0467A

FIGURE 1

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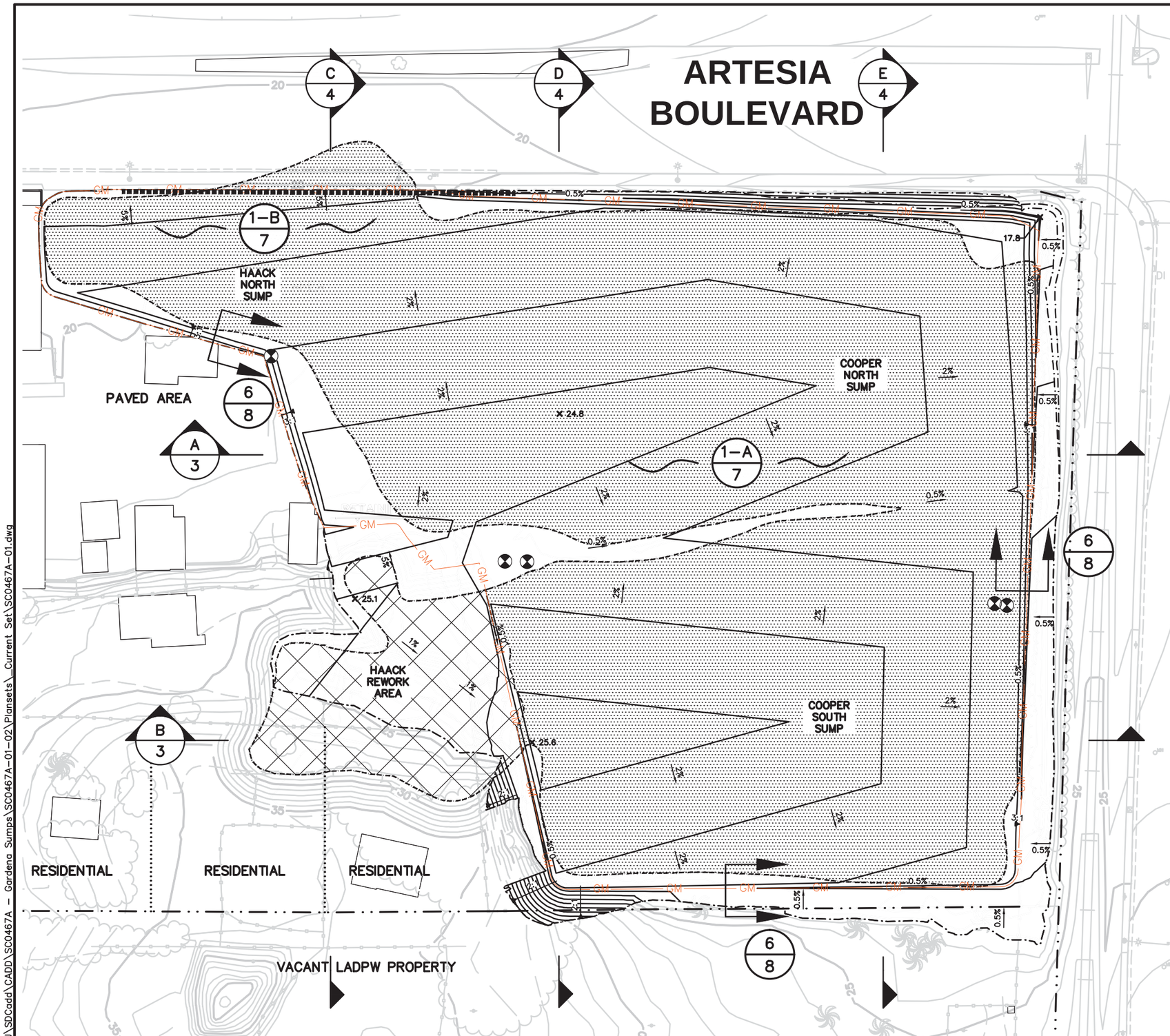

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- LIMIT OF FINAL COVER GEOMEMBRANE
- SHEET PILE CUT OFF WALL (NOTE 4)
- CHAIN–LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- APPROXIMATE DISTRIBUTION OF SLUDGE
- HAACK REWORK MATERIAL TO BE REMOVED
- EXISTING GROUNDWATER MONITORING WELL TO BE ABANDONED

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.
4. SHEET PILE CUT OFF WALL WILL NOT EXTEND ABOVE EXISTING GROUND SURFACE.

0 60' 120'

SCALE IN FEET

OPTIONAL ALTERNATIVE 2A FINAL COVER
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE:	NOVEMBER 2013	FIGURE
PROJECT NO.	SC0467A	2

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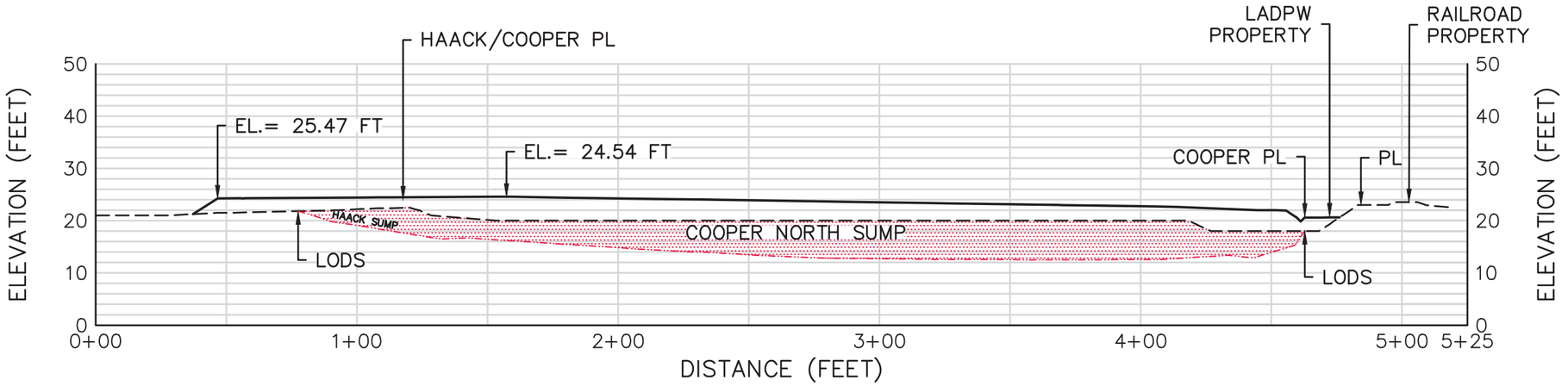
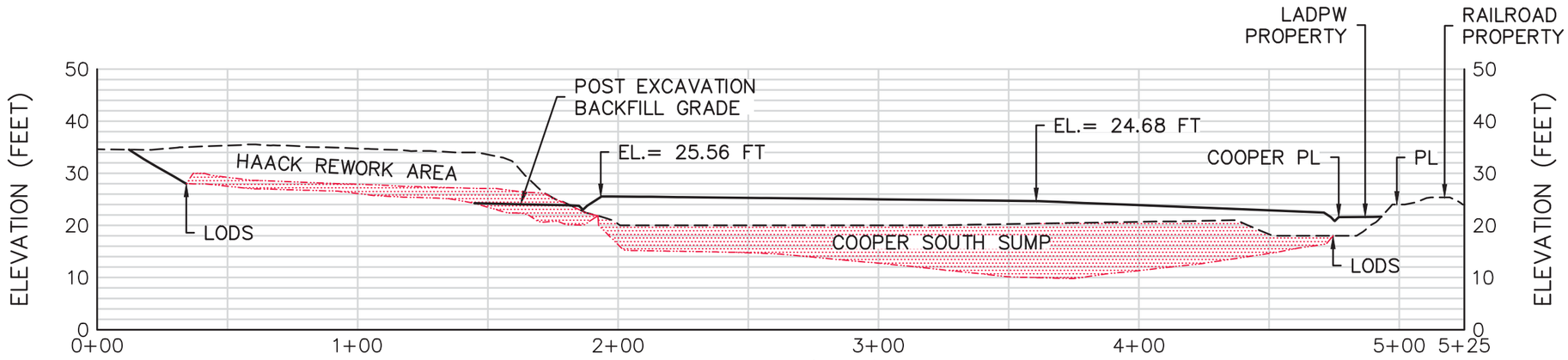


SECTION A



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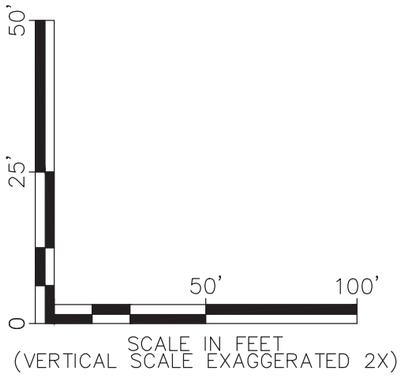

LEGEND

- EXISTING GRADE
- FINAL GRADE
- APPROXIMATE LIMITS OF DETECTED SLUDGE

NOTES:

1. LODS = LIMIT OF DETECTED SLUDGE
2. LADPW = LOS ANGELES DEPARTMENT OF PUBLIC WORKS
3. PL = PROPERTY LINE

OPTIONAL ALTERNATIVE 2A EAST–WEST SECTIONS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2013

PROJECT NO. SC0467A

FIGURE 3

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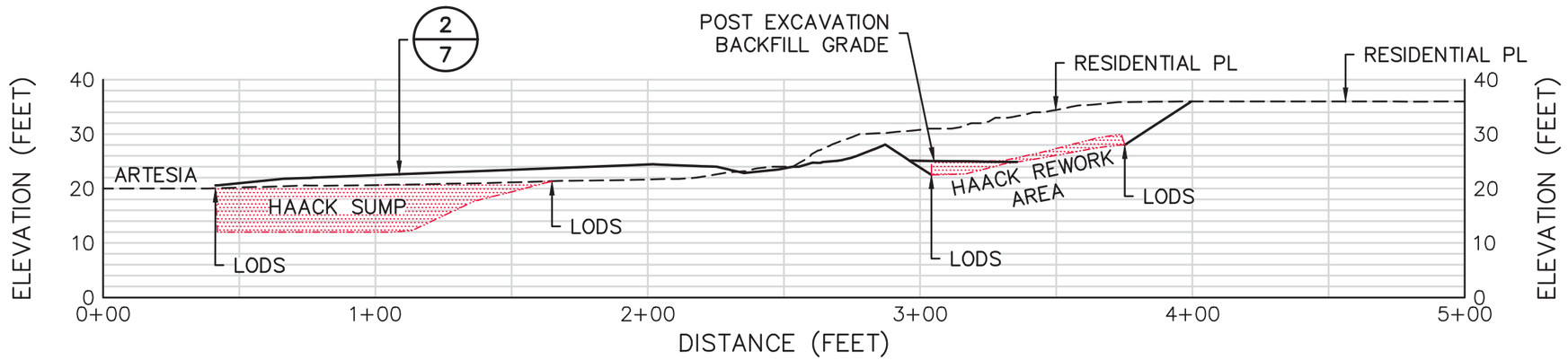

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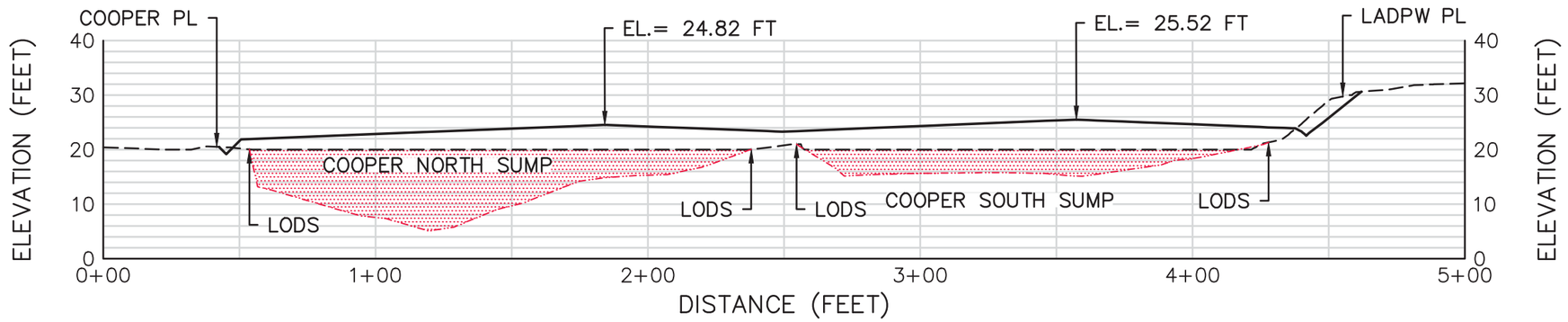

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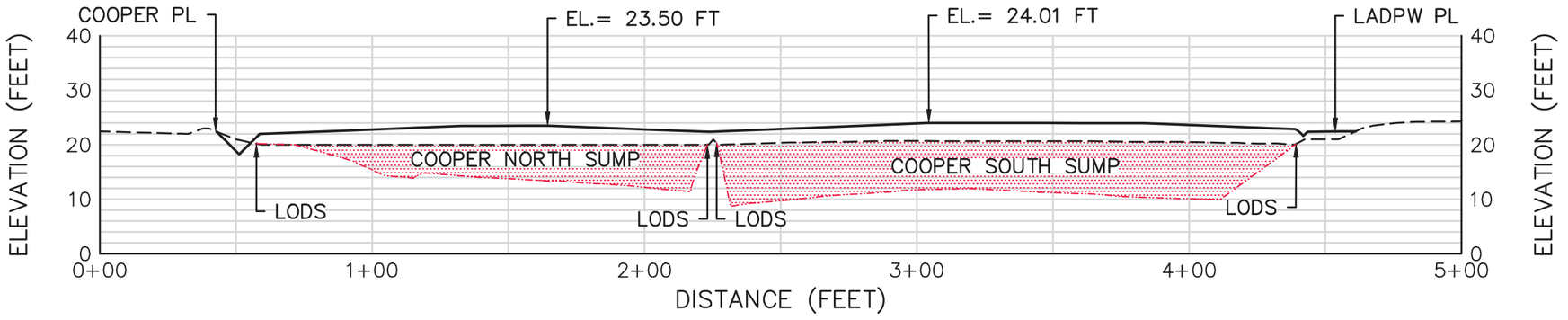
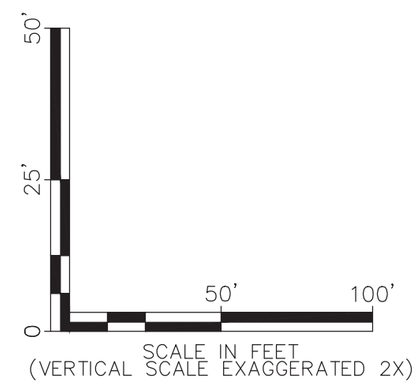


SECTION E



LEGEND

- EXISTING GRADE
- FINAL GRADE
- APPROXIMATE LIMITS OF DETECTED SLUDGE

NOTES:

1. LODS = LIMIT OF DETECTED SLUDGE
2. LADPW = LOS ANGELES DEPARTMENT OF PUBLIC WORKS
3. PL = PROPERTY LINE

OPTIONAL ALTERNATIVE 2A NORTH–SOUTH SECTIONS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

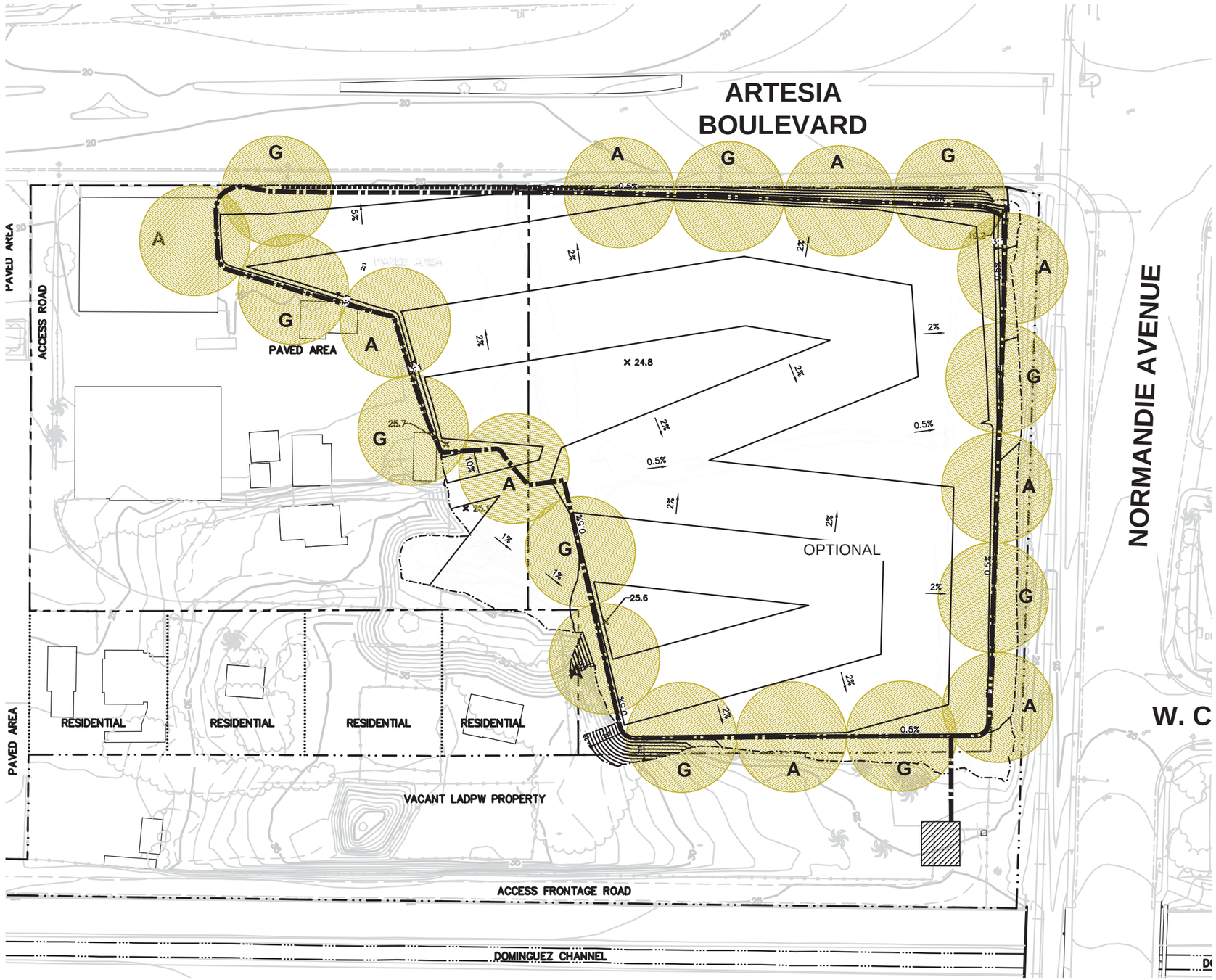
Geosyntec consultants

DATE: NOVEMBER 2013

PROJECT NO. SC0467A

FIGURE 4

P:\PRJ\SDCadd\CADD\SC0467A – Gardena Sumps\SC0467A-01-02\Planset_Current Set\SC0467A-01.dwg



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- SHEET PILE CUT OFF WALL (NOTE 5)
- CHAIN–LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH

VERTICAL GAS CONTROL WELL RADIUS OF INFLUENCE (WELL AT CENTER OF CIRCLE)
A = AIR INLET WELL
G = GAS EXTRACTION WELL

4/8

VERTICAL GAS COLLECTION PIPE LOCATION

PROPOSED TREATMENT SYSTEM LOCATION (NOTE 4)

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.
4. TREATMENT SYSTEM LOCATION MAY BE MODIFIED TO ACCOMODATE FUTURE SITE DEVELOPMENT.
5. SHEET PILE CUT OFF WALL WILL NOT EXTEND ABOVE EXISTING GROUND SURFACE.

0 80' 160'
SCALE IN FEET

OPTIONAL ALTERNATIVE 2A VERTICAL GAS CONTROL LAYOUT PLAN
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2013

PROJECT NO. SC0467A

FIGURE 5

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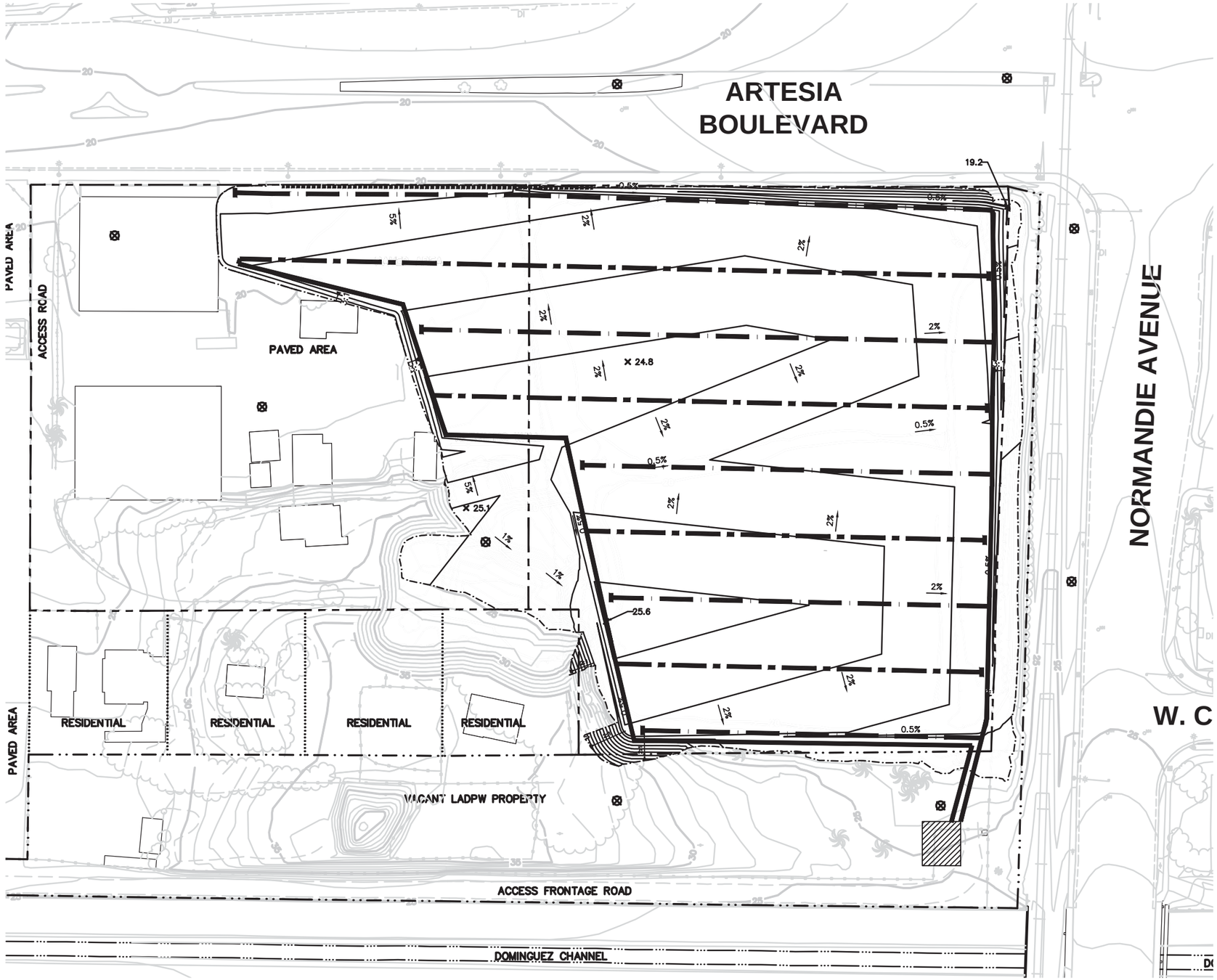

LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- SHEET PILE CUT OFF WALL (NOTE 5)
- CHAIN–LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- HORIZONTAL GAS COLLECTION GEOSTRIP
- HORIZONTAL AIR INLET GEOSTRIP
- HORIZONTAL GAS COLLECTION / AIR INLET SOLID WALL PIPE LOCATION
- PROPOSED TREATMENT SYSTEM LOCATION (NOTE 4)
- GAS MONITORING PROBE 5/8

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.
4. TREATMENT SYSTEM LOCATION MAY BE MODIFIED TO ACCOMODATE FUTURE SITE DEVELOPMENT.
5. SHEET PILE CUT OFF WALL WILL NOT EXTEND ABOVE EXISTING GROUND SURFACE.

0 80' 160'

SCALE IN FEET

OPTIONAL ALTERNATIVE 2A HORIZONTAL GAS CONTROL SYSTEM
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2013

PROJECT NO. SC0467A

FIGURE 6

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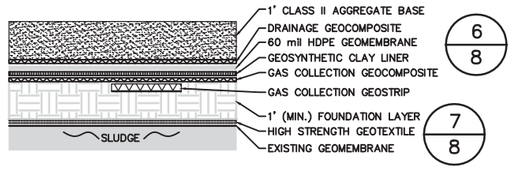
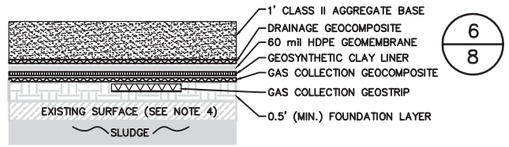


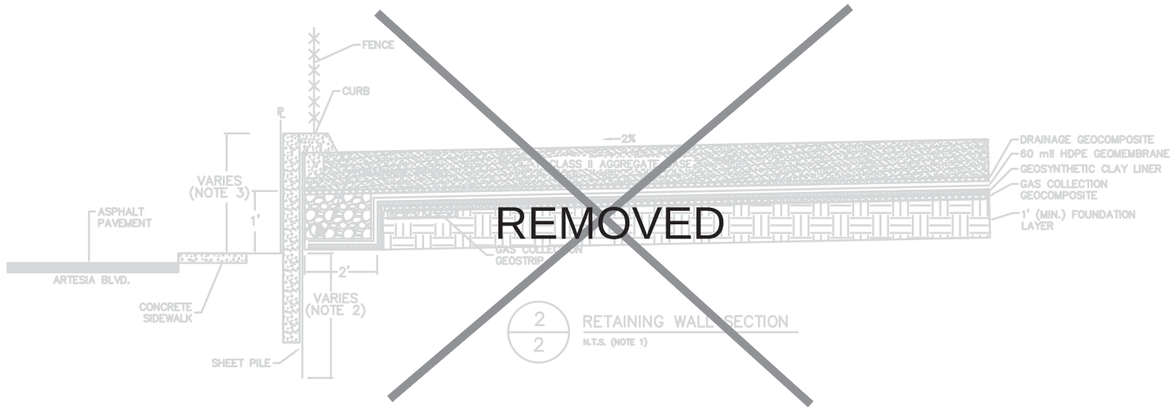
1-A / 2 ALTERNATIVE 2A COOPER SUMP CAP DETAIL

SCALE = 1" = 4' (NOTE 1)



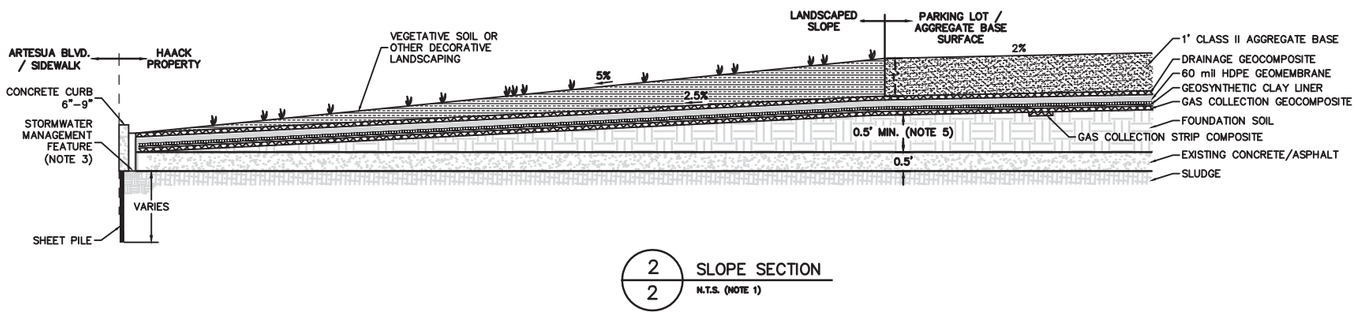
1-B / 2 ALTERNATIVE 2A HAACK SUMP CAP DETAIL

SCALE = 1" = 4' (NOTE 1)



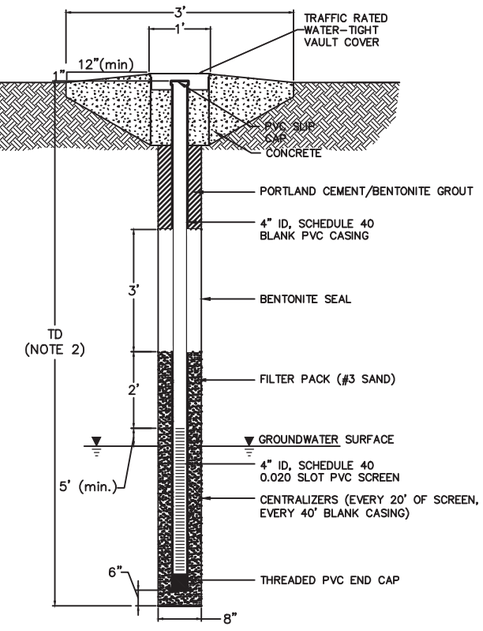
2/2 RETAINING WALL SECTION

N.T.S. (NOTE 1)



2/2 SLOPE SECTION

N.T.S. (NOTE 1)



3 DETAIL

NEW MONITORING WELL

N.T.S.

P:\PR\SDCadd\Library\Monitoring_wells\MW_Flush.dwg

NOTES:

1. GEOSYNTHETIC THICKNESS EXAGGERATED FOR CLARITY.
2. FINAL CONSTRUCTION DEPTHS BASED ON FIELD CONDITIONS. ALL DEPTHS IN FEET BELOW GROUND SURFACE.
3. STORMWATER MANAGEMENT FEATURE MAY DIFFER FROM SHOWN AS IDENTIFIED DURING FINAL DESIGN.
4. EXISTING SURFACE IS DEGRADED ASPHALT OR CONCRETE. SURFACE WILL BE PROTECTED IN PLACE.

OPTIONAL ALTERNATIVE 2A DETAILS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

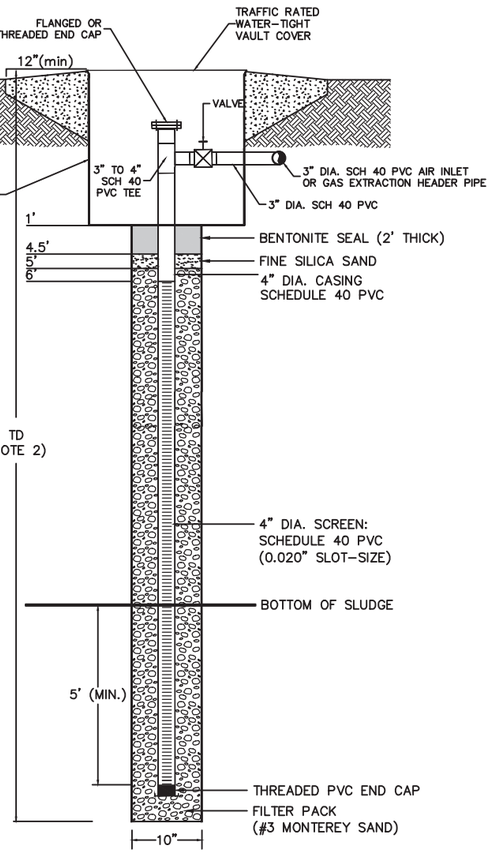
Geosyntec consultants

DATE: NOVEMBER 2013

PROJECT NO. SC0467A

FIGURE 7

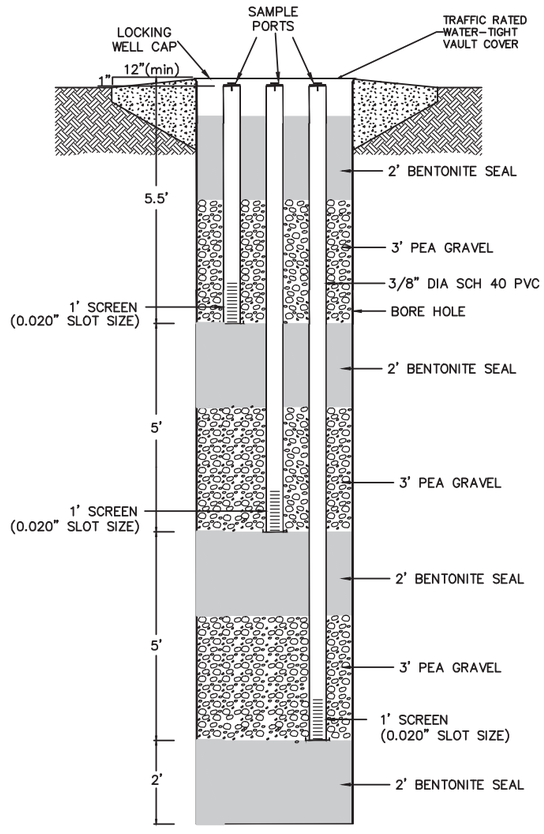
P:\PR\SDCadd\CADD\SC0467A - Gardena Sumps\SC0467A-01-02\Planset_Current Set\SC0467A-07.dwg



4/5 ALTERNATIVE 2 AND 3 CONCEPTUAL VERTICAL GAS CONTROL WELL

N.T.S.

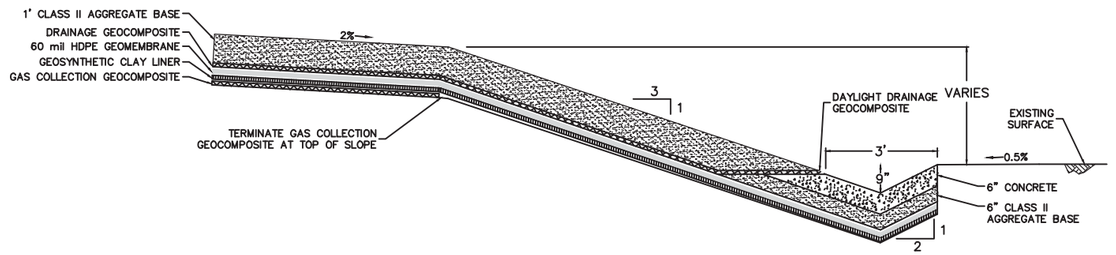
P:\PRJ\SDCadd\Library\Gas System\Gas044.dwg



5/6 DETAIL GAS MONITORING PROBE

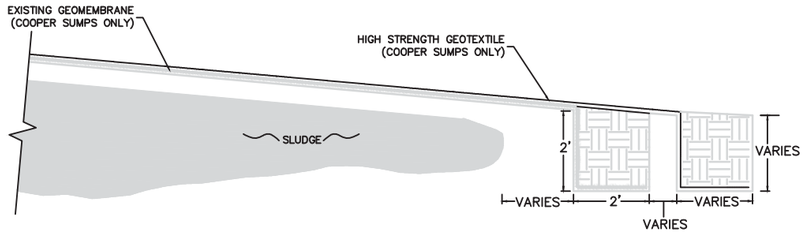
N.T.S.

P:\PRJ\SDCadd\Library\Gas System\Gas044.dwg



6/2 ALTERNATIVE 2A COVER TERMINATION

SCALE = 1" = 4' (NOTE 1)



7/7 ALTERNATIVE 2A HIGH STRENGTH GEOTEXTILE ANCHOR TRENCH DETAIL

SCALE = 1" = 4' (NOTE 1)

NOTES:

1. GEOSYNTHETIC THICKNESS EXAGGERATED FOR CLARITY.

OPTIONAL ALTERNATIVE 2A DETAILS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2013

PROJECT NO. SC0467A

FIGURE 8

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Stantec Consulting Services Inc.
3777 Worsham Avenue, Suite 200, Long Beach CA 90808-1774

February 24, 2015
File: 185850299.500

Attention: Mr. Mustapha Guerbaz
Remedial Project Manager
Brownsfield and Environmental Restoration Program
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress CA 90630

Dear Mr. Guerbaz,

Reference: Temporary Cover Installation at the Haack Rework Area
Gardena Sumps Site, DTSC Project No. 401218
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California 90247

Stantec Consulting Services Inc. (Stantec), on behalf of Atlantic Richfield Company (ARC), has prepared this report on the installation of the temporary cover over the existing geomembrane covering the Haack Rework area. This work was outlined in the *Work Plan for Temporary Cover Installation at the Haack Rework Area* presented to the Department of Toxic Substances Control (DTSC) on October 21, 2014. The Work Plan was approved by the DTSC on November 12, 2014. This temporary cover will prevent rainwater infiltration and/or accidental dermal exposure until the final remedy is implemented as proposed in Geosyntec Consultant's July 1, 2014 *Revised Final Feasibility Study Report (FS Report)*.

All remedy alternatives evaluated in the *FS Report* would remove the temporary cover, geomembrane, and waste material from the Haack Rework Area. For this reason ARC requested this temporary cover to be placed over the existing geomembrane in the Haack Rework Area.

Site Description

The Site is located on the southwest corner of Artesia Boulevard and Normandie Avenue, in the City of Gardena, Los Angeles County, California (Figure 1). The Site occupies approximately 5.6 acres and is subdivided into two parcels of approximately 3.0 acres (Cooper Property) and 2.6 acres (Haack Property). The Site (Figure 2) is bordered to the south by a Los Angeles County Department of Public Works (LACDPW) property and the concrete-lined Dominguez Flood Channel and to the west by commercial and residential buildings.

The area where the temporary cover is to be placed is in the central eastern portion of the Haack Property (Figure 3) that is currently covered with 45 mil geomembrane material. The geomembrane was installed by the DTSC in 1994, and had become degraded over the years with a number of rips and tears.

Reference: **Temporary Cover Installation at the Haack Rework Area**
Gardena Sumps Site, DTSC Project No. 401218
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California 90247

Health & Safety

Prior to start of field activities, Stantec updated the site-specific health and safety plan (HASP) in compliance with 29 CFR 19.10.120(e). All personnel working on the site were required to review the HASP prior to beginning work and signed an agreement that they will adhere to the conditions in the HASP. Additionally, all site field personnel and subcontractors were ARC Control of Work (CoW) trained.

The following health and safety protocol were followed while on site:

1. Site workers conducted a daily tailgate meeting and review the Site Specific Health and Safety Plan;

2. An ARC Hazard Identification Task Risk Assessment (HITRA) were completed and reviewed by Stantec personnel and subcontractors prior to implementation of work;

3. The following Personal Protective Equipment (PPE) were worn:

    a. Hard hat
    b. Steel toe boots
    c. Safety glasses
    d. Long sleeve shirts and pants
    e. Safety vest
    f. Latex, Kevlar, and/or leather gloves as appropriate
    g. Particulate dust masks as needed

4. All equipment operators were certified to operate the specific piece of equipment they were using such as skip loaders and/or Bobcat type of equipment.

Scope of Work

The following scope of work was followed to install the temporary cover over the original geomembrane cover at the Haack Rework Area:

1) Cleaned off debris and soil from adjacent slope with flat shovels and brooms;

2) Patched existing rips and tears using surplus polypropylene ethylene copolymer (PEC) geomembrane material in general accordance with Stantec's June 25, 2013 *Interim Cover Maintenance Plan*. No testing of repairs were performed as this is a temporary repair;

Reference: **Temporary Cover Installation at the Haack Rework Area**
Gardena Sumps Site, DTSC Project No. 401218
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California 90247

3) Installed Americover® 20 mil Reinforced Heavy Duty White sheeting (Americover®) over the original PEC cover. The Americover sheeting is constructed of reinforced polyethylene film on two sides that encapsulate a grid pattern of polyester yarn, and a hot sheet of polyethylene, to form a very strong three layer product (Attachment A). The Americover® sheeting was in approximate 20 x 50 foot sections and were connected using double-side tape with a 3 inch overlap. The overlap was sealed using 4 inch wide, heavy-duty tape that has weather resistant polyethylene backing with a rubber adhesive provided by Americover;

4) The Americover® sheeting extended beneath the existing Cooper Sumps perimeter fence to a length that covered the western edge of the new Cooper Sumps liner, and beneath the Best Management Practice (BMPs) devices currently placed around the perimeter;

5) Placed a minimum of two layers of sand bags (BMPs) around the perimeter of the covered area above the Americover® sheeting that is between the Haack Rework Area and Cooper Sumps; and

6) Placed 3-4 inches of clean Class II Base Rock, not compacted, above the Americover® sheeting to prevent sunlight degradation.

Figure 3 shows the location of the temporary cover installation. Figure 4 shows the cover placement for the Haack Rework Area temporary cover. Attachment B has photographs of the old geomembrane, the covering of Americover®, and the final soil covering.

The Haack Rework Area will be inspected during the quarterly groundwater monitoring events in general compliance with Stantec's June 25, 2013 *Interim Cover Maintenance Plan.* The results of these inspections will be documented in the *Annual Cover Inspection and Maintenance Report*, submitted to the DTSC annually.

Reference: Temporary Cover Installation at the Haack Rework Area
Gardena Sumps Site, DTSC Project No. 401218
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California 90247

If you have any comments regarding the contents of this letter, please contact Mr. Kyle Christie with ARC at 714-670-5303 or via e-mail at kyle.christie@bp.com.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Prepared by:

for R.C.

Rodney Crother, CHg.
Senior Geologist

Reviewed by:

Michael Crowley, PE
Senior Engineer

Approved and Submitted by:

Kelly C. Brown, PG 6714
Principal Geologist

Attachment: Figure 1 - Site Location Map
Figure 2 - Site Map
Figure 3 – Temporary Americover Material Installation Haack Rework Area
Figure 4 – Temporary Cover Installation Schematic

Attachment A – Americover® 20 mil Heavy Duty White Spec Sheet
Attachment B - Photographs

Reference: **Temporary Cover Installation at the Haack Rework Area**
Gardena Sumps Site, DTSC Project No. 401218
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California 90247

Distribution:

Mr. Mustapha Guerbaz **(Original – paper format, and CD)**
Southern California Cleanup Operations Branch
Cypress Office
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630-4732

Mr. Perry Myers, PE **(1 Copy – paper format)**
Engineering and Special Projects Office
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento CA 95826

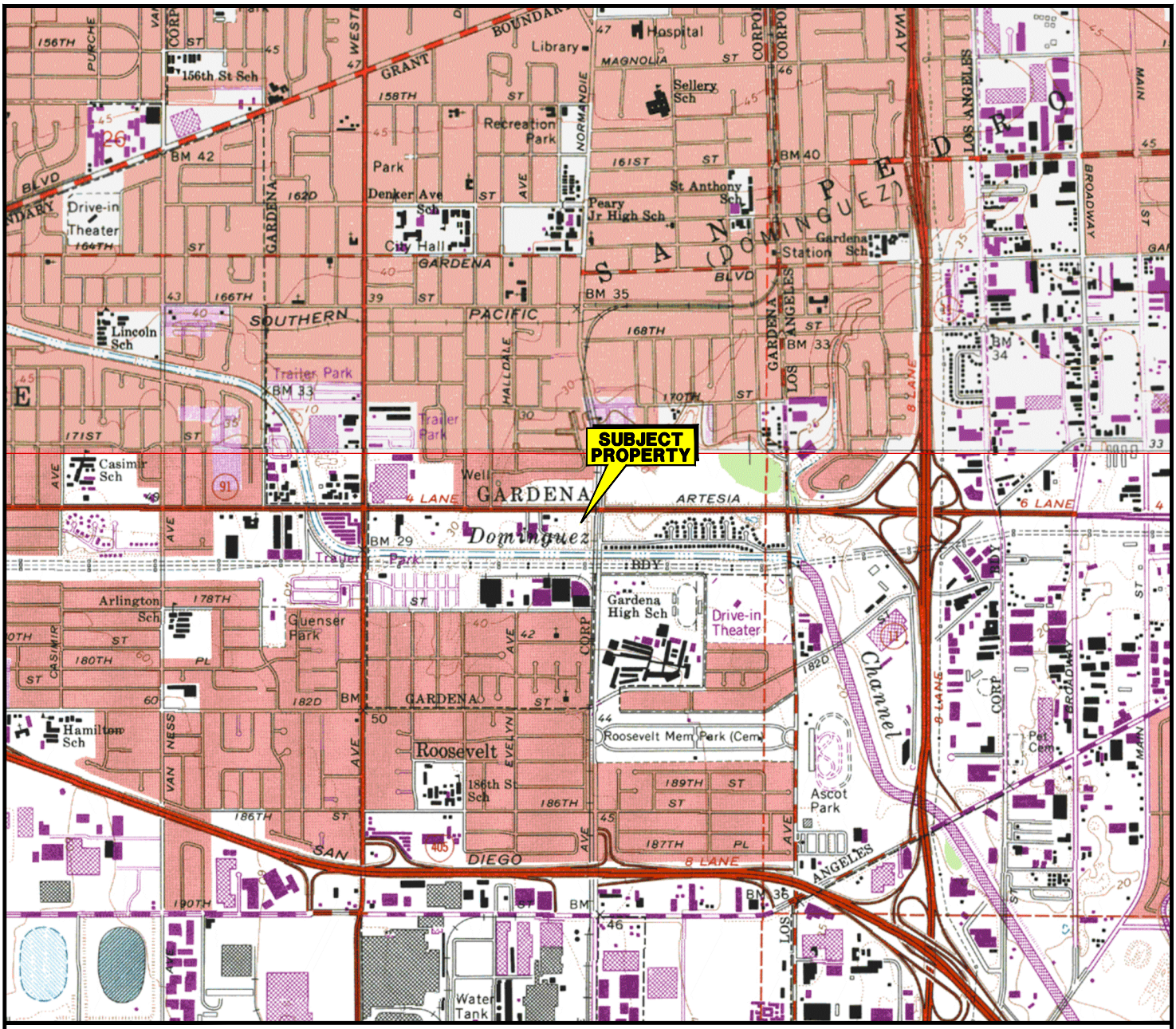
Dennis A. Ragen, Esq. **(Transmittal Letter Only – paper format)**
Deputy Attorney General
110 West A Street, Suite 1100
San Diego, CA 92101

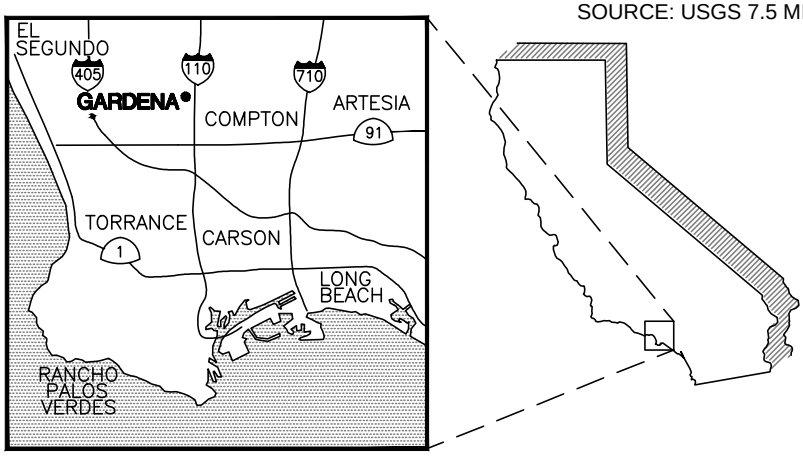
Mr. Kyle A. Christie **(1 Electronic Copy to ENFOS and 1 CD format)**
Atlantic Richfield Company
LPR 4-440
4 Centerpointe Drive
La Palma, CA 90623-1066

Mr. Doug Reinhart **(1 Electronic Copy - CD format)**
BP Legal
150 W. Warrenville Road
Mail Code 200-1W
Naperville, Illinois 60563

Stantec Consulting Services Inc.
3777 Worsham Avenue, Suite 200, Long Beach CA 90808-1774

FIGURES





SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC MAP, TORRANCE QUADRANGLE, 1964
PHOTOREVISED 1981
INGLEWOOD QUADRANGLE, 1964
PHOTOREVISED 1981

N

0 2000 4000

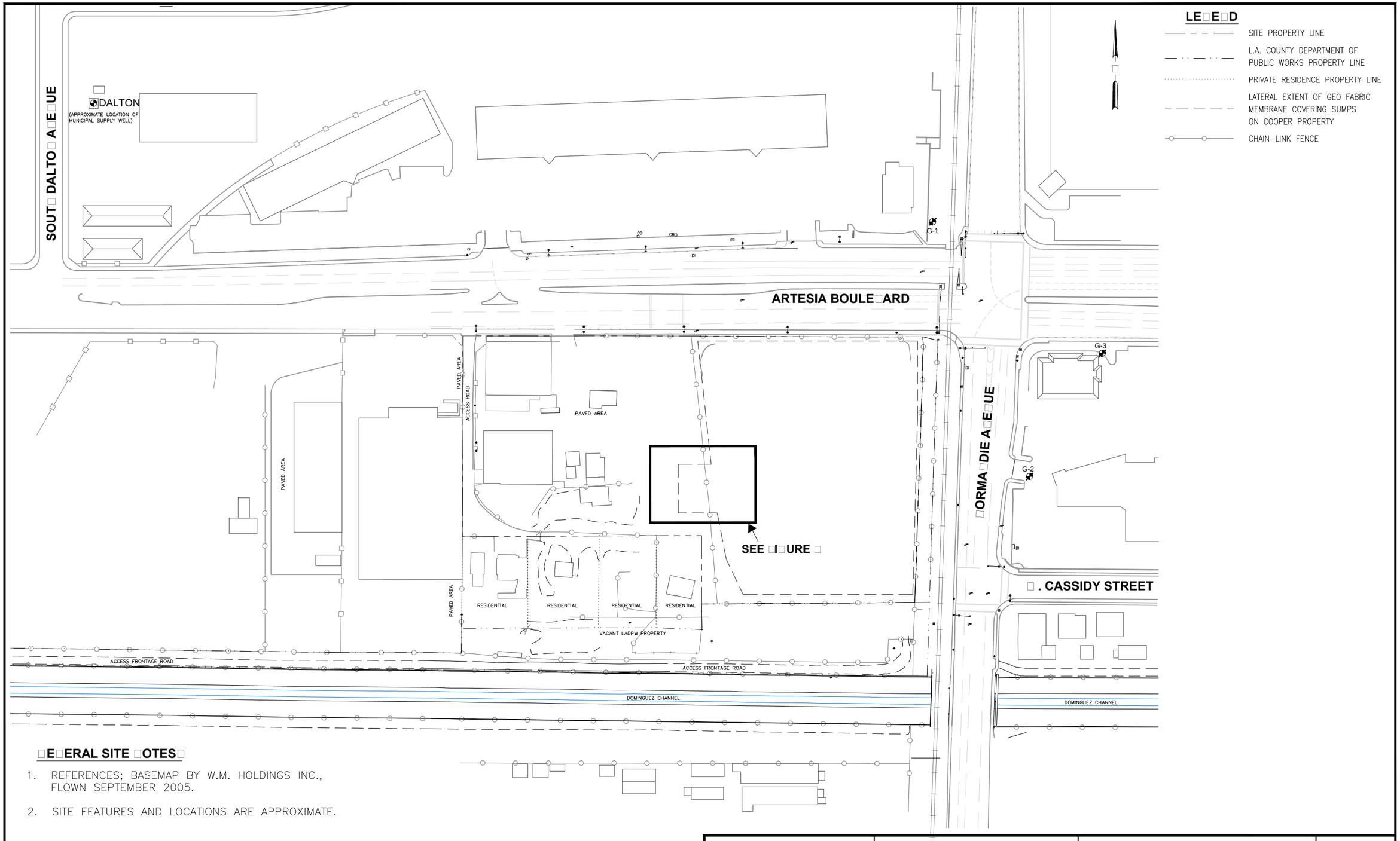
APPROXIMATE SCALE (FEET)

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
PHONE: (805) 230-1266 FAX: (805) 230-1277

FOR:		FIGURE:
GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA	SITE LOCATION MAP	1

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802613	R. Roman	M. Mason	K. Brown	12/09/13

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\GW-GardenaSumps\dwg\2013-Q4\BP-GS_SLM.dwg|TRoman|Dec 09, 2013 at 15:22|Layout: F1



GENERAL SITE NOTES

1. REFERENCES; BASEMAP BY W.M. HOLDINGS INC., FLOWN SEPTEMBER 2005.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.

0 140 280

APPROXIMATE SCALE (FEET)

Stantec
3777 Worsham Avenue, Suite 200
Long Beach, California
Phone: (562) 354-2630

FOR:			
Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA		SITE MAP	2
JOB NUMBER: 211802613.700	DRAWN BY: J.Barboza	CHECKED BY: M.Mason	APPROVED BY: K.Brown	DATE: 04/15/09

FILEPATH:V:\2118\active_CADD\GIS-US1331\Projects 2014\other offices\Long Beach\Gardena_sumps\20140925_BPGardenaSumps_fig2_site_map_(acad_2010).dwg|rocampo|Sep 25, 2014 at 16:45|Layout: figure_2

□E□ERAL SITE □OTES□

1. REFERENCE: GOOGLE EARTH PROFESSIONAL 2014.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.

0 30 60

APPROXIMATE SCALE IN FEET

Stantec
3777 Worsham Avenue, Suite 200
Long Beach, California
Phone: (562) 354-2630

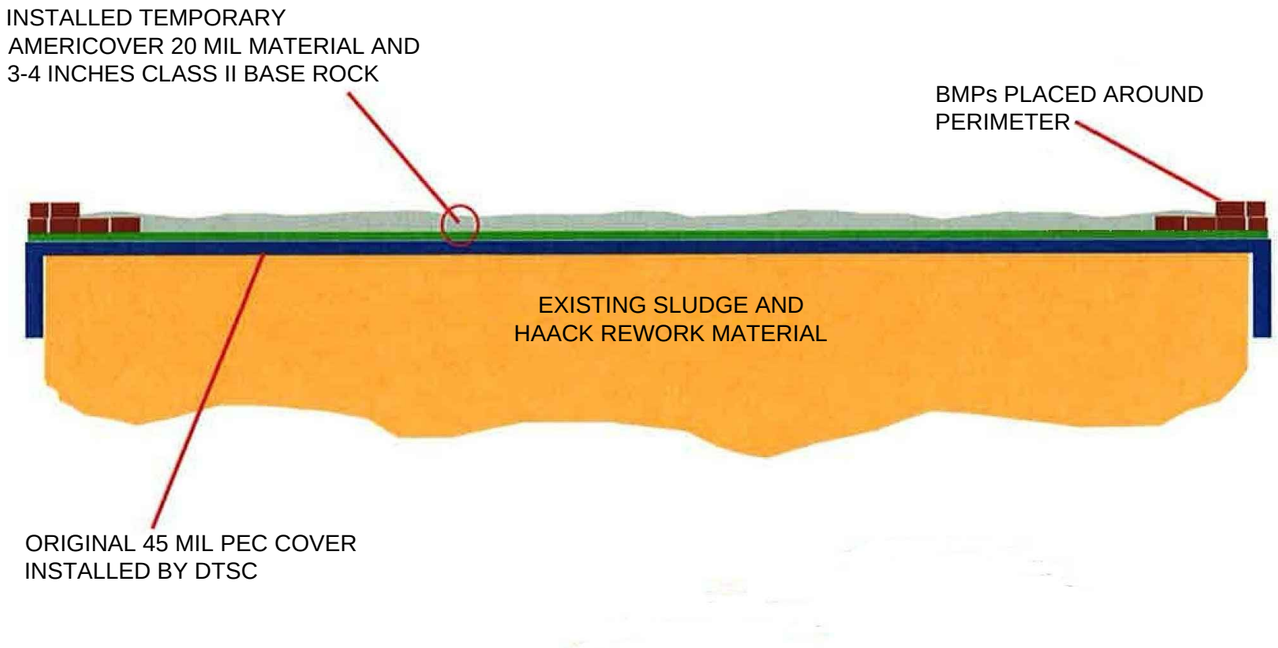
FOR:
Southwest Corner of Artesia Boulevard
and Normandie Avenue
Gardena, CA

TEMPORARY AMERICOVER
MATERIAL INSTALLATION
HAACK REWORK AREA

3

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802613.700	R. OCampo	R. Crother	K.Brown	09/25/14

FILEPATH:V:\2118\active_CADDIGIS-US1331\Projects 2015\other offices\Long Beach\Gardena_sumps\20150212_BPGardenaSumps_fig2_site_map.dwg|rocampo|Feb 18, 2015 at 8:36|Layout: figure_3



NOT TO SCALE

Stantec
3777 Worsham Avenue, Suite 200
Long Beach, California
Phone: (562) 354-2630

FOR:			
Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA	TEMPORARY COVER INSTALLATION SCHEMATIC		4
JOB NUMBER: 211802613.700	DRAWN BY: R. OCampo	CHECKED BY: R. Crother	APPROVED BY: K.Brown	DATE: 09/25/14

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Stantec Consulting Services Inc.
3777 Worsham Avenue, Suite 200, Long Beach CA 90808-1774

ATTACHMENT A

AMERICOVER® 20 MIL HEAVY DUTY WHITE SPEC SHEET

PSR 20WW

www.americover.com
800-747-6095
fax: 760-747-1920

Product	Part #
PSR20WW	20WW

APPLICATIONS

- Temporary Enclosures
- Outdoor Storage Covers
- Construction Site Coverings
- Interim Landfill Covers
- Daily Landfill Covers
- Temporary Erosion Control
- Pit/Pond Liners
- Railroad Car Covers
- Temporary Walls
- Asbestos, Lead, or Mold Abatement Applications
- Building Enclosures
- Scaffold Wrapping
- Remediation Covers
- Underslab Vapor Retarders
- Crawlspace

Product Description

Americover's PSR offers several advantages in different applications. With its 1000 denier polyester string the Americover's PSR series offers excellent tear strength at the string and the open areas between the strings provide outstanding elongation properties. These physical characteristics make our PSR the appropriate material for a wide variety of applications.

Americover's PSR Films are manufactured using a blend of the best virgin polyethylene resins formed into two skins. These skins act as the "bread" to the reinforced "sandwich" encapsulating a grid pattern of polyester string and a hot sheet of polyethylene to form a three layer product suitable for multiple applications.

Product Use

PSR 20WW is significantly stronger and more tear resistant than standard 20 mil poly films. The extrusion lamination process and high strength reinforcement scrim make these films exceptionally strong.

Size & Packaging

Standard rolls are 6.75' x 100', 13.34' x 100' and 20' x 100'. Custom sizes available to meet your specifications.

Color: White/White

PSR 20WW

Product Testing Data: PSR 20WW

Properties	Test Method	English	Metric
APPEARANCE		White/White	
Thickness, Nominal		20 mil	0.51 mm
Weight Per Msf		105 lbs/MSF 15.1 oz/ yd2	513 g/m2
Construction		Extrusion laminated with scrim reinforcement	
1” Tensile Strength	ASTM D7003	90 lbf.	400 N
Elongation At Peak Strength	ASTM D7003	25%	25%
Elongation At Break	ASTM D7003	900%	900%
Grab Tensile	ASTM D7004	135 lbf.	600 N
Puncture Strength	ASTM D4833	39 lbf.	173 N
*Trapezoid Tear	ASTM D4533	95 lbf.	423 N
Hydrostatic Resistance	ASTM D751	150 psi	1034 kPa
Maximum Use Temperature		180°F	82°C
Minimum Use Temperature		-70°F	-57°C
Permeability			
Wvtr	ASTM E96 **Method A	0.010 g/100in2/day	0.16 g/m2/day
Perm Rating	ASTM E96 **Method A	0.022 U.S. Perms	0.015 Metric Perms

Notice: All values are determined on specimens prepared to ASTM standards.

Nominal values should not be interpreted as specifications.

The information provided herein is based upon data believed to be reliable. All testing is performed in accordance with ASTM standards and procedures. All values are typical and nominal and do not represent either minimum or maximum performance of the product. Although the information is accurate to the best of our knowledge and belief, no representation of warranty or guarantee is made as to the suitability or completeness of such information. Likewise, no representation of warranty or guarantee, express or implied, or merchantability, fitness or otherwise, is made as to product application for a particular use.

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Stantec Consulting Services Inc.
3777 Worsham Avenue, Suite 200, Long Beach CA 90808-1774

ATTACHMENT B

PHOTOGRAPHS

Haack Rework Area 1994 cover material prior to repair of degraded areas.

Haack Rework Area 1994 cover repair of degraded areas prior too installation of temporary cover.

Haack Rework Area with Americover® White placed over old cover prior to base rock placement.

Completed temporary cover installation over Haack Rework Area with BMPs.

Environmental Oversight Agreement
for the City of Gardena, Gardena Sumps Site

Docket No. HSA-FY 17/18-092

1. INTRODUCTION

This Environmental Oversight Agreement ("Oversight Agreement") is made between the City of Gardena ("City" or "Local Agency") and the California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") in connection with a "blighted property" as that term is defined in Health and Safety Code Section 25403(b).

1.1. Purpose of Agreement. The purpose of this Oversight Agreement is to facilitate the City's investigation of the Gardena Sumps property, located within the City's and DTSC's jurisdiction; to provide for reimbursement of DTSC's oversight costs; and to assist the City in meeting the requirements to complete the investigation plan. Under this Oversight Agreement, the City may request (and pay for) oversight without any commitment to move forward with a project and may request early consultation with DTSC, where desirable.

1.2. Parties. DTSC and the City are each a "Party" to, and collectively are the "Parties" to, this Oversight Agreement.

1.3. Jurisdiction.

1.3.1. City's Jurisdiction. The City is authorized by Section 25403 to take certain actions in response to blighted properties within its corporate boundaries. Section 25403.1, subdivision (a)(1)(A) authorizes the Local Agency to take any action that the Local Agency determines is necessary and that is consistent with other state and federal laws to investigate or clean up a release of hazardous material (as that term is defined in Health and Safety Code section 25403(i)), on, under, or from a blighted property located within the Local Agency, whether the Local Agency owns the property or not, if the applicable provisions in Health and Safety Code section 25403.1, subdivisions (a) and (b) are satisfied. In addition, Health and Safety Code sections 25403.1(a)(2)(B) and 25403.4 recognizes the need for the Local Agency to pay the DTSC's costs pursuant to an agreement. This Oversight Agreement includes payment of the DTSC's costs to review and approve the investigation plan and conduct certain oversight of completion of that plan.

1.3.2. DTSC Jurisdiction. Health and Safety Code section 25403 et seq. authorizes DTSC to enter an Oversight Agreement with a Local Agency with respect to a blighted property and calls for cost reimbursement agreements between DTSC and local agencies.

1.4 Property. The Parties intend for this Oversight Agreement to be utilized in connection with the Cooper portion of the Gardena Sumps property (Gardena Sumps), which is located on the southwest corner of Artesia Boulevard and Normandie Avenue,

and is identified by Los Angeles County Parcel Numbers 6106-036-034 and 6106-036-035.

2. AGREEMENT

THE PARTIES HEREBY AGREE AS FOLLOWS:

2.0. Activities to be Conducted. DTSC and the City will undertake activities as specified in this Oversight Agreement and as more specifically detailed in Exhibits A, B, and C. The Parties acknowledge and agree that all work performed pursuant to this Oversight Agreement is intended to be consistent with applicable laws and regulations, including, but not limited to, Health and Safety Code sections 25403-25403.8.

2.1. Intentionally Omitted.

2.2. Amendment of Exhibits. Upon approval in writing by the Oversight Agreement Manager for DTSC and by the City, any one or more of the Exhibits may be amended and the Exhibits, as amended, will be incorporated into this Oversight Agreement.

2.3 Additional Activities. Activities in addition to those specified in an agreed upon Scope of Work may be conducted, and DTSC oversight provided, pursuant to amendment(s) to an Exhibit in accordance with Sections 2.2 and 2.8. If DTSC expects additional oversight costs to be incurred related to these additional activities, DTSC will provide an estimate of the additional oversight cost to the City as an amendment to Exhibit B as provided in section 2.8.

2.4 Oversight Agreement Managers and Project Managers. Patrick Hsieh is designated by DTSC as its Project Manager for this Oversight Agreement. Mitchell G. Lansdell is designated by the City as its Manager for this Oversight Agreement. Each Party to this Oversight Agreement will provide at least ten (10) days advance written notice to the other of any change in its designated Oversight Agreement Manager. DTSC and the City may designate a Project Manager for the property incorporated into this Oversight Agreement. Both DTSC and the City reserve the right to appoint different Project Managers, pursuant to this Oversight Agreement, for different projects that may be ongoing at the same time.

2.5 Notices and Submittals.

2.5.1 All notices, documents and communications that are to be given under this Oversight Agreement, unless otherwise specified, will be sent to the respective Parties at the following addresses

To DTSC:

Patrick Hsieh
Brownfields & Environmental Restoration Program
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630

To the City:

Mitchell G. Lansdell, City Manager (retired)
City of Gardena
1700 W. 162nd Street, Room 112
Gardena, 90247-3778

2.5.2 The Parties will give such notices to known property owners and other parties as required by applicable law.

2.6 DTSC Document Review and Approval. If DTSC determines that any report, plan, schedule or other document submitted for approval pursuant to this Oversight Agreement does not meet the conditions in this Oversight Agreement or fails to protect public health or safety or the environment, DTSC will consult with the City and return comments to the City with recommended changes.

2.7 Extension Requests. If the City is unable to perform any activity or submit any document within the time required under this Oversight Agreement, the City may, prior to expiration of the time, request an extension of the time in writing. The extension request shall include a justification for the delay. All such requests shall be in advance of the date on which the activity or document is due.

2.8 Payment. A current estimate of DTSC's oversight costs with respect to the Scope of Work described in Exhibit A is contained in Exhibit B. The Parties understand that the estimate set forth in Exhibit B cannot be relied upon as the final cost figure. The City agrees to pay (1) all costs incurred by DTSC in association with preparation of this Oversight Agreement; (2) for review of documents submitted by the City subsequent to the effective date of this Agreement; and (3) all costs incurred by DTSC in implementing, providing oversight, or conducting other activities pursuant to this Oversight Agreement. Costs incurred include interest on unpaid amounts that are billed and outstanding more than 60 days from the date of DTSC's quarterly invoice. DTSC will notify the City when its charges approach sixty-five percent (65%) of the total Cost Estimate prepared for the property. The Parties agree to evaluate the budget to determine if either a revised estimate or scope of work is needed at the time of the written notice or whether the City wishes to terminate as provided in Section 24 of the Standard Provisions (Exhibit D). If DTSC or the City anticipates a change in the Scope of Work or the need for revision of the Cost Estimate, DTSC will provide a revised estimate in advance of exceeding the total cost estimate.

2.8.1 In anticipation of the activities to be completed under this Oversight Agreement, the City will make an advance payment of $33,305 to DTSC no later than thirty (30) days after the effective date of this Oversight Agreement. If the City's advance payment does not cover all costs payable to DTSC under this subsection, DTSC will invoice the City quarterly. The City agrees to pay the additional costs within sixty (60) days of receipt of DTSC's quarterly invoice.

2.8.2 All payments made by the City for activities performed pursuant to this Oversight Agreement will be by check made payable to the "Department of Toxic Substances Control," and bearing on its face the project code for the property (DTSC Site Code 301801) and the Contract Number of this Oversight Agreement. Payments should be made to:

Department of Toxic Substances Control
Accounting/Cashier
1001 I Street, 21st Floor
P.O. Box 806
Sacramento, California 95812-0806

2.9 Exhibits. Standard provisions of this Oversight Agreement are contained in Exhibit D (Oversight Agreement Standard Provisions), attached to this Oversight Agreement. All exhibits attached to this Oversight Agreement, including Exhibit D, are incorporated into this Oversight Agreement by reference.

2.10. Effective Date. The effective date of this Oversight Agreement is the date when this Oversight Agreement is fully executed.

2.11. Representative Authority. Each undersigned representative of the Parties to this Oversight Agreement certifies that she or he is fully authorized to enter into the terms and conditions of this Oversight Agreement and to execute and legally bind the Party to this Oversight Agreement.

2.12. Counterparts. This Oversight Agreement may be executed and delivered in any number of counterparts, each of which when executed and delivered shall be deemed to be an original, but such counterparts shall together constitute one and the same document.

Date: Feb. 20, 2018

John Scandura, Branch Chief
Cleanup Program - Cypress
Brownfields & Environmental Restoration Program
Department of Toxic Substances Control

Tasha Cerda

Date: 02-13-18

Tasha Cerda, Mayor
City of Gardena

Approved as to Form:

Peter L. Wallin, City Attorney
City of Gardena

EXHIBITS

A SCOPE OF WORK

B COST ESTIMATE FOR REMEDIATION OVERSIGHT SCOPE OF WORK

C EXCAVATION PILOT TEST AND FEASIBILITY ANALYSIS WORK PLAN (to be attached once reviewed and approved)

D OVERSIGHT AGREEMENT STANDARD PROVISIONS

EXHIBIT A

INITIAL SCOPE OF WORK: GARDENA SUMPS EXCAVATION PILOT TEST AND FEASIBILITY ANALYSIS WORK PLAN

The following tasks may be completed as part of this Oversight Agreement:

TASK 1. Technical Consultation and Assistance With Work Plan for Pilot Test.

DTSC will provide technical consultation and assistance to the City in connection with developing an Excavation Pilot Test and Feasibility Analysis Work Plan (Work Plan) to implement a pilot test designed to evaluate various issues (including but not limited to those specified on Exhibit A-1) that may arise in connection with an excavation-oriented remedy at the Gardena Sumps site. Technical consultation may include, but is not limited to, participating in meetings and/or conference calls; researching responses to City's questions; reviewing and approving technical reports; conducting site visits; and performing other related activities requested by the City. DTSC's technical consultation shall not include actual physical cleanup of the Gardena Sumps site.

TASK 2. The final Work Plan, when approved by DTSC, shall be included as Exhibit C to the Oversight Agreement .

TASK 3. The parties agree to meet and confer regarding public participation efforts they may undertake including, but not limited to, the issuance of a Fact Sheet related to the Work Plan activities.

TASK 4. The City will comply with California Environmental Quality Act (CEQA) as applicable for all activities conducted under the Oversight Agreement.

TASK 5. The City and its contractor will submit to DTSC the draft Work Plan within 45 days of the effective date of this Agreement.

TASK 6. The City will work with its contractor, under DTSC field oversight, to implement the Work Plan within sixty (60) days of DTSC approval of the Work Plan. The City may request an extension of up to sixty (60) days, if needed, to obtain City Council approval of the full funding to implement the Work Plan.

TASK 7. The City and its contractor will submit to DTSC a Work Plan Report describing the collected data and recommendations in connection with the evaluation of the excavation-oriented remedy alternative within 45 days of completing field activities.

EXHIBIT A-1

DTSC'S GOALS FOR SLUDGE PILOT STUDY GARDENA SUMPS SITE
AS PROVIDED TO GARDENA

GAS GENERATION

- Quantify generation of hydrogen sulfide and sulfur dioxide gases to determine potential threat to workers and public
- Evaluate containment measures such as
    - Tent
    - Hood over auger
    - Spray-on products (Hydroseal, Odex)
    - Gas treatment methods

SOLIDIFICATION/NUETRALIZATION OF SLUDGE

- Evaluate methods of mixing sludge and amendments to facilitate excavation and off-haul
    - Bucket mixing
    - Auger
    - Pug mill
- Evaluate different amendment mixtures using the results of the previous bench-scale testing, or perform new testing

TRANSPORTATION

- Determine effective methods of or need for odor control
- Is direct loading necessary/feasible
- Evaluate haul truck accessibility
- Can amended or un-amended sludge be stockpiled and under what conditions

DISPOSAL

- Identify receiving facilities and their requirements
- Identify any treatment necessary to meet disposal facility requirements
- Feasibility of Clean Harbors Buttonwillow performing amendment/neutralization, excavation and disposal

EXHIBIT B

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
COST ESTIMATE WORKSHEET*
OVERSIGHT AGREEMENT

City of Gardena
Project Name: Gardena Sumps - Excavation Pilot Test and Feasibility Analysis Work Plan, Fieldwork, and Report
CalStars Site Code:
Date: September 7, 2017

PHASE / TASK	PROJECT STAFF OR SUPPORT GROUP / DTSC EMPLOYEE CLASSIFICATION												
	Agreement Coordinator	Project Manager		Supervisor		Toxicology	Geology	Industrial Hygiene	Engineering	Public Participation	CEQA	Legal	Clerical
	AGPA	ES	EG	Sup. ES	Sup. HSEI	Staff Toxicologist	Eng. Geo.	Assoc. IH	HSE	PPS	AEP	Staff Counsel	OT (T)
Processing of Oversight Agreement	4		4	2								4	1
Review and provide comments on Pilot Test Work Plan [1]			24	4		8	18	8	24	8		2	2
Meeting with City of Gardena to discuss DTSC comments on Work Plan [2]			8	8		4	4		4				
Field Work Oversight [3]			20				20	2					
Review Pilot Test Report [4]			24	4		8	8	8	40			2	2
Project Management [5]			14										1
Total No. Hours/Class													
Hourly Rate/Class													
Cost/Class													
Grand Total Cost	4	0	94	18	0	20	50	18	68	8	0	6	6
	$136	$132	$218	$287	$251	$206	$256	$175	$256	$136	$132	$224	$83
Notes:	$544	$0	$20,492	$5,166	$0	$4,120	$12,800	$3,150	$17,408	$1,088	$0	$1,344	$498

* Based on DTSC Contract Estimation Rates, effective 07/01/2017 - 06/30/2018. Hourly rates include indirect labor costs, are revised annually, and are subject to change.	
Advance Payment	**$33,305**

DTSC Employee Classification Abbreviations:

AEP -- Associate Environmental Planner
Assoc. IH -- Associate Industrial Hygienist
Eng. Geo. -- Engineering Geologist
ES -- Environmental Scientist
HSE -- Hazardous Substances Scientist
OT (T) -- Office Technician (Typing)
PPS -- Public Participation Specialist
SSA -- Staff Services Analyst
Sup. ES -- Supervising Environmental Scientist
Sup. HSEI -- Supervising Hazardous Substances Engineer I

1. DTSC assumes review of Work Plan may require several iterations.
2. Assuming two meetings to discuss the Work Plan
3. Assuming three days of field work oversight
4. DTSC assumes review of Work Plan Report may require several iterations.
5. All administrative activies, internal meetings, and updating Envirostor.

EXHIBIT C

FINAL GARDENA SUMPS EXCAVATION PILOT TEST AND FEASIBILITY ANALYSIS WORK PLAN PREPARED BY EKI

EXHIBIT D

OVERSIGHT AGREEMENT STANDARD PROVISIONS

1. The Standard Provisions in this Exhibit D are incorporated by reference into and are a part of the Oversight Agreement. The Standard Provisions have been placed in this Exhibit D for reasons of administrative efficiency. As used herein Local Agency has the meaning provided in Health and Safety Code section 25403.

2. Payment Provisions. Subject to Section 2.8 of the Oversight Agreement, if any bill is not paid by the Local Agency within sixty (60) days after it is sent by DTSC, the Local Agency may be deemed to be in material default of this Oversight Agreement.

If an advance payment is called for under Section 2.8 of this Oversight Agreement, and if such advance payment exceeds DTSC's actual costs for Oversight Agreement preparation, consultation, review, approval, oversight and other activities conducted under this Oversight Agreement, DTSC will provide an accounting for expenses and refund the difference within one hundred-twenty (120) days after termination of this Oversight Agreement in accordance with Section 24 of this Exhibit. In no other case will the Local Agency be entitled to a refund from DTSC or to assert a claim against DTSC for any amount paid or expended under this Oversight Agreement.

3. Billing Dispute Resolution. If the Local Agency disputes a DTSC billing, or any part of a DTSC billing, the Local Agency will notify DTSC's designated Oversight Agreement Manager and attempt to resolve the dispute informally. If the Local Agency desires a formal dispute resolution process with regard to the billing, the Local Agency will file a request for dispute resolution in writing within 45 days of the date of receiving the bill in dispute, or by such later deadline as the Parties may agree to in writing. The written request will describe all issues in dispute and will set forth the reasons for the dispute, both factual and legal. The Local Agency will send the written request to:

Special Assistant for Cost Recovery and Reimbursement Policy
Department of Toxic Substances Control
P.O. Box 806
Sacramento, CA 95812-0806

The Local Agency will also send a copy of the written request for dispute resolution to the person designated in subsection 2.5.1 of this Oversight Agreement to receive submittals. A decision on the billing dispute will be rendered by the person designated above or other DTSC designee. The existence of a dispute shall not excuse, stay or suspend any other compliance obligation or deadline required pursuant to this Oversight Agreement.

4. Communications. All DTSC approvals and decisions made regarding submittals and notifications will be communicated to the Local Agency in writing by DTSC's Oversight Agreement Manager or his/her designee. No informal advice, guidance, or suggestions or comments by DTSC regarding reports, plans, specifications, schedules or any other writings by the Local Agency shall be construed to relieve the Local Agency

of the obligation to obtain such written approvals.

5. Endangerment During Implementation. In the event DTSC determines that any activity or operations caused by or on behalf of the Local Agency or its agents (whether or not pursued in compliance with this Oversight Agreement) may pose an imminent or substantial endangerment to the health and safety of people on any property or in the surrounding area or to the environment: i) the Local Agency will take the necessary actions as directed by DTSC to abate the endangerment it created for such period of time as may be needed to abate the endangerment; or ii) if DTSC determines that conditions require DTSC to exercise its authority to abate the endangerment, the Local Agency may stop further implementation of this Oversight Agreement. However, if the Local Agency stops implementation, the Local Agency must meet the conditions under Section 12 of this Exhibit (Notification of Environmental Condition) and, if necessary, must revise the applicable Scope of Work and meet the stop-work conditions as provided in Section 23 of this Exhibit (Amendments). If DTSC determines that an endangerment is the result of Local Agency actions that have caused a release of hazardous materials or substantially worsened the endangerment, the Local Agency will take those reasonable steps DTSC determines are necessary to mitigate the condition that the Local Agency caused or substantially worsened and to secure the property in order to avoid endangerment to the community. These steps may include installing a protective cover, constructing fencing and signage or other appropriate means to protect public health and the environment. The Local Agency will not be compelled to fully assess or mitigate a release of hazardous materials if DTSC determines that the Local Agency did not cause or substantially worsen the release.

6. Condition Precedent. It is expressly understood and agreed that DTSC's receipt of the advance payment, if any, described in subsection 2.8.1 of this Oversight Agreement is a condition precedent to any obligation of DTSC to provide consultation, oversight, review and/or comment on documents or to provide any work or perform any activity pursuant to this Oversight Agreement.

7. Record Retention. DTSC will retain all cost records associated with the work performed under this Oversight Agreement for such time periods as may be required by applicable state law. The Local Agency may request to inspect all documents that support DTSC's cost determination in accordance with the Public Records Act, Government Code section 6250 *et seq.*

8. Project Coordinator. The work performed pursuant to this Oversight Agreement will be under the direction and supervision of a qualified Project Coordinator, with expertise in the cleanup of sites impacted by hazardous materials. The Local Agency will submit: a) the name and address of the Project Coordinator; and b) in order to demonstrate expertise in the cleanup of sites impacted by hazardous materials, the resume of the Project Coordinator. The Local Agency will promptly notify DTSC of any change in the identity of the Project Coordinator. All engineering and geological work shall be conducted in conformance with applicable state law, including but not limited to, Business and Professions Code sections 6735 and 7835.

9. Access. If DTSC determines access is necessary in order to perform any of the tasks contained in Exhibit A (Scope of Work), the Local Agency will exercise its best efforts to provide access for its contractors and representatives, DTSC and its representatives, and any other governmental entity with jurisdiction over any aspect of this project, to the property subject to this Oversight Agreement for which access is needed. In the event that such access is not provided, it is understood that the implementation of tasks identified in this Agreement for the property for which access cannot be obtained may not proceed. The Local Agency will also exercise its best efforts to provide access for DTSC and its representatives access and/or obtain access to any area beyond the boundaries of the Property subject to this Oversight Agreement to which access is necessary to implement this Oversight Agreement. To the extent such access is obtained by the Local Agency, such access will be provided to DTSC's employees, contractors, and consultants at all reasonable times. Nothing in this section is intended or shall be construed to limit in any way the right of entry or inspection that DTSC or any other agency may otherwise have by operation of any law. To the extent such access can be legally obtained by DTSC or the Local Agency, DTSC and its authorized representatives shall have the authority to enter and move freely about all of the property at the property at all reasonable times for purposes including, but not limited to: inspecting records and operating logs, sampling activities, administering any other aspects of this Oversight Agreement relating to the property, reviewing the progress of the Local Agency in carrying out the terms of this Oversight Agreement, conducting such tests as DTSC may determine are necessary, and verifying the data submitted to DTSC by the Local Agency.

10. Sampling, Data and Document Availability. The Local Agency will submit to DTSC a listing of all known reports in its possession, including sample analysis results, environmental assessment reports, and any other information in its possession pertinent to the hazardous materials management and/or release, characterization and cleanup of the property. The Local Agency will provide copies of any non-privileged reports or information requested by DTSC and will identify privileged or other confidential documents that the Local Agency is not providing. The Local Agency will also inform DTSC of any other known reports and documents, not in its possession, pertinent to the hazardous materials release, characterization and cleanup of a property, including the name of the document (if known) and the identity and address of the person/entity with possession of the document (if known).

11. Notification of Field Activities. The Local Agency will inform DTSC at least seven (7) days in advance of all field activities which the Local Agency undertakes, including activities the Local Agency directs a third party to undertake, pursuant to this Oversight Agreement at the property and will allow DTSC and its authorized representatives to take duplicates of any samples collected by the Local Agency pursuant to this Oversight Agreement.

12. Notification of Environmental Condition. The Local Agency shall notify DTSC's Agreement Manager immediately upon learning of any condition posing an immediate threat to public health or safety or the environment. Within seven (7) days of the Local Agency's discovery of such a condition, the Local Agency shall submit a brief report to

DTSC, setting forth the events that occurred and the measures taken, if any, in response to those events.

13. Preservation of Documentation. The Local Agency will maintain a central repository of the data, reports, other documents that it prepares pursuant to this Oversight Agreement and other documents relevant to the activities conducted under this Oversight Agreement. All such data, reports and other documents regarding the property will be preserved by the Local Agency for a minimum of six (6) years after the conclusion of all activities carried out under this Oversight Agreement with respect to the property. If DTSC requests that some or all of these documents be preserved for a longer period of time, the Local Agency will either: (i) comply with that request, (ii) deliver the documents to DTSC, or (iii) permit DTSC to copy the documents prior to destruction. Following the expiration of the six-year minimum retention period for documents regarding the property, the Local Agency will notify DTSC in writing at least ninety (90) days before destroying any documents prepared pursuant to this Oversight Agreement with respect to the property. If any litigation, claim, negotiation, audit or other action involving the records has been started before the expiration of the six-year period with respect to the property, the related records will be retained until the completion and resolution of all issues arising from that action or until the end of the six-year period, whichever is later.

14. Time Periods. Unless otherwise specified, time periods begin from the date this Oversight Agreement is fully executed, and "days" means calendar days. "Business days" means all calendar days that are not weekends or official State holidays.

15. Local Agency Liabilities. This Oversight Agreement shall not be construed in any manner as an admission by the Local Agency of any fact or liability of any kind, nor shall this Oversight Agreement be considered or interpreted as an admission or an assumption by the Local Agency of any liability or acknowledgment of liability or responsibility for the investigation or assessment of, response or remediation to any environmental condition on the property or the costs of such activities, for which the Local Agency is not otherwise liable or responsible. Nothing in this Oversight Agreement shall constitute or be considered a satisfaction or release from liability for any condition or claim arising as a result of Local Agency's past, current, or future operations. Nothing in this Oversight Agreement is intended or shall be construed to limit the rights of any of the Parties with respect to claims arising out of or relating to the release, discharge, deposit or disposal of hazardous materials at the property or at any other location, if such hazardous materials are removed from the property.

16. State Government Liabilities. The State of California (State) shall not be liable for any injuries or damages to persons or property resulting from acts or omissions by the Local Agency or its directors, officers, employees, agents, representatives, successors, assigns, contractors or consultants in carrying out any action or activity pursuant to this Oversight Agreement. Neither DTSC nor the State may be deemed to be a party to any contract entered into by the Local Agency or its directors, officers, employees, agents, successors, assigns, contractors or consultants in carrying out any action or activity pursuant to this Oversight Agreement.

17. Third Party Actions. In the event that the Local Agency is a party to any suit or claim for damages or contribution to which DTSC is not a party, relating to the property subject to this Agreement, the Local Agency will notify DTSC in writing within ten (10) days after service of the complaint in the third-party action. However, failure to give such notice within 10 days will not be a material breach of this agreement, and this requirement confers no rights on any third parties not party to this Agreement.

18. Reservation of Rights. DTSC and the Local Agency each reserve the following rights.

a. DTSC reserves its right to pursue cost recovery under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, California Health and Safety Code sections 25201.9, 25343, 25360, 33459.3, subdivision (m) and any other law. The Local Agency reserves its rights to pursue cost recovery under the California Health and Safety Code section 25403.3 and any other applicable section of the law.

b. Nothing in this Oversight Agreement is intended or shall be construed to limit, preclude or affect the authority of DTSC to pursue any legal, equitable or administrative remedies pursuant to state or federal law or to take any action authorized by law or equity to protect public health and safety or the environment and recovering the costs thereof, including DTSC's authority to take action, or require other persons to take action, under chapter 6.5 or chapter 6.8 of division 20 of the Health and Safety Code or under the Polanco Act and to recover DTSC's costs for those actions.

c. Nothing in this Oversight Agreement shall constitute or be construed as a waiver, defense to, or limitation on of the Local Agency's rights (including any covenant not to sue or release), with respect to any claim, cause of action, or demand in law or equity that the Local Agency may have against any person, as defined in section 101(21) of CERCLA, or Health and Safety Code section 25319, who is not a signatory to this Oversight Agreement.

19. Compliance with Applicable Laws. Nothing in this Oversight Agreement relieves the Local Agency from complying with all applicable laws and regulations, and the Local Agency will conform to all actions required by this Oversight Agreement to all applicable federal, state and local laws and regulations.

20. California Law. This Oversight Agreement shall be governed, performed and interpreted under the laws of the State of California.

21. Parties Bound. This Oversight Agreement applies to and is binding, jointly and severally, upon each signatory and upon any successor agency of either the Local Agency or the State of California that may have responsibility for and jurisdiction over the subject matter of this Oversight Agreement. No change in the ownership or corporate or business status of the Property or any owner of the Property shall alter any signatory's responsibilities under this Oversight Agreement.

22. Severability. If any portion of this Oversight Agreement is ultimately determined

not to be enforceable, that portion will be severed from the Oversight Agreement and the severability shall not affect the enforceability of the remaining terms of the Oversight Agreement.

23. Amendments. Except as otherwise specified in this section and in section 2.2 of this Oversight Agreement, this Oversight Agreement may be amended as specified in this section to withdraw the property from this Oversight Agreement. The Local Agency may withdraw the property from this Oversight Agreement by giving written notice to DTSC that the Local Agency will stop work on that property within the next thirty (30) days. DTSC may withdraw the property by giving written notice to the Local Agency that DTSC will stop work on the Property within the next thirty (30) days. The effective date of withdrawal is the end of the 30 day notice period. Prior to stopping work on the property, the Local Agency must ensure that the property will pose no greater public health or environmental risk than it posed prior to the Local Agency's activities on the property. In the event that the Local Agency withdraws the property from this Oversight Agreement, the Local Agency will be responsible for DTSC's costs through the effective date of withdrawal. The Scope of Work may be amended by mutual written agreement of the parties. Such amendments or modifications are effective on the third business day following the day the last Party signing the amendment or modification sends its notification of signing to the other Party. The Parties may agree to a different effective date.

24. Termination for Convenience. Except as otherwise provided in this Section, each Party to this Oversight Agreement reserves the right to unilaterally terminate this Oversight Agreement for any reason, or for no reason. Termination requires that either Party give a thirty (30) day advance written notice of the election to terminate this Oversight Agreement to the other Party. Prior to termination the Local Agency must ensure that the property will pose no greater public health or environmental risk as a result of the Local Agency activities than it posed prior to the Local Agency's activities at the property. In the event that this Oversight Agreement is terminated under this section and subject to Section 2.8 of the Oversight Agreement, the Local Agency will be responsible for DTSC's costs through the effective date of termination.

OFFICE of the CITY MANAGER
1700 WEST 162nd STREET / GARDENA, CALIFORNIA 90247-3732 / WWW.CITYOFGARDENA.ORG / PHONE (310) 217-9503

April 22, 2019
REF: 19-094

Nick Ta, Project Manager
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630

Subject: GARDENA SUMPS, 301801 (sm)

Dear Mr. Ta:

In light of the ongoing, DTSC-sanctioned excavation of "Pit F" at the Ascon Landfill in Huntington Beach, the City of Gardena has determined to discontinue preparation of a work plan for a pilot study to assess the same remedy at the Gardena Sumps site. Accordingly, this letter will serve as an Official 30-Day Notice of Termination of the Oversight Agreement, dated February 20, 2018, entered into by Gardena and DTSC.

The City of Gardena would ask that DTSC move forward with approval of the feasibility study for the Sumps once the analysis in that document is updated to reflect (1) the results of the Pit F excavation, (2) the conclusions in DTSC's 2015 EIR for the Ascon landfill site (i.e., that highly odorous wastes of the types found at both Ascon Pit F and Gardena Sumps can be safely excavated and sent for off-site disposal), and (3) the other pertinent documents associated with the Pit F excavation (e.g., DTSC's May 2017 approval of the final Remedial Design Report for Ascon Landfill). The analysis and conclusions in the draft feasibility study provided most recently to Gardena (July 2014) obviously do not reflect the extensive record supporting DTSC's 2015-2019 decision-making for Pit F. That record calls into question much of the analysis presented in the July 2014 draft feasibility study, hence the need for an updated version.

The City would also ask that following approval of an updated feasibility study, DTSC promptly move forward with development of a Remedial Action Plan ("RAP") for the Sumps, and then with the applicable public review and comment processes under Chapter 6.8 of the Health and Safety Code and CEQA. The RAP should evaluate Arco's preferred capping remedy (Alternative 2a) and the excavation remedy (Alternative 4) in a fashion that, among other things:

- is consistent with and acknowledges the experience gained via the Pit F remediation process;
- is free from the persistent pro-capping/anti-excavation bias noted by DTSC's "ESPO" staff (discussed on page 2 of Mr. Lansdell's March 21, 2017, letter to Deputy Director Nazemi);
- addresses the failure to comply with ARARs noted by EPA's reviewer (also addressed in Mr. Lansdell's letter to Deputy Director Nazemi);

TASHA CERDA, Mayor / ART KASKANIAN, Mayor Pro Tem
MARK E. HENDERSON, Councilmember / DAN MEDINA, Councilmember / RODNEY G. TANAKA, Councilmember
MINA SEMENZA, City Clerk / J. INGRID TSUKIYAMA, City Treasurer / EDWARD MEDRANO, City Manager / PETER L. WALLIN, City Attorney

- fairly and honestly evaluates, as part of the cost criterion evaluation and consistent with DTSC Management Memo EO-02-002-MM, the differential impacts on land values as between Alternatives 2a and 4;

- documents what progress Arco has made toward securing the so-called institutional control agreements on which its "implementability" analysis has long relied in order to leave unremediated hazardous wastes in public rights of ways and on property neither owned nor controlled by Arco; and

- allows for implementation of Alternative 4 if the Pit F remediation is successful and Alternative 4 otherwise performs satisfactorily according to the remedy selection criteria set forth in the National Contingency Plan and Section 25356.1(d) of the Health and Safety Code.

A RAP that addresses these points head on and honestly will have greater credibility with the public and will be more likely to survive a CEQA challenge. A RAP that fails to address these points could leave the Department with another Exide-like environmental justice black eye, and perhaps liability for fees incurred by a CEQA petitioner. Other than Arco, no one benefits from that scenario.

The City appreciates your assistance and looks forward to moving the project forward.

Respectfully,

EDWARD MEDRANO
City Manager

EM:nw

c: Mitchell G. Lansdell, City Manager (retired)
Peter L. Wallin, City Attorney
Robert P. Doty, Cox, Castle & Nicholson LLP
Earl James, EKI Environmental & Water, Inc.

OFFICE of the CITY MANAGER
1700 WEST 162nd STREET / GARDENA, CALIFORNIA 90247-3732 / WWW.CITYOFGARDENA.ORG / PHONE (310) 217-9503

June 30, 2020
REF: 2020.261

Nick Ta, Project Manager
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630

Subject: GARDENA SUMPS, 301801 (sm)

Dear Mr. Ta:

On April 22, 2019 the City Manager of Gardena sent a letter to DTSC indicating that the City was not supportive of Alternative 2A. This letter is to inform you that the City is no longer holding to that position and is now supportive of the 2A alternative in order to facilitate the development project which is being proposed by InSite, a specialized builder of self-storage and industrial developments.

InSite made a presentation at the Gardena City Council meeting on May 26, 2020 of the proposed project at the Gardena Sump site. While the City Council could not approve a project at this time, they did indicate their support and encouraged InSite to file its development applications.

Please feel free to contact me if you have any questions regarding this matter.

Respectfully,

Clint Osorio
City Manager

CO:sdc
cc: Carmen Vasquez, City Attorney
Lisa Kranitz, Assistant City Attorney

TASHA CERDA, Mayor / MARK E. HENDERSON, Mayor Pro Tem
PAULETTE C. FRANCIS, Councilmember / ART KASKANIAN, Councilmember / RODNEY G. TANAKA, Councilmember
MINA SEMENZA, City Clerk / J. INGRID TSUKIYAMA, City Treasurer / CLINT OSORIO, City Manager / CARMEN VASQUEZ, City Attorney

Department of Toxic Substances Control

Jared Blumenfeld
Secretary for
Environmental Protection

Meredith Williams, Ph.D.
Director
5796 Corporate Avenue
Cypress, California 90630

Gavin Newsom
Governor

July 14, 2020

Mr. Chuck Carmel
Liabilities Manager
Atlantic Richfield Company (ARC)
160 Alamo Plaza
P.O. Box 465
Alamo, CA 94507

APPROVAL OF FINAL FEASIBILITY STUDY FOR THE GARDENA SUMPS, 1450 W. ARTESIA BLVD., GARDENA, CA 90447 (DTSC SITE CODE. 401218)

Dear Mr. Carmel:

The California Department of Toxic Substances Control (DTSC) has reviewed the final Feasibility Study Report (FS), dated July 1, 2014. The Report was submitted by Geosyntec Consultants on behalf of Atlantic Richfield Company (ARC) for the Gardena Sumps Site (Site) as a requirement of Consent Decree CV04-7882-AHM (JTLx). The FS includes a summary of the remedial investigation, remedial action objectives, and a comparative analysis of the identified applicable remedial technologies and alternatives based on the National Contingency Plan's nine criteria.

The Site is approximately 5.6 acres, consisting of 2 parcels currently owned by the Haack family and the Cooper family trust. The Site was developed as a clay mine during the 1920s by the Moneta Brick Company. Clay mining resulted in excavations that were reportedly used for refinery sludge disposal beginning in approximately 1940. By September 1946, the Haack, Cooper South and Cooper North Sumps had been filled with sludge. By December 1951, the western portion of the Haack Sump had been covered by asphalt and a concrete slab, and was converted into a parking lot. On October 1, 1952, the northern-most strip of the Site property was sold to the State of California for a highway easement (now Artesia Blvd).

Currently, the two Cooper sumps are capped by a geosynthetic liner that was installed by OHM Corporation (OHM) in July 1993 under DTSC oversight. An additional geosynthetic liner was placed over the 1993 liner in August 2013. Currently, the Haack property is leased to various tenants who operate small businesses, including a U-Haul rental agency, a metal fabricating, blasting and painting company, and an auto body repair shop.

Remedial investigations at the Site identified the sludge volumes in the sumps to be 6,700 cubic yards (cy), 7,000 cy, and 2,250 cy in the Cooper South, Cooper North, and Haack Sumps, respectively. Constituents identified in the sludge included volatile fuel hydrocarbons (VFHs), total extractable hydrocarbons (TEHs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons (PAHs), Title 22 metals, mercury, and hexavalent chromium. The Feasibility Study evaluated four remedial alternatives, including: no action, capping with selective excavation, capping with selective excavation and stabilization/neutralization, and excavation with offsite disposal.

DTSC staff has reviewed the FS and hereby approves the FS. Please submit the Final Feasibility Report with the stamp and signature of a registered California professional engineer or registered California professional geologist. DTSC requests that a Remedial Action Plan be submitted to proceed with the remedial action for the sludge waste at the Site. As part of DTSC's public participation process, a community survey will need to be initiated to ascertain community interest in the Site. DTSC requests ARC coordinate the initiation of the community survey with the DTSC project manager.

If you have any questions regarding the project, please contact Nick Ta, the project manager at (714) 484-5381 or by email at: nicholas.ta@dtsc.ca.gov, or the Unit Supervisor, Patrick Hsieh at (714) 484- 5442 or by email at: patrick.hsieh@dtsc.ca.gov.

Sincerely,

A. Edward Morelan

A. Edward Morelan, PG, CEG
Branch Chief,
Site Mitigation and Restoration Program
Department of Toxic Substances Control

cc:

Nick Ta (via e-mail at Nicholas.ta@dtsc.ca.gov)
Project Manager
Site Mitigation and Restoration Program
Department of Toxic Substances Control

Geosyntec consultants

16644 West Bernardo Drive, Suite 301
San Diego, CA 92127
PH 858.674.6559
FAX 858.674.6586
www.geosyntec.com

3 August 2020

Nick Ta
Project Manager
Department of Toxic Substances Control
5796 Corporate Ave
Cypress, California

Subject: Final Feasibility Report Certification
Gardena Sump
Gardena, California

Dear Mr. Ta,

Geosyntec Consultants, Inc. (Geosyntec) has prepared this certification for the Final Feasibility Study Report (FS) dated 1 July 2014 on behalf of Atlantic Richfield Company (ARC) for the Gardena Sumps Site (Site) as a requirement of Consent Decree CV04-7882-AHM (JTLx). Geosyntec understands that the Department of Toxic Substances Control (DTSC) approved the FS on 14 July 2020 and is requesting California Professional Engineer certification.

The FS was prepared by or under the direct oversight of Ms. Rebecca Oliver, a Professional Civil Engineer in the State of California. Ms. Oliver's certifying stamp and signature has been provided with this letter to be included with the FS.

Please contact Ms. Oliver if you have any questions or need any additional information at (619) 810-4032.

Sincerely,

Madeline Downing
Senior Staff Engineer

Rebecca Oliver, P.E.
Principal

Attachments:

Final Feasibility Study Report Certification

CERTIFICATION PAGE

FINAL FEASIBILITY STUDY
GARDENA SUMPS
GARDENA, CALIFORNIA

The Engineering evaluations, conclusions, and recommendations this Feasibility Study were prepared under the supervision and direction of the undersigned, whose seal as a registered Professional Engineer is affixed below.

8/3/2020

Rebecca Oliver, P.E. Date

Principal

Gardena Sumps Site

1440 Artesia Boulevard
(Southwest Corner of Artesia Boulevard and Normandie Avenue)
Gardena, California 90248

Third Quarter 2020 Semi-Annual Groundwater Monitoring Report

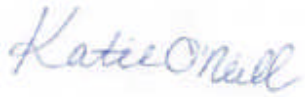
Prepared for:
Atlantic Richfield Company
4 Centerpointe Drive, Ste. 200
La Palma, California 90623-1066

Prepared by:
Stantec Consulting Services Inc.
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
805-230-1266 tel
805-230-1277 fax

October 15, 2020

Sign-off Sheet

This document entitled Third Quarter 2020 Semi-Annual Groundwater Monitoring Report was prepared by Stantec Consulting Services Inc. for the account of Atlantic Richfield Company. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

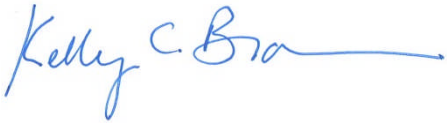


Prepared by _____
(signature)

Katie O'Neill, Project Engineer

Reviewed by _____
(signature)

Mark Mason, Associate Geologist, PG # 9505



Reviewed by _____
(signature)

Kelly C. Brown, Principal Geologist, PG# 6714

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Executive Summary

Station No.: Gardena Sumps Site
Address: 1440 West Artesia Blvd., Gardena CA (SW Corner of Artesia Blvd & Normandie Avenue)
Reporting Period: July - September 2020 (Third Quarter) Semi-Annual
Atlantic Richfield Company Environmental Engineer/Phone No.: Mr. Charles Carmel / (562) 512-1020
Consulting Co./Contact Person/Phone No.: Stantec / Kelly C. Brown, PG / (562) 354-2638
Stantec Project No.: 185850766.300
Primary Agency/Regulatory ID No.: CA DTSC / Mr. Nick Ta, Supervisor
Other Agencies to Receive Copies: None

WORK PERFORMED THIS PERIOD [July through September 2020]:

1. Issued notifications to DTSC and stakeholders regarding Third Quarter 2020 Semi-Annual groundwater sampling event.
2. Completed quarterly groundwater gauging and sampling at on-site groundwater monitoring wells on August 18 and 19, 2020.
3. Conducted monthly perimeter fence, gates, and signs inspections.
4. Performed quarterly cover inspection for the Cooper and Haack Rework Properties during the Semi-Annual groundwater sampling event.
5. Prepared and submitted the Second Quarter 2020 Status Reports.
6. Prepare the *Third Quarter 2020 Semi-Annual Groundwater Monitoring Report*.

WORK PROPOSED FOR NEXT PERIOD [October 2020 through March 2021]:

1. Prepare and submit the Third and Fourth Quarter 2020 Reports.
2. Submit the Third Quarter *2020 Semi-Annual Groundwater Monitoring Report*.
3. Issue notifications to DTSC and stakeholders regarding the First Quarter 2021 Semi-Annual groundwater sampling event.
4. Perform the First Quarter 2021 Semi-Annual groundwater sampling event in February 2021.
5. Conduct monthly perimeter fence, gates, and signs inspections.
6. Perform quarterly site cover inspection and site repair activities (as necessary).
7. Perform weed abatement (as necessary).
8. Submit Remedial Action Plan.

Current Quarter's Groundwater Results Summary / Remarks		
Agency Directive Requirement	Perform Semi-Annual Groundwater Monitoring	
Compliance Goal	N/A – Monitoring performed under a consent decree	
Frequency/Date(s) of Monitoring and Sampling	Semi-Annual – Third Quarter 2020 / August 18 and 19, 2020	
Liquid-Phase Hydrocarbon Present	No	
Water Wells (within 4,000-ft) and Their Respective Directions	T3S/R14W-S25P4 S.B.B.M. ≈1,200 ft / WNW (Dalton #1)	
Closest Surface Water	Dominguez Channel ≈ 100-200 ft / South	
Current GW Remediation Techniques	Not Applicable	
Permits for Discharge	Not Applicable	
Monitoring Well Summary	4 zone A monitoring wells on-site, 1 intermediate zone monitoring well on-site, 3 zone B wells on-site. 8 of the 10 monitoring wells were gauged and sampled this quarter. Wells MW-01A and MW-01B have been removed from the sampling plan after approval from the DTSC on October 30, 2014 and are now only inspected for integrity annually during the first quarter event. Wells MW-01A and MW-01B were mistakenly also gauged and inspected this quarter but are not used in reported data.	
Quantity of Purge Water Generated	Approximately 25 gallons	
Monitored Zones	A (upper hydraulic zone)	B (lower hydraulic zone)
Depths to Groundwater	12.51 to 19.70 ft. BTOC	15.41 to 21.61 ft. BTOC
Range in Groundwater Elevation	5.75 to 7.25 ft. MSL	3.95 to 4.48 ft. MSL
Groundwater Flow Direction	South-southeast (A180)	East-southeast (A108)
Horizontal Groundwater Gradient (ft./ft.)	0.0040	0.0019
Vertical Groundwater Gradient (ft./ft.)	0.030 to 0.045 (downward)	
Approximate Horizontal Groundwater Velocity Beneath the Site	0.034 ft./day	0.071 ft./day
Analytical Findings	The Third Quarter 2020 Semi-Annual sampling event results are generally consistent with the analytical data from the previous sampling events (since May of 1994).	
Problems Encountered this Quarter	Well MW-01A&B were also inspected and gauged this quarter, but not used in data calculations.	
Key Findings This Quarter	Water levels are relatively stable in both the upper hydraulic zone and in the lower hydraulic zone, with only minor increases and decreases in both.	

Abbreviations

ARC	Atlantic Richfield Company
AS	Air Sparge
ASTM	ASTM International (formerly American Society for Testing and Materials)
ASTs	Above-Ground Storage Tanks
bgs	Below ground surface
BOD	Biological Oxygen Demand
BTEX	Benzene, toluene, ethylbenzene, total xylene isomers
BTU	British Thermal Unit
CalDHS	California Department of Health Services
CalDWR	California Department of Water Resources
CAO	Cleanup and Abatement Order
COD	Chemical Oxygen Demand
CPT	Cone Penetrometer Test
CPT/ROST	Cone Penetrometer Test/Rapid Optical Screening Tool
CPT/UVIF	Cone Penetrometer Test/Ultraviolet Induced Fluorescence
CRWQCB-LA	California Regional Water Quality Control Board – Los Angeles
CW	Cluster Well
DHZ	Deep Hydrostratigraphic Zone
DIPE	Di-Isopropyl Ether
DMW	Diffuser Monitoring Well
DTSC	Department of Toxic Substances Control
DW	Diffuser Well
EFR	Enhanced Fluid Recovery
EPA	Environmental Protection Agency
ESA	Environmental Site Assessment
ETBE	Ethyl Tert-Butyl Ether
FID	Flame Ionization Detector

FS	Feasibility Study
ft	Feet or foot
ft/ft	Feet per foot
ft^2/day	Square feet per day
gpm	Gallons per minute
GPR	Ground Penetrating Radar
GRO	Gasoline Range Organic (hydrocarbon range: C_4-C_{12})
HASP	Health and Safety Plan
ICE	Internal Combustion Engine
IDW	Investigation-derived waste
INA	Inaccessible
Kn	Effective hydraulic conductivity
Ko	Hydraulic conductivity
LADHS	Los Angeles County Department of Health Services
lb/yr	Pounds per year
MCL	Maximum contaminant level
LNAPL	Light Non-Aqueous Phase Liquid
MDL	Method Detection Limit
mg/kg	Milligrams per kilogram (parts per million)
mg/mL	Milligrams per milliliter (parts per million)
MHZ	Middle Hydrostratigraphic
MRLs	Minimum Risk Levels
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSDS	Material Safety Data Sheet
MSL	Mean Sea Level
MTBE	Methyl Tert-Butyl Ether
MW	Monitoring Well
°C	Degrees Celsius
°F	Degrees Fahrenheit
ORP	Oxidation-Reduction Potential
PID	Photo ionization Detector
PZ	Piezometer
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QC	Quality Control

RAP	Remedial Action Plan
RLs	Reporting Limits
SCAQMD	South Coast Air Quality Monitoring District
SCFM	Standard Cubic Feet per Minute
SCM	Site Conceptual Model
SHZ	Shallow Hydrostratigraphic Zone
SOPs	Standard Operating Procedures
SPH	Separate Phase Hydrocarbons
STLC	Soluble Threshold Limit Concentration
SUZ	Shallow Unsaturated Zone
SVE	Soil Vapor Extraction
Tn	Effective transmissivity
To	Hydraulic transmissivity
TAME	Tert-Amyl Methyl Ether
TBA	Tert-Butyl Alcohol
TOC	Total Organic Carbon
TSO	Tesoro Refining & Marketing Company, LLC
µg/L	Micrograms per liter (parts per billion)
µg/kg	Micrograms per kilogram (parts per billion)
USCS	Unified Soil Classification System
USGS	United States Geological Survey
USTs	Underground Storage Tanks
VEPR	Vapor Enhanced Product Recovery
VS	Vapor Sample Name prefix
VW	Vapor Well

1.0 INTRODUCTION

The Gardena Sumps Site (the Site) is located at the southwest corner of Artesia Boulevard and Normandie Avenue in the City of Gardena, Los Angeles County, California (Figure 1). The Site occupies approximately 5.6 acres and is subdivided into two parcels of approximately 3.0 acres (Cooper Property) and 2.6 acres (Haack Property). For this report, the adjacent Los Angeles Department of Public Works (LADPW) land immediately south of the Cooper Property is also considered a portion of the Site. Properties surrounding the Cooper and Haack Properties are used for residential, commercial, and light industrial purposes. Approximately 80 percent of the surface area of the Cooper Property consists of two large sumps that are covered with geo-synthetic material. These sumps contain apparent refinery wastes (subsequently referred to as "sludge"). A smaller sludge sump also underlies the northeastern portion of the Haack Property (Figure 2).

Quarterly monitoring and sampling were agreed to as part of the Consent Decree (US District Court, Central District of California, 2004), entered into between California Department of Toxic Substances Control (DTSC) and Atlantic Richfield Company (ARC), which became effective November 4, 2004 (§VIIC, paragraph 2, lines 2-3). SECOR International Incorporated (SECOR), now known as Stantec Consulting Services Inc. (Stantec), working on behalf of ARC, started quarterly monitoring activities in January 2006. At present, eight wells are included in the monitoring program (MW-02A/B, MW-03A/B, MW-04A/B, MW-05A and G-4). Wells MW-01A and MW-01B were approved for removal from the regular sampling program in a letter from the DTSC dated October 30, 2014 and will no longer be sampled. The DTSC granted ARC's request to terminate sampling of these two wells with the stipulation that they would be monitored annually during the Second Quarter groundwater monitoring event and kept in good condition so that they might be utilized in the future should the need arise. Wellhead integrity monitoring and maintenance of these two wells has previously been reported in the Second Quarter Groundwater Monitoring Report of each year. On September 8, 2017, ARC requested a reduction in sampling from quarterly to semi-annually and this request was granted by the DTSC in a letter dated October 12, 2017. Sampling at the site now occurs only during the first and third quarters each year. Wellhead integrity monitoring, maintenance and reporting will occur during the first quarter semi-annual event each year. To date, groundwater monitoring, sampling, and analytical activities through the third calendar quarter of 2020 have been completed. This report presents the findings of the Third Quarter 2020 Semi-Annual groundwater sampling event.

2.0 SITE BACKGROUND

The Site was used for grazing livestock until the late 1920's when the Moneta Brick Company (a.k.a. Higgins Brickyard) started excavating clay for commercial use. They continued mining clay from the Site through the early 1930's. In the early 1940's the clay pits, created by the mining operations, were used to dispose of refinery sludge allegedly from petroleum refining situated in Southern California. During the late 1950's and early 1960's waste material from a metal casting facility located on the Haack property may also have impacted the properties. The Aircraft Magnesium Corporation, which operated this facility at that time, is no longer in business.

In early 1981, the California Department of Health Services (DHS) and the U.S. Environmental Protection Agency (USEPA) became the first regulatory agencies to address the environmental issues at the Site. In 1982, four off-site groundwater monitoring wells (G-1 through G-4) were constructed by the USEPA beyond the perimeter of the Site (Figure 2). The wells were installed in saturated portions of the Bellflower Aquiclude. Well G-4, the only DHS/USEPA well that still exists, is not screened in either the upper hydraulic Zone A or lower hydraulic Zone B that have until recently been monitored by four well clusters (MW-01A/01B, MW-02A/02B, MW-03A/03B, and MW-04A/04B) and well MW-05A. Wells MW-01A/01B were approved for removal from the regular sampling plan in a letter dated October 30, 2014 and are no longer being sampled.

Historical analytical results for organic compounds in groundwater from these four "G" series wells yielded results that were below the method detection limit (MDL) for the compounds examined. Continued groundwater monitoring of these wells by regulatory agencies yielded similar results. Three of these wells (G-1, G-2, and G-3) have subsequently been destroyed during development of properties surrounding the Site.

In 1993/1994, three well clusters (MW-01A/B, MW-02A/B, and MW-03A/B) were installed to monitor two hydraulic zones within the Bellflower Aquiclude beneath the Site. The depths to the two hydraulic zones, designated Zone A (upper) and Zone B (lower), are approximately 15 to 25 and 75 to 80 feet below ground surface (bgs), respectively. Well construction details for these six wells, and four previously installed USEPA wells are summarized in Table 1. Complete details can be found in Appendix D of the RI/FS Workplan dated November 11, 2005 (SECOR, 2005).

In February 2007, an additional well cluster (MW-04A/B) was installed on Site near the western boundary of the Cooper Property. This fourth well cluster is used to monitor saturated zones A and B. Well construction data for these two wells are summarized in Table 1. More detail is included in Appendix A of the 2007 First Quarter Groundwater Monitoring Report, dated April 18, 2007 (SECOR, 2007a).

During the Third Quarter 2009, MW-05A was installed in the U-Haul parking lot of the Haack Property. This well is used to monitor the upper hydraulic zone (zone A) immediately downgradient of a portion of the Haack sump. Well construction data for this well is summarized in Table 1.

Wells MW-01A/01B were approved for removal from the regular sampling program in a letter dated October 30, 2014 and are no longer being sampled. The DTSC granted the ARC request to terminate sampling of these two wells with the stipulation that they should be inspected each year during the second quarter groundwater monitoring event and kept in good condition so that they might be utilized at some time in the future should the need arise. Condition inspection and maintenance of these two wells is to be reported in the Second Quarter Groundwater Monitoring Report. However, in October 2017, the DTSC approved semi-annual sampling of site wells. Inspection of these two wells now occurs during the First Quarter Semi-Annual sampling event of each year.

3.0 SAMPLING PROCEDURES

Groundwater Gauging. On August 18, 2020, ten groundwater monitoring wells (MW-01A/1B, MW-02A/B, MW-03A/B, MW-04A/B, MW-05A, and G-4) were gauged for depth to groundwater. Wells MW-01A and MW-01B are inspected during the first quarter of each year, however they were inspected and gauged during this event. After the purging and sampling of each well, the wells are normally gauged for total depth from designated measuring points at the top of the PVC well casings (Table 2). Well G-4 is not normally gauged for total depth due to the presence of a dedicated pump blocking the passage of the depth sounder. During this and the previous two field events the well MW-02A may have been incorrectly gauged for total depth (deeper than possible). The discrepancy is being investigated.

Groundwater Purging. On August 18 and 19, 2020, groundwater purging was performed. Due to past vandalism, well MW-04B is currently purged with a decontaminated rental pump and dedicated Teflon® tubing. The remaining groundwater monitoring wells are equipped with dedicated QED Well Wizard™, low-flow gas actuated submersible bladder pumps. The Well Wizard™, submersible bladder pumps are constructed with a stainless-steel outer sleeve and a Teflon® lined internal bladder. Each Well Wizard™ pump is 3.5-feet long with an outside diameter of 1.5-inches. The inlet portal is located at the base of the pump. The pumps are positioned with the base inlet situated in the center of the well screen interval. Teflon® tubing is installed to convey purge and sample water from the pump outlet to the surface and as a gas-actuation line to operate the pump bladder.

Purging and sampling was accomplished in accordance with American Society for Testing and Materials (ASTM) Method D6771 using low-flow techniques. A typical purge rate of approximately 0.10 to 0.30 gallons per minute is used for each well. Following ASTM Method D6771, the minimum volume of groundwater purged prior to sampling was equal to at least three times the volume of water within the discharge tubing and bladder of the dedicated pump.

During purging, water quality parameters for both upper (A) and lower (B) hydraulic zone wells were monitored with Horiba U-52 Water Quality Multi-Parameter meters, and Solinst Depth to Water Meters. Due to improved accuracy and reliability of the newer Horiba U-52 meters with respect to turbidity measurements, separate turbidity meters are no longer being used. Parameters monitored included electrical conductivity (EC), pH, temperature, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity (NTU's). The rental vendor calibration forms are provided in Appendix A. Purging continued until at least three tubing/bladder volumes of water were removed, and water quality parameter measurements had stabilized. Copies of the field data sheets containing the gauging, well purging and sampling data are also provided in Appendix A.

Groundwater Sampling. On August 18 and 19, 2020, groundwater sampling was performed immediately following purging of each well. Groundwater sampling procedures followed the protocol outlined in the Quality Assurance Project Plan (QAPP) and the Field Sampling Plan (FSP),

of the RI/FS Workplan (SECOR, 2005). Groundwater samples were collected using dedicated (except where noted), gas-actuated, submersible bladder pumps. Samples were discharged directly into containers provided by the laboratory that were appropriate for the analysis to be performed. Samples collected for dissolved metals analyses were filtered in the field using in-line 0.45-micron filter cartridges. The sample containers were secured with caps, labeled, and placed on ice for transport to Test America Analytical Testing Corporation of Irvine, California (Test America), a State certified laboratory, for analysis. Strict chain-of-custody procedures were followed during sample handling. Chain-of-custody records were maintained for all samples collected. In addition to the samples obtained from the monitoring wells, field blanks prepared in the field, and laboratory-prepared trip blanks were analyzed. One blind duplicate sample is collected from well MW-02A each quarter (labeled this quarter as RS-SUMP-20200819), was included with the samples to verify the integrity of the field and laboratory procedures. All samples were submitted to Test America and tested for the typical full suite of analytes.

Waste Disposition. During the Third Quarter 2020 Semi-Annual sampling event approximately 25 gallons of purge water were generated and were temporarily stored on Site in a 55-gallon D.O.T. approved container. Upon completion of the sampling event, the purge water drum was removed and shipped to an approved recycling facility. A copy of the shipping documentation is contained in Appendix A.

Groundwater Analytical Methods. Per the RI/FS Work plan all groundwater samples (except as described above) were analyzed for the following analytes, employing the USEPA methods indicated.

Analytes	USEPA Method	Notes
Gasoline range organics (GRO; hydrocarbon range C4 through C12, inclusive)	8015B	This analysis has been identified in historic reports for the Site as Total Petroleum Hydrocarbons modified for gasoline (TPHg) (by GC/MS (CA LUFT) EPA Method 8015 modified for gasoline (8015 M).
Volatile organic compounds (VOC's)	8260B	Selected analytical results are listed in Summary Tables. Acetone was not analyzed. RL were limits lowered to match CA state MCL's in June, 2009. Complete analytical results are given in an appendix to this report.
Semi-Volatiles (SVOC's)	8270C	Only Bis (2-ethylhexyl) Phthalate is listed in Summary Tables. RL were limits lowered to match CA state MCL's in June, 2009. Complete analytical results are given in Appendix-C of this report.
Polynuclear Aromatic Hydrocarbons (PAH's)	8270C	During the First Quarter 2006, only on-site wells were analyzed for PAH's. During subsequent quarters, all wells have been analyzed for PAH's. Currently done by EPA Method 8270C. Due to CA state MCL's Benzo(a)Pyrene is tested by method 8270-C SIM.
Chromium VI	7199	Changed from 7196A, May 2009 at DTSC request.
Mercury (Hg)	7470A and 7470A-Dissolved	Samples were analyzed for both suspended and dissolved Mercury.

Analytes	USEPA Method	Notes
Other Metals	6020 and 6020-Dissolved	Samples were analyzed for both suspended and dissolved Metals.
pH	9040B	pH is also measured in the field with a Horiba U-52
Total sulfide	SM 4500-SD	Earlier reports show this by method 376.2
General Minerals & Inorganics	Numerous methods	General Minerals testing was discontinued in the third quarter of 2012.

4.0 GROUNDWATER MONITORING AND SAMPLING RESULTS

Groundwater Gradient. The observed groundwater gradient, flow direction and velocity for the current quarter 2020 sampling event are generally consistent with historical observations. Figure 3 depicts the elevation of groundwater observed during the current sampling event in monitoring wells completed in the Upper Hydraulic Zone A. Figure 4 presents data for Lower Hydraulic Zone B during the current sampling event. After calculating the groundwater elevations of the wells and plotting them on a scaled map, the horizontal groundwater gradient in Hydraulic Zone A was estimated at 0.0041, directed towards the South with an azimuth of 180 degrees for the current 2020 event (Figure 3, Table 2). The horizontal groundwater gradient in the Hydraulic Zone B was estimated at a gradient of 0.0019, directed to the East-southeast, with an azimuth of 108 degrees for the current 2020 event (Figure 4, Table 2). The vertical hydraulic gradient between the upper and lower hydraulic zones varies from 0.030 at MW-03 to 0.045 at MW-02 and is directed downwards (Table 2). Monitoring wells MW-01A and MW-01B which have been removed from the sampling plan and are generally only gauged and inspected in the first quarter sampling event were also inspected and gauged this quarter, however they were not used in data calculations (Table 2, Figures 3 and 4).

During the current Third Quarter of 2020, the Hydraulic Zones A and B both showed very little water level change compared to the previous sampling event during the First Quarter 2020. Minor fluctuations in the upper hydraulic Zone-A ranged from a 0.12 foot increase at well MW-02A to a decrease of 0.13 feet at MW-05A. The lower hydraulic Zone-B also showed minor fluctuations with an increase of 0.07 feet at well MW-03B and a decrease of 0.12 feet at MW-04B for the current Third Quarter 2020 event.

The top of the screened interval for well MW-02A has been several feet below the groundwater surface elevations each quarter since it was constructed and is currently approximately 4.76 feet below the groundwater surface. Groundwater elevations at well MW-03A have historically been and are currently within the screened interval. The groundwater surface elevations for well MW-04A has also been variably above or within the screened interval since installation and is currently 0.68 feet below the top of the screen, within the screened interval. The current groundwater elevation at MW-05A places it 0.25 feet below the top of the screen, within the screened interval.

Figure 5a illustrates the stratigraphic soil types and well completion schedule for each groundwater monitoring well. Figure 5b shows a hydrograph and a pH record of each well covering the period when groundwater monitoring has been performed at the Site (early 1994 to the present). Figure 5c illustrates the velocity and direction of the groundwater utilizing rose diagrams that cover the period from 1994 to the present. The two rose diagrams depict the horizontal groundwater flow velocity, the flow direction, and the frequency the flow occurred at a given velocity in a given direction. These diagrams display data for both the upper hydraulic Zone A and for the lower hydraulic Zone B beneath the Site. The groundwater flow velocities and calculations are summarized in Table 2.

Groundwater Analytical Results. Complete analytical reports from Eurofins Calscience Irvine and chain-of-custody documentation are provided in Appendix C. Selected results are compiled in Tables 3 through 8; presented on Figures 3 and 4; and are summarized below. Concentrations qualified by a "J flag" are estimated values detected at a level below the quantifiable method RL and above the MDL. Concentrations which are greater than the established MCL's are identified in a gray highlighted analyte result box in the tables.

All eight groundwater monitoring wells sampled showed no detectable concentrations of GRO at or above the RL (Table 3) during the current Third Quarter 2020 Semi-Annual sampling event. The sample from MW-05A had a J-flag detection of GRO with an estimated concentration of 40 J µg/L.

VOC's above the RL were not detected in any of the eight wells sampled during the current quarter's sampling event.

There were also no VOC's reported between the MDL and RL (J-flag detection) this sampling event.

Methylene Chloride (also known as dichloromethane) was not detected in any of the eight wells sampled during the current sampling event.

Only one SVOC was found to exceed the RL during the current sampling event. The SVOC 2,6-dinitrotoluene was detected above the RL in well MW-03B (23 µg/L). This is an anomalous detection of an analyte not normally found on site. This well will be watched for further anomalies.

Another SVOC, sometimes detected is Bis(2-ethylhexyl) phthalate (DEHP), however it was not detected above the RL this during this sampling event (Table 4). DEHP is used as a plasticizer in the manufacturing of PVC. DEHP was detected at a J-flag concentration in one of the eight wells this event. It was detected in MW-02B (4.3 J µg/L).

There were five SVOC's detected between the RL and MDL during this event. Benzoic acid was detected in seven of the eight wells ranging from 0.99 J µg/L in MW-04B to 2.2 J µg/L in well G-4. Di-n-octyl phthalate was detected in well MW-02B (3.6 J µg/L). Acenaphthene (0.064 J µg/L) and benzyl alcohol (0.057 J µg/L) were detected in well MW-03B. Also found was 2,4-dimethylphenol (0.093 J µg/L) in well MW-05A (Table 4).

One of two Polynuclear Aromatic Hydrocarbons (PAH's) being tested for, Chrysene and Pyrene, was detected above the RL in one of the eight wells sampled during the current quarter's sampling event. Pyrene was detected in well MW-05A with a concentration of 0.20 µg/L (Table 4).

Chloroform was not reported from any of the samples collected during the current event. In the past, chloroform has been detected at very low reportable concentrations in the field blanks, and rarely chloromethane.

The pH levels reported since 1994 to present are provided in Table 4 and illustrated in Figure 5b. When field and laboratory pH measurements are available, then both measurements are reported in Table 4. The pH levels have remained relatively constant for all monitoring wells since Stantec (previously SECOR) began sampling in the First Quarter of 2006. During each sampling event the pH reading for well MW-05A is typically lower than all the other wells. The current pH field reading of 6.27 (Table-4 and Figure 5B).

Total Sulfides were not reported in concentrations above the RL in any of the eight wells sampled during the current sampling event (Appendix C). Reactive Sulfides are no longer measured due to changes in the USEPA protocol (Table 4).

For each reporting period since the year 2000, and again during the current sampling event, both dissolved (starting 2006) and non-dissolved-phase barium have been detected above the RL in all wells (Tables 5 and 6). Barium has often been detected at the up-gradient and off-Site wells MW-01A and MW-01B which are no longer being sampled. The highest concentration of barium detected this sampling event was in well MW-03-A, [Total Metals (110 µg/L) and Dissolved Metals (110 µg/L)].

Reportable trace concentrations of arsenic were detected during the current quarter's sampling event in both dissolved and non-dissolved phases. Arsenic above the RL was reported in samples from four of the eight wells sampled for Total Metals and from four of the eight for Dissolved Metals. Total Metals Arsenic was detected above the RL in MW-03B, MW-04B, MW-05A, and G-4. Dissolved Metals Arsenic above the RL was found in the same wells (Tables 5 and 6). MW-05A showed the highest concentrations of Arsenic for the Total Metals (8.2 µg/L) and for Dissolved Metals (7.1 µg/L) phases.

Arsenic was also detected in J-flag concentrations for Total Metals and for Dissolved Metals, respectively, in MW-02A (0.55 J and 0.51 J µg/L), MW-02B (0.95 J and 0.95 J µg/L), MW-03A (0.65 J and 0.60 J µg/L) and well MW-04A (0.79 J and 0.80 J µg/L) (Tables 5 and 6).

No wells showed elevated concentrations of metals during the current sampling event (above the California DPH MCL's.

Mercury was not detected above the RL or in J-flag concentrations during the current sampling event (Tables 5 and 6). It was reported in J-flag concentration in well MW-04A (0.14 J µg/L).

Hexavalent Chromium (Chrome VI) was not reported above the RL during the current sampling event (Table 4 and Appendix C). It was reported in J-flag concentrations in wells MW-03A (0.50 J µg/L) and MW-04A (0.27 J µg/L).

Three wells showed zinc concentrations above the RL during this sampling event. MW-02B showed 26 J µg/L, G-4 showed 21 J µg/L, and MW-05A had a detection of 120 µg/L for total metals and 89 µg/L for dissolved metals (Table 6).

Quality Control / Quality Assurance: Upon receipt of the analytical data from Eurofins Calscience, Stantec reviewed the data from groundwater samples, and field quality control samples including a duplicate sample, field blanks, and trip blanks. A quality assurance/quality control (QA/QC) sample, identified as RS-SUMP-20200819 was collected on August 19th during the Third Quarter 2020 sampling event. Sample RS-SUMP-20200819 was a blind duplicate sample collected from down-gradient well MW-02A. The duplicate sample during this event showed identical results to the MW-02A sample for GRO and all VOC analytes tested. Trip and field blank results for all VOCs analyzed were non-detect during the Third Quarter 2020 sampling event. These quality control samples are taken to confirm the integrity of the field sampling and sample handling processes for this sampling event. The laboratory also employs its own QA/QC procedures. Those results are shown in their laboratory reports (Appendix A). All laboratory QA/QC results are within acceptable limits, except where otherwise noted.

5.0 CONCLUSIONS

The following conclusions are drawn from the quarterly groundwater monitoring and sampling data:

- The Third Quarter 2020 Semi-Annual sampling event results are generally consistent with the analytical data from past sampling events (since February 2006).

- Groundwater levels have relatively stable across both hydraulic zones, showing little change, with maximum variances showing a drop of 0.013 feet in MW-05A to an increase or rise in groundwater elevation of 0.12 feet in MW-02A.

6.0 PROPOSED MONITORING ACTIVITIES

Stantec anticipates performing quarterly cover inspection and maintenance (as necessary) and semi-annual groundwater monitoring activities at the Site during the First Quarter of 2021. These activities include, but are not limited to the following items:

- Perform semi-annual groundwater gauging and sampling at groundwater monitoring wells MW-02A/2B, MW-03A/3B, MW-04A/4B, MW-05A, and G-4 in February 2021;
- Perform quarterly site cover inspection, maintenance, and repair (as necessary);
- Perform weed abatement as necessary; and
- Perform monthly monitoring of site fence, gates, and signs integrity.

7.0 STANDARD LIMITATIONS

This report was prepared in accordance with the scope of work outlined in Stantec's contract and with generally accepted professional engineering and environmental consulting practices existing at the time this report was prepared and applicable to the location of the site. It was prepared for the exclusive use of Atlantic Richfield Company for the express purpose stated above. Any re-use of this report for a different purpose or by others not identified above shall be at the user's sole risk without liability to Stantec. To the extent that this report is based on information provided to Stantec by third parties, Stantec may have made efforts to verify this third-party information, but Stantec cannot guarantee the completeness or accuracy of this information. The opinions expressed and data collected are based on the conditions of the site existing at the time of the field investigation. No other warranties, expressed or implied, are made by Stantec.

Prepared by:

Katie O'Neill
Project Engineer

Reviewed by:

Mark Mason, P.G.# 9505
Geologic Associate

All information, conclusions, and recommendations provided by Stantec in this document regarding the Gardena Sumps Site been prepared under the supervision of and reviewed by the licensed professional whose signature appears below.

Registered Approver:

Name: **Kelly C. Brown P.G.# 6714**
Principal Geologist

Date: **October 15, 2020**

Stamp:

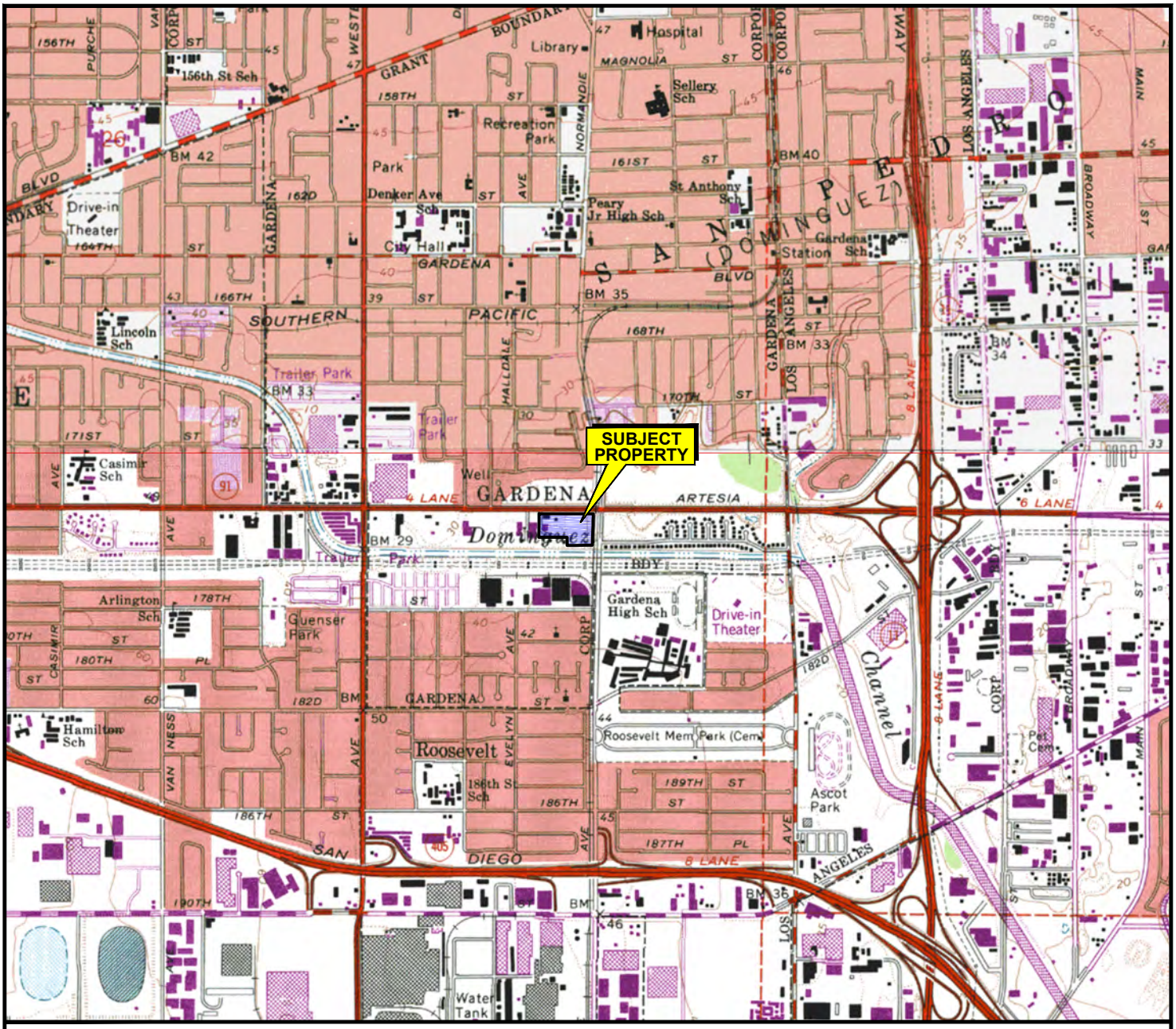
8.0 REFERENCES

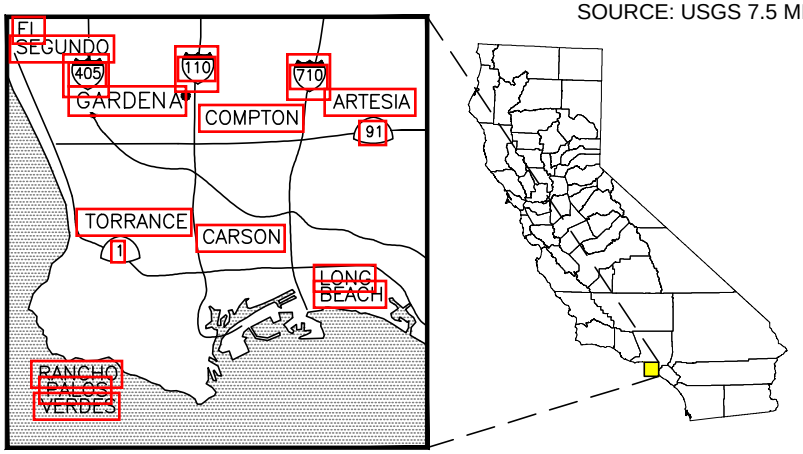
County of Los Angeles, http://dpw.lacounty.gov/wrd/Precip/alert_rain/raindata.cfm?id=315 Department of Public Works, Water Resources Division – Hydrologic Records, Alhambra CA.

Department of Toxic Substances Control, 2014, Letter to Kyle Christie, Atlantic Richfield Company, *REQUEST TO REMOVE MONITORING WELLS MW-01A AND MW-01B FROM SAMPLING PROGRAM,* October 30, 2014

US District Court, Central District of California, 2004, Case No. CV04-7882-AHM (JTLx), The California DTSC v. Atlantic Richfield Company: *Consent Decree*

FIGURES





SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC MAP, TORRANCE QUADRANGLE, 1964
PHOTOREVISED 1981
INGLEWOOD QUADRANGLE, 1964
PHOTOREVISED 1981

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0 2000 4000

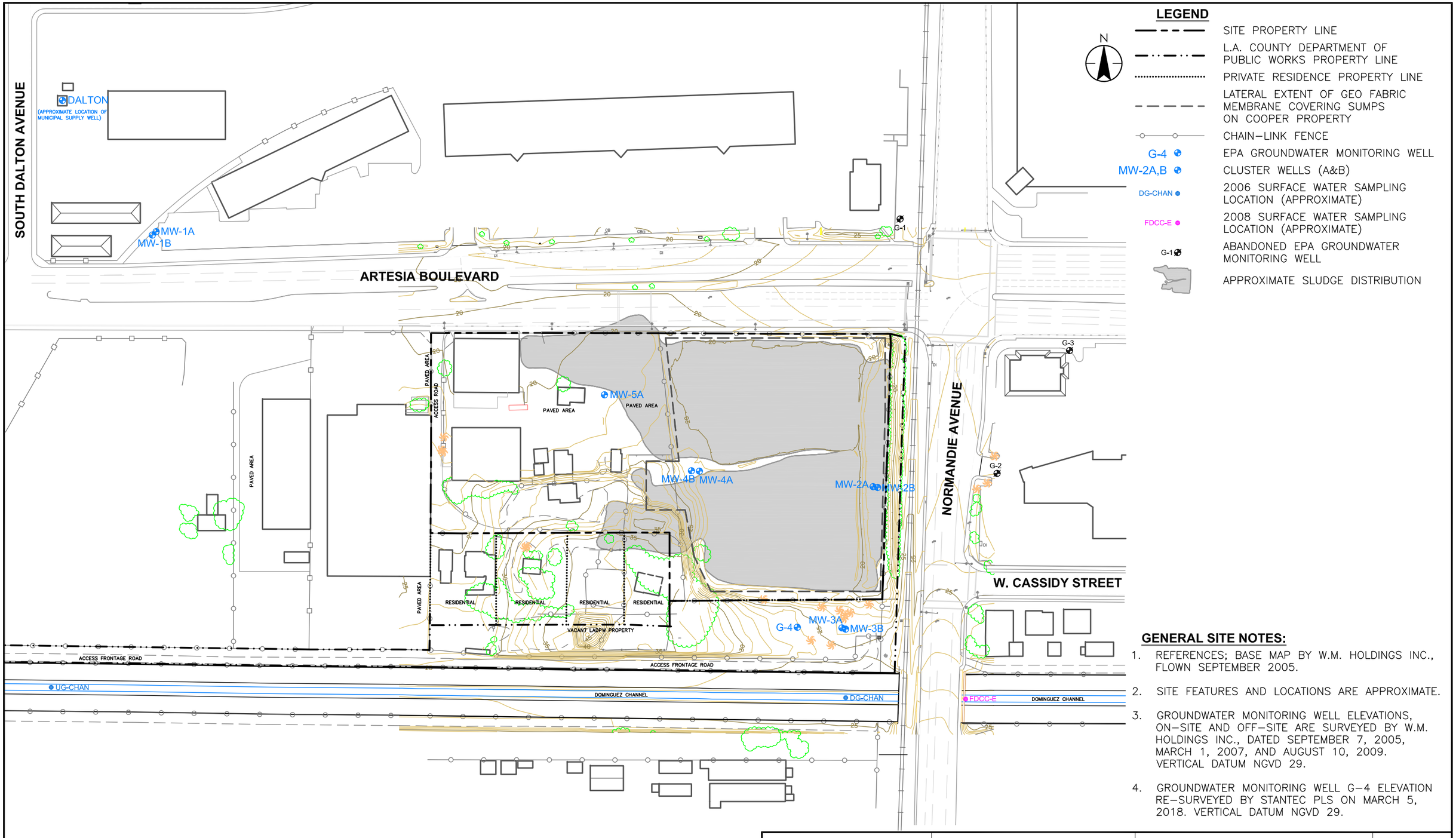
APPROXIMATE SCALE (FEET)

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
PHONE: (805) 230-1266 FAX: (805) 230-1277

FOR:		FIGURE:
GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA	SITE LOCATION MAP	1

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185850766	R. Roman	M. Mason	K. Brown	09/04/19

FILEPATH:E:\1858\active\185850766\03_data\cad\Groundwater\2019-Q3\20190904_dwg_bpgs_q3gwm19-slm.dwg|troman|Sep 04, 2019 at 12:06|Layout: F1_SLM (USGS)



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-2A,B — CLUSTER WELLS (A&B)
- DG-CHAN — 2006 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- FDCC-E — 2008 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- G-1 — ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SLUDGE DISTRIBUTION

GENERAL SITE NOTES:

1. REFERENCES; BASE MAP BY W.M. HOLDINGS INC., FLOWN SEPTEMBER 2005.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE ARE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005, MARCH 1, 2007, AND AUGUST 10, 2009. VERTICAL DATUM NGVD 29.
4. GROUNDWATER MONITORING WELL G–4 ELEVATION RE–SURVEYED BY STANTEC PLS ON MARCH 5, 2018. VERTICAL DATUM NGVD 29.

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
PHONE:(805) 230-1266 FAX:(805) 230-1277

FOR:				FIGURE:
GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA		SITE MAP SHOWING GROUNDWATER MONITORING WELL LOCATIONS		2
JOB NUMBER: 185850766	DRAWN BY: R. Roman	CHECKED BY: M. Mason	APPROVED BY: K. Brown	DATE: 09/04/19

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SOUTH DALTON AVENUE

DALTON
(APPROXIMATE LOCATION OF MUNICIPAL SUPPLY WELL)

MW-01A
(10.94 MSL)

GRO	NS
VOC	NS
SVOC	NS
LAB pH	NS
FIELD pH	NS
PAH	NS
TSULF	NS

ARTESIA BOULEVARD

(7.25 MSL)

GRO	40 J
VOC	ND
SVOC	ND
LAB pH	6.70
FIELD pH	6.27
PAH	0.20
TSULF	<50

(6.70 MSL)

GRO	<50
VOC	ND
SVOC	ND
LAB pH	7.30
FIELD pH	7.05
PAH	ND
TSULF	<50

G-1

G-3

PAVED AREA

ACCESS ROAD

7.25 — MW-05A — 7.25

PAVED AREA

PAVED AREA

7.00 — 7.00

6.75 — MW-04A — MW-02A — 6.75

6.50 — 6.50

6.25 — 6.25

6.00 — 6.00

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

RESIDENTIAL

VACANT LADPW PROPERTY

5.75 — G-4 — MW-03A — 5.75

ACCESS FRONTAGE ROAD

ACCESS FRONTAGE ROAD

UG-CHAN

DOMINGUEZ CHANNEL

(5.75 FT MSL)

GRO	<50
VOC	ND
SVOC	ND
LAB pH	7.50
FIELD pH	7.02
PAH	ND
TSULF	<50

NORMANDIE AVENUE

G-2

(6.64 MSL)

GRO	<50
VOC	ND
SVOC	ND
LAB pH	7.40
FIELD pH	6.96
PAH	ND
TSULF	<50

W. CASSIDY STREET

FDCC-E

DOMINGUEZ CHANNEL

N

LEGEND

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- MW-02A,B — CLUSTER WELLS (A&B)
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- FDCC-E — 2008 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- G-1 — ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SLUDGE DISTRIBUTION
- GROUNDWATER ELEVATION CONTOUR LINE, DASHED WHERE INFERRED (Feet above mean sea level)
- GROUNDWATER GRADIENT (0.0038) BENEATH COOPER SUMP-BEARING 169°
- SELECTED VOLATILE ORGANIC, SEMIVOLATILE ORGANIC, AND METAL CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L) AND pH IN GROUNDWATER SAMPLED ON FEBRUARY 18, 2020
- (6.68 FT MSL) GROUNDWATER ELEVATION FEET ABOVE MSL

GRO	=GASOLINE RANGE ORGANICS (C_4-C_{12}) BY 8015B
VOC	=VOLATILE ORGANIC COMPOUNDS BY 8260B
SVOC	=SEMI-VOLATILE ORGANIC COMPOUNDS BY 8270C BIS(2-ETYLHEXYL) PHTHALATE
LAB pH	=pH MEASURED IN THE LAB BY 9040B
FIELD pH	=pH MEASURED IN THE FIELD PRIOR TO SAMPLING
PAH	=POLYNUCLEAR AROMATIC HYDROCARBON BY 8270C CHRYSENE, PYRENE
TSULF	=TOTAL SULFIDES BY SM4500-SC,D

ND	NON-DETECT
J	ANALYTE WAS DETECTED BETWEEN THE MDL AND THE RL
0.16 J*	2-METHYLNAPHTHALENE
4.3 J**	BENZOIC ACID
†	MW-01A & & G-4 NOT USED FOR GROUNDWATER GRADIENT CALCULATIONS
NS	NOT SAMPLED THIS EVENT

GENERAL SITE NOTES:

1. REFERENCES; BASE MAP BY W.M. HOLDINGS INC., FLOWN SEPTEMBER 2005.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
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0 140 280

APPROXIMATE SCALE (FEET)

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
PHONE:(805) 230-1266 FAX:(805) 230-1277

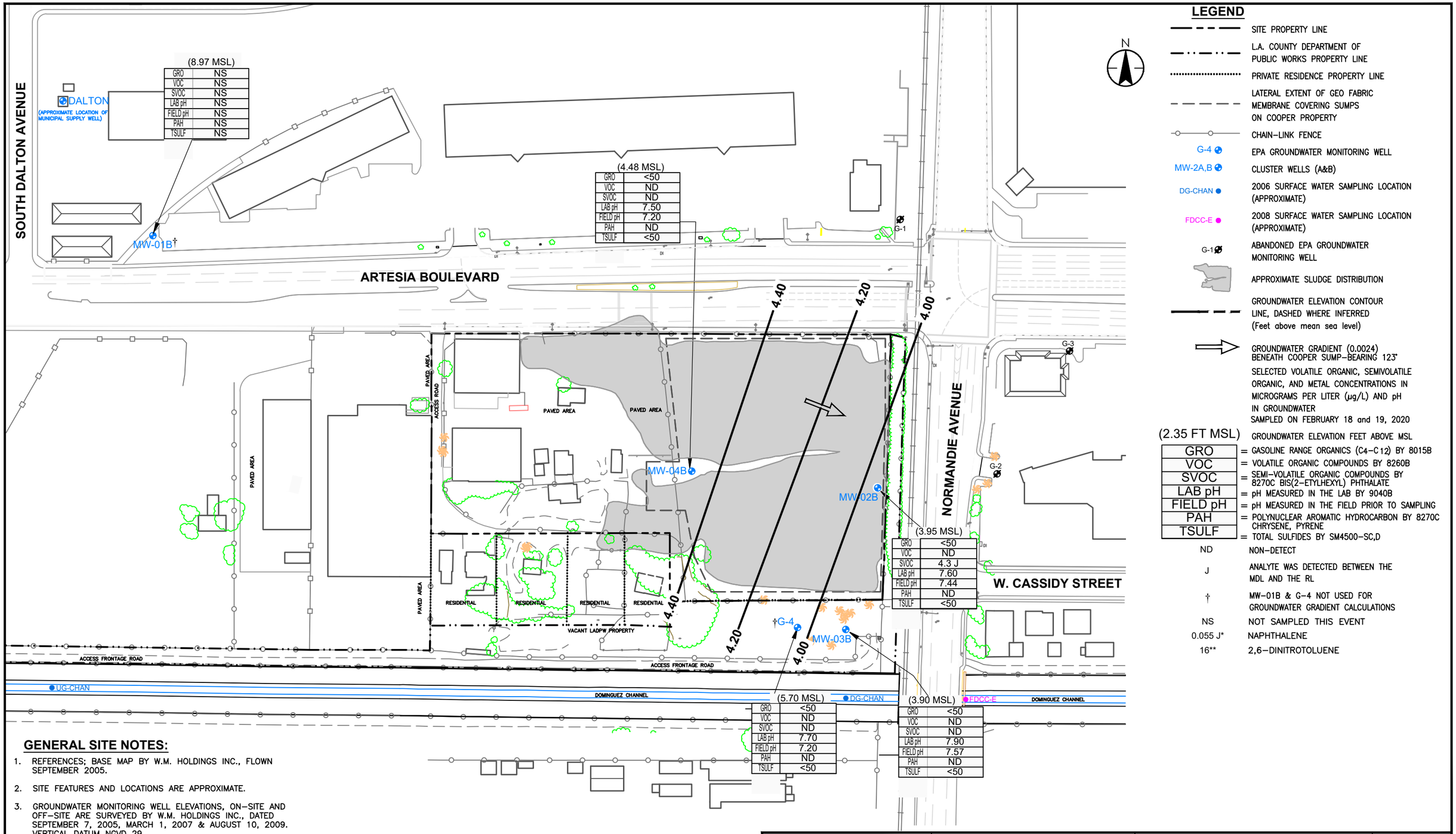
FOR:
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

GROUNDWATER ELEVATIONS AND SELECTED ANALYTICAL RESULTS FOR UPPER HYDRAULIC ZONE A SECOND SEMI-ANNUAL 2020

FIGURE: 3

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185850766	M.Ramirez	M. Mason	K. Brown	09/29/20

FILEPATH:V:\1857\active\Secor\CADD_00 OTHER OFFICES\THOUSAND OAKS\GARDENA SUMP\2020-Q3\20190904_dwg_bpgs_q1gwm20.dwg|MiRamirez|Oct 05, 2020 at 12:39|Layout: F3_GWA



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- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 EPA GROUNDWATER MONITORING WELL
- MW-2A,B CLUSTER WELLS (A&B)
- DG-CHAN 2006 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- FDCC-E 2008 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- G-1 ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SLUDGE DISTRIBUTION
- GROUNDWATER ELEVATION CONTOUR LINE, DASHED WHERE INFERRED (Feet above mean sea level)
- GROUNDWATER GRADIENT (0.0024) BENEATH COOPER SUMP–BEARING 123°
- SELECTED VOLATILE ORGANIC, SEMIVOLATILE ORGANIC, AND METAL CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L) AND pH IN GROUNDWATER SAMPLED ON FEBRUARY 18 and 19, 2020

(2.35 FT MSL) GROUNDWATER ELEVATION FEET ABOVE MSL

GRO	= GASOLINE RANGE ORGANICS (C4–C12) BY 8015B
VOC	= VOLATILE ORGANIC COMPOUNDS BY 8260B
SVOC	= SEMI–VOLATILE ORGANIC COMPOUNDS BY 8270C BIS(2–ETYLHEXYL) PHTHALATE
LAB pH	= pH MEASURED IN THE LAB BY 9040B
FIELD pH	= pH MEASURED IN THE FIELD PRIOR TO SAMPLING
PAH	= POLYNUCLEAR AROMATIC HYDROCARBON BY 8270C CHRYSENE, PYRENE
TSULF	= TOTAL SULFIDES BY SM4500–SC,D
ND	NON–DETECT
J	ANALYTE WAS DETECTED BETWEEN THE MDL AND THE RL
†	MW–01B & G–4 NOT USED FOR GROUNDWATER GRADIENT CALCULATIONS
NS	NOT SAMPLED THIS EVENT
0.055 J*	NAPHTHALENE
16**	2,6–DINITROTOLUENE

GENERAL SITE NOTES:

1. REFERENCES; BASE MAP BY W.M. HOLDINGS INC., FLOWN SEPTEMBER 2005.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE ARE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005, MARCH 1, 2007 & AUGUST 10, 2009. VERTICAL DATUM NGVD 29.
4. GROUNDWATER MONITORING WELL G–4 ELEVATION RE–SURVEYED BY STANTEC PLS ON MARCH 5, 2018. VERTICAL DATUM NGVD 29.

0 140 280

APPROXIMATE SCALE (FEET)

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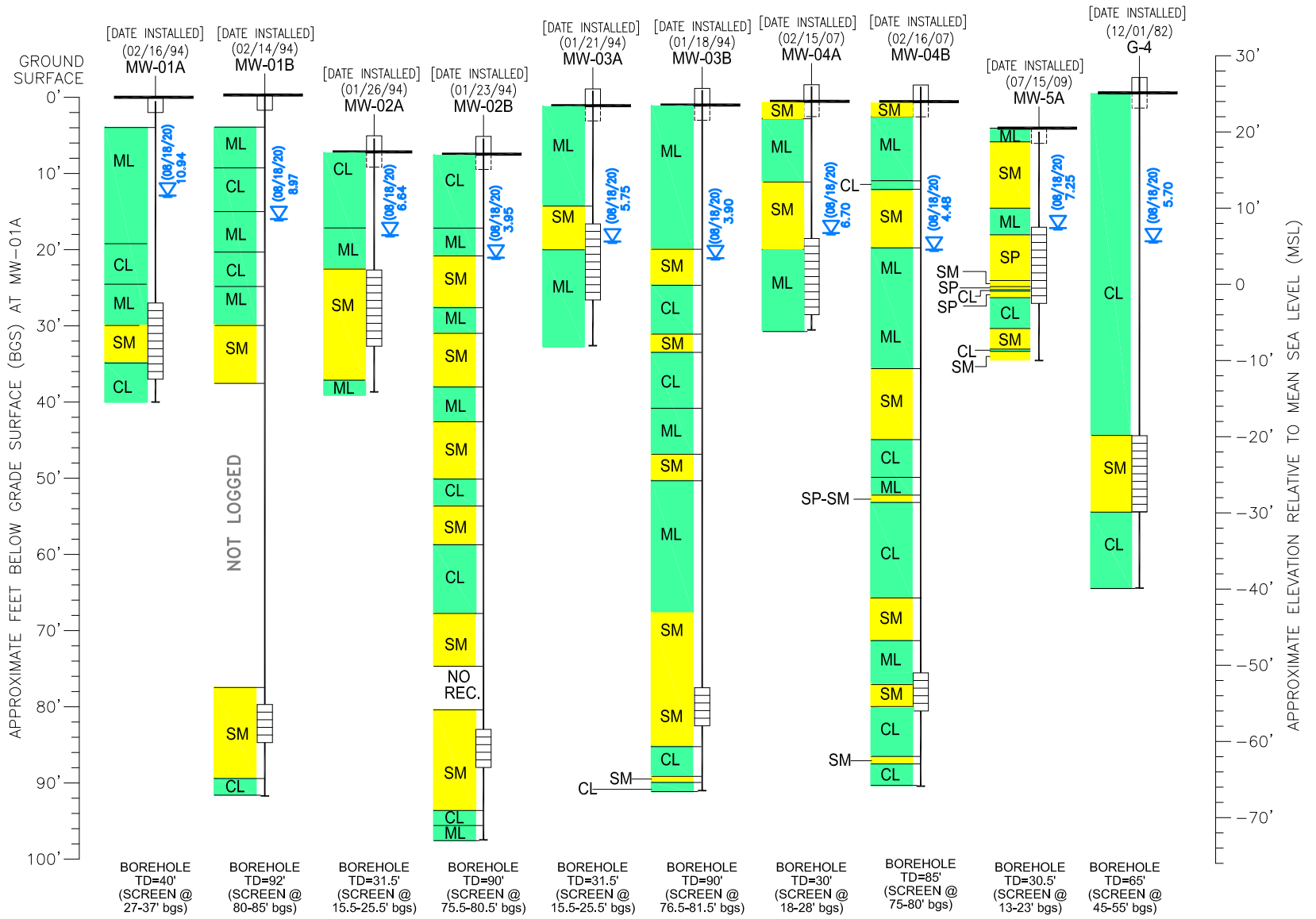
FOR:
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

GROUNDWATER ELEVATIONS AND SELECTED ANALYTICAL RESULTS FOR LOWER HYDRAULIC ZONE B SECOND SEMI-ANNUAL 2020

FIGURE: 4

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185850766	M.Ramirez	M. Mason	K. Brown	09/29/20

FILEPATH:V:\1857\active\Secor\CADD_00 OTHER OFFICES\THOUSAND OAKS\GARDENA SUMP\2020-Q3\20190904_dwg_bpgs_q1gwm20.dwg|MiRamirez|Sep 29, 2020 at 14:34|Layout: F4_GWB



LEGEND

GROUNDWATER ELEVATION (DATE)

NOTE:

1. GROUNDWATER MONITORING WELL ELEVATIONS, ON-SITE AND OFF-SITE ARE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005, AND MARCH 1, 2007. VERTICAL DATUM NGVD 29.
2. GROUNDWATER MONITORING WELL G-4 ELEVATION RE-SURVEYED BY STANTEC PLS ON MARCH 5, 2018. VERTICAL DATUM NGVD 29.

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FOR:
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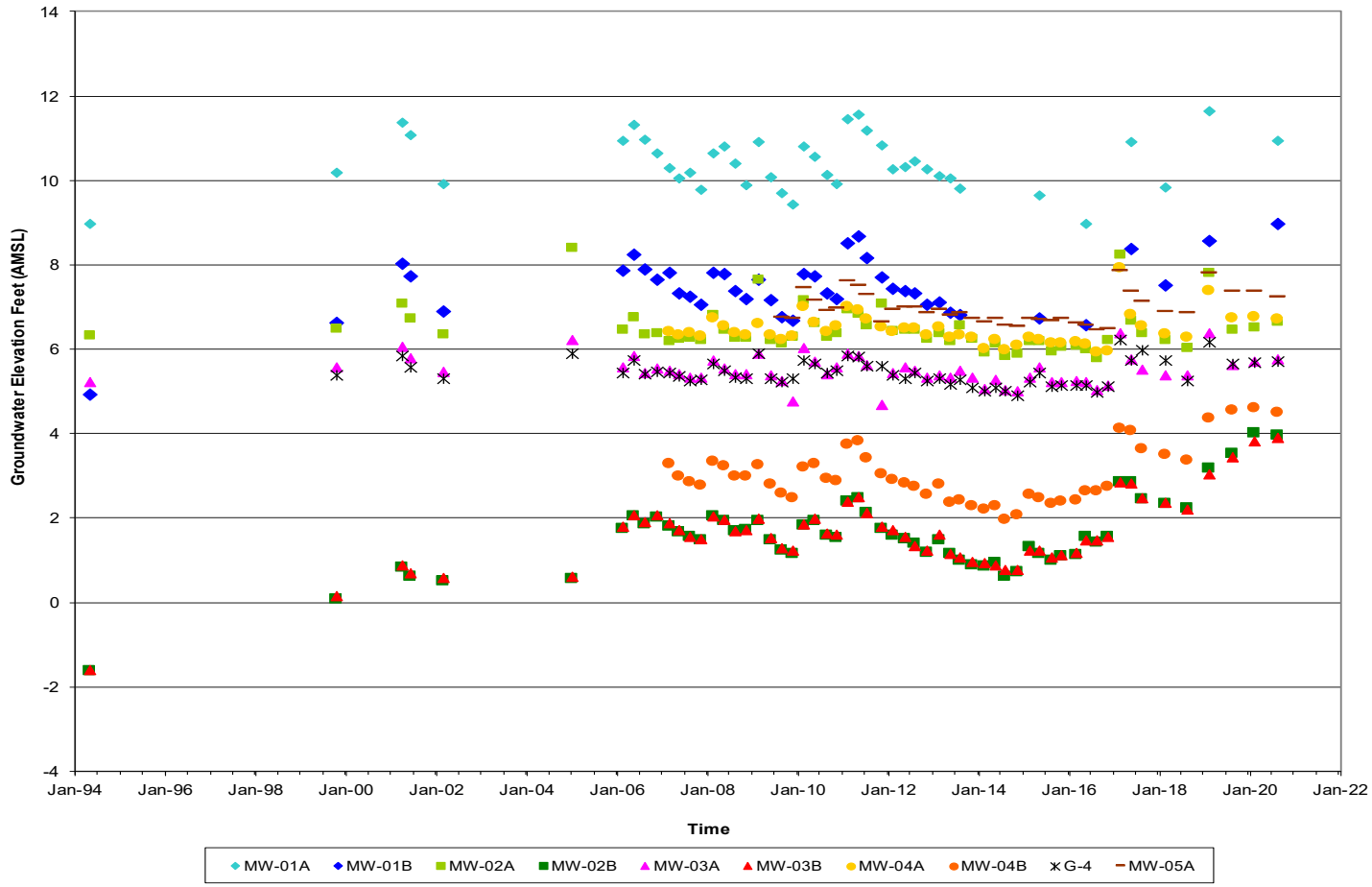
Gardena, CA

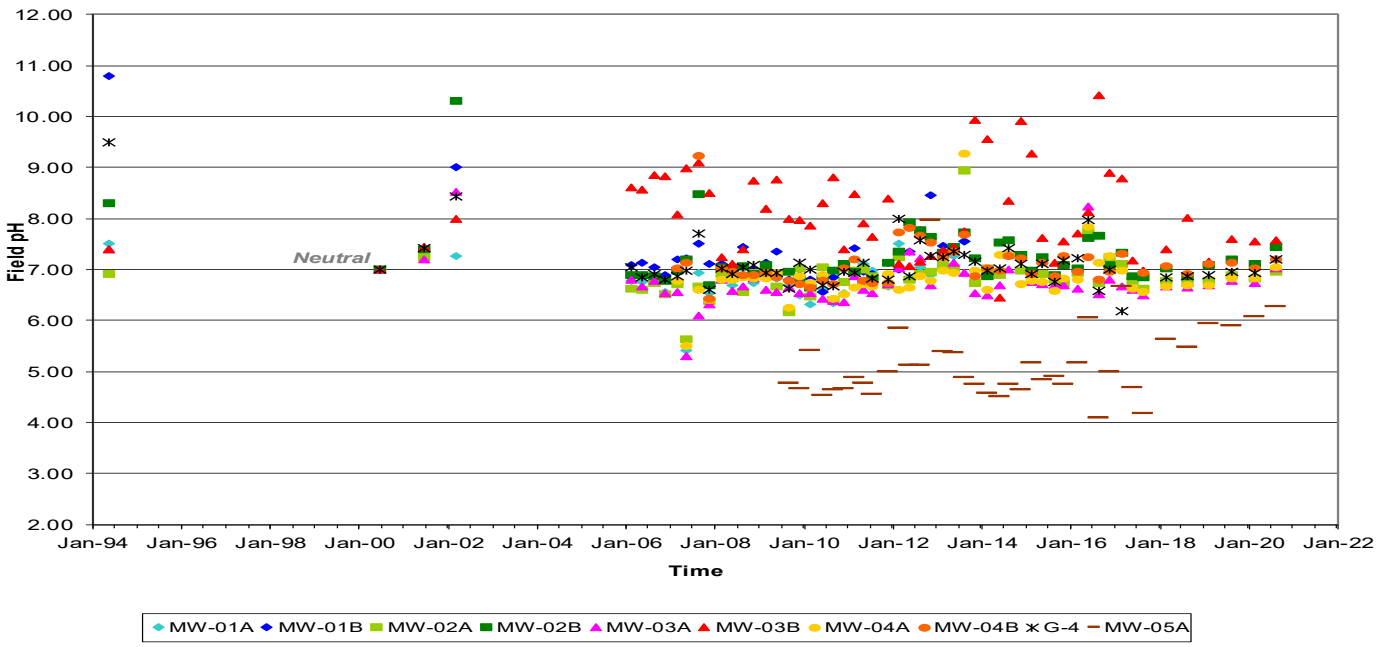
WELL COMPLETION SCHEDULE AND SOIL TYPE FOR GROUNDWATER MONITORING WELLS
SECOND SEMI-ANNUAL 2020

FIGURE: 5A

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185850766	R. Roman	M. Mason	K. Brown	09/29/20

FILEPATH:V:\1857\active\Secor\CADD_00 OTHER OFFICES\THOUSAND OAKS\GARDENA SUMP\2020-Q3\20190904_dwg_bpgs_q3gwm20-hydrograph.dwg|MiRamirez|Oct 05, 2020 at 12:57|Layout: F5A





GRAPH NOTES:

1. ALL pH MEASUREMENTS TAKEN JUNE 15, 2000 WERE OBTAINED USING pH PAPER INSTEAD OF A pH METER. THUS, DATA RESOLUTION WAS LIMITED TO WHOLE pH UNITS.
2. DURING THE SECOND QUARTER 2007 THE INSTRUMENT USED TO MEASURE pH IN WELLS COMPLETED IN THE UPPER SATURATED ZONE HAD CALIBRATION ISSUES THAT RESULTED IN SLIGHTLY LOWER pH VALUES. DURING THE THIRD QUARTER 2007 A CALIBRATION ISSUE DEVELOPED IN THE INSTRUMENT USED TO MEASURE pH VALUES IN WELLS WITHIN THE LOWER SATURATED ZONE RESULTING IN SLIGHTLY ELEVATED pH VALUES.
3. WELL G-4 CASING WAS DAMAGED IN EARLY 2017. IT WAS REPAIRED IN 2018 AND RE-SURVEYED FOR ELEVATION BY STANTEC SURVEYORS ON MAY 5, 2018.

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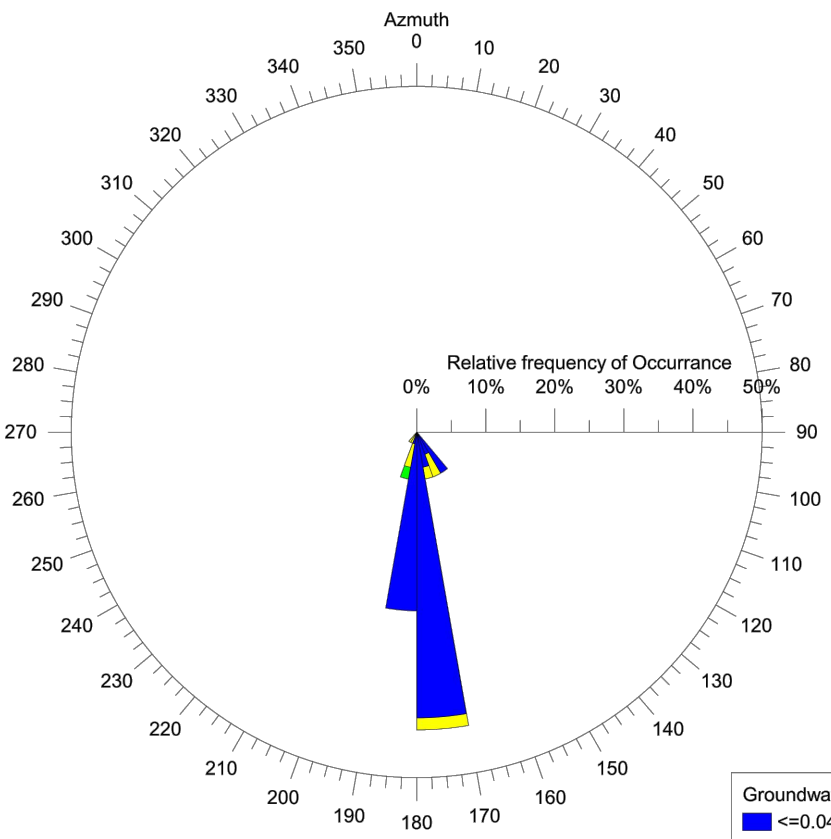
FOR:		FIGURE:
GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA	HYDROGRAPH AND FIELD pH SECOND SEMI-ANNUAL 2020	5B

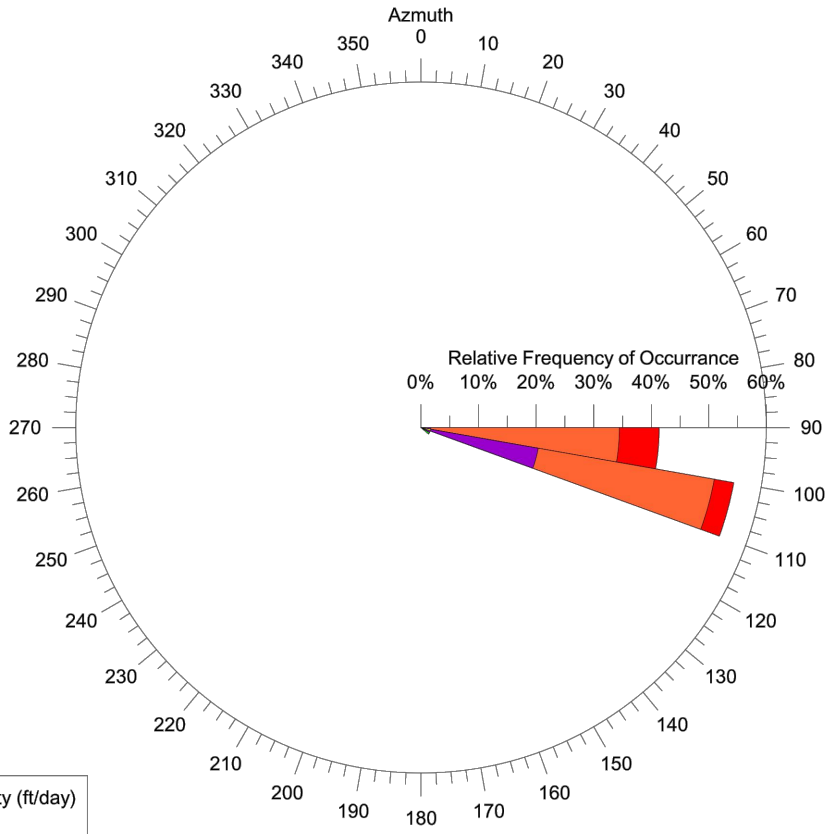
JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185850766	R. Roman	M. Mason	K. Brown	09/29/20

FILEPATH:V:\1857\active\Secor\CADD_00 OTHER OFFICES\THOUSAND OAKS\GARDENA SUMP\2020-Q3\20190904_dwg_bpgs_q3gwm20-hydrograph.dwg|MiRamirez|Sep 29, 2020 at 15:02|Layout:

Groundwater Velocity and Direction
Upper Monitored Zone - Cooper Property



Groundwater Velocity and Direction
Lower Monitored Zone - Cooper Property



Groundwater Velocity (ft/day)
- <=0.04
- >0.04 - 0.08
- >0.08 - 0.12
- >0.12 - 0.16
- >0.16 - 0.2
- >0.2

NOTES:

1. OBSERVATION PERIOD OF ESTIMATED GROUNDWATER GRADIENT, VELOCITY, AND DIRECTION FOR VELOCITY POLAR DIAGRAMS, FOR FEBRUARY 15, 1994 TO PRESENT.

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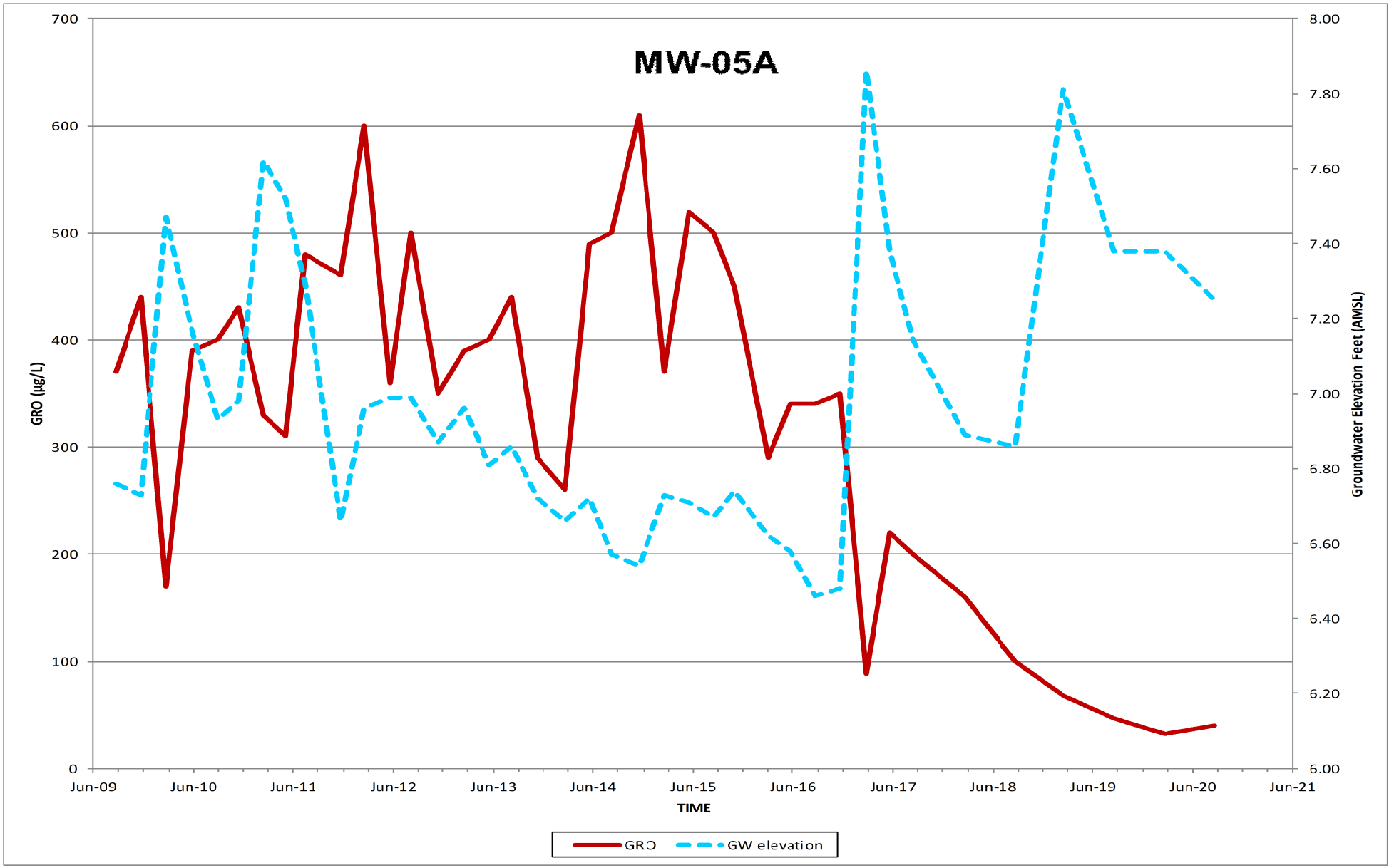
FOR:
GARDENA SUMPS
Southwest Corner of Artesia Boulevard
and Normandie Avenue
Gardena, CA

ROSE DIAGRAMS
SECOND SEMI-ANNUAL 2020

FIGURE:
5C

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185850766	R. Roman	M. Mason	K. Brown	09/29/20

FILEPATH:V:\1857\active\Secor\CADD_00 OTHER OFFICES\THOUSAND OAKS\GARDENA SUMP\2020-Q3\20190904_dwg_bpgs_q3gwm20-hydrograph.dwg|MiRamirez|Sep 29, 2020 at 15:12|Layout: F5C



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FOR:
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Southwest Corner of Artesia Boulevard
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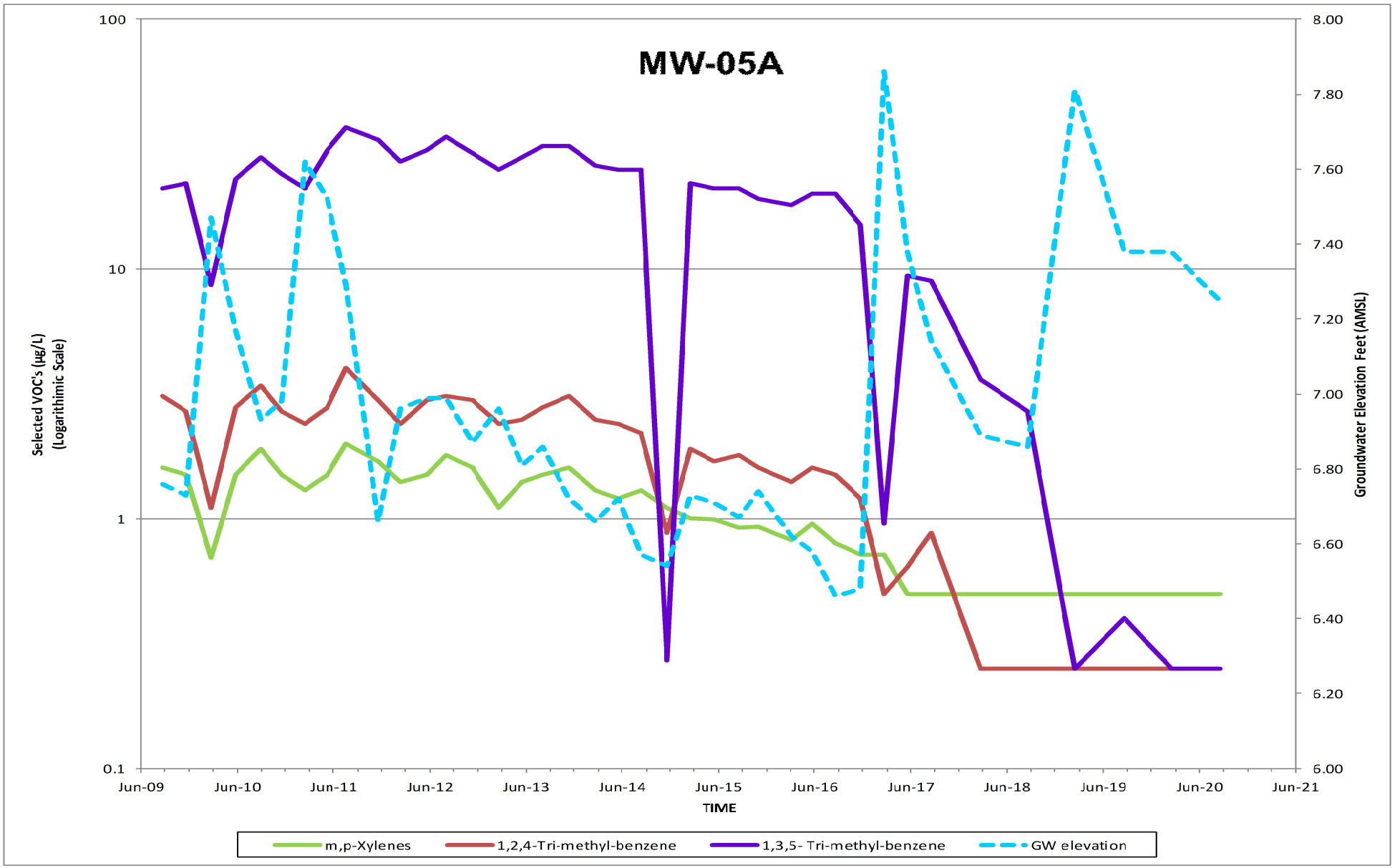
Gardena, CA

MW-05A
GRO TRENDS GRAPH
SECOND SEMI-ANNUAL 2020

FIGURE:
6A

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185850766	R. Roman	M. Mason	K. Brown	09/29/20

FILEPATH:V:\1857\active\Secor\CADD_00 OTHER OFFICES\THOUSAND OAKS\GARDENA SUMP\2020-Q3\20190904_dwg_bpgs_q3gwm20-hydrograph.dwg|MiRamirez|Sep 29, 2020 at 15:18|Layout: F6A



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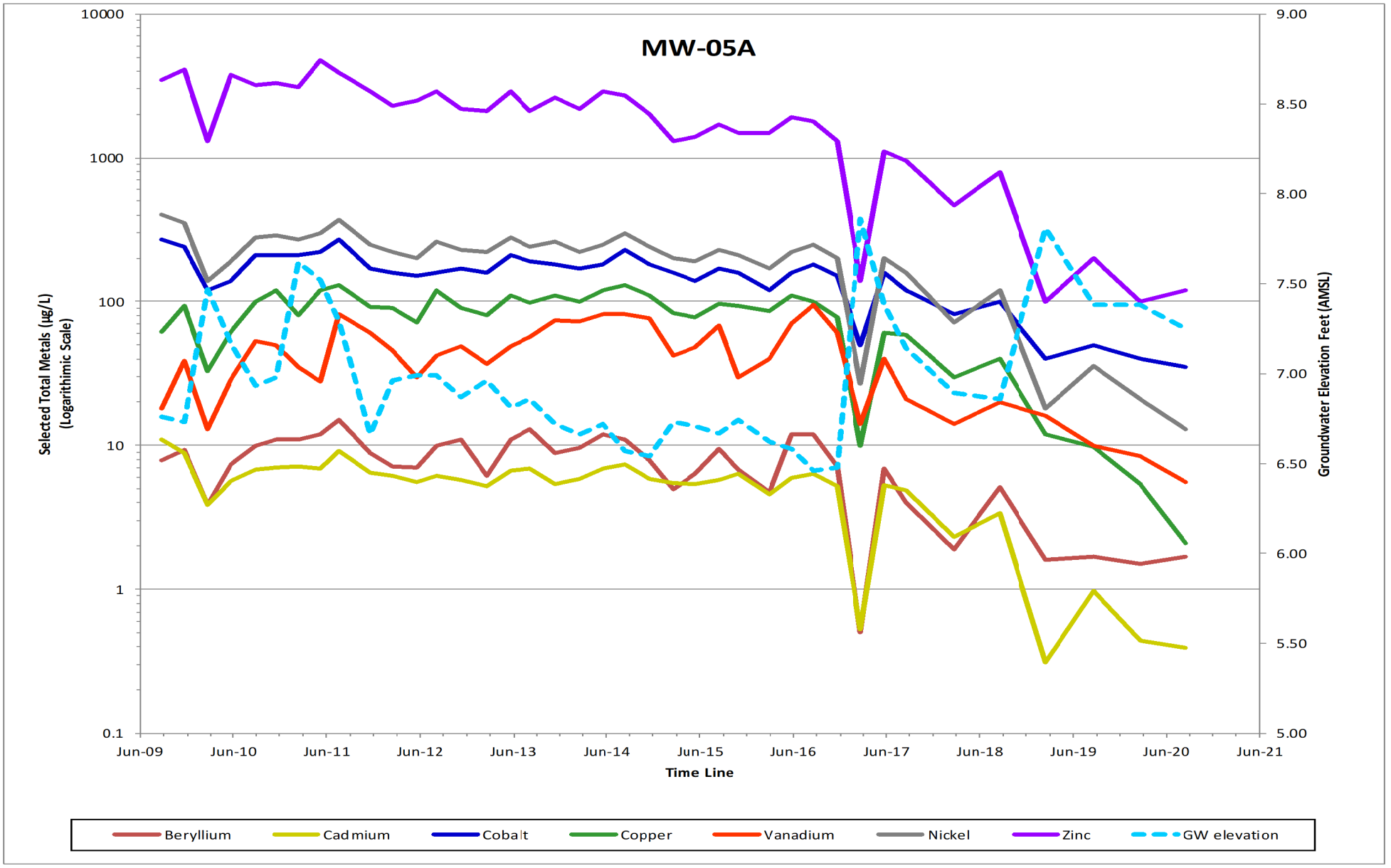
FOR:
GARDENA SUMPS
Southwest Corner of Artesia Boulevard
and Normandie Avenue
Gardena, CA

MW-05A
SELECTED VOC's TRENDS GRAPH
SECOND SEMI-ANNUAL 2020

FIGURE:
6B

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185850766	R. Roman	M. Mason	K. Brown	09/29/20

FILEPATH:V:\1857\active\Secor\CADD_00 OTHER OFFICES\THOUSAND OAKS\GARDENA SUMP\2020-Q3\20190904_dwg_bpgs_q3gwm20-hydrograph.dwg|MiRamirez|Sep 29, 2020 at 15:22|Layout: F6B



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FOR:
GARDENA SUMPS
Southwest Corner of Artesia Boulevard
and Normandie Avenue
Gardena, CA

MW-05A
SELECTED TOTAL METALS
TRENDS GRAPH
SECOND SEMI-ANNUAL 2020

FIGURE:
6C

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185850766	R. Roman	M. Mason	K. Brown	09/29/20

FILEPATH:V:\1857\active\Secor\CADD_00 OTHER OFFICES\THOUSAND OAKS\GARDENA SUMP\2020-Q3\20190904_dwg_bpgs_q3gwm20-hydrograph.dwg|MiRamirez|Sep 29, 2020 at 15:25|Layout: F6C

TABLES

Table 1
Groundwater Monitoring Well Construction Specifications
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Date Installed	Date Abandoned	Well Diameter (inches)	Well Material	Top of Casing Elevation (ft MSL)	Surface Elevation (ft MSL)	Total Depth of Boring (ft bgs)	Total Depth of Well (ft bgs)	Screen Interval (ft bgs)	Screen Interval (ft MSL)
MW-01A	02/16/94	--	4"	sch. 40 PVC	23.55	23.55	40	40	27-37	-2.95 to -12.95
MW-01B	02/14/94	--	4"	sch. 40 PVC	23.69	23.69	92	86	80-85	-55.73 to -60.73
MW-02A	01/26/94	--	4"	sch. 40 PVC	19.15	17.38	31.5	31.5	15.5-25.5	1.88 to -8.12
MW-02B	01/23/94	--	4"	sch. 40 PVC	19.36	17.08	90	83	75.5-80.5	-58.42 to -63.42
MW-03A	01/21/94	--	4"	sch. 40 PVC	25.45	23.46	31.5	27	15.5-25.5	7.96 to -2.04
MW-03B	01/18/94	--	4"	sch. 40 PVC	25.51	23.54	90	83.5	76.5-81.5	-52.96 to -57.96
MW-04A	02/15/07	--	4"	sch. 40 PVC	24.02	21.16	30	28	18-28	6.02 to -3.98
MW-04B	02/16/07	--	4"	sch. 40 PVC	23.99	21.19	88	85	75-80	-51.01 to 56.01
MW-05A	07/20/09	--	4"	sch. 40 PVC	20.21	20.50	30.5	28	13-23	7.5 to -2.5
G-1	12/1/1982*	1987 or 1988	4"	PVC*	--	--	70	62	50-55	-25.92 to -30.92
G-2	12/1/1982*	1987 or 1988	4"	PVC*	--	--	70	65	40-50	-14.91 to -24.91
G-3	12/1/1982*	1987 or 1988	4"	PVC*	--	--	65	65	50-60	-24.94 to -34.94
G-4	12/01/82	--	2"	PVC	26.79**	25.14	65	65	45-55	-19.86 to -29.86

Notes
ft bgs = Feet below ground surface
ft MSL = Feet Mean Sea Level
-- = Not applicable / Not analylized
* = Assumed from data for G-4
Total depth of well and screen intervals determined from downhole camera inspection conducted on December, 15, 2005
** = Well G-4 casing was damaged in early 2017. It was repaired in 2018 and resurveyed on May 5, 2018. Former elevation was 27.12' AMSL.

References
California Department of Health Services, 1987: *Site Inspection Report Gardena Sumps, Gardena, California.*
URS Consultants, Inc., 1994: *Groundwater Remedial Investigation Technical Memorandum, Gardena Sumps City of Gardena, California.*
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.
Top of well casing and surface elevation surveyed by WM Holdings, Incorporated on September 7, 2005 and March 1, 2007.
During the first quarter 2010 the screened interval for MW-05A was edited to show the correct MSL interval.
3-5-2018 elevation survey by Stantec PLS survey

Table 2
Two Year Summary of Groundwater Gauging and Elevation Data
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-01A	24.05	02/21/18	14.22	37.43	9.83	-1.08	NC	NC	NC	NC	Well is inspected annually during the 1st quarter
MW-01A	24.05	02/12/19	12.40	37.50	11.65	1.82	NC	NC	NC	NC	
MW-01A	24.05	02/18/20	NM	37.50	NM	NM	NC	NC	NC	NC	
MW-01A	24.05	08/18/20	13.11	NM	10.94	-0.71	NC	NC	NC	NC	Well Gauged Only
MW-01B	24.27	02/21/18	16.76	85.16	7.51	-0.86	NM	NC	NC	NM	Well is inspected annually during the 1st quarter
MW-01B	24.27	02/12/19	15.70	85.15	8.57	1.06	NM	NC	NC	NM	
MW-01B	24.27	02/18/20	NM	85.15	NM	NM	NM	NC	NC	NM	
MW-01B	24.27	08/18/20	15.30	NM	8.97	0.40	NM	NC	NC	NM	
MW-02A	19.15	08/21/18	13.11	28.42	6.04	-0.18	164	0.0034	0.028	--	
MW-02A	19.15	02/12/19	11.33	28.41	7.82	1.78	199	0.0065	0.054	--	
MW-02A	19.15	08/20/19	12.69	NM	6.46	-1.36	170	0.0041	0.034	--	TD not measured
MW-02A	19.15	02/18/20	12.63	NM	6.52	-1.30	169	0.0038	0.031	--	TD data recorded incorrectly
MW-02A	19.15	08/18/20	12.51	32.10	6.64	0.12	180	0.0041	0.034	--	
MW-02B	19.36	08/21/18	17.13	83.00	2.23	-0.11	102	0.0042	0.156	0.064	
MW-02B	19.36	02/12/19	16.18	83.00	3.18	0.95	111	0.0042	0.156	0.077	
MW-02B	19.36	08/20/19	15.85	83.04	3.51	0.33	107	0.0037	0.137	0.049	
MW-02B	19.36	02/18/20	15.35	83.12	4.01	0.83	123	0.0024	0.089	0.042	
MW-02B	19.36	08/18/20	15.41	83.11	3.95	-0.06	108	0.0019			
MW-03A	25.45	08/21/18	20.08	28.55	5.37	-0.01	164	0.0034	0.028	--	
MW-03A	25.45	02/12/19	19.08	28.50	6.37	1.00	199	0.0065	0.054	--	
MW-03A	25.45	08/20/19	19.83	28.65	5.62	-0.75	170	0.0041	0.034	--	
MW-03A	25.45	02/18/20	19.74	28.63	5.71	-0.66	169	0.0038	0.031	--	
MW-03A	25.45	08/18/20	19.70	28.61	5.75	0.04	180	0.0041	0.034	--	
MW-03B	25.51	08/21/18	23.30	83.11	2.21	-0.14	102	0.0042	0.156	0.052	
MW-03B	25.51	02/12/19	22.40	83.15	3.11	0.90	111	0.0042	0.156	0.055	
MW-03B	25.51	08/20/19	22.07	83.10	3.44	0.33	107	0.0037	0.137	0.036	
MW-03B	25.51	02/18/20	21.68	83.04	3.83	0.72	123	0.0024	0.089	0.031	
MW-03B	25.51	08/18/20	21.61	83.04	3.90	0.07	108	0.0019			
MW-04A	24.02	08/21/18	17.74	31.26	6.28	-0.08	164	0.0034	0.028	--	
MW-04A	24.02	02/12/19	16.63	31.29	7.39	1.11	199	0.0065	0.054	--	
MW-04A	24.02	08/20/19	17.29	31.25	6.73	-0.66	170	0.0041	0.034	--	
MW-04A	24.02	02/18/20	17.25	31.25	6.77	-0.62	169	0.0038	0.031	--	
MW-04A	24.02	08/18/20	17.32	31.26	6.70	-0.07	180	0.0041	0.034	--	
MW-04B	23.99	08/21/18	20.63	88.30	3.36	-0.14	102	0.0042	0.156	0.051	
MW-04B	23.99	02/12/19	19.64	88.35	4.35	0.99	111	0.0042	0.156	0.053	
MW-04B	23.99	08/20/19	19.43	88.30	4.56	0.21	107	0.0037	0.137	0.038	
MW-04B	23.99	02/18/20	19.39	87.12	4.60	0.25	123	0.0024	0.089	0.038	
MW-04B	23.99	08/18/20	19.51	87.10	4.48	-0.12	108	0.0019	0.071	-0.079	
MW-05A	20.21	08/21/18	13.35	28.36	6.86	-0.03	164	0.0034	0.028	--	
MW-05A	20.21	02/12/19	12.40	28.30	7.81	0.95	199	0.0065	0.054	--	
MW-05A	20.21	08/20/19	12.83	28.28	7.38	-0.43	170	0.0041	0.034	--	
MW-05A	20.21	02/18/20	12.83	28.24	7.38	-0.43	169	0.0038	0.031	--	
MW-05A	20.21	08/18/20	12.96	28.21	7.25	-0.13	180	0.0041	0.034	--	
G-4***	26.79	08/21/18	21.54	NM	5.25	-0.14	--	--	--	--	2" well w/pump prevents TD measurement
G-4	26.79	02/12/19	20.62	NM	6.17	0.92	--	--	--	--	2" well w/pump prevents TD measurement
G-4	26.79	08/20/19	21.13	NM	5.66	-0.51	--	--	--	--	2" well w/pump prevents TD measurement
G-4	26.79	02/18/20	21.10	NM	5.69	-0.48	--	--	--	--	2" well w/pump prevents TD measurement
G-4	26.79	08/18/20	21.09	NM	5.70	0.01	--	--	--	--	2" well w/pump prevents TD measurement

Notes:
ft MSL = Feet Mean Sea Level
ft btoc = Feet below top of casing
NM = Not Measured
NC = Horizontal Groundwater Gradient & Velocity Not calculated off of Cooper Sump Site
-- = Not applicable / Not analyzed
Groundwater velocity calculations based on an assumed average porosity (n) and hydraulic conductivity (K) of the upper and lower
*** = repaired casing height, casing resurveyed on 3-5-2018 by Stantec PLS Survey
On October 12, 2017, the DTSC approved sampling reduction to Semi-Annually, 1st and 3rd quarters only

References:

EEI, 1987: *Site Inspection Report Gardena Sumps, Gardena, California.*
DTSC, 2000 and 2001: *2002 Groundwater Sampling Report for Gardena Sumps.*
DTSC, 2002: *2002 Groundwater Sampling Report for Gardena Sumps.*
URS Consultants, Inc., 1994: *Groundwater Remedial Investigation Technical Memorandum, Gardena Sumps City of Gardena, California.*
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps City of Gardena, California.

Table 3
Two Year Summary of Volatile Organic Compounds Measured in Groundwater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-01A	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-02A	08/22/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20180822	08/22/18	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	02/13/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20190213	02/13/19	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	08/21/19		<50	--	<0.50	<0.50	<0.50	<0.50	**2.2**	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20190821	08/21/19	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	02/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP	02/19/20	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	08/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20200819	08/19/20	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	08/22/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	02/13/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	08/21/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	02/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	08/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/21/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	02/12/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/20/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	02/18/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/18/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Two Year Summary of Volatile Organic Compounds Measured in Groundwater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-03B	08/21/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	02/12/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/20/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	02/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/18/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	08/22/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	02/13/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	08/21/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	02/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	08/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	08/22/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	02/13/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	08/21/19		<50	--	<0.50	<0.50	<0.50	<0.50	**16**	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	02/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	08/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-05A	08/21/18		**100**	--	0.40 J	<0.50	<0.50	<0.50	0.41 J	<0.50	<0.50	<1.0	<0.50	<0.50	**2.7**
MW-05A	02/12/19		**68**	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-05A	08/20/19		47 J	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	0.40 J
MW-05A	02/18/20		32 J	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-05A	08/18/20		40 J	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Two Year Summary of Volatile Organic Compounds Measured in Groundwater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
G-4	08/21/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	02/12/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/20/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	02/18/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/18/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20180821	08/21/18	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20190212	02/12/19	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20190213	02/13/19	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20190820	08/20/19	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20190821	08/21/19	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20200218	02/18/20	Field Blank	<50	--	<0.50	<0.50	**0.56**	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20200219	02/19/20	Field Blank	<50	--	<0.50	<0.50	**0.38 J**	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20200818	08/18/20	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20200819	08/19/20	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20180821	08/21/18	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20180822	08/22/18	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20190212	02/12/19	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20190213	02/13/19	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20190820	08/20/19	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20190821	08/21/19	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20200218	02/18/20	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20200219	02/19/20	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20200818	08/18/20	Trip Blank	26 J	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20200819	08/19/20	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Two Year Summary of Volatile Organic Compounds Measured in Groundwater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na

Notes:
GRO = Gasolone Range Organics by modified EPA Method 8015B
* = Analyte was quantitated below the established linear calibration range. Amount reported is an estimate.
ND = Not Detected. This data was obtained from a summary table of a report not prepared by SECOR/Stantec.
<# = Analyte was not detected above the Reporting Limit (#)
µg/L = micrograms per liter
na = Not applicable
-- = Not applicable / Not analyzed
J = Analyte was detected between the MDL and the RL
MB or B = Analyte detected in the method blank
LH,AY = Due to sample matrix effects, the surrogate recovery was outside of acceptance limits.
PV = Hydrocarbon result partly due to individual peak(s) in quantity range.
Results highlighted with **Bold** font indicate results > RL
(1) - National Primary Drinking Water Regulations - EPA Region 9
(2) - California Department of Public Health
MCLs = Maximum Contaminant Levels
bold # Results highlighted with a gray box indicate results > MCL
During Q2, 2017 GW event, due to vandalism (hinges on well lid cut off and pump stolen), MW-04B and G-4 were sampled using a bailer and analyzed only for GRO and VOC's.
During Q3, 2017 GW event, due to vandalism (monument was found damaged), a no-purge sample was collected from G-4. A trip blank was not collected on 8/17/17 due to VOA breakage.

References:

DTSC, 2000 and 2001. *2000 and 2001Groundwater Sampling Report for Gardena Sumps.*
DTSC, 2002. *2002 Groundwater Sampling Report for Gardena Sumps.*
URS, 1994. *Groundwater Remedial Investigation Technical Memorandum* , Gardena Sumps, 1440 West Artesia Boulevard, Gardena, CA., November 14.
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.
EPA, 2009. *Drinking Water Standards and Health Advisories Table* , November

Table 4
Two Year Summary of Select Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium VI, pH, and Sulfide Measured in Groundwater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

			EPA Method:	8270C		376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (ug/L)	Chrysene (ug/L)	Pyrene (ug/L)	Total (ug/L)	Reactive (ug/L)	(ug/L)		
EPA Region 9 MCLs (1)			6	na	0.2 (3)	na	na	100 (4)	na	na
California DPH MCLs (2)			6	na	0.2 (3)	na	na	10	na	na
MW-01A	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--
MW-01B	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--
MW-02A	08/22/18		**11 B**	<0.49	<0.49	<50	--	<2.0	7.30	6.74
MW-02A	02/13/19		<5.0	<0.50	<0.50	<50	--	<2.0	7.90	6.77
MW-02A	08/21/19		4.2 J	<0.49	<0.49	<50	--	<2.0	7.80	6.89
MW-02A	02/19/20		**5.8**	<0.48	<0.48	<50	--	<2.0	7.70	6.82
MW-02A	08/19/20		<4.8	<0.19	<0.19	<50	--	<2.0	7.40	6.96
MW-02B	08/22/18		**34 B**	<0.50	<0.50	<50	--	<2.0	7.60	6.86
MW-02B	02/13/19		<4.9	<0.49	<0.49	<50	--	<2.0	8.00	7.08
MW-02B	08/21/19		**20**	<0.49	<0.49	<50	--	<2.0	8.00	7.19
MW-02B	02/19/20		4.8	<0.48	<0.48	<50	--	<2.0	7.90	7.11
MW-02B	08/19/20		4.3 J	<0.19	<0.19	<50	--	<2.0	7.60	7.44
MW-03A	08/21/18		2.2 J, B	<0.50	<0.50	<50	--	<2.0	7.30	6.65
MW-03A	02/12/19		<4.9	<0.49	<0.49	<50	--	1.2 J	7.40	6.70
MW-03A	08/20/19		<5.1	<0.51	<0.51	<50	--	0.37 J	7.70	6.78
MW-03A	02/18/20		<4.9	<0.49	<0.49	<50	--	0.54 J	7.60	6.73
MW-03A	08/18/20		<4.8	<0.19	<0.19	<50	--	0.50 J	7.50	7.02
MW-03B	08/21/18		**27 B**	<0.50	<0.50	<50	--	<2.0	7.60	8.01
MW-03B	02/12/19		**9.6**	<0.49	<0.49	<50	--	0.57 J	7.70	7.15
MW-03B	08/20/19		<5.1	<0.51	<0.51	<50	--	<2.0	8.00	7.60
MW-03B	02/19/20		3.0 J	<0.48	<0.48	<50	--	<2.0	8.10	7.54
MW-03B	08/18/20		<4.8	<0.19	<0.19	<50	--	<2.0	7.90	7.57
MW-04A	08/22/18		2.4 J, B	<0.50	<0.50	<50	--	<2.0	7.30	6.69
MW-04A	02/13/19		2.9 J	<0.49	<0.49	<50	--	<2.0	7.70	6.70
MW-04A	08/21/19		<4.9	<0.49	<0.49	<50	--	<2.0	7.80	6.83
MW-04A	02/19/20		<4.8	<0.48	<0.48	<50	--	<2.0	7.70	6.82
MW-04A	08/19/20		<4.8	<0.19	<0.19	<50	--	0.27 J	7.30	7.05
MW-04B	08/22/18		2.9 J, B	<0.50	<0.50	<50	--	<2.0	7.50	6.91
MW-04B	02/13/19		<5.0	<0.50	<0.50	**550**	--	<2.0	8.10	7.10
MW-04B	08/21/19		<4.9	<0.49	<0.49	**1100**	--	<2.0	8.10	7.13
MW-04B	02/19/20		<4.8	<0.48	<0.48	<50	--	<2.0	7.90	7.03
MW-04B	08/19/20		<4.7	<0.48	<0.48	<50	--	<2.0	7.50	7.20
MW-05A	08/21/18		<4.9	<0.49	<0.49	<50	--	<2.0	5.70	5.48
MW-05A	02/12/19		<4.9	<0.49	0.17 J	<50	--	<2.0	6.70	5.94
MW-05A	08/20/19		<5.1	<0.51	0.21 J	<50	--	<2.0	6.60	5.90
MW-05A	02/18/20		3.8 J	<0.49	<0.49	<50	--	<2.0	6.80	6.07
MW-05A	08/18/20		<4.7	<0.19	**0.20**	<50	--	<2.0	6.70	6.27
G-4	08/21/18		2.2 J, B	<0.49	<0.49	<50	--	<2.0	7.40	6.87
G-4	02/12/19		<4.9	<0.49	<0.49	<50	--	<2.0	7.60	6.89
G-4	08/20/19		<5.1	<0.51	<0.51	<50	--	<2.0	7.80	6.96
G-4	02/18/20		<4.9	<0.49	<0.49	<50	--	<2.0	7.80	6.94
G-4	08/18/20		<4.7	<0.19	<0.19	<50	--	<2.0	7.70	7.20

Table 4
Two Year Summary of Select Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium VI, pH, and Sulfide Measured in Groundwater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8270C			376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (ug/L)	Chrysene (ug/L)	Pyrene (ug/L)	Total (ug/L)	Reactive (ug/L)	(ug/L)		
EPA Region 9 MCLs (1)			6	na	0.2 (3)	na	na	100 (4)	na	na
California DPH MCLs (2)			6	na	0.2 (3)	na	na	10	na	na

Notes:
& 09-29-10 = wells were re-sampled on 9/29/2010 for SVOC analytes.
* = Analyte was quantitated below the established linear calibration range. Amount reported is an estimate.
** = pH was measured in the field using a Horriba U-22XB water quality meter
J = Analyte was detected between the MDL and the RL
LN,AY = The MS &/or the MSD were below acceptance limits due to sample matrix interference.
ND = Not Detected. This data was obtained from a summary table of a report not prepared by SECOR.The actual laboratory reports are not available, thus MDL's can not be determined for this
ND* = no MDL for reactive sulfide identified by the laboratory
<# = Analyte was not detected above the Reporting Limit (#)
NS = Not sampled
D = detected below quantitation limit
MB or B = Analyte present in Method Blank
µg/L = micrograms per liter
-- = Not applicable / Not analyzed
pH measurements on June 15, 2000 were obtained using pH paper
pH measurements reported prior to 2006 were obtained from a summary table of a report not prepared by SECOR. The pH measurements are presumed to have been obtained in the field.
Results highlighted with **Bold** font indicate results > RL
(1) - National Primary Drinking Water Regulations - EPA Region 9
(2) - California Department of Public Health
(3) - Identified as Benzo(a)pyrene for MCL
(4) - Identified as Total Chromium for MCL
MCLs = Maximum Contaminant Levels
bold # Results highlighted with a gray box indicate results > MCL
1 - MCL for PAHs undifferentiated based on Benzo(a)pyrene.
2 - Secondary MCL (SMCL)
na = Not applicable
During Q2, 2017 GW event, due to vandalism (hinges on well lid cut off and pump stolen), MW-04B and G-4 were sampled using a bailer and analyzed only for GRO and VOC's.
During Q3, 2017 GW event, due to vandalism (monument was found damaged), a no-purge sample was collected from G-4.

References:

DTSC, 2000 and 2001. *2000 and 2001Groundwater Sampling Report for Gardena Sumps.*
DTSC, 2002. *2002 Groundwater Sampling Report for Gardena Sumps.*
URS, 1994. *Groundwater Remedial Investigation Technical Memorandum* , Gardena Sumps, 1440 West Artesia Boulevard, Gardena, CA., November 14.
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.
EPA, 2009. *Drinking Water Standards and Health Advisories Table* , November

Table 5
Two Year Summary of Title 22 Metals (Total) Measured in Groundwater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020															7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-01A	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-02A	08/22/18		<2.0	<1.0	**91**	<0.50	0.35 J	<2.0	**2.3**	0.85 J	<1.0	**7.8**	1.1 J	0.80 J	<1.0	<1.0	**6.0**	3.2 J	<0.20
MW-02A	02/13/19		<2.0	<1.0	**94**	<0.50	0.43 J	<2.0	**2.2**	1.3 J	<1.0	**6.7**	0.82 J	1.2 J	<1.0	<1.0	**5.9**	<20	<0.20
MW-02A	08/21/19		<2.0	<1.0	**95**	<0.50	0.38 J	0.50 J,B	**2.2**	1.5 J, B	<1.0	**7.3**	0.91 J	0.53 J	<1.0	<1.0	**6.0**	4.8 J	<0.20
MW-02A	08/21/19		<2.0	<1.0	**95**	<0.50	0.38 J	0.50 J,B	**2.2**	1.5 J, B	<1.0	**7.3**	0.91 J	0.53 J	<1.0	<1.0	**6.0**	4.8 J	<0.20
MW-02A	02/19/20		<2.0	<1.0	**110**	<0.50	0.51 J	<2.0	**2.5**	1.8 J	<1.0	**7.8**	0.69 J	<2.0	<1.0	<1.0	**6.6**	13 J	<0.20
MW-02A	08/19/20		<2.0	0.55 J	**96**	<0.50	0.52 J	<2.0	**2.2**	1.3 J	<1.0	**8.4**	0.68 J	0.77 J	<1.0	<1.0	**6.2**	<20	<0.20
MW-02B	08/22/18		<2.0	0.85 J	**38**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.2**	<2.0	<2.0	<1.0	<1.0	<2.0	3.3 J	<0.20
MW-02B	02/13/19		<2.0	0.94 J	**36**	<0.50	<1.0	<2.0	<1.0	0.57 J	<1.0	**4.6**	<2.0	0.68 J	<1.0	<1.0	<2.0	7.4 J	<0.20
MW-02B	08/21/19		<2.0	**2.8**	**44**	<0.50	<1.0	0.85 J, B	<1.0	0.5 J, B	<1.0	**5.5**	0.61 J	<2.0	<1.0	<1.0	<2.0	6.5 J	<0.20
MW-02B	02/19/20		<2.0	**1.3**	**44**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**5.7**	<2.0	<2.0	<1.0	<1.0	<2.0	3.4 J	<0.20
MW-02B	08/19/20		0.61 J	0.95 J	**41**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**7.0**	<2.0	<2.0	<1.0	<1.0	<2.0	**26**	<0.20
MW-03A	08/21/18		<2.0	0.53 J	**95**	<0.50	<1.0	0.67 J	<1.0	0.66 J	<1.0	1.6 J	1.1 J	0.74 J	<1.0	<1.0	**3.4**	6.7 J	<0.20
MW-03A	02/12/19		<2.0	0.57 J	**72**	<0.50	<1.0	1.4 J, B	<1.0	0.90 J	<1.0	1.7 J	1.1 J	<2.0	<1.0	<1.0	**4.2**	<20	<0.20
MW-03A	08/20/19		<2.0	<1.0	**86**	<0.50	<1.0	0.66 J	<1.0	<2.0	<1.0	1.5 J	0.69 J	<2.0	<1.0	<1.0	**3.4**	4.6 J, B	<0.20
MW-03A	02/18/20		<2.0	0.50 J	**96**	<0.50	**1.70**	0.67 J	<1.0	1.3 J	<1.0	1.4 J	1.1 J	<2.0	<1.0	<1.0	**4.4**	8.2 J	<0.20
MW-03A	08/18/20		<2.0	0.65 J	**110**	<0.50	<1.0	0.75 J	<1.0	0.76 J	<1.0	1.6 J	1.0 J	1.9 J	<1.0	<1.0	**4.6**	3.0 J	<0.20
MW-03B	08/21/18		<2.0	**1.9**	**38**	<0.50	<1.0	0.59 J	<1.0	<2.0	<1.0	**4.1**	0.84 J	<2.0	<1.0	<1.0	<2.0	3.2 J	<0.20
MW-03B	02/12/19		<2.0	**2.0**	**34**	<0.50	<1.0	0.78 J, B	<1.0	<2.0	<1.0	**3.7**	1.0 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/20/19		<2.0	**2.0**	**33**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.3**	0.78 J	<2.0	<1.0	<1.0	<2.0	7.6 J, B	<0.20
MW-03B	02/19/20		<2.0	**2.4**	**34**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.3**	0.92 J	<2.0	<1.0	<1.0	<2.0	3.4 J	<0.20
MW-03B	08/18/20		<2.0	**4.1**	**42**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.4**	1.1 J	1.5 J	<1.0	<1.0	<2.0	<20	<0.20
MW-04A	08/22/18		<2.0	0.90 J	**25**	<0.50	0.28 J	<2.0	0.63 J	<2.0	<1.0	**4.7**	**2.8**	0.56 J	<1.0	<1.0	**11**	3.2 J	<0.20
MW-04A	02/12/19		<2.0	**1.2**	**30**	<0.50	<1.0	<2.0	0.75 J	1.1 J	<1.0	**4.8**	**5.1**	0.65 J	<1.0	<1.0	**11**	<20	<0.20
MW-04A	08/21/19		<2.0	0.91 J	**30**	<0.50	0.39 J	0.69 J, B	0.63 J	1.0 J, B	<1.0	**5.5**	**2.7**	<2.0	<1.0	<1.0	**11**	4.4 J	<0.20
MW-04A	02/19/20		<2.0	0.84 J	**26**	<0.50	0.60 J	<2.0	0.76 J	1.3 J	<1.0	**5.8**	**2.5**	0.51 J	<1.0	<1.0	**12**	4.2 J	0.16 J
MW-04A	08/19/20		<2.0	0.79 J	**23**	<0.50	0.36 J	<2.0	0.56 J	0.71 J	<1.0	**5.8**	**2.2**	0.68 J	<1.0	<1.0	**11**	<20	<0.20
MW-04B	08/22/18		<2.0	**3.6**	**52**	<0.50	<1.0	0.95 J	<1.0	<2.0	<1.0	**2.7**	1.3 J	0.78 J	<1.0	<1.0	1.2 J	8.4 J	<0.20
MW-04B	02/13/19		<2.0	**2.0**	**51**	<0.50	<1.0	0.55 J	<1.0	<2.0	<1.0	**2.6**	0.98 J	0.68 J	<1.0	<1.0	<2.0	4.9 J	<0.20
MW-04B	08/21/19		<2.0	**1.9**	**62**	<0.50	<1.0	1.0 J, B	<1.0	<2.0	<1.0	**2.8**	1.3 J	<2.0	<1.0	<1.0	<2.0	6.8 J	<0.20
MW-04B	02/19/20		<2.0	**3.9**	**56**	<0.50	<1.0	0.73 J	<1.0	0.87 J	<1.0	**3.2**	1.7 J	<2.0	<1.0	<1.0	1.0 J	17 J	<0.20
MW-04B	08/19/20		<2.0	**3.2**	**53**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.1**	0.63 J	0.65 J	<1.0	<1.0	<2.0	4.0 J	<0.20

Table 5
Two Year Summary of Title 22 Metals (Total) Measured in Groundwater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020															7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-05A	08/21/18		<4.0	**6.4**	**18**	**5.1**	**3.4**	<4.0	**100**	**40**	<2.0	1.8 J	**120**	**14**	<2.0	<2.0	**20**	**790**	**0.24**
MW-05A	02/12/19		<2.0	**8.0**	**18**	**1.6**	0.31 J	0.88 J, B	**40**	**12**	<1.0	**2.8**	**18**	1.2 J	<1.0	<1.0	**16**	**100**	<0.20
MW-05A	08/20/19		<2.0	**7.8**	**19**	**1.7**	0.98 J	<2.0	**50**	**9.8**	<1.0	**2.2**	**36**	1.4 J	<1.0	<1.0	**10**	**200 B**	<0.20
MW-05A	02/18/20		<2.0	**7.1**	**19**	**1.5**	0.44 J	<2.0	**40**	**5.4**	<1.0	**2.3**	**21**	1.6 J	<1.0	<1.0	**8.4**	**100**	**0.22**
MW-05A	08/18/20		0.57 J	**8.2**	**20**	**1.7**	0.39 J	<2.0	**35**	**2.1**	<1.0	**3.5**	**13**	1.7 J	<1.0	0.31 J	**5.6**	**120 F1**	<0.20
G-4	08/21/18		<2.0	0.97 J	**27**	<0.50	<1.0	<2.0	0.98 J	0.78 J	<1.0	**18**	1.6 J	<2.0	<1.0	<1.0	**7.7**	12 J	<0.20
G-4	02/12/19		<2.0	0.92 J	**32**	<0.50	<1.0	**3.3 B**	**1.1**	0.95 J	<1.0	**15**	**3.7**	0.74 J	<1.0	<1.0	**7.5**	<20	<0.20
G-4	08/20/19		<2.0	**1.0**	**29**	<0.50	<1.0	<2.0	0.85 J	<2.0	<1.0	**17**	1.5 J	0.58 J	<1.0	<1.0	**7.3**	10 J, B	<0.20
G-4	02/18/20		<2.0	0.79 J	**28**	<0.50	<1.0	<2.0	0.91 J	0.84 J	<1.0	**15**	1.5 J	<2.0	<1.0	<1.0	**6.4**	5.3 J	<0.20
G-4	08/18/20		<2.0	**1.4**	**34**	<0.50	<1.0	<2.0	0.86 J	0.65 J	<1.0	**15**	**2.1**	**2.0**	<1.0	<1.0	**6.9**	**21**	<0.20

Notes:
* = Analyte was quantitated below the established linear calibration range. Amount reported is an estimate.
** = Method in water by manual cold vapor
CQ = Analyte concentration greater than 10 times the blank concentration
J = Analyte was detected between the MDL and the RL
LN,AY = The MS &/or the MSD were below acceptance limits due to sample matrix interference.
ND = Not Detected.
MB or B = Analyte present in Method Blank
B-1 = Analyte present in Method Blank, Analyte concentration in sample is greater than 10x the concentration found in the method blank
<# = Analyte was not detected above the Reporting Limit (#)
ug/L = micrograms per liter
na = Not applicable
-- = Not applicable / Not analyzed
Results highlighted with **Bold** font indicate results > RL
(1) - National Primary Drinking Water Regulations - EPA Region 9
(2) - California Department of Public Health
(3) - Secondary MCL per CCR Title 22, Div. 4, Chapter 15, Article 16
MCLs = Maximum Contaminant Levels
bold # Results highlighted with a gray box indicate results > MCL
During Q2, 2017 GW event, due to vandalism (hinges on well lid cut off and pump stolen), MW-04B and G-4 were sampled using a bailer and analyzed only for GRO and VOC's.
During Q3, 2017 GW event, due to vandalism (monument was found damaged), a no-purge sample was collected from G-4.

References:

Ecology and Environment, 1987. *Site Inspection Report Gardena Sumps, Gardena California.*
DTSC, 2000 and 2001. *2000 and 2001Groundwater Sampling Report for Gardena Sumps.*
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SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.
EPA, 2009. *Drinking Water Standards and Health Advisories Table* , November.

Table 6
Two Year Summary of Title 22 Metals (Dissolved) Measured in Groundwater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-01A	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-02A	08/22/18		<2.0	<1.0	**74**	<0.50	0.28 J	<2.0	**1.6**	1.3 J	<1.0	**7.7**	0.96 J	<2.0	<1.0	<1.0	**5.7**	4.3 J	<0.20
MW-02A	02/13/19		<2.0	<1.0	**100**	<0.50	0.44 J	1.9 J, B	**2.5**	1.4 J	<1.0	**7.8**	1.7 J, B	<2.0	<1.0	<1.0	**6.6**	<20	<0.20
MW-02A	08/21/19		<2.0	<1.0	**100**	<0.50	0.40 J	<2.0	**2.5**	1.4 J	<1.0	**7.3**	0.87 J	<2.0	<1.0	<1.0	**6.5**	4.6 J, B	<0.20
MW-02A	02/19/20		<2.0	<1.0	**100**	<0.50	0.39 J	<2.0	**2.4**	**6.1**	0.74 J	**7.8**	1.3 J	0.93 J	<1.0	<1.0	**6.2**	18 J	<0.20
MW-02A	08/19/20		0.57 J	0.51 J	**92**	<0.50	0.46 J	<2.0	**2.6**	**1.4 J**	<1.0	**8.4**	0.75 J	0.67 J	<1.0	<1.0	**6.2**	<20	<0.20
MW-02B	08/22/18		<2.0	0.94 J	**39**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.2**	<2.0	<2.0	<1.0	<1.0	<2.0	2.9 J	<0.20
MW-02B	02/13/19		0.54 J	**1.0**	**38**	<0.50	<1.0	0.76 J, B	**1.3**	<2.0	<1.0	**4.9**	0.78 J, B	<2.0	<1.0	<1.0	<2.0	2.5 J	<0.20
MW-02B	08/21/19		<2.0	**1.1**	**43**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**5.3**	<2.0	<2.0	<1.0	<1.0	<2.0	5.7 J, B	<0.20
MW-02B	02/19/20		<2.0	**1.1**	**46**	<0.50	<1.0	<2.0	<1.0	**2.4**	<1.0	**6.1**	0.56 J	<2.0	<1.0	<1.0	<2.0	4.7 J	<0.20
MW-02B	08/19/20		0.79 J	0.95 J	**43**	<0.50	<1.0	<2.0	0.91 J	<2.0	<1.0	**7.1**	**11**	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03A	08/21/18		0.57 J	<1.0	**100**	<0.50	<1.0	<2.0	<1.0	0.70 J	<1.0	1.5 J	0.99 J	<2.0	<1.0	<1.0	**3.3**	3.0 J	<0.20
MW-03A	02/12/19		<2.0	0.57 J	**71**	<0.50	<1.0	1.1 J, B	<1.0	0.53 J	<1.0	1.6 J	1.1 J	<2.0	<1.0	<1.0	**4.0**	4.2 J	<0.20
MW-03A	08/20/19		<2.0	0.63 J	**91**	0.37 J	<1.0	0.87 J	0.62 J	0.82 J	<1.0	**2.0**	0.93 J	<2.0	<1.0	0.20 J	**3.7**	5.2 J, B	<0.20
MW-03A	02/18/20		<2.0	<1.0	**91**	<0.50	**1.6**	0.66 J	<1.0	1.1 J	<1.0	1.3 J	0.97 J	<2.0	<1.0	<1.0	**4.3**	6.3 J	<0.20
MW-03A	08/18/20		<2.0	0.60 J	**110**	<0.50	<1.0	0.74 J	<1.0	1.1 J	<1.0	1.7 J	1.1 J	1.6 J	<1.0	<1.0	**4.5**	<20	<0.20
MW-03B	08/21/18		<2.0	**2.1**	**39**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.3**	0.76 J	<2.0	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-03B	02/12/19		<2.0	**2.2**	**36**	<0.50	<1.0	0.63 J, B	<1.0	<2.0	<1.0	**3.6**	0.94 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/20/19		1.0 J	**2.0**	**33**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.4**	0.87 J	<2.0	<1.0	<1.0	<2.0	8.6 J, B	<0.20
MW-03B	02/19/20		<2.0	**2.4**	**35**	<0.50	<1.0	<2.0	<1.0	**5.9**	<1.0	**4.7**	1.5 J	<2.0	<1.0	<1.0	<2.0	8.6 J	<0.20
MW-03B	08/18/20		<2.0	**3.9**	**48**	<0.50	<1.0	<2.0	0.97 J	<2.0	<1.0	**4.1**	1.1 J	1.4 J	<1.0	<1.0	<2.0	<20	<0.20
MW-04A	08/22/18		<2.0	0.83 J	**25**	<0.50	0.26 J	<2.0	**1.1**	1.1 J	<1.0	**5.0**	**2.6**	<2.0	<1.0	<1.0	**11**	4.1 J	<0.20
MW-04A	02/13/19		<2.0	**1.2**	**31**	<0.50	<1.0	0.78 J, B	0.80 J	1.5 J	<1.0	**5.0**	**4.2 B**	<2.0	<1.0	<1.0	**11**	4.9 J	<0.20
MW-04A	08/21/19		<2.0	0.96 J	**31**	<0.50	0.34 J	0.54 J	**1.1**	0.86 J	<1.0	**6.0**	**2.6**	<2.0	<1.0	<1.0	**12**	4.7 J,F2,B	<0.20
MW-04A	02/19/20		<2.0	0.82 J	**27**	<0.50	0.38 J	<2.0	0.66 J	**7.1**	<1.0	**6.4**	**3.1**	0.66 J	<1.0	<1.0	**12**	7.9 J	<0.20
MW-04A	08/19/20		0.55 J	0.80 J	**23**	<0.50	0.34 J	<2.0	**1.7**	0.85 J	<1.0	**5.7**	**2.4**	0.61 J	<1.0	<1.0	**11**	<20	0.14 J
MW-04B	08/22/18		<2.0	**3.2**	**51**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**2.7**	0.64 J	<2.0	<1.0	<1.0	<2.0	3.2 J	<0.20
MW-04B	02/13/19		<2.0	**2.3**	**61**	<0.50	<1.0	0.93 J, B	**1.5**	0.61 J	<1.0	**3.0**	1.6 J, B	<2.0	<1.0	<1.0	<2.0	2.9 J	<0.20
MW-04B	08/21/19		<2.0	**2.1**	**65**	<0.50	<1.0	0.50 J	**1.0**	<2.0	<1.0	**2.6**	1.3 J	<2.0	<1.0	<1.0	<2.0	2.9 J	<0.20
MW-04B	02/19/20		<2.0	**3.9**	**57**	0.30 J	0.26 J	0.58 J	<1.0	**3.1**	<1.0	**3.7**	**2.0**	0.81 J	<1.0	0.27 J	<2.0	6.9 J	<0.20
MW-04B	08/19/20		<2.0	**3.1**	**53**	<0.50	<1.0	<2.0	0.71 J	<2.0	<1.0	**3.2**	0.56 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20

Table 6
Two Year Summary of Title 22 Metals (Dissolved) Measured in Groundwater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-05A	08/21/18		<4.0	**5.0**	**16**	**3.6**	**2.9**	<4.0	**93**	**28**	<2.0	**1.8 J**	**110**	**11**	<2.0	<2.0	**11**	**710**	<0.20
MW-05A	02/12/19		<2.0	**6.7**	**17**	**1.3**	0.34 J	0.62 J, B	**40**	**4.6**	<1.0	**2.7**	**18**	<2.0	<1.0	<1.0	**5.1**	**94**	<0.20
MW-05A	08/20/19		<2.0	**6.9**	**18**	**2.1**	**1.2**	<2.0	**52**	**9.4**	<1.0	**2.1**	**42**	1.4 J	<1.0	<1.0	**9.9**	**240 B**	<0.20
MW-05A	02/18/20		<2.0	**7.8**	**23**	**1.8**	0.42 J	<2.0	**42**	**7.1**	<1.0	**4.0**	**23**	**2.2**	<1.0	<1.0	**8.5**	**120**	0.15 J
MW-05A	08/18/20		0.64 J	**7.1**	**19**	**1.7**	0.56 J	<2.0	**39**	**2.0**	<1.0	**3.2**	**19**	**1.3 J**	<1.0	0.28 J	**4.0**	**89 F1, B**	<0.20
G-4	08/21/18		<2.0	0.82 J	**27**	<0.50	<1.0	<2.0	**1.2**	0.58 J	<1.0	**16**	1.4 J	<2.0	<1.0	<1.0	**7.6**	2.7 J	<0.20
G-4	02/12/19		<2.0	0.93 J	**29**	<0.50	<1.0	0.59 J, B	**1.0**	0.60 J	<1.0	**15**	1.9 J	<2.0	<1.0	<1.0	**7.1**	<20	<0.20
G-4	08/20/19		0.66 J	**1.0**	**32**	<0.50	<1.0	<2.0	**1.1**	<2.0	<1.0	**16**	1.6 J	<2.0	<1.0	<1.0	**7.1**	**76 B**	<0.20
G-4	02/18/20		<2.0	0.91 J	**29**	<0.50	<1.0	<2.0	0.99 J	0.78 J	<1.0	**16**	1.6 J	0.53 J	<1.0	<1.0	**6.8**	5.7 J	<0.20
G-4	08/18/20		<2.0	**1.3**	**39**	<0.50	<1.0	<2.0	**1.2**	0.70 J	<1.0	**14**	**2.1**	1.8 J	<1.0	<1.0	**6.9**	<20	<0.20

Notes:
<# = Analyte was not detected above the Reporting Limit (#)
ND = Not Detected.
-- = Not applicable / Not analyzed
na = Not applicable
CQ = analyte concentration greater than 10 times the blank concentration
J = Analyte was detected between the MDL and the RL
MB or B = Analyte present in Method Blank
ug/L = micrograms per liter
Results highlighted with **Bold** font indicate results > RL
(1) - National Primary Drinking Water Regulations - EPA Region 9
(2) - California Department of Public Health
(3) - Secondary MCL per CCR Title 22, Div. 4, Chapter 15, Article 16
MCLs = Maximum Contaminant Levels
bold # Results highlighted with a gray box indicate results > MCL
-- = Not applicable / Not analyzed
During Q2, 2017 GW event, due to vandalism (hinges on well lid cut off and pump stolen), MW-04B and G-4 were sampled using a bailer and analyzed only for GRO and VOC's.
During Q3, 2017 GW event, due to vandalism (monument was found damaged), a no-purge sample was collected from G-4.

References:
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.
Prior to 2006, some table data was incorrectly represented in mg/L and has been updated to correctly reflect µg/L.
EPA, 2009. *Drinking Water Standards and Health Advisories Table* , November

Appendix A FIELD DATA SHEETS, CALIBRATION CERTIFICATES, WASTE REMOVAL DOCUMENTATION, CERTIFIED LABORATORY ANALYTICAL REPORTS AND HISTORICAL DATA TABLES,

(Included on attached CD)

Gardena Sumps Site
1440 West Artesia Blvd.
(Southwest Corner of Artesia Boulevard and Normandie Avenue)
Gardena, California
Stantec Project No. 185850766

Stantec

GROUNDWATER ELEVATION MEASUREMENT FORM

Gardena Sumps, Gardena, CA

PROJECT NO.: 185850766.000

DATE: 8.18.20

LOCATION: SW corner of Artesia Blvd. and Normandie Ave.

STAFF / TECHNICIAN : Alex Gastelum & Ron Baron

Depth to Water ORDER	Well ID	G = good, F = fair, P = poor: Surface Seal Condition	Concrete Seal Condition	Gasket Condition	Lid Secure (y or n)	Lock (y or n)	Expanding Cap (y or n)	Total Depth (feet btoc)	1Q-2020 Depth to Water (feet btoc)	3Q-2020 Depth to Water (feet btoc)	Difference ie: Current - Previous	Depth to Product (feet btoc)	Floating Product Thickness (feet)	Time	Comments
1	MW-01A	Vault	--------	--------	--------	No	N/A	--------	--------	13.11	--------	none obs	none	0615	No Access-Not Measured
2	MW-01B	Vault	--------	--------	--------	No	N/A	--------	--------	15.30	--------	none obs	none	0618	No Access-Not Measured
4	MW-02A	Monument	N/A	N/A	Y	Yes	N/A	32.10	12.63	12.51	+.12	none obs	none	0735	
5	MW-02B	Monument	N/A	N/A	Y	Yes	N/A	33.11	15.35	15.41	-.06	none obs	none	0730	
6	MW-03A	Monument	N/A	N/A	Y	Yes	N/A	28.61	19.74	19.70	+.04	none obs	none	0650	
7	MW-03B	Monument	N/A	N/A	Y	Yes	N/A	33.04	21.68	21.61	+.07	none obs	none	0655	
8	MW-04A	Monument	N/A	N/A	Y	Yes	N/A	31.26	17.25	17.32	-.07	none obs	none	0700	
9	MW-04B	Monument	N/A	N/A	Y	Yes	N/A	37.10	19.39	19.51	-.12	none obs	none	0715	
3	MW-05A	Vault	FAIR	GOOD	Y	No	N/A	28.21	12.83	12.96	-.13	none obs	none	0630	
10	G-4	Monument	N/A	N/A	Y	Yes	N/A	49.70	21.1	21.09	+.01	none obs	none	0640	

Notes:

Use G = good, F = fair, and P = poor for well/seal conditions

All wells are custom fitted with QED flush mounted well caps

KECK Water Level meters used for Shallow wells: GEOTECH

KECK Water Level meters used for Deep wells: GEOTECH

YSI used for deep wells: HORIBA U52

YSI used for shallow wells: HORIBA U52

Turbidity measurements are recorded with a LaMotte turbidity meter.

Number of drums on site:

	on arrival	on leaving		(approximate volume-gallons)
soil	0	0		
trash/ppe	0	0		
water	0	1		
empty	1			

Comments: Horiba multi-parameter units are now pre-calibrated in the rental office prior to use in the field, turbidity measurements are through the Horiba units

SEE CALIBRATION CERTIFICATE.

Instrument Calibration Area

DATE	Type	ID #	Temp	pH			Cond	ORP	Tubidity			DO	TDS		Comments:
			F or C	4	7	10	S/m	mv	0	1	10				
															Factory Calibration data
															Factory Calibration data
															Factory Calibration data
															Factory Calibration data

Reviewed by:

SAMPLE COLLECTION LOG
Quarterly Groundwater Sampling
1440 Artesia Blvd., Gardena, CA.

DATE: 8.18.20

SAMPLERS: A CASTELLUM RON BARON

SAMPLE ID	WELL ID	SAMPLE DEPTH (ft. bgs)	MATRIX (sample, blank)	SAMPLE METHOD	COLLECTION TIME	TURB. READING
MW-05A	11	21.71	SAMPLE	PUMP	0720	12.0
FB-Sump-20200818	11	—	BLANK	POUR	0730	NM
G-4	11	51.98	SAMPLE	PUMP	0840	0.0
MW-03B	11	80.97	SAMPLE	PUMP	0944	0.3
MW-03A	11	22.49	SAMPLE	PUMP	1014	0.0

SAMPLE COLLECTION LOG
Quarterly Groundwater Sampling
1440 Artesia Blvd., Gardena, CA.

DATE: 8.19.20

SAMPLERS: A. CASTELLUM RON BARRON

SAMPLE ID	WELL ID	SAMPLE DEPTH (ft. bgs)	MATRIX (sample, blank)	SAMPLE METHOD	COLLECTION TIME	TURB. READING
MW-04B	11	80.30	SAMPLE	PUMP	0741	6.3
FB-SUMP-20200819	11	—	BLANK	POUR	0750	NM
MW-04A	11	25.86	SAMPLE	PUMP	0811	6.2
MW-02A	11	22.27	SAMPLE	PUMP	0858	0.0
RS-SUMP-20200819	11	22.27	SAMPLE	PUMP	0700	0.0
MW-02B	11	80.28	SAMPLE	PUMP	0918	0.0

GARDENA SUMPS
GROUNDWATER SAMPLE FIELD DATA SHEET

PROJECT NO.: 185850766
CLIENT: Atlantic Richfield

WELL ID: **MW-02A**
DATE: 8.19.20

ADDRESS: Southwest corner of Artesia Blvd. and Normandie Ave, Gardena, CA

Stainless Steel Submersible Pump: Pump Bladder Volume 395 ml (0.099 Gal.)
Gallons/Linear Foot: Poly Tubing ID 3/8" (0.375) = 0.0057 Gals/FT

22.27	**X** 0.0057 =	**0.13**	**X** (3) =	**0.38**	**+** 0.3 Gal =	**0.68**	Gals
Pump Depth (BTOC)	(Tubing Volume Gal/ft.)		One Purge Volume		(3) Bladder Volumes		Calculated Purge Volume

TIME (2400)	VOLUME (GALLONS)	TEMP (°C/°F)	PH	ORP (mV))	E.C (m/s)	TURB. (NTU'S)	DIS.02 (mg /L)	TDS	COLOR (VISUAL)	WATER DEPTH
0847	0.1	23.11	6.93	123	1.14	0.0	0.47	0.730	CLR	13.24
0850	1.0	23.09	6.94	123	1.12	0.0	0.56	0.727	CLR	13.33
0853	2.0	23.02	6.94	122	1.11	0.0	0.96	0.701	CLR	13.42
0856	3.0	23.16	6.96	124	1.09	0.0	0.99	0.691	CLR	13.50

SAMPLE ID: **MW-02A** DATE: 8 19 20 TIME: 0858

RS-Sump-2020 0819 / 8.19.20 / 0700

Duplicate or blank samples: / /

Note: *Minimum purge volume is three gallons per well. During the sampling process, some pumped water is not collected as samples but lost into the purge collection buckets. Average Total water volume pumped is approximately four to five gallons per well.*

Begin Purge (**rate/time**): / 0847 End Purge (**rate/time**): / 0856

Sample Depth (BTOC): **22.27** (same as pump depth) Screen Int. (BGS): **15.5-25.5** Actual Purge Volume: **3.0** gals.

Total Well Depth (BGS): **31.5** (--) Depth To Water (BTOC): ~~18.51~~ 12.51 (=) Water Column 18.99

Water Column: 18.99 (X) 0.8 = 15.19 (80% Recharge) (TD-80% Recharge)= 16.30 (Do Not Sample Below This Level)

D.T.W. @ time of sampling: 13.50 T.D. (B.T.O.C. after sampling): 32.10

COMPLETED BY (print): A. GASTELUM SIGNATURE:

REVIEWED BY: *DATE:*

Field Notes:

Stantec

GARDENA SUMPS
GROUNDWATER SAMPLE FIELD DATA SHEET

PROJECT NO.: 185850766 WELL ID: **MW-02B**
CLIENT: Atlantic Richfield DATE: 8.19.20
ADDRESS: Southwest corner of Artesia Blvd. and Normandie Ave, Gardena, CA

Stainless Steel Submersible Pump: Pump Bladder Volume 395 ml (0.099 Gal.)
Gallons/Linear Foot: Poly Tubing ID 3/8" (0.375) = 0.0057 Gals/FT

80.28	**X** 0.0057 =	**0.46**	**X** (3) =	**1.37**	**+** 0.3 Gal =	**1.67**	Gals
Pump Depth (BTOC)	(Tubing Volume Gal/ft.)	One Purge Volume		(3) Bladder Volumes		Calculated Purge Volume	

TIME (2400)	VOLUME (GALLONS)	TEMP (°C/°F)	PH	ORP (mV))	E.C (m/s)	TURB. (NTU'S)	DIS.02 (mg /L)	TDS	COLOR (VISUAL)	WATER DEPTH
0907	0.1	25.20	7.49	-31	2.66	0.2	0.33	1.76	CLR	15.56
0910	1.0	25.01	7.46	-48	2.76	0.0	0.03	1.79	CLR	15.29
0913	2.0	24.30	7.44	-58	2.82	0.0	0.00	1.80	CLR	16.02
0916	3.0	23.75	7.44	-66	2.82	0.0	0.00	1.80	CLR	16.09

SAMPLE ID: **MW-02B** DATE: 8 19 20 TIME: 0918

_____ / _____ / _____

Duplicate or blank samples: _____ / _____ / _____

Note: *Minimum purge volume is three gallons per well. During the sampling process, some pumped water is not collected as samples but lost into the purge collection buckets. Average Total water volume pumped is approximately four to five gallons per well.*

Begin Purge (**rate/time**): _____ / 0907 End Purge (**rate/time**): _____ / 0916

Sample Depth (BTOC): **80.28** Screen Int. (BGS): **75.5-80.5** Actual Purge Volume: **3.0** gals.
(same as pump depth)

Total Well Depth (BGS): **83.0** (--) Depth To Water (BTOC): 15.41 (=) Water Column 67.59

Water Column: 67.59 (X) 0.8 = 54.07 (80% Recharge) (TD-80% Recharge)= 28.92 (Do Not Sample Below This Level)

D.T.W. @ time of sampling: 16.09 T.D. (B.T.O.C. after sampling): 83.11

COMPLETED BY (print): A. CASTELUM SIGNATURE: _____

REVIEWED BY: _____ *DATE:* _____

Field Notes:

_____

_____

_____

_____

_____

Stantec

GARDENA SUMPS
GROUNDWATER SAMPLE FIELD DATA SHEET

PROJECT NO.: 185850766 WELL ID: MW-04A
CLIENT: Atlantic Richfield DATE: 8.19.20
ADDRESS: Southwest corner of Artesia Blvd. and Normandie Ave, Gardena, CA

Stainless Steel Submersible Pump: Pump Bladder Volume 395 ml (0.099 Gal.)
Gallons/Linear Foot: Poly Tubing ID 3/8" (0.375) = 0.0057 Gals/FT

25.86	X 0.0057 =	0.15	X (3) =	0.44	+ 0.3 Gal =	0.74	Gals
Pump Depth (BTOC)	(Tubing Volume Gal/ft.)	One Purge Volume		(3) Bladder Volumes		Calculated Purge Volume	

TIME (2400)	VOLUME (GALLONS)	TEMP (°C/°F)	PH	ORP (mV))	E.C (m/s)	TURB. (NTU'S)	DIS.02 (mg /L)	TDS	COLOR (VISUAL)	WATER DEPTH
0800	0.1	25.30	7.42	-13	3.54	0.8	8.62	2.32	CLR	17.50
0803	1.0	24.35	7.03	83	3.66	6.7	5.19	2.34	CLR	17.62
0806	2.0	24.32	7.04	96	3.60	5.5	4.99	2.33	CLR	17.78
0809	3.0	24.30	7.05	103	3.64	6.2	4.96	2.35	CLR	17.81

SAMPLE ID: MW-04A DATE: 8.19.20 TIME: 0811

_____ / _____ / _____

Duplicate or blank samples: _____ / _____ / _____

Note: *Minimum purge volume is three gallons per well. During the sampling process, some pumped water is not collected as samples but lost into the purge collection buckets. Average Total water volume pumped is approximately four to five gallons per well.*

Begin Purge (**rate/time**): _____ / 0800 End Purge (**rate/time**): _____ / 0809

Sample Depth (BTOC): 25.86 Screen Int. (BGS): 18.0-28.0 Actual Purge Volume: 3.0 gals.
(same as pump depth)

Total Well Depth (BGS): 28.0 (--) Depth To Water (BTOC): 17.32 (=) Water Column 10.68

Water Column: 10.68 (X) 0.8 = 8.54 (80% Recharge) (TD-80% Recharge)= 19.45 (Do Not Sample Below This Level)

D.T.W. @ time of sampling: 17.81 T.D. (B.T.O.C. after sampling): 31.26

COMPLETED BY (print): A. GASTELUM SIGNATURE: _____

REVIEWED BY: _____ *DATE:* _____

Field Notes:

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Stantec

GARDENA SUMPS
GROUNDWATER SAMPLE FIELD DATA SHEET

PROJECT NO.: 185850766 WELL ID: **MW-04B**
CLIENT: Atlantic Richfield DATE: 8.19.20
ADDRESS: Southwest corner of Artesia Blvd. and Normandie Ave, Gardena, CA

Stainless Steel Submersible Pump: Pump Bladder Volume 395 ml (0.099 Gal.)
Gallons/Linear Foot: Poly Tubing ID 3/8" (0.375) = 0.0057 Gals/FT

80.3	**X** 0.0057 =	**0.46**	**X** (3) =	**1.37**	+ 0.3 Gal =	**1.67** Gals
Pump Depth (BTOC)	(Tubing Volume Gal/ft.)	One Purge Volume		(3) Bladder Volumes		Calculated Purge Volume

TIME (2400)	VOLUME (GALLONS)	TEMP (°C/°F)	PH	ORP (mV))	E.C (m/s)	TURB. (NTU'S)	DIS.02 (mg /L)	TDS	COLOR (VISUAL)	WATER DEPTH
0729	0.1	24.19	7.06	-85	2.65	6.9	5.90	1.69	CLR	19.53
0733	1.0	24.05	7.09	-84	2.65	5.8	4.29	1.70	CLR	19.93
0736	2.0	23.77	7.19	-87	2.62	6.2	4.09	1.67	CLR	20.38
0739	3.0	23.81	7.20	-90	2.62	6.3	4.12	1.69	CLR	20.87

SAMPLE ID: **MW-04B** DATE: 8 19 20 TIME: 0741

FB-Sump-2020 0819 / 8 19 20 / 0750

Duplicate or blank samples: / / .

Note: *Minimum purge volume is three gallons per well. During the sampling process, some pumped water is not collected as samples but lost into the purge collection buckets. Average Total water volume pumped is approximately four to five gallons per well.*

Begin Purge (**rate/time**): / 0729 End Purge (**rate/time**): / 0739

Sample Depth (BTOC): **80.30** Screen Int. (BGS): **75.0-80.0** Actual Purge Volume: **3.0** gals.
(same as pump depth)

Total Well Depth (BGS): **85.0** (--) Depth To Water (BTOC): 18.51 (=) Water Column 66.49

Water Column: 66.49 (X) 0.8 = 53.19 (80% Recharge) (TD-80% Recharge)= 31.80 (Do Not Sample Below This Level)

D.T.W. @ time of sampling: 20.87 T.D. (B.T.O.C. after sampling): 87.10

COMPLETED BY (print): A GASTELUM SIGNATURE:

REVIEWED BY: *DATE:*

Field Notes:

Stantec

GARDENA SUMPS
GROUNDWATER SAMPLE FIELD DATA SHEET

PROJECT NO.: 185850766 WELL ID: **MW-05A**
CLIENT: Atlantic Richfield DATE: 8·18·20
ADDRESS: Southwest corner of Artesia Blvd. and Normandie Ave, Gardena, CA

Stainless Steel Submersible Pump: Pump Bladder Volume 395 ml (0.099 Gal.)
Gallons/Linear Foot: Poly Tubing ID 3/8" (0.375) = 0.0057 Gals/FT

21.71	**X** 0.0057 **=**	**0.12**	**X** (3) =	**0.37**	**+** 0.3 Gal **=**	**0.67**	Gals
Pump Depth (BTOC)	(Tubing Volume Gal/ft.)		One Purge Volume		(3) Bladder Volumes		Calculated Purge Volume

TIME (2400)	VOLUME (GALLONS)	TEMP (°C/°F)	PH	ORP (mV))	E.C (m/s)	TURB. (NTU'S)	DIS.02 (mg /L)	TDS	COLOR (VISUAL)	WATER DEPTH
0705	0.1	24.50	6.33	19	4.81	25.2	4.33	3.17	CLDY	13.33
0708	1.0	23.88	6.31	17	4.97	11.5	3.98	3.16	CLDY	13.40
0711	2.0	23.90	6.30	17	4.94	11.0	3.85	3.12	CLDY	13.41
0714	3.0	23.97	6.27	19	4.97	12.0	3.80	3.18	CLDY	13.45

SAMPLE ID: **MW-05A** DATE: 8·18·20 TIME: 0720

FB-Sump-2020-0818 / 8·18·20 / 0730

Duplicate or blank samples: / /

Note: *Minimum purge volume is three gallons per well. During the sampling process, some pumped water is not collected as samples but lost into the purge collection buckets. Average Total water volume pumped is approximately four to five gallons per well.*

Begin Purge (**rate/time**): / 0705 End Purge (**rate/time**): / 0714

Sample Depth (BTOC): **21.71** (same as pump depth) Screen Int. (BGS): **13.0-23.0** Actual Purge Volume: **3.0** gals.

Total Well Depth (BGS): **28.0** (--) Depth To Water (BTOC): 12.96 (=) Water Column 15.04

Water Column: 15.04 (X) 0.8 = 12.03 (80% Recharge) (TD-80% Recharge)= 15.96 (Do Not Sample Below This Level)

D.T.W. @ time of sampling: 13.40 T.D. (B.T.O.C. after sampling): 28.21

COMPLETED BY (print): A. GASTELUM SIGNATURE:

REVIEWED BY: *DATE:*

Field Notes:

Stantec

GARDENA SUMPS
GROUNDWATER SAMPLE FIELD DATA SHEET

PROJECT NO.: 185850766 WELL ID: **MW-03A**
CLIENT: Atlantic Richfield DATE: 8.18.20
ADDRESS: Southwest corner of Artesia Blvd. and Normandie Ave, Gardena, CA

Stainless Steel Submersible Pump: Pump Bladder Volume 395 ml (0.099 Gal.)
Gallons/Linear Foot: Poly Tubing ID 3/8" (0.375) = 0.0057 Gals/FT

22.49	**X** 0.0057 **=**	**0.13**	**X** (3) =	**0.38**	**+** 0.3 Gal **=**	**0.68**	Gals
Pump Depth (BTOC)	(Tubing Volume Gal/ft.)	One Purge Volume		(3) Bladder Volumes		Calculated Purge Volume	

TIME (2400)	VOLUME (GALLONS)	TEMP (°C/°F)	PH	ORP (mV))	E.C (m/s)	TURB. (NTU'S)	DIS.02 (mg /L)	TDS	COLOR (VISUAL)	WATER DEPTH
1003	0.1	23.6	7.05	44	2.39	7.6	6.51	1.53	CLR	20.01
1006	1.0	22.9	7.04	62	2.40	12.1	5 39	1.54	CLR	20.28
1009	2.0	23.1	702	76	2.42	5.3	5.37	1.55	CLR	20.56
1012	3.0	23.2	7.02	85	2.40	0.0	5.22	1.56	CLR	21.01

SAMPLE ID: **MW-03A** DATE: TIME: 1014

_____ / _____ / _____

Duplicate or blank samples: _____ / _____ / _____

Note: *Minimum purge volume is three gallons per well. During the sampling process, some pumped water is not collected as samples but lost into the purge collection buckets. Average Total water volume pumped is approximately four to five gallons per well.*

Begin Purge (**rate/time**): _____ / 1003 End Purge (**rate/time**): _____ / 1012

Sample Depth (BTOC): **22.49** Screen Int. (BGS): **15.5-25.5** Actual Purge Volume: **3.0** gals.
(same as pump depth)

Total Well Depth (BGS): **27.0** (--) Depth To Water (BTOC): 19.70 (=) Water Column 7.30

Water Column: 7.30 (X) 0.8 = 5.84 (80% Recharge) (TD-80% Recharge)= 21.16 (Do Not Sample Below This Level)

D.T.W. @ time of sampling: 20.01 T.D. (B.T.O.C. after sampling): 28.61

COMPLETED BY (print): A. GASTELUM SIGNATURE:

REVIEWED BY: _____ *DATE:* _____

Field Notes:

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Stantec

GARDENA SUMPS
GROUNDWATER SAMPLE FIELD DATA SHEET

PROJECT NO.: 185850766 WELL ID: G-4
CLIENT: Atlantic Richfield DATE: 8.18.20
ADDRESS: Southwest corner of Artesia Blvd. and Normandie Ave, Gardena, CA

Stainless Steel Submersible Pump: Pump Bladder Volume 395 ml (0.099 Gal.)
Gallons/Linear Foot: Poly Tubing ID 3/8" (0.375) = 0.0057 Gals/FT

50.00 **X** 0.0057 **=** **0.285** **X** (3) = **0.855** **+** 0.3 Gal **=** **1.155**
Gals

Pump Depth (BTOC)	(Tubing Volume Gal/ft.)	One Purge Volume	(3) Bladder Volumes	Calculated Purge Volume

TIME (2400)	VOLUME (GALLONS)	TEMP (°C/°F)	PH	ORP (mV))	E.C (m/s)	TURB. (NTU'S)	DIS.02 (mg /L)	TDS	COLOR (VISUAL)	WATER DEPTH
0828	0.1	22.32	7.23	92	4.22	0.0	8.35	2.69	CLR	22.39
0831	1.0	21.82	7.21	99	4.36	0.0	7.00	2.82	CLR	22.79
0834	2.0	21.78	7.21	102	4.32	0.0	6.93	2.94	CLR	23.04
0837	3.0	21.78	7.20	105	4.40	0.0	6.90	3.02	CLR	23.11

SAMPLE ID: G-4 DATE: 8.18.20 TIME: 0840

_____ / _____ / _____

Duplicate or blank samples: _____ / _____ / _____

Note: *Minimum purge volume is three gallons per well. During the sampling process, some pumped water is not collected as samples but lost into the purge collection buckets. Average Total water volume pumped is approximately four to five gallons per well.*

Begin Purge (**rate/time**): _____ / 0828 End Purge (**rate/time**): _____ / 0837

Sample Depth (BTOC): **50.0** Screen Int. (BGS): **45.0-55.0** Actual Purge Volume: **3.0** gals.
(same as pump depth)

Total Well Depth (BGS): **65.0** (--) Depth To Water (BTOC): 21.09 (=) Water Column 43.91

Water Column: 43.91 (X) 0.8 = 35.12 (TD-80% Recharge)= 29.87
(80% Recharge) (Do Not Sample Below This Level)

D.T.W. @ time of sampling: 23.11 T.D. (B.T.O.C. after sampling): 49.70

COMPLETED BY (print): A. Gastelum SIGNATURE: _____

REVIEWED BY: _____ *DATE:* _____

Field Notes:

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Stantec

GARDENA SUMPS
GROUNDWATER SAMPLE FIELD DATA SHEET

PROJECT NO.: 185850766 WELL ID: **MW-03B**
CLIENT: Atlantic Richfield DATE: 8.18.20
ADDRESS: Southwest corner of Artesia Blvd. and Normandie Ave, Gardena, CA

Stainless Steel Submersible Pump: Pump Bladder Volume 395 ml (0.099 Gal.)
Gallons/Linear Foot: Poly Tubing ID 3/8" (0.375) = 0.0057 Gals/FT

80.97	**X** 0.0057 **=**	**0.46**	**X** (3) =	**1.38**	**+** 0.3 Gal **=**	**1.68**	Gals
Pump Depth (BTOC)	(Tubing Volume Gal/ft.)	One Purge Volume		(3) Bladder Volumes		Calculated Purge Volume	

TIME (2400)	VOLUME (GALLONS)	TEMP (°C/°F)	PH	ORP (mV))	E.C (m/s)	TURB. (NTU'S)	DIS.02 (mg /L)	TDS	COLOR (VISUAL)	WATER DEPTH
0930	0.1	22.70	7.59	-40	2.35	0.0	6.35	1.51	CLR	22.51
0934	1.0	22.05	7.56	-78	2.36	0.4	5.18	1.50	CLR	23.31
0938	2.0	21.99	7.55	-77	2.37	0.0	4.99	1.51	CLR	24.42
0942	3.0	22.00	7.57	-72	2.39	0.3	4.89	1.52	CLR	25.44

SAMPLE ID: **MW-03B** DATE: 8-18.20 TIME: 0944

_____ / _____ / _____

Duplicate or blank samples: _____ / _____ / _____

Note: *Minimum purge volume is three gallons per well. During the sampling process, some pumped water is not collected as samples but lost into the purge collection buckets. Average Total water volume pumped is approximately four to five gallons per well.*

Begin Purge (**rate/time**): _____ / _____ End Purge (**rate/time**): _____ / _____

Sample Depth (BTOC): **80.97** Screen Int. (BGS): **76.5-81.5** Actual Purge Volume: **3.0** gals.
(same as pump depth)

Total Well Depth (BGS): **83.5** (--) Depth To Water (BTOC): 21.61 (=) Water Column 61.89

Water Column: 61.89 (X) 0.8 = 49.51 (80% Recharge) (TD-80% Recharge)= 33.98 (Do Not Sample Below This Level)

D.T.W. @ time of sampling: 25.44 T.D. (B.T.O.C. after sampling): 83.04

COMPLETED BY (print): A. CASTELLUM SIGNATURE: _____

REVIEWED BY: _____ DATE: _____

Field Notes:

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Stantec

geotech
Calibrated at Geotech's California South service center
155 East Liberty Ave, Suite A
Anaheim, CA 92801
Fax: (714) 998-7382

Horiba U52 Calibration Certificate

Unit Number: 3531
Serial Number: BV5MS0NX

Calibration Date 8/17/2020
Technician: Mark Esquibel

☑ U52 Display is clear, and free of damage
☑ Cable and accessories are free of damage

Sonde Serial #: 4J93NL12

Display Battery: 6 V **Pass**
Spare Battery: 6.41 V **Pass**

Bath Temp: 24.76 °C
Meter Temp: 24.76 °C
Variance (°C): 0 °C **Pass**

Cond

Calibration	Reading	Buffer Lot #	Exp. Date	
1.413 mS	1.413 mS	0GD943	4/21	**Pass**

pH

Point Test	Calibration	Reading	Buffer Lot #	Exp. Date	
2 Point	6.86	6.86		3/22	**Pass**
	pH 4	pH 4	9GG1174	7/21	**Pass**

ORP

Calibration	Reading	Buffer Lot #	Exp. Date	
220 mV	220 mV	0GE775	2/21	**Pass**

Turbidity

Zero	Reading	Variance		Cal	Reading	Variance	
0 ntu	0 ntu	0 ntu	**Pass**	100 ntu	100 ntu	0.0%	**Pass**

DO

Berometer	Calibration	Reading	Variance		Test Fluid
760 mmHg	100 %	100 %	0.0%	**Pass**	Water Saturated Air

Time: Min.	Sec.	Reading		Nitrogen Lot #
0	37	1.9 %	**Pass**	166-401769762-1

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ANALYTICAL REPORT

Eurofins Calscience Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614-5817
Tel: (949)261-1022

Laboratory Job ID: 440-270516-1
Client Project/Site: BP Gardena Sumps
Revision: 1

For:
Stantec Consulting Corp.
290 Conejo Ridge Avenue, Suite 200
Thousand Oaks, California 91361

Attn: Kelly Brown

Authorized for release by:
9/1/2020 9:08:26 AM

Lena Davidkov, Project Manager II
(949)260-3229
Lena.Davidkova@Eurofinset.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the BPLAMP Technical Specifications, applicable federal, state, local regulations and certification requirements as well as the methodologies as described in laboratory SOPs reviewed by the BPLAMP. This Laboratory Report is confidential and is intended for the sole use of Eurofins TestAmerica and its client. This report shall not be reproduced, except in full, without written permission from TestAmerica. The signature on the cover page extends to the case narrative and all the data and forms in the package. The Chain of Custody is included and is an integral part of this report.

Lena Davidkov
Project Manager II
9/1/2020 9:08:26 AM

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Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

GC VOA

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

HPLC/IC

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier	Qualifier Description
^	ICV,CCV,ICB,CCB, ISA, ISB, CRI, CRA, DLCK or MRL standard: Instrument related QC is outside acceptance limits.
B	Compound was found in the blank and sample.
F1	MS and/or MSD recovery exceeds control limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
F1	MS and/or MSD recovery exceeds control limits.
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)

Glossary (Continued)

Abbreviation	These commonly used abbreviations may or may not be present in this report.
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 440-270516-1

Laboratory: Eurofins Calscience Irvine

Narrative

Job Narrative
440-270516-1

Comments
This report was revised to correct sample IDs for samples TB-SUMP and FB-SUMP to add sampling dates to the names 20200818

Receipt
The samples were received on 8/18/2020 6:00 PM; the samples arrived in good condition, and where required, properly preserved and on ice. The temperatures of the 2 coolers at receipt time were 4.2º C and 4.3º C.

GC/MS VOA
Method 8260B: The continuing calibration verification (CCV) associated with batch 440-621204 recovered above the upper control limit for n-Butylbenzene and Ethylbenzene. The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported. The associated samples are impacted: MW-05A (440-270516-1), G-4 (440-270516-2), MW-03B (440-270516-3), MW-03A (440-270516-4), TB-SUMP-20200818 (440-270516-5), FB-SUMP-20200818 (440-270516-6) and (CCVIS 440-621204/2).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GC/MS Semi VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

HPLC/IC
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Metals
Method 7470A: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for Mercurypreparation batch 440-621288 and 440-621291 and analytical batch 440-621418 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

Method 6020: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 440-622041 and 440-622042 and analytical batch 440-622194 were outside control limits for Zinc. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

Method 6020: The method blank for preparation batch 440-622041 and analytical batch 440-622194 contained Zinc above the method detection limit. This target analyte concentration was less than half the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

Method 6020: The initial calibration verification (ICV) result for batch 440-622171 was above the upper control limit for Silver. Sample results were non-detects, and have been reported as qualified data.

Method 6020: The continuing calibration verification (CCV) associated with batch 440-622171 recovered above the upper control limit for Beryllium. The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported. The associated samples are impacted: G-4 (440-270516-2), MW-03B (440-270516-3) and MW-03A (440-270516-4).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
Method SM 4500 S2 D: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for analytical batch 440-621667 were outside control limits. Sample matrix interference is suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Job ID: 440-270516-1 (Continued)

Laboratory: Eurofins Calscience Irvine (Continued)

Organic Prep
Method 3510C: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with preparation batch 570-89056. LCS/LCSD was performed to meet QC requirements.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOA Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270516-1

Client Sample ID: MW-05A — Lab Sample ID: 440-270516-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
2,4-Dimethylphenol	0.093	J	0.19	0.032	ug/L	1		8270C SIM	Total/NA
Pyrene	0.20		0.19	0.047	ug/L	1		8270C SIM	Total/NA
GRO (C4-C12)	40	J	50	25	ug/L	1		8015B	Total/NA
Antimony	0.57	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Arsenic	8.2		1.0	0.50	ug/L	1		6020	Total Recoverable
Barium	20		1.0	0.50	ug/L	1		6020	Total Recoverable
Beryllium	1.7		0.50	0.25	ug/L	1		6020	Total Recoverable
Cadmium	0.39	J	1.0	0.25	ug/L	1		6020	Total Recoverable
Cobalt	35		1.0	0.50	ug/L	1		6020	Total Recoverable
Copper	2.1		2.0	0.50	ug/L	1		6020	Total Recoverable
Molybdenum	3.5		2.0	0.50	ug/L	1		6020	Total Recoverable
Nickel	13		2.0	0.50	ug/L	1		6020	Total Recoverable
Selenium	1.7	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Thallium	0.31	J	1.0	0.20	ug/L	1		6020	Total Recoverable
Vanadium	5.6		2.0	1.0	ug/L	1		6020	Total Recoverable
Zinc	120	F1	20	2.5	ug/L	1		6020	Total Recoverable
Antimony	0.64	J	2.0	0.50	ug/L	1		6020	Dissolved
Arsenic	7.1		1.0	0.50	ug/L	1		6020	Dissolved
Barium	19		1.0	0.50	ug/L	1		6020	Dissolved
Beryllium	1.7		0.50	0.25	ug/L	1		6020	Dissolved
Cadmium	0.56	J	1.0	0.25	ug/L	1		6020	Dissolved
Cobalt	39		1.0	0.50	ug/L	1		6020	Dissolved
Copper	2.0		2.0	0.50	ug/L	1		6020	Dissolved
Molybdenum	3.2		2.0	0.50	ug/L	1		6020	Dissolved
Nickel	19		2.0	0.50	ug/L	1		6020	Dissolved
Selenium	1.3	J	2.0	0.50	ug/L	1		6020	Dissolved
Thallium	0.28	J	1.0	0.20	ug/L	1		6020	Dissolved
Vanadium	4.0		2.0	1.0	ug/L	1		6020	Dissolved
Zinc	89	F1 B	20	2.5	ug/L	1		6020	Dissolved
pH	6.7	HF	0.1	0.1	SU	1		9040B	Total/NA

Client Sample ID: G-4 — Lab Sample ID: 440-270516-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Benzoic acid	2.2	J	4.7	0.53	ug/L	1		8270C SIM	Total/NA
Arsenic	1.4		1.0	0.50	ug/L	1		6020	Total Recoverable
Barium	34		1.0	0.50	ug/L	1		6020	Total Recoverable
Cobalt	0.86	J	1.0	0.50	ug/L	1		6020	Total Recoverable
Copper	0.65	J	2.0	0.50	ug/L	1		6020	Total Recoverable

This Detection Summary does not include radiochemical test results.

Client Sample ID: G-4 (Continued) — Lab Sample ID: 440-270516-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Molybdenum	15		2.0	0.50	ug/L	1		6020	Total Recoverable
Nickel	2.1		2.0	0.50	ug/L	1		6020	Total Recoverable
Selenium	2.0		2.0	0.50	ug/L	1		6020	Total Recoverable
Vanadium	6.9		2.0	1.0	ug/L	1		6020	Total Recoverable
Zinc	21		20	2.5	ug/L	1		6020	Total Recoverable
Arsenic	1.3		1.0	0.50	ug/L	1		6020	Dissolved
Barium	39		1.0	0.50	ug/L	1		6020	Dissolved
Cobalt	1.2		1.0	0.50	ug/L	1		6020	Dissolved
Copper	0.70	J	2.0	0.50	ug/L	1		6020	Dissolved
Molybdenum	14		2.0	0.50	ug/L	1		6020	Dissolved
Nickel	2.1		2.0	0.50	ug/L	1		6020	Dissolved
Selenium	1.8	J	2.0	0.50	ug/L	1		6020	Dissolved
Vanadium	6.9		2.0	1.0	ug/L	1		6020	Dissolved
pH	7.7	HF	0.1	0.1	SU	1		9040B	Total/NA

Client Sample ID: MW-03B — Lab Sample ID: 440-270516-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
2,6-Dinitrotoluene	23		0.19	0.036	ug/L	1		8270C SIM	Total/NA
Acenaphthene	0.064	J	0.19	0.061	ug/L	1		8270C SIM	Total/NA
Benzoic acid	1.9	J	4.8	0.53	ug/L	1		8270C SIM	Total/NA
Benzyl alcohol	0.057	J	0.19	0.036	ug/L	1		8270C SIM	Total/NA
Arsenic	4.1		1.0	0.50	ug/L	1		6020	Total Recoverable
Barium	42		1.0	0.50	ug/L	1		6020	Total Recoverable
Molybdenum	4.4		2.0	0.50	ug/L	1		6020	Total Recoverable
Nickel	1.1	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Selenium	1.5	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Arsenic	3.9		1.0	0.50	ug/L	1		6020	Dissolved
Barium	48		1.0	0.50	ug/L	1		6020	Dissolved
Cobalt	0.97	J	1.0	0.50	ug/L	1		6020	Dissolved
Molybdenum	4.1		2.0	0.50	ug/L	1		6020	Dissolved
Nickel	1.1	J	2.0	0.50	ug/L	1		6020	Dissolved
Selenium	1.4	J	2.0	0.50	ug/L	1		6020	Dissolved
pH	7.9	HF	0.1	0.1	SU	1		9040B	Total/NA

Client Sample ID: MW-03A — Lab Sample ID: 440-270516-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Benzoic acid	2.0	J	4.8	0.53	ug/L	1		8270C SIM	Total/NA
Cr (VI)	0.50	J	2.0	0.25	ug/L	1		7199	Total/NA
Arsenic	0.65	J	1.0	0.50	ug/L	1		6020	Total Recoverable
Barium	110		1.0	0.50	ug/L	1		6020	Total Recoverable

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-03A (Continued) — Lab Sample ID: 440-270516-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chromium	0.75	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Copper	0.76	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Molybdenum	1.6	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Nickel	1.0	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Selenium	1.9	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Vanadium	4.6		2.0	1.0	ug/L	1		6020	Total Recoverable
Zinc	3.0	J	20	2.5	ug/L	1		6020	Total Recoverable
Arsenic	0.60	J	1.0	0.50	ug/L	1		6020	Dissolved
Barium	110		1.0	0.50	ug/L	1		6020	Dissolved
Chromium	0.74	J	2.0	0.50	ug/L	1		6020	Dissolved
Copper	1.1	J	2.0	0.50	ug/L	1		6020	Dissolved
Molybdenum	1.7	J	2.0	0.50	ug/L	1		6020	Dissolved
Nickel	1.1	J	2.0	0.50	ug/L	1		6020	Dissolved
Selenium	1.6	J	2.0	0.50	ug/L	1		6020	Dissolved
Vanadium	4.5		2.0	1.0	ug/L	1		6020	Dissolved
pH	7.5	HF	0.1	0.1	SU	1		9040B	Total/NA

Client Sample ID: TB-SUMP-20200818 — Lab Sample ID: 440-270516-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
GRO (C4-C12)	26	J	50	25	ug/L	1		8015B	Total/NA

Client Sample ID: FB-SUMP-20200818 — Lab Sample ID: 440-270516-6

No Detections.

This Detection Summary does not include radiochemical test results.

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270516-1

Client Sample ID: MW-05A
Date Collected: 08/18/20 07:20
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-1
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/19/20 09:04	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/19/20 09:04	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/19/20 09:04	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/19/20 09:04	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/19/20 09:04	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Benzene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Bromobenzene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Bromoform	ND		1.0	0.40	ug/L			08/19/20 09:04	1
Bromomethane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Chloroethane	ND		1.0	0.40	ug/L			08/19/20 09:04	1
Chloroform	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Chloromethane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Dibromochloromethane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Dibromomethane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/19/20 09:04	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/19/20 09:04	1
Methylene Chloride	ND		1.0	0.88	ug/L			08/19/20 09:04	1
Naphthalene	ND		1.0	0.40	ug/L			08/19/20 09:04	1
n-Butylbenzene	ND		1.0	0.40	ug/L			08/19/20 09:04	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
o-Xylene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/19/20 09:04	1

Client Sample ID: MW-05A

Date Collected: 08/18/20 07:20
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-1

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Styrene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Toluene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Trichloroethene	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/19/20 09:04	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/19/20 09:04	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*99*		*80 - 120*		*08/19/20 09:04*	*1*
Dibromofluoromethane (Surr)	*98*		*76 - 132*		*08/19/20 09:04*	*1*
Toluene-d8 (Surr)	*108*		*80 - 128*		*08/19/20 09:04*	*1*

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,4-Trichlorobenzene	ND		0.19	0.056	ug/L		08/20/20 07:12	08/21/20 13:46	1
1,2-Dichlorobenzene	ND		0.19	0.043	ug/L		08/20/20 07:12	08/21/20 13:46	1
1,3-Dichlorobenzene	ND		0.19	0.042	ug/L		08/20/20 07:12	08/21/20 13:46	1
1,4-Dichlorobenzene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 13:46	1
2,4,5-Trichlorophenol	ND		4.7	1.4	ug/L		08/20/20 07:12	08/21/20 13:46	1
2,4,6-Trichlorophenol	ND		4.7	1.3	ug/L		08/20/20 07:12	08/21/20 13:46	1
2,4-Dichlorophenol	ND		4.7	1.8	ug/L		08/20/20 07:12	08/21/20 13:46	1
2,4-Dimethylphenol	**0.093**	**J**	0.19	0.032	ug/L		08/20/20 07:12	08/21/20 13:46	1
2,4-Dinitrophenol	ND		4.7	0.96	ug/L		08/20/20 07:12	08/21/20 13:46	1
2,4-Dinitrotoluene	ND		0.19	0.028	ug/L		08/20/20 07:12	08/21/20 13:46	1
2,6-Dinitrotoluene	ND		0.19	0.036	ug/L		08/20/20 07:12	08/21/20 13:46	1
2-Chloronaphthalene	ND		0.19	0.054	ug/L		08/20/20 07:12	08/21/20 13:46	1
2-Chlorophenol	ND		0.19	0.045	ug/L		08/20/20 07:12	08/21/20 13:46	1
2-Methylnaphthalene	ND		0.19	0.039	ug/L		08/20/20 07:12	08/21/20 13:46	1
2-Methylphenol	ND		4.7	1.5	ug/L		08/20/20 07:12	08/21/20 13:46	1
2-Nitroaniline	ND		4.7	1.2	ug/L		08/20/20 07:12	08/21/20 13:46	1
2-Nitrophenol	ND		4.7	1.8	ug/L		08/20/20 07:12	08/21/20 13:46	1
3,3'-Dichlorobenzidine	ND		4.7	1.2	ug/L		08/20/20 07:12	08/21/20 13:46	1
3-Nitroaniline	ND		4.7	1.2	ug/L		08/20/20 07:12	08/21/20 13:46	1
4,6-Dinitro-2-methylphenol	ND		4.7	0.84	ug/L		08/20/20 07:12	08/21/20 13:46	1
4-Bromophenyl phenyl ether	ND		0.19	0.043	ug/L		08/20/20 07:12	08/21/20 13:46	1
4-Chloro-3-methylphenol	ND		4.7	1.8	ug/L		08/20/20 07:12	08/21/20 13:46	1
4-Chloroaniline	ND		4.7	1.6	ug/L		08/20/20 07:12	08/21/20 13:46	1
4-Chlorophenyl phenyl ether	ND		0.19	0.047	ug/L		08/20/20 07:12	08/21/20 13:46	1
4-Nitroaniline	ND		4.7	1.5	ug/L		08/20/20 07:12	08/21/20 13:46	1
4-Nitrophenol	ND		4.7	0.90	ug/L		08/20/20 07:12	08/21/20 13:46	1
Acenaphthene	ND		0.19	0.061	ug/L		08/20/20 07:12	08/21/20 13:46	1
Acenaphthylene	ND		0.19	0.051	ug/L		08/20/20 07:12	08/21/20 13:46	1
Aniline	ND		0.19	0.020	ug/L		08/20/20 07:12	08/21/20 13:46	1
Anthracene	ND		0.19	0.041	ug/L		08/20/20 07:12	08/21/20 13:46	1
Azobenzene	ND		0.19	0.044	ug/L		08/20/20 07:12	08/21/20 13:46	1

Client Sample ID: MW-05A

Date Collected: 08/18/20 07:20
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-1

Matrix: Water

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzidine	ND		4.7	0.72	ug/L		08/20/20 07:12	08/21/20 13:46	1
Benzo[a]anthracene	ND		0.19	0.047	ug/L		08/20/20 07:12	08/21/20 13:46	1
Benzo[a]pyrene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 13:46	1
Benzo[b]fluoranthene	ND		0.19	0.041	ug/L		08/20/20 07:12	08/21/20 13:46	1
Benzo[g,h,i]perylene	ND		0.19	0.040	ug/L		08/20/20 07:12	08/21/20 13:46	1
Benzo[k]fluoranthene	ND		0.19	0.040	ug/L		08/20/20 07:12	08/21/20 13:46	1
Benzoic acid	ND		4.7	0.53	ug/L		08/20/20 07:12	08/21/20 13:46	1
Benzyl alcohol	ND		0.19	0.036	ug/L		08/20/20 07:12	08/21/20 13:46	1
bis (2-chloroisopropyl) ether	ND		0.19	0.040	ug/L		08/20/20 07:12	08/21/20 13:46	1
Bis(2-chloroethoxy)methane	ND		0.19	0.058	ug/L		08/20/20 07:12	08/21/20 13:46	1
Bis(2-chloroethyl)ether	ND		0.19	0.037	ug/L		08/20/20 07:12	08/21/20 13:46	1
Bis(2-ethylhexyl) phthalate	ND		4.7	3.2	ug/L		08/20/20 07:12	08/21/20 13:46	1
Butyl benzyl phthalate	ND		4.7	2.0	ug/L		08/20/20 07:12	08/21/20 13:46	1
Chrysene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 13:46	1
Dibenz(a,h)anthracene	ND		0.19	0.035	ug/L		08/20/20 07:12	08/21/20 13:46	1
Dibenzofuran	ND		0.19	0.046	ug/L		08/20/20 07:12	08/21/20 13:46	1
Diethyl phthalate	ND		4.7	1.5	ug/L		08/20/20 07:12	08/21/20 13:46	1
Dimethyl phthalate	ND		4.7	1.4	ug/L		08/20/20 07:12	08/21/20 13:46	1
Di-n-butyl phthalate	ND		4.7	1.4	ug/L		08/20/20 07:12	08/21/20 13:46	1
Di-n-octyl phthalate	ND		4.7	1.4	ug/L		08/20/20 07:12	08/21/20 13:46	1
Fluoranthene	ND		0.19	0.042	ug/L		08/20/20 07:12	08/21/20 13:46	1
Fluorene	ND		0.19	0.049	ug/L		08/20/20 07:12	08/21/20 13:46	1
Hexachlorobenzene	ND		0.19	0.049	ug/L		08/20/20 07:12	08/21/20 13:46	1
Hexachlorobutadiene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 13:46	1
Hexachlorocyclopentadiene	ND		0.19	0.034	ug/L		08/20/20 07:12	08/21/20 13:46	1
Hexachloroethane	ND		0.19	0.051	ug/L		08/20/20 07:12	08/21/20 13:46	1
Indeno[1,2,3-cd]pyrene	ND		0.19	0.042	ug/L		08/20/20 07:12	08/21/20 13:46	1
Isophorone	ND		1.9	0.052	ug/L		08/20/20 07:12	08/21/20 13:46	1
Naphthalene	ND		0.19	0.047	ug/L		08/20/20 07:12	08/21/20 13:46	1
Nitrobenzene	ND		0.19	0.063	ug/L		08/20/20 07:12	08/21/20 13:46	1
N-Nitrosodimethylamine	ND		0.19	0.18	ug/L		08/20/20 07:12	08/21/20 13:46	1
N-Nitrosodi-n-propylamine	ND		0.19	0.033	ug/L		08/20/20 07:12	08/21/20 13:46	1
N-Nitrosodiphenylamine	ND		0.19	0.045	ug/L		08/20/20 07:12	08/21/20 13:46	1
Pentachlorophenol	ND		4.7	0.72	ug/L		08/20/20 07:12	08/21/20 13:46	1
Phenanthrene	ND		0.19	0.049	ug/L		08/20/20 07:12	08/21/20 13:46	1
Phenol	ND		0.19	0.031	ug/L		08/20/20 07:12	08/21/20 13:46	1
Pyrene	**0.20**		0.19	0.047	ug/L		08/20/20 07:12	08/21/20 13:46	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*101*		*53 - 117*	*08/20/20 07:12*	*08/21/20 13:46*	*1*
2-Fluorophenol (Surr)	*43*		*21 - 80*	*08/20/20 07:12*	*08/21/20 13:46*	*1*
Nitrobenzene-d5 (Surr)	*88*		*43 - 114*	*08/20/20 07:12*	*08/21/20 13:46*	*1*
Phenol-d6 (Surr)	*25*		*3 - 63*	*08/20/20 07:12*	*08/21/20 13:46*	*1*

Method: 8015B - Gasoline Range Organics - (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	**40**	**J**	50	25	ug/L			08/19/20 19:21	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*108*		*65 - 140*		*08/19/20 19:21*	*1*

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270516-1

Client Sample ID: MW-05A

Date Collected: 08/18/20 07:20
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-1

Matrix: Water

Method: 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cr (VI)	ND		2.0	0.25	ug/L			08/18/20 21:06	1

Method: 6020 - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.57	J	2.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:40	1
Arsenic	8.2		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:40	1
Barium	20		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:40	1
Beryllium	1.7		0.50	0.25	ug/L		08/25/20 16:10	08/26/20 11:40	1
Cadmium	0.39	J	1.0	0.25	ug/L		08/25/20 16:10	08/26/20 11:40	1
Chromium	ND		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:40	1
Cobalt	35		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:40	1
Copper	2.1		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:40	1
Lead	ND		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:40	1
Molybdenum	3.5		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:40	1
Nickel	13		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:40	1
Selenium	1.7	J	2.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:40	1
Silver	ND		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:40	1
Thallium	0.31	J	1.0	0.20	ug/L		08/25/20 16:10	08/26/20 11:40	1
Vanadium	5.6		2.0	1.0	ug/L		08/25/20 16:10	08/26/20 11:40	1
Zinc	120	F1	20	2.5	ug/L		08/25/20 16:10	08/26/20 11:40	1

Method: 6020 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.64	J	2.0	0.50	ug/L		08/25/20 16:08	08/26/20 12:04	1
Arsenic	7.1		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 12:04	1
Barium	19		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 12:04	1
Beryllium	1.7		0.50	0.25	ug/L		08/25/20 16:08	08/26/20 12:04	1
Cadmium	0.56	J	1.0	0.25	ug/L		08/25/20 16:08	08/26/20 12:04	1
Chromium	ND		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 12:04	1
Cobalt	39		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 12:04	1
Copper	2.0		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 12:04	1
Lead	ND		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 12:04	1
Molybdenum	3.2		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 12:04	1
Nickel	19		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 12:04	1
Selenium	1.3	J	2.0	0.50	ug/L		08/25/20 16:08	08/26/20 12:04	1
Silver	ND		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 12:04	1
Thallium	0.28	J	1.0	0.20	ug/L		08/25/20 16:08	08/26/20 12:04	1
Vanadium	4.0		2.0	1.0	ug/L		08/25/20 16:08	08/26/20 12:04	1
Zinc	89	F1 B	20	2.5	ug/L		08/25/20 16:08	08/26/20 12:04	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND	F1	0.20	0.10	ug/L		08/19/20 12:17	08/19/20 17:15	1

Method: 7470A - Mercury (CVAA) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND	F1	0.20	0.10	ug/L		08/19/20 12:21	08/19/20 18:03	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Sulfide	ND	F1	50	27	ug/L			08/21/20 15:56	1

Client Sample ID: MW-05A

Date Collected: 08/18/20 07:20
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-1
Matrix: Water

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH	6.7	HF	0.1	0.1	SU			08/20/20 15:29	1

Client Sample ID: G-4

Date Collected: 08/18/20 08:40
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-2
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/19/20 10:26	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/19/20 10:26	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/19/20 10:26	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/19/20 10:26	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Benzene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Bromobenzene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Bromoform	ND		1.0	0.40	ug/L			08/19/20 10:26	1
Bromomethane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Chloroethane	ND		1.0	0.40	ug/L			08/19/20 10:26	1
Chloroform	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Chloromethane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Dibromochloromethane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Dibromomethane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/19/20 10:26	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/19/20 10:26	1
Methylene Chloride	ND		1.0	0.88	ug/L			08/19/20 10:26	1

Client Sample ID: G-4
Date Collected: 08/18/20 08:40
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-2
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
n-Butylbenzene	ND		1.0	0.40	ug/L			08/19/20 10:26	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
o-Xylene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Styrene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Toluene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Trichloroethene	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/19/20 10:26	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/19/20 10:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*103*		*80 - 120*		*08/19/20 10:26*	*1*
Dibromofluoromethane (Surr)	*96*		*76 - 132*		*08/19/20 10:26*	*1*
Toluene-d8 (Surr)	*110*		*80 - 128*		*08/19/20 10:26*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS) - RA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/20/20 13:24	1
Naphthalene	ND		1.0	0.40	ug/L			08/20/20 13:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*101*		*80 - 120*		*08/20/20 13:24*	*1*
Dibromofluoromethane (Surr)	*98*		*76 - 132*		*08/20/20 13:24*	*1*
Toluene-d8 (Surr)	*110*		*80 - 128*		*08/20/20 13:24*	*1*

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,4-Trichlorobenzene	ND		0.19	0.056	ug/L		08/20/20 07:12	08/21/20 14:05	1
1,2-Dichlorobenzene	ND		0.19	0.043	ug/L		08/20/20 07:12	08/21/20 14:05	1
1,3-Dichlorobenzene	ND		0.19	0.042	ug/L		08/20/20 07:12	08/21/20 14:05	1
1,4-Dichlorobenzene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 14:05	1
2,4,5-Trichlorophenol	ND		4.7	1.4	ug/L		08/20/20 07:12	08/21/20 14:05	1
2,4,6-Trichlorophenol	ND		4.7	1.3	ug/L		08/20/20 07:12	08/21/20 14:05	1
2,4-Dichlorophenol	ND		4.7	1.8	ug/L		08/20/20 07:12	08/21/20 14:05	1
2,4-Dimethylphenol	ND		0.19	0.032	ug/L		08/20/20 07:12	08/21/20 14:05	1
2,4-Dinitrophenol	ND		4.7	0.96	ug/L		08/20/20 07:12	08/21/20 14:05	1
2,4-Dinitrotoluene	ND		0.19	0.028	ug/L		08/20/20 07:12	08/21/20 14:05	1
2,6-Dinitrotoluene	ND		0.19	0.036	ug/L		08/20/20 07:12	08/21/20 14:05	1
2-Chloronaphthalene	ND		0.19	0.054	ug/L		08/20/20 07:12	08/21/20 14:05	1
2-Chlorophenol	ND		0.19	0.045	ug/L		08/20/20 07:12	08/21/20 14:05	1
2-Methylnaphthalene	ND		0.19	0.039	ug/L		08/20/20 07:12	08/21/20 14:05	1
2-Methylphenol	ND		4.7	1.5	ug/L		08/20/20 07:12	08/21/20 14:05	1
2-Nitroaniline	ND		4.7	1.2	ug/L		08/20/20 07:12	08/21/20 14:05	1
2-Nitrophenol	ND		4.7	1.8	ug/L		08/20/20 07:12	08/21/20 14:05	1

Client Sample ID: G-4
Date Collected: 08/18/20 08:40
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-2
Matrix: Water

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
3,3'-Dichlorobenzidine	ND		4.7	1.2	ug/L		08/20/20 07:12	08/21/20 14:05	1
3-Nitroaniline	ND		4.7	1.2	ug/L		08/20/20 07:12	08/21/20 14:05	1
4,6-Dinitro-2-methylphenol	ND		4.7	0.84	ug/L		08/20/20 07:12	08/21/20 14:05	1
4-Bromophenyl phenyl ether	ND		0.19	0.043	ug/L		08/20/20 07:12	08/21/20 14:05	1
4-Chloro-3-methylphenol	ND		4.7	1.8	ug/L		08/20/20 07:12	08/21/20 14:05	1
4-Chloroaniline	ND		4.7	1.6	ug/L		08/20/20 07:12	08/21/20 14:05	1
4-Chlorophenyl phenyl ether	ND		0.19	0.047	ug/L		08/20/20 07:12	08/21/20 14:05	1
4-Nitroaniline	ND		4.7	1.5	ug/L		08/20/20 07:12	08/21/20 14:05	1
4-Nitrophenol	ND		4.7	0.90	ug/L		08/20/20 07:12	08/21/20 14:05	1
Acenaphthene	ND		0.19	0.061	ug/L		08/20/20 07:12	08/21/20 14:05	1
Acenaphthylene	ND		0.19	0.051	ug/L		08/20/20 07:12	08/21/20 14:05	1
Aniline	ND		0.19	0.020	ug/L		08/20/20 07:12	08/21/20 14:05	1
Anthracene	ND		0.19	0.041	ug/L		08/20/20 07:12	08/21/20 14:05	1
Azobenzene	ND		0.19	0.044	ug/L		08/20/20 07:12	08/21/20 14:05	1
Benzidine	ND		4.7	0.72	ug/L		08/20/20 07:12	08/21/20 14:05	1
Benzo[a]anthracene	ND		0.19	0.047	ug/L		08/20/20 07:12	08/21/20 14:05	1
Benzo[a]pyrene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 14:05	1
Benzo[b]fluoranthene	ND		0.19	0.041	ug/L		08/20/20 07:12	08/21/20 14:05	1
Benzo[g,h,i]perylene	ND		0.19	0.040	ug/L		08/20/20 07:12	08/21/20 14:05	1
Benzo[k]fluoranthene	ND		0.19	0.040	ug/L		08/20/20 07:12	08/21/20 14:05	1
Benzoic acid	**2.2**	**J**	4.7	0.53	ug/L		08/20/20 07:12	08/21/20 14:05	1
Benzyl alcohol	ND		0.19	0.036	ug/L		08/20/20 07:12	08/21/20 14:05	1
bis (2-chloroisopropyl) ether	ND		0.19	0.040	ug/L		08/20/20 07:12	08/21/20 14:05	1
Bis(2-chloroethoxy)methane	ND		0.19	0.058	ug/L		08/20/20 07:12	08/21/20 14:05	1
Bis(2-chloroethyl)ether	ND		0.19	0.037	ug/L		08/20/20 07:12	08/21/20 14:05	1
Bis(2-ethylhexyl) phthalate	ND		4.7	3.2	ug/L		08/20/20 07:12	08/21/20 14:05	1
Butyl benzyl phthalate	ND		4.7	2.0	ug/L		08/20/20 07:12	08/21/20 14:05	1
Chrysene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 14:05	1
Dibenz(a,h)anthracene	ND		0.19	0.035	ug/L		08/20/20 07:12	08/21/20 14:05	1
Dibenzofuran	ND		0.19	0.046	ug/L		08/20/20 07:12	08/21/20 14:05	1
Diethyl phthalate	ND		4.7	1.5	ug/L		08/20/20 07:12	08/21/20 14:05	1
Dimethyl phthalate	ND		4.7	1.4	ug/L		08/20/20 07:12	08/21/20 14:05	1
Di-n-butyl phthalate	ND		4.7	1.4	ug/L		08/20/20 07:12	08/21/20 14:05	1
Di-n-octyl phthalate	ND		4.7	1.4	ug/L		08/20/20 07:12	08/21/20 14:05	1
Fluoranthene	ND		0.19	0.042	ug/L		08/20/20 07:12	08/21/20 14:05	1
Fluorene	ND		0.19	0.049	ug/L		08/20/20 07:12	08/21/20 14:05	1
Hexachlorobenzene	ND		0.19	0.049	ug/L		08/20/20 07:12	08/21/20 14:05	1
Hexachlorobutadiene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 14:05	1
Hexachlorocyclopentadiene	ND		0.19	0.034	ug/L		08/20/20 07:12	08/21/20 14:05	1
Hexachloroethane	ND		0.19	0.051	ug/L		08/20/20 07:12	08/21/20 14:05	1
Indeno[1,2,3-cd]pyrene	ND		0.19	0.042	ug/L		08/20/20 07:12	08/21/20 14:05	1
Isophorone	ND		1.9	0.052	ug/L		08/20/20 07:12	08/21/20 14:05	1
Naphthalene	ND		0.19	0.047	ug/L		08/20/20 07:12	08/21/20 14:05	1
Nitrobenzene	ND		0.19	0.063	ug/L		08/20/20 07:12	08/21/20 14:05	1
N-Nitrosodimethylamine	ND		0.19	0.18	ug/L		08/20/20 07:12	08/21/20 14:05	1
N-Nitrosodi-n-propylamine	ND		0.19	0.033	ug/L		08/20/20 07:12	08/21/20 14:05	1
N-Nitrosodiphenylamine	ND		0.19	0.045	ug/L		08/20/20 07:12	08/21/20 14:05	1
Pentachlorophenol	ND		4.7	0.72	ug/L		08/20/20 07:12	08/21/20 14:05	1
Phenanthrene	ND		0.19	0.049	ug/L		08/20/20 07:12	08/21/20 14:05	1

Client Sample ID: G-4
Date Collected: 08/18/20 08:40
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-2
Matrix: Water

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phenol	ND		0.19	0.031	ug/L		08/20/20 07:12	08/21/20 14:05	1
Pyrene	ND		0.19	0.047	ug/L		08/20/20 07:12	08/21/20 14:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*102*		*53 - 117*	*08/20/20 07:12*	*08/21/20 14:05*	*1*
2-Fluorophenol (Surr)	*57*		*21 - 80*	*08/20/20 07:12*	*08/21/20 14:05*	*1*
Nitrobenzene-d5 (Surr)	*88*		*43 - 114*	*08/20/20 07:12*	*08/21/20 14:05*	*1*
Phenol-d6 (Surr)	*35*		*3 - 63*	*08/20/20 07:12*	*08/21/20 14:05*	*1*

Method: 8015B - Gasoline Range Organics - (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	ND		50	25	ug/L			08/19/20 19:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*108*		*65 - 140*		*08/19/20 19:49*	*1*

Method: 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cr (VI)	ND		2.0	0.25	ug/L			08/18/20 21:45	1

Method: 6020 - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:51	1
Arsenic	**1.4**		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:51	1
Barium	**34**		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:51	1
Beryllium	ND	^	0.50	0.25	ug/L		08/25/20 16:10	08/26/20 09:51	1
Cadmium	ND		1.0	0.25	ug/L		08/25/20 16:10	08/26/20 09:51	1
Chromium	ND		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:51	1
Cobalt	**0.86**	**J**	1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:51	1
Copper	**0.65**	**J**	2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:51	1
Lead	ND		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:51	1
Molybdenum	**15**		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:51	1
Nickel	**2.1**		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:51	1
Selenium	**2.0**		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:51	1
Silver	ND	^	1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:51	1
Thallium	ND		1.0	0.20	ug/L		08/25/20 16:10	08/26/20 09:51	1
Vanadium	**6.9**		2.0	1.0	ug/L		08/25/20 16:10	08/26/20 09:51	1
Zinc	**21**		20	2.5	ug/L		08/25/20 16:10	08/26/20 09:51	1

Method: 6020 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:31	1
Arsenic	**1.3**		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:31	1
Barium	**39**		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:31	1
Beryllium	ND	^	0.50	0.25	ug/L		08/25/20 16:08	08/26/20 10:31	1
Cadmium	ND		1.0	0.25	ug/L		08/25/20 16:08	08/26/20 10:31	1
Chromium	ND		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:31	1
Cobalt	**1.2**		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:31	1
Copper	**0.70**	**J**	2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:31	1
Lead	ND		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:31	1
Molybdenum	**14**		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:31	1

Client Sample ID: G-4

Lab Sample ID: 440-270516-2

Date Collected: 08/18/20 08:40
Date Received: 08/18/20 18:00

Matrix: Water

Method: 6020 - Metals (ICP/MS) - Dissolved (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nickel	**2.1**		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:31	1
Selenium	**1.8**	**J**	2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:31	1
Silver	ND	^	1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:31	1
Thallium	ND		1.0	0.20	ug/L		08/25/20 16:08	08/26/20 10:31	1
Vanadium	**6.9**		2.0	1.0	ug/L		08/25/20 16:08	08/26/20 10:31	1
Zinc	ND		20	2.5	ug/L		08/25/20 16:08	08/26/20 10:31	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/19/20 12:17	08/19/20 17:22	1

Method: 7470A - Mercury (CVAA) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/19/20 12:21	08/19/20 18:10	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Sulfide	ND		50	27	ug/L			08/21/20 15:56	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH	**7.7**	**HF**	0.1	0.1	SU			08/20/20 15:29	1

Client Sample ID: MW-03B

Lab Sample ID: 440-270516-3

Date Collected: 08/18/20 09:44
Date Received: 08/18/20 18:00

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/19/20 10:53	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/19/20 10:53	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/19/20 10:53	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/19/20 10:53	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/19/20 10:53	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/19/20 10:53	1

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270516-1

Client Sample ID: MW-03B
Date Collected: 08/18/20 09:44
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-3
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Bromobenzene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Bromoform	ND		1.0	0.40	ug/L			08/19/20 10:53	1
Bromomethane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Chloroethane	ND		1.0	0.40	ug/L			08/19/20 10:53	1
Chloroform	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Chloromethane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Dibromochloromethane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Dibromomethane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/19/20 10:53	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/19/20 10:53	1
Methylene Chloride	ND		1.0	0.88	ug/L			08/19/20 10:53	1
Naphthalene	ND		1.0	0.40	ug/L			08/19/20 10:53	1
n-Butylbenzene	ND		1.0	0.40	ug/L			08/19/20 10:53	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
o-Xylene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Styrene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Toluene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Trichloroethene	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/19/20 10:53	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/19/20 10:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*101*		*80 - 120*		*08/19/20 10:53*	*1*
Dibromofluoromethane (Surr)	*97*		*76 - 132*		*08/19/20 10:53*	*1*
Toluene-d8 (Surr)	*107*		*80 - 128*		*08/19/20 10:53*	*1*

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,4-Trichlorobenzene	ND		0.19	0.056	ug/L		08/20/20 07:12	08/21/20 14:23	1
1,2-Dichlorobenzene	ND		0.19	0.043	ug/L		08/20/20 07:12	08/21/20 14:23	1
1,3-Dichlorobenzene	ND		0.19	0.042	ug/L		08/20/20 07:12	08/21/20 14:23	1
1,4-Dichlorobenzene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 14:23	1
2,4,5-Trichlorophenol	ND		4.8	1.4	ug/L		08/20/20 07:12	08/21/20 14:23	1

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270516-1

Client Sample ID: MW-03B
Date Collected: 08/18/20 09:44
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-3
Matrix: Water

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4,6-Trichlorophenol	ND		4.8	1.3	ug/L		08/20/20 07:12	08/21/20 14:23	1
2,4-Dichlorophenol	ND		4.8	1.8	ug/L		08/20/20 07:12	08/21/20 14:23	1
2,4-Dimethylphenol	ND		0.19	0.032	ug/L		08/20/20 07:12	08/21/20 14:23	1
2,4-Dinitrophenol	ND		4.8	0.96	ug/L		08/20/20 07:12	08/21/20 14:23	1
2,4-Dinitrotoluene	ND		0.19	0.028	ug/L		08/20/20 07:12	08/21/20 14:23	1
2,6-Dinitrotoluene	**23**		0.19	0.036	ug/L		08/20/20 07:12	08/21/20 14:23	1
2-Chloronaphthalene	ND		0.19	0.054	ug/L		08/20/20 07:12	08/21/20 14:23	1
2-Chlorophenol	ND		0.19	0.045	ug/L		08/20/20 07:12	08/21/20 14:23	1
2-Methylnaphthalene	ND		0.19	0.039	ug/L		08/20/20 07:12	08/21/20 14:23	1
2-Methylphenol	ND		4.8	1.5	ug/L		08/20/20 07:12	08/21/20 14:23	1
2-Nitroaniline	ND		4.8	1.2	ug/L		08/20/20 07:12	08/21/20 14:23	1
2-Nitrophenol	ND		4.8	1.8	ug/L		08/20/20 07:12	08/21/20 14:23	1
3,3'-Dichlorobenzidine	ND		4.8	1.2	ug/L		08/20/20 07:12	08/21/20 14:23	1
3-Nitroaniline	ND		4.8	1.2	ug/L		08/20/20 07:12	08/21/20 14:23	1
4,6-Dinitro-2-methylphenol	ND		4.8	0.84	ug/L		08/20/20 07:12	08/21/20 14:23	1
4-Bromophenyl phenyl ether	ND		0.19	0.043	ug/L		08/20/20 07:12	08/21/20 14:23	1
4-Chloro-3-methylphenol	ND		4.8	1.8	ug/L		08/20/20 07:12	08/21/20 14:23	1
4-Chloroaniline	ND		4.8	1.6	ug/L		08/20/20 07:12	08/21/20 14:23	1
4-Chlorophenyl phenyl ether	ND		0.19	0.047	ug/L		08/20/20 07:12	08/21/20 14:23	1
4-Nitroaniline	ND		4.8	1.5	ug/L		08/20/20 07:12	08/21/20 14:23	1
4-Nitrophenol	ND		4.8	0.90	ug/L		08/20/20 07:12	08/21/20 14:23	1
Acenaphthene	**0.064**	**J**	0.19	0.061	ug/L		08/20/20 07:12	08/21/20 14:23	1
Acenaphthylene	ND		0.19	0.051	ug/L		08/20/20 07:12	08/21/20 14:23	1
Aniline	ND		0.19	0.020	ug/L		08/20/20 07:12	08/21/20 14:23	1
Anthracene	ND		0.19	0.041	ug/L		08/20/20 07:12	08/21/20 14:23	1
Azobenzene	ND		0.19	0.044	ug/L		08/20/20 07:12	08/21/20 14:23	1
Benzidine	ND		4.8	0.72	ug/L		08/20/20 07:12	08/21/20 14:23	1
Benzo[a]anthracene	ND		0.19	0.047	ug/L		08/20/20 07:12	08/21/20 14:23	1
Benzo[a]pyrene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 14:23	1
Benzo[b]fluoranthene	ND		0.19	0.041	ug/L		08/20/20 07:12	08/21/20 14:23	1
Benzo[g,h,i]perylene	ND		0.19	0.040	ug/L		08/20/20 07:12	08/21/20 14:23	1
Benzo[k]fluoranthene	ND		0.19	0.040	ug/L		08/20/20 07:12	08/21/20 14:23	1
Benzoic acid	**1.9**	**J**	4.8	0.53	ug/L		08/20/20 07:12	08/21/20 14:23	1
Benzyl alcohol	**0.057**	**J**	0.19	0.036	ug/L		08/20/20 07:12	08/21/20 14:23	1
bis (2-chloroisopropyl) ether	ND		0.19	0.040	ug/L		08/20/20 07:12	08/21/20 14:23	1
Bis(2-chloroethoxy)methane	ND		0.19	0.058	ug/L		08/20/20 07:12	08/21/20 14:23	1
Bis(2-chloroethyl)ether	ND		0.19	0.037	ug/L		08/20/20 07:12	08/21/20 14:23	1
Bis(2-ethylhexyl) phthalate	ND		4.8	3.2	ug/L		08/20/20 07:12	08/21/20 14:23	1
Butyl benzyl phthalate	ND		4.8	2.0	ug/L		08/20/20 07:12	08/21/20 14:23	1
Chrysene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 14:23	1
Dibenz(a,h)anthracene	ND		0.19	0.035	ug/L		08/20/20 07:12	08/21/20 14:23	1
Dibenzofuran	ND		0.19	0.046	ug/L		08/20/20 07:12	08/21/20 14:23	1
Diethyl phthalate	ND		4.8	1.5	ug/L		08/20/20 07:12	08/21/20 14:23	1
Dimethyl phthalate	ND		4.8	1.4	ug/L		08/20/20 07:12	08/21/20 14:23	1
Di-n-butyl phthalate	ND		4.8	1.4	ug/L		08/20/20 07:12	08/21/20 14:23	1
Di-n-octyl phthalate	ND		4.8	1.4	ug/L		08/20/20 07:12	08/21/20 14:23	1
Fluoranthene	ND		0.19	0.042	ug/L		08/20/20 07:12	08/21/20 14:23	1
Fluorene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 14:23	1
Hexachlorobenzene	ND		0.19	0.049	ug/L		08/20/20 07:12	08/21/20 14:23	1

Client Sample ID: MW-03B

Date Collected: 08/18/20 09:44
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-3

Matrix: Water

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hexachlorobutadiene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 14:23	1
Hexachlorocyclopentadiene	ND		0.19	0.034	ug/L		08/20/20 07:12	08/21/20 14:23	1
Hexachloroethane	ND		0.19	0.051	ug/L		08/20/20 07:12	08/21/20 14:23	1
Indeno[1,2,3-cd]pyrene	ND		0.19	0.042	ug/L		08/20/20 07:12	08/21/20 14:23	1
Isophorone	ND		1.9	0.052	ug/L		08/20/20 07:12	08/21/20 14:23	1
Naphthalene	ND		0.19	0.048	ug/L		08/20/20 07:12	08/21/20 14:23	1
Nitrobenzene	ND		0.19	0.063	ug/L		08/20/20 07:12	08/21/20 14:23	1
N-Nitrosodimethylamine	ND		0.19	0.18	ug/L		08/20/20 07:12	08/21/20 14:23	1
N-Nitrosodi-n-propylamine	ND		0.19	0.033	ug/L		08/20/20 07:12	08/21/20 14:23	1
N-Nitrosodiphenylamine	ND		0.19	0.045	ug/L		08/20/20 07:12	08/21/20 14:23	1
Pentachlorophenol	ND		4.8	0.72	ug/L		08/20/20 07:12	08/21/20 14:23	1
Phenanthrene	ND		0.19	0.049	ug/L		08/20/20 07:12	08/21/20 14:23	1
Phenol	ND		0.19	0.031	ug/L		08/20/20 07:12	08/21/20 14:23	1
Pyrene	ND		0.19	0.047	ug/L		08/20/20 07:12	08/21/20 14:23	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*102*		*53 - 117*	*08/20/20 07:12*	*08/21/20 14:23*	*1*
2-Fluorophenol (Surr)	*56*		*21 - 80*	*08/20/20 07:12*	*08/21/20 14:23*	*1*
Nitrobenzene-d5 (Surr)	*87*		*43 - 114*	*08/20/20 07:12*	*08/21/20 14:23*	*1*
Phenol-d6 (Surr)	*35*		*3 - 63*	*08/20/20 07:12*	*08/21/20 14:23*	*1*

Method: 8015B - Gasoline Range Organics - (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	ND		50	25	ug/L			08/19/20 20:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*110*		*65 - 140*		*08/19/20 20:16*	*1*

Method: 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cr (VI)	ND		2.0	0.25	ug/L			08/18/20 22:24	1

Method: 6020 - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:53	1
Arsenic	**4.1**		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:53	1
Barium	**42**		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:53	1
Beryllium	ND	^	0.50	0.25	ug/L		08/25/20 16:10	08/26/20 09:53	1
Cadmium	ND		1.0	0.25	ug/L		08/25/20 16:10	08/26/20 09:53	1
Chromium	ND		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:53	1
Cobalt	ND		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:53	1
Copper	ND		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:53	1
Lead	ND		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:53	1
Molybdenum	**4.4**		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:53	1
Nickel	**1.1**	**J**	2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:53	1
Selenium	**1.5**	**J**	2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:53	1
Silver	ND	^	1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:53	1
Thallium	ND		1.0	0.20	ug/L		08/25/20 16:10	08/26/20 09:53	1
Vanadium	ND		2.0	1.0	ug/L		08/25/20 16:10	08/26/20 09:53	1
Zinc	ND		20	2.5	ug/L		08/25/20 16:10	08/26/20 09:53	1

Client Sample ID: MW-03B

Date Collected: 08/18/20 09:44
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-3

Matrix: Water

Method: 6020 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:33	1
Arsenic	**3.9**		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:33	1
Barium	**48**		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:33	1
Beryllium	ND	^	0.50	0.25	ug/L		08/25/20 16:08	08/26/20 10:33	1
Cadmium	ND		1.0	0.25	ug/L		08/25/20 16:08	08/26/20 10:33	1
Chromium	ND		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:33	1
Cobalt	**0.97**	**J**	1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:33	1
Copper	ND		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:33	1
Lead	ND		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:33	1
Molybdenum	**4.1**		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:33	1
Nickel	**1.1**	**J**	2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:33	1
Selenium	**1.4**	**J**	2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:33	1
Silver	ND	^	1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:33	1
Thallium	ND		1.0	0.20	ug/L		08/25/20 16:08	08/26/20 10:33	1
Vanadium	ND		2.0	1.0	ug/L		08/25/20 16:08	08/26/20 10:33	1
Zinc	ND		20	2.5	ug/L		08/25/20 16:08	08/26/20 10:33	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/19/20 12:17	08/19/20 17:24	1

Method: 7470A - Mercury (CVAA) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/19/20 12:21	08/19/20 18:12	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Sulfide	ND		50	27	ug/L			08/21/20 15:56	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH	**7.9**	**HF**	0.1	0.1	SU			08/20/20 15:29	1

Client Sample ID: MW-03A

Date Collected: 08/18/20 10:14
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-4

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/19/20 11:21	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/19/20 11:21	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/19/20 11:21	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/19/20 11:21	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/19/20 11:21	1

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270516-1

Client Sample ID: MW-03A
Date Collected: 08/18/20 10:14
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-4
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/19/20 11:21	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Benzene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Bromobenzene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Bromoform	ND		1.0	0.40	ug/L			08/19/20 11:21	1
Bromomethane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Chloroethane	ND		1.0	0.40	ug/L			08/19/20 11:21	1
Chloroform	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Chloromethane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Dibromochloromethane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Dibromomethane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/19/20 11:21	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/19/20 11:21	1
Methylene Chloride	ND		1.0	0.88	ug/L			08/19/20 11:21	1
Naphthalene	ND		1.0	0.40	ug/L			08/19/20 11:21	1
n-Butylbenzene	ND		1.0	0.40	ug/L			08/19/20 11:21	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
o-Xylene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Styrene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Toluene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Trichloroethene	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/19/20 11:21	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/19/20 11:21	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*102*		*80 - 120*		*08/19/20 11:21*	*1*

Client Sample ID: MW-03A
Date Collected: 08/18/20 10:14
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-4
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Dibromofluoromethane (Surr)	*95*		*76 - 132*		*08/19/20 11:21*	*1*
Toluene-d8 (Surr)	*111*		*80 - 128*		*08/19/20 11:21*	*1*

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,4-Trichlorobenzene	ND		0.19	0.057	ug/L		08/20/20 07:12	08/21/20 14:41	1
1,2-Dichlorobenzene	ND		0.19	0.043	ug/L		08/20/20 07:12	08/21/20 14:41	1
1,3-Dichlorobenzene	ND		0.19	0.042	ug/L		08/20/20 07:12	08/21/20 14:41	1
1,4-Dichlorobenzene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 14:41	1
2,4,5-Trichlorophenol	ND		4.8	1.4	ug/L		08/20/20 07:12	08/21/20 14:41	1
2,4,6-Trichlorophenol	ND		4.8	1.3	ug/L		08/20/20 07:12	08/21/20 14:41	1
2,4-Dichlorophenol	ND		4.8	1.8	ug/L		08/20/20 07:12	08/21/20 14:41	1
2,4-Dimethylphenol	ND		0.19	0.032	ug/L		08/20/20 07:12	08/21/20 14:41	1
2,4-Dinitrophenol	ND		4.8	0.96	ug/L		08/20/20 07:12	08/21/20 14:41	1
2,4-Dinitrotoluene	ND		0.19	0.028	ug/L		08/20/20 07:12	08/21/20 14:41	1
2,6-Dinitrotoluene	ND		0.19	0.036	ug/L		08/20/20 07:12	08/21/20 14:41	1
2-Chloronaphthalene	ND		0.19	0.054	ug/L		08/20/20 07:12	08/21/20 14:41	1
2-Chlorophenol	ND		0.19	0.045	ug/L		08/20/20 07:12	08/21/20 14:41	1
2-Methylnaphthalene	ND		0.19	0.039	ug/L		08/20/20 07:12	08/21/20 14:41	1
2-Methylphenol	ND		4.8	1.5	ug/L		08/20/20 07:12	08/21/20 14:41	1
2-Nitroaniline	ND		4.8	1.2	ug/L		08/20/20 07:12	08/21/20 14:41	1
2-Nitrophenol	ND		4.8	1.8	ug/L		08/20/20 07:12	08/21/20 14:41	1
3,3'-Dichlorobenzidine	ND		4.8	1.2	ug/L		08/20/20 07:12	08/21/20 14:41	1
3-Nitroaniline	ND		4.8	1.2	ug/L		08/20/20 07:12	08/21/20 14:41	1
4,6-Dinitro-2-methylphenol	ND		4.8	0.84	ug/L		08/20/20 07:12	08/21/20 14:41	1
4-Bromophenyl phenyl ether	ND		0.19	0.043	ug/L		08/20/20 07:12	08/21/20 14:41	1
4-Chloro-3-methylphenol	ND		4.8	1.8	ug/L		08/20/20 07:12	08/21/20 14:41	1
4-Chloroaniline	ND		4.8	1.6	ug/L		08/20/20 07:12	08/21/20 14:41	1
4-Chlorophenyl phenyl ether	ND		0.19	0.047	ug/L		08/20/20 07:12	08/21/20 14:41	1
4-Nitroaniline	ND		4.8	1.5	ug/L		08/20/20 07:12	08/21/20 14:41	1
4-Nitrophenol	ND		4.8	0.90	ug/L		08/20/20 07:12	08/21/20 14:41	1
Acenaphthene	ND		0.19	0.061	ug/L		08/20/20 07:12	08/21/20 14:41	1
Acenaphthylene	ND		0.19	0.051	ug/L		08/20/20 07:12	08/21/20 14:41	1
Aniline	ND		0.19	0.020	ug/L		08/20/20 07:12	08/21/20 14:41	1
Anthracene	ND		0.19	0.041	ug/L		08/20/20 07:12	08/21/20 14:41	1
Azobenzene	ND		0.19	0.044	ug/L		08/20/20 07:12	08/21/20 14:41	1
Benzidine	ND		4.8	0.72	ug/L		08/20/20 07:12	08/21/20 14:41	1
Benzo[a]anthracene	ND		0.19	0.047	ug/L		08/20/20 07:12	08/21/20 14:41	1
Benzo[a]pyrene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 14:41	1
Benzo[b]fluoranthene	ND		0.19	0.041	ug/L		08/20/20 07:12	08/21/20 14:41	1
Benzo[g,h,i]perylene	ND		0.19	0.040	ug/L		08/20/20 07:12	08/21/20 14:41	1
Benzo[k]fluoranthene	ND		0.19	0.040	ug/L		08/20/20 07:12	08/21/20 14:41	1
Benzoic acid	**2.0**	**J**	4.8	0.53	ug/L		08/20/20 07:12	08/21/20 14:41	1
Benzyl alcohol	ND		0.19	0.036	ug/L		08/20/20 07:12	08/21/20 14:41	1
bis (2-chloroisopropyl) ether	ND		0.19	0.040	ug/L		08/20/20 07:12	08/21/20 14:41	1
Bis(2-chloroethoxy)methane	ND		0.19	0.058	ug/L		08/20/20 07:12	08/21/20 14:41	1
Bis(2-chloroethyl)ether	ND		0.19	0.037	ug/L		08/20/20 07:12	08/21/20 14:41	1
Bis(2-ethylhexyl) phthalate	ND		4.8	3.2	ug/L		08/20/20 07:12	08/21/20 14:41	1
Butyl benzyl phthalate	ND		4.8	2.0	ug/L		08/20/20 07:12	08/21/20 14:41	1

Client Sample ID: MW-03A
Date Collected: 08/18/20 10:14
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-4
Matrix: Water

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chrysene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 14:41	1
Dibenz(a,h)anthracene	ND		0.19	0.035	ug/L		08/20/20 07:12	08/21/20 14:41	1
Dibenzofuran	ND		0.19	0.046	ug/L		08/20/20 07:12	08/21/20 14:41	1
Diethyl phthalate	ND		4.8	1.5	ug/L		08/20/20 07:12	08/21/20 14:41	1
Dimethyl phthalate	ND		4.8	1.4	ug/L		08/20/20 07:12	08/21/20 14:41	1
Di-n-butyl phthalate	ND		4.8	1.4	ug/L		08/20/20 07:12	08/21/20 14:41	1
Di-n-octyl phthalate	ND		4.8	1.4	ug/L		08/20/20 07:12	08/21/20 14:41	1
Fluoranthene	ND		0.19	0.042	ug/L		08/20/20 07:12	08/21/20 14:41	1
Fluorene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 14:41	1
Hexachlorobenzene	ND		0.19	0.049	ug/L		08/20/20 07:12	08/21/20 14:41	1
Hexachlorobutadiene	ND		0.19	0.050	ug/L		08/20/20 07:12	08/21/20 14:41	1
Hexachlorocyclopentadiene	ND		0.19	0.034	ug/L		08/20/20 07:12	08/21/20 14:41	1
Hexachloroethane	ND		0.19	0.051	ug/L		08/20/20 07:12	08/21/20 14:41	1
Indeno[1,2,3-cd]pyrene	ND		0.19	0.042	ug/L		08/20/20 07:12	08/21/20 14:41	1
Isophorone	ND		1.9	0.052	ug/L		08/20/20 07:12	08/21/20 14:41	1
Naphthalene	ND		0.19	0.048	ug/L		08/20/20 07:12	08/21/20 14:41	1
Nitrobenzene	ND		0.19	0.063	ug/L		08/20/20 07:12	08/21/20 14:41	1
N-Nitrosodimethylamine	ND		0.19	0.18	ug/L		08/20/20 07:12	08/21/20 14:41	1
N-Nitrosodi-n-propylamine	ND		0.19	0.033	ug/L		08/20/20 07:12	08/21/20 14:41	1
N-Nitrosodiphenylamine	ND		0.19	0.045	ug/L		08/20/20 07:12	08/21/20 14:41	1
Pentachlorophenol	ND		4.8	0.72	ug/L		08/20/20 07:12	08/21/20 14:41	1
Phenanthrene	ND		0.19	0.049	ug/L		08/20/20 07:12	08/21/20 14:41	1
Phenol	ND		0.19	0.031	ug/L		08/20/20 07:12	08/21/20 14:41	1
Pyrene	ND		0.19	0.047	ug/L		08/20/20 07:12	08/21/20 14:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*108*		*53 - 117*	*08/20/20 07:12*	*08/21/20 14:41*	*1*
2-Fluorophenol (Surr)	*60*		*21 - 80*	*08/20/20 07:12*	*08/21/20 14:41*	*1*
Nitrobenzene-d5 (Surr)	*92*		*43 - 114*	*08/20/20 07:12*	*08/21/20 14:41*	*1*
Phenol-d6 (Surr)	*39*		*3 - 63*	*08/20/20 07:12*	*08/21/20 14:41*	*1*

Method: 8015B - Gasoline Range Organics - (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	ND		50	25	ug/L			08/19/20 20:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*111*		*65 - 140*		*08/19/20 20:43*	*1*

Method: 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cr (VI)	**0.50**	**J**	2.0	0.25	ug/L			08/18/20 22:37	1

Method: 6020 - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:55	1
Arsenic	**0.65**	**J**	1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:55	1
Barium	**110**		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:55	1
Beryllium	ND	^	0.50	0.25	ug/L		08/25/20 16:10	08/26/20 09:55	1
Cadmium	ND		1.0	0.25	ug/L		08/25/20 16:10	08/26/20 09:55	1
Chromium	**0.75**	**J**	2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:55	1
Cobalt	ND		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:55	1

Client Sample ID: MW-03A

Lab Sample ID: 440-270516-4

Date Collected: 08/18/20 10:14

Matrix: Water

Date Received: 08/18/20 18:00

Method: 6020 - Metals (ICP/MS) - Total Recoverable (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	**0.76**	**J**	2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:55	1
Lead	ND		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:55	1
Molybdenum	**1.6**	**J**	2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:55	1
Nickel	**1.0**	**J**	2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:55	1
Selenium	**1.9**	**J**	2.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:55	1
Silver	ND	^	1.0	0.50	ug/L		08/25/20 16:10	08/26/20 09:55	1
Thallium	ND		1.0	0.20	ug/L		08/25/20 16:10	08/26/20 09:55	1
Vanadium	**4.6**		2.0	1.0	ug/L		08/25/20 16:10	08/26/20 09:55	1
Zinc	**3.0**	**J**	20	2.5	ug/L		08/25/20 16:10	08/26/20 09:55	1

Method: 6020 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:35	1
Arsenic	**0.60**	**J**	1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:35	1
Barium	**110**		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:35	1
Beryllium	ND	^	0.50	0.25	ug/L		08/25/20 16:08	08/26/20 10:35	1
Cadmium	ND		1.0	0.25	ug/L		08/25/20 16:08	08/26/20 10:35	1
Chromium	**0.74**	**J**	2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:35	1
Cobalt	ND		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:35	1
Copper	**1.1**	**J**	2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:35	1
Lead	ND		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:35	1
Molybdenum	**1.7**	**J**	2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:35	1
Nickel	**1.1**	**J**	2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:35	1
Selenium	**1.6**	**J**	2.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:35	1
Silver	ND	^	1.0	0.50	ug/L		08/25/20 16:08	08/26/20 10:35	1
Thallium	ND		1.0	0.20	ug/L		08/25/20 16:08	08/26/20 10:35	1
Vanadium	**4.5**		2.0	1.0	ug/L		08/25/20 16:08	08/26/20 10:35	1
Zinc	ND		20	2.5	ug/L		08/25/20 16:08	08/26/20 10:35	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/19/20 12:17	08/19/20 17:26	1

Method: 7470A - Mercury (CVAA) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/19/20 12:21	08/19/20 18:15	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Sulfide	ND		50	27	ug/L			08/21/20 15:56	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH	**7.5**	**HF**	0.1	0.1	SU			08/20/20 15:29	1

Client Sample ID: TB-SUMP-20200818

Lab Sample ID: 440-270516-5

Date Collected: 08/18/20 00:01

Matrix: Water

Date Received: 08/18/20 18:00

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/19/20 11:49	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/19/20 11:49	1

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270516-1

Client Sample ID: TB-SUMP-20200818
Date Collected: 08/18/20 00:01
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-5
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/19/20 11:49	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/19/20 11:49	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/19/20 11:49	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/19/20 11:49	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/19/20 11:49	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/19/20 11:49	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/19/20 11:49	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/19/20 11:49	1
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/19/20 11:49	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/19/20 11:49	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/19/20 11:49	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/19/20 11:49	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Benzene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Bromobenzene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Bromoform	ND		1.0	0.40	ug/L			08/19/20 11:49	1
Bromomethane	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Chloroethane	ND		1.0	0.40	ug/L			08/19/20 11:49	1
Chloroform	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Chloromethane	ND		0.50	0.25	ug/L			08/19/20 11:49	1
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Dibromochloromethane	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Dibromomethane	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/19/20 11:49	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/19/20 11:49	1
Methylene Chloride	ND		1.0	0.88	ug/L			08/19/20 11:49	1
Naphthalene	ND		1.0	0.40	ug/L			08/19/20 11:49	1
n-Butylbenzene	ND		1.0	0.40	ug/L			08/19/20 11:49	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
o-Xylene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Styrene	ND		0.50	0.25	ug/L			08/19/20 11:49	1

Client Sample ID: TB-SUMP-20200818

Lab Sample ID: 440-270516-5

Date Collected: 08/18/20 00:01
Matrix: Water
Date Received: 08/18/20 18:00

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Toluene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Trichloroethene	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/19/20 11:49	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/19/20 11:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*102*		*80 - 120*		*08/19/20 11:49*	*1*
Dibromofluoromethane (Surr)	*98*		*76 - 132*		*08/19/20 11:49*	*1*
Toluene-d8 (Surr)	*109*		*80 - 128*		*08/19/20 11:49*	*1*

Method: 8015B - Gasoline Range Organics - (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	**26**	**J**	50	25	ug/L			08/19/20 22:06	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*108*		*65 - 140*		*08/19/20 22:06*	*1*

Client Sample ID: FB-SUMP-20200818

Lab Sample ID: 440-270516-6

Date Collected: 08/18/20 07:30
Matrix: Water
Date Received: 08/18/20 18:00

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/19/20 17:09	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/19/20 17:09	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/19/20 17:09	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/19/20 17:09	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/19/20 17:09	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/19/20 17:09	1

Client Sample ID: FB-SUMP-20200818
Date Collected: 08/18/20 07:30
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-6
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Bromobenzene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Bromoform	ND		1.0	0.40	ug/L			08/19/20 17:09	1
Bromomethane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Chloroethane	ND		1.0	0.40	ug/L			08/19/20 17:09	1
Chloroform	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Chloromethane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Dibromochloromethane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Dibromomethane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/19/20 17:09	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/19/20 17:09	1
Methylene Chloride	ND		1.0	0.88	ug/L			08/19/20 17:09	1
Naphthalene	ND		1.0	0.40	ug/L			08/19/20 17:09	1
n-Butylbenzene	ND		1.0	0.40	ug/L			08/19/20 17:09	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
o-Xylene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Styrene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Toluene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Trichloroethene	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/19/20 17:09	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/19/20 17:09	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*106*		*80 - 120*		*08/19/20 17:09*	*1*
Dibromofluoromethane (Surr)	*97*		*76 - 132*		*08/19/20 17:09*	*1*
Toluene-d8 (Surr)	*109*		*80 - 128*		*08/19/20 17:09*	*1*

Method: 8015B - Gasoline Range Organics - (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	ND		50	25	ug/L			08/19/20 22:33	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*108*		*65 - 140*		*08/19/20 22:33*	*1*

Surrogate Summary

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270516-1

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Water — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)		
		BFB	DBFM	TOL
Lab Sample ID	Client Sample ID	(80-120)	(76-132)	(80-128)
440-270516-1	MW-05A	99	98	108
440-270516-1 MS	MW-05A	102	95	104
440-270516-1 MSD	MW-05A	104	94	105
440-270516-2	G-4	103	96	110
440-270516-2 - RA	G-4	101	98	110
440-270516-3	MW-03B	101	97	107
440-270516-4	MW-03A	102	95	111
440-270516-5	TB-SUMP-20200818	102	98	109
440-270516-6	FB-SUMP-20200818	106	97	109
440-270547-A-15 MS	Matrix Spike	102	96	106
440-270547-A-15 MSD	Matrix Spike Duplicate	104	97	104
LCS 440-621204/1002	Lab Control Sample	101	92	106
LCS 440-621378/1002	Lab Control Sample	101	94	105
MB 440-621204/4	Method Blank	103	97	108
MB 440-621378/4	Method Blank	103	97	108

Surrogate Legend

BFB = 4-Bromofluorobenzene (Surr)
DBFM = Dibromofluoromethane (Surr)
TOL = Toluene-d8 (Surr)

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM)

Matrix: Water — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)			
		TBP	2FP	NBZ	PHL6
Lab Sample ID	Client Sample ID	(53-117)	(21-80)	(43-114)	(3-63)
440-270516-1	MW-05A	101	43	88	25
440-270516-2	G-4	102	57	88	35
440-270516-3	MW-03B	102	56	87	35
440-270516-4	MW-03A	108	60	92	39
LCS 570-89056/2-A	Lab Control Sample	107	63	93	40
LCSD 570-89056/3-A	Lab Control Sample Dup	108	64	93	40
MB 570-89056/1-A	Method Blank	95	63	92	39

Surrogate Legend

TBP = 2,4,6-Tribromophenol (Surr)
2FP = 2-Fluorophenol (Surr)
NBZ = Nitrobenzene-d5 (Surr)
PHL6 = Phenol-d6 (Surr)

Method: 8015B - Gasoline Range Organics - (GC)

Matrix: Water — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)
		BFB1
Lab Sample ID	Client Sample ID	(65-140)
440-270337-C-1 MS	Matrix Spike	118
440-270337-C-1 MSD	Matrix Spike Duplicate	118
440-270516-1	MW-05A	108
440-270516-2	G-4	108

Surrogate Summary

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270516-1

Method: 8015B - Gasoline Range Organics - (GC) (Continued)

Matrix: Water

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)
Lab Sample ID	Client Sample ID	BFB1 (65-140)
440-270516-3	MW-03B	110
440-270516-4	MW-03A	111
440-270516-5	TB-SUMP-20200818	108
440-270516-6	FB-SUMP-20200818	108
LCS 440-621256/14	Lab Control Sample	114
MB 440-621256/15	Method Blank	107

Surrogate Legend

BFB = 4-Bromofluorobenzene (Surr)

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 440-621204/4
Matrix: Water
Analysis Batch: 621204

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/19/20 08:36	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/19/20 08:36	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/19/20 08:36	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/19/20 08:36	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/19/20 08:36	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Benzene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Bromobenzene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Bromoform	ND		1.0	0.40	ug/L			08/19/20 08:36	1
Bromomethane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Chloroethane	ND		1.0	0.40	ug/L			08/19/20 08:36	1
Chloroform	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Chloromethane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Dibromochloromethane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Dibromomethane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/19/20 08:36	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/19/20 08:36	1
Methylene Chloride	ND		1.0	0.88	ug/L			08/19/20 08:36	1
Naphthalene	ND		1.0	0.40	ug/L			08/19/20 08:36	1
n-Butylbenzene	ND		1.0	0.40	ug/L			08/19/20 08:36	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
o-Xylene	ND		0.50	0.25	ug/L			08/19/20 08:36	1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 440-621204/4
Matrix: Water
Analysis Batch: 621204

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Styrene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Toluene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Trichloroethene	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/19/20 08:36	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/19/20 08:36	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*103*		*80 - 120*		*08/19/20 08:36*	*1*
Dibromofluoromethane (Surr)	*97*		*76 - 132*		*08/19/20 08:36*	*1*
Toluene-d8 (Surr)	*108*		*80 - 128*		*08/19/20 08:36*	*1*

Lab Sample ID: LCS 440-621204/1002
Matrix: Water
Analysis Batch: 621204

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1,2-Tetrachloroethane	25.0	27.3		ug/L		109	60 - 141
1,1,1-Trichloroethane	25.0	27.4		ug/L		110	70 - 130
1,1,2,2-Tetrachloroethane	25.0	28.9		ug/L		116	63 - 130
1,1,2-Trichloroethane	25.0	28.5		ug/L		114	70 - 130
1,1-Dichloroethane	25.0	26.5		ug/L		106	64 - 130
1,1-Dichloroethene	25.0	25.5		ug/L		102	70 - 130
1,1-Dichloropropene	25.0	27.4		ug/L		110	70 - 130
1,2,3-Trichlorobenzene	25.0	26.7		ug/L		107	60 - 140
1,2,3-Trichloropropane	25.0	27.1		ug/L		108	63 - 130
1,2,4-Trichlorobenzene	25.0	27.7		ug/L		111	60 - 140
1,2,4-Trimethylbenzene	25.0	29.1		ug/L		117	70 - 135
1,2-Dibromo-3-Chloropropane	25.0	28.4		ug/L		114	52 - 140
1,2-Dibromoethane (EDB)	25.0	27.0		ug/L		108	70 - 130
1,2-Dichlorobenzene	25.0	27.0		ug/L		108	70 - 130
1,2-Dichloroethane	25.0	23.7		ug/L		95	57 - 138
1,2-Dichloropropane	25.0	27.3		ug/L		109	67 - 130
1,3,5-Trimethylbenzene	25.0	29.9		ug/L		120	70 - 136
1,3-Dichlorobenzene	25.0	27.8		ug/L		111	70 - 130
1,3-Dichloropropane	25.0	27.0		ug/L		108	70 - 130
1,4-Dichlorobenzene	25.0	28.0		ug/L		112	70 - 130
2,2-Dichloropropane	25.0	29.7		ug/L		119	68 - 141
2-Chlorotoluene	25.0	29.7		ug/L		119	70 - 130
4-Chlorotoluene	25.0	29.9		ug/L		120	70 - 130
Benzene	25.0	27.6		ug/L		110	68 - 130
Bromobenzene	25.0	27.2		ug/L		109	70 - 130

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 440-621204/1002
Matrix: Water
Analysis Batch: 621204

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Bromochloromethane	25.0	24.3		ug/L		97	70 - 130
Bromodichloromethane	25.0	26.9		ug/L		108	70 - 132
Bromoform	25.0	26.9		ug/L		107	60 - 148
Bromomethane	25.0	22.4		ug/L		89	64 - 139
Carbon tetrachloride	25.0	28.0		ug/L		112	60 - 150
Chlorobenzene	25.0	28.3		ug/L		113	70 - 130
Chloroethane	25.0	22.9		ug/L		91	64 - 135
Chloroform	25.0	26.7		ug/L		107	70 - 130
Chloromethane	25.0	18.7		ug/L		75	47 - 140
cis-1,2-Dichloroethene	25.0	26.7		ug/L		107	70 - 133
cis-1,3-Dichloropropene	25.0	28.4		ug/L		114	70 - 133
Dibromochloromethane	25.0	27.3		ug/L		109	69 - 145
Dibromomethane	25.0	24.2		ug/L		97	70 - 130
Dichlorodifluoromethane	25.0	15.0		ug/L		60	29 - 150
Ethylbenzene	25.0	30.0		ug/L		120	70 - 130
Hexachlorobutadiene	25.0	29.4		ug/L		118	10 - 150
Isopropylbenzene	25.0	30.1		ug/L		120	70 - 136
m,p-Xylene	25.0	27.8		ug/L		111	70 - 130
Methylene Chloride	25.0	23.4		ug/L		94	52 - 130
Naphthalene	25.0	26.1		ug/L		104	60 - 140
n-Butylbenzene	25.0	33.5		ug/L		134	65 - 150
N-Propylbenzene	25.0	30.9		ug/L		124	67 - 139
o-Xylene	25.0	28.4		ug/L		114	70 - 130
p-Isopropyltoluene	25.0	30.8		ug/L		123	70 - 132
sec-Butylbenzene	25.0	31.6		ug/L		126	70 - 138
Styrene	25.0	26.0		ug/L		104	70 - 134
tert-Butylbenzene	25.0	30.0		ug/L		120	70 - 130
Tetrachloroethene	25.0	28.3		ug/L		113	70 - 130
Toluene	25.0	29.3		ug/L		117	70 - 130
trans-1,2-Dichloroethene	25.0	26.6		ug/L		106	70 - 130
trans-1,3-Dichloropropene	25.0	27.4		ug/L		110	70 - 132
Trichloroethene	25.0	24.1		ug/L		96	70 - 130
Trichlorofluoromethane	25.0	23.0		ug/L		92	60 - 150
Vinyl chloride	25.0	21.9		ug/L		88	59 - 133

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*101*		*80 - 120*
Dibromofluoromethane (Surr)	*92*		*76 - 132*
Toluene-d8 (Surr)	*106*		*80 - 128*

Lab Sample ID: 440-270516-1 MS
Matrix: Water
Analysis Batch: 621204

Client Sample ID: MW-05A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1,2-Tetrachloroethane	ND		10.0	10.7		ug/L		107	60 - 149
1,1,1-Trichloroethane	ND		10.0	11.0		ug/L		110	70 - 130
1,1,2,2-Tetrachloroethane	ND		10.0	12.1		ug/L		121	63 - 130

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 440-270516-1 MS
Matrix: Water
Analysis Batch: 621204

Client Sample ID: MW-05A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,2-Trichloroethane	ND		10.0	11.4		ug/L		114	70 - 130
1,1-Dichloroethane	ND		10.0	10.4		ug/L		104	65 - 130
1,1-Dichloroethene	ND		10.0	10.1		ug/L		101	70 - 130
1,1-Dichloropropene	ND		10.0	10.8		ug/L		108	64 - 130
1,2,3-Trichlorobenzene	ND		10.0	10.4		ug/L		104	60 - 140
1,2,3-Trichloropropane	ND		10.0	11.2		ug/L		112	60 - 130
1,2,4-Trichlorobenzene	ND		10.0	10.9		ug/L		109	60 - 140
1,2,4-Trimethylbenzene	ND		10.0	11.1		ug/L		111	70 - 130
1,2-Dibromo-3-Chloropropane	ND		10.0	11.9		ug/L		119	48 - 140
1,2-Dibromoethane (EDB)	ND		10.0	10.7		ug/L		107	70 - 131
1,2-Dichlorobenzene	ND		10.0	10.4		ug/L		104	70 - 130
1,2-Dichloroethane	ND		10.0	9.90		ug/L		99	56 - 146
1,2-Dichloropropane	ND		10.0	10.8		ug/L		108	69 - 130
1,3,5-Trimethylbenzene	ND		10.0	11.1		ug/L		111	70 - 130
1,3-Dichlorobenzene	ND		10.0	10.8		ug/L		108	70 - 130
1,3-Dichloropropane	ND		10.0	10.9		ug/L		109	70 - 130
1,4-Dichlorobenzene	ND		10.0	11.0		ug/L		110	70 - 130
2,2-Dichloropropane	ND		10.0	11.4		ug/L		114	69 - 138
2-Chlorotoluene	ND		10.0	11.5		ug/L		115	70 - 130
4-Chlorotoluene	ND		10.0	11.4		ug/L		114	70 - 130
Benzene	ND		10.0	10.8		ug/L		108	66 - 130
Bromobenzene	ND		10.0	11.1		ug/L		111	70 - 130
Bromochloromethane	ND		10.0	9.84		ug/L		98	70 - 130
Bromodichloromethane	ND		10.0	10.6		ug/L		106	70 - 138
Bromoform	ND		10.0	10.9		ug/L		109	59 - 150
Bromomethane	ND		10.0	8.55		ug/L		86	62 - 131
Carbon tetrachloride	ND		10.0	10.9		ug/L		109	60 - 150
Chlorobenzene	ND		10.0	10.7		ug/L		107	70 - 130
Chloroethane	ND		10.0	8.80		ug/L		88	68 - 130
Chloroform	ND		10.0	10.2		ug/L		102	70 - 130
Chloromethane	ND		10.0	7.15		ug/L		71	39 - 144
cis-1,2-Dichloroethene	ND		10.0	10.5		ug/L		105	70 - 130
cis-1,3-Dichloropropene	ND		10.0	10.7		ug/L		107	70 - 133
Dibromochloromethane	ND		10.0	10.9		ug/L		109	70 - 148
Dibromomethane	ND		10.0	10.1		ug/L		101	70 - 130
Dichlorodifluoromethane	ND		10.0	5.68		ug/L		57	25 - 142
Ethylbenzene	ND		10.0	11.3		ug/L		113	70 - 130
Hexachlorobutadiene	ND		10.0	11.3		ug/L		113	10 - 150
Isopropylbenzene	ND		10.0	11.2		ug/L		112	70 - 132
m,p-Xylene	ND		10.0	10.3		ug/L		103	70 - 133
Methylene Chloride	ND		10.0	9.27		ug/L		93	52 - 130
Naphthalene	ND		10.0	10.5		ug/L		105	60 - 140
n-Butylbenzene	ND		10.0	12.7		ug/L		127	61 - 149
N-Propylbenzene	ND		10.0	12.0		ug/L		120	66 - 135
o-Xylene	ND		10.0	10.5		ug/L		105	70 - 133
p-Isopropyltoluene	ND		10.0	11.4		ug/L		114	70 - 130
sec-Butylbenzene	ND		10.0	12.2		ug/L		122	67 - 134
Styrene	ND		10.0	9.67		ug/L		97	29 - 150
tert-Butylbenzene	ND		10.0	11.0		ug/L		110	70 - 130

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 440-270516-1 MS
Matrix: Water
Analysis Batch: 621204

Client Sample ID: MW-05A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Tetrachloroethene	ND		10.0	11.0		ug/L		110	70 - 137
Toluene	ND		10.0	11.2		ug/L		112	70 - 130
trans-1,2-Dichloroethene	ND		10.0	10.6		ug/L		106	70 - 130
trans-1,3-Dichloropropene	ND		10.0	10.3		ug/L		103	70 - 138
Trichloroethene	ND		10.0	9.68		ug/L		97	70 - 130
Trichlorofluoromethane	ND		10.0	9.28		ug/L		93	60 - 150
Vinyl chloride	ND		10.0	8.20		ug/L		82	50 - 137

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*102*		*80 - 120*
Dibromofluoromethane (Surr)	*95*		*76 - 132*
Toluene-d8 (Surr)	*104*		*80 - 128*

Lab Sample ID: 440-270516-1 MSD
Matrix: Water
Analysis Batch: 621204

Client Sample ID: MW-05A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,1,1,2-Tetrachloroethane	ND		10.0	10.6		ug/L		106	60 - 149	1	20
1,1,1-Trichloroethane	ND		10.0	10.7		ug/L		107	70 - 130	2	20
1,1,2,2-Tetrachloroethane	ND		10.0	11.8		ug/L		118	63 - 130	3	30
1,1,2-Trichloroethane	ND		10.0	10.8		ug/L		108	70 - 130	6	25
1,1-Dichloroethane	ND		10.0	10.4		ug/L		104	65 - 130	0	20
1,1-Dichloroethene	ND		10.0	10.3		ug/L		103	70 - 130	2	20
1,1-Dichloropropene	ND		10.0	10.9		ug/L		109	64 - 130	1	20
1,2,3-Trichlorobenzene	ND		10.0	10.9		ug/L		109	60 - 140	5	20
1,2,3-Trichloropropane	ND		10.0	10.8		ug/L		108	60 - 130	3	30
1,2,4-Trichlorobenzene	ND		10.0	11.1		ug/L		111	60 - 140	2	20
1,2,4-Trimethylbenzene	ND		10.0	11.4		ug/L		114	70 - 130	3	25
1,2-Dibromo-3-Chloropropane	ND		10.0	11.5		ug/L		115	48 - 140	3	30
1,2-Dibromoethane (EDB)	ND		10.0	10.3		ug/L		103	70 - 131	4	25
1,2-Dichlorobenzene	ND		10.0	10.9		ug/L		109	70 - 130	5	20
1,2-Dichloroethane	ND		10.0	9.23		ug/L		92	56 - 146	7	20
1,2-Dichloropropane	ND		10.0	10.5		ug/L		105	69 - 130	3	20
1,3,5-Trimethylbenzene	ND		10.0	11.6		ug/L		116	70 - 130	4	20
1,3-Dichlorobenzene	ND		10.0	10.9		ug/L		109	70 - 130	1	20
1,3-Dichloropropane	ND		10.0	10.2		ug/L		102	70 - 130	7	25
1,4-Dichlorobenzene	ND		10.0	11.2		ug/L		112	70 - 130	2	20
2,2-Dichloropropane	ND		10.0	11.2		ug/L		112	69 - 138	2	25
2-Chlorotoluene	ND		10.0	11.9		ug/L		119	70 - 130	4	20
4-Chlorotoluene	ND		10.0	11.9		ug/L		119	70 - 130	4	20
Benzene	ND		10.0	10.6		ug/L		106	66 - 130	2	20
Bromobenzene	ND		10.0	11.2		ug/L		112	70 - 130	1	20
Bromochloromethane	ND		10.0	9.39		ug/L		94	70 - 130	5	25
Bromodichloromethane	ND		10.0	10.5		ug/L		105	70 - 138	0	20
Bromoform	ND		10.0	9.99		ug/L		100	59 - 150	9	25
Bromomethane	ND		10.0	8.18		ug/L		82	62 - 131	4	25
Carbon tetrachloride	ND		10.0	11.0		ug/L		110	60 - 150	0	25

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 440-270516-1 MSD
Matrix: Water
Analysis Batch: 621204

Client Sample ID: MW-05A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chlorobenzene	ND		10.0	10.8		ug/L		108	70 - 130	1	20
Chloroethane	ND		10.0	8.96		ug/L		90	68 - 130	2	25
Chloroform	ND		10.0	10.2		ug/L		102	70 - 130	0	20
Chloromethane	ND		10.0	7.30		ug/L		73	39 - 144	2	25
cis-1,2-Dichloroethene	ND		10.0	10.5		ug/L		105	70 - 130	0	20
cis-1,3-Dichloropropene	ND		10.0	10.3		ug/L		103	70 - 133	4	20
Dibromochloromethane	ND		10.0	10.1		ug/L		101	70 - 148	7	25
Dibromomethane	ND		10.0	9.48		ug/L		95	70 - 130	6	25
Dichlorodifluoromethane	ND		10.0	5.75		ug/L		57	25 - 142	1	30
Ethylbenzene	ND		10.0	11.3		ug/L		113	70 - 130	1	20
Hexachlorobutadiene	ND		10.0	11.6		ug/L		116	10 - 150	3	20
Isopropylbenzene	ND		10.0	11.1		ug/L		111	70 - 132	0	20
m,p-Xylene	ND		10.0	10.3		ug/L		103	70 - 133	1	25
Methylene Chloride	ND		10.0	9.09		ug/L		91	52 - 130	2	20
Naphthalene	ND		10.0	10.8		ug/L		108	60 - 140	3	30
n-Butylbenzene	ND		10.0	13.2		ug/L		132	61 - 149	4	20
N-Propylbenzene	ND		10.0	12.5		ug/L		125	66 - 135	4	20
o-Xylene	ND		10.0	10.4		ug/L		104	70 - 133	1	20
p-Isopropyltoluene	ND		10.0	11.7		ug/L		117	70 - 130	3	20
sec-Butylbenzene	ND		10.0	12.4		ug/L		124	67 - 134	2	20
Styrene	ND		10.0	9.67		ug/L		97	29 - 150	0	35
tert-Butylbenzene	ND		10.0	11.8		ug/L		118	70 - 130	7	20
Tetrachloroethene	ND		10.0	11.2		ug/L		112	70 - 137	1	20
Toluene	ND		10.0	11.1		ug/L		111	70 - 130	1	20
trans-1,2-Dichloroethene	ND		10.0	10.7		ug/L		107	70 - 130	1	20
trans-1,3-Dichloropropene	ND		10.0	9.68		ug/L		97	70 - 138	6	25
Trichloroethene	ND		10.0	9.79		ug/L		98	70 - 130	1	20
Trichlorofluoromethane	ND		10.0	9.33		ug/L		93	60 - 150	1	25
Vinyl chloride	ND		10.0	8.40		ug/L		84	50 - 137	2	30

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*104*		*80 - 120*
Dibromofluoromethane (Surr)	*94*		*76 - 132*
Toluene-d8 (Surr)	*105*		*80 - 128*

Lab Sample ID: MB 440-621378/4
Matrix: Water
Analysis Batch: 621378

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/20/20 08:41	1
Naphthalene	ND		1.0	0.40	ug/L			08/20/20 08:41	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*103*		*80 - 120*		*08/20/20 08:41*	*1*
Dibromofluoromethane (Surr)	*97*		*76 - 132*		*08/20/20 08:41*	*1*
Toluene-d8 (Surr)	*108*		*80 - 128*		*08/20/20 08:41*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 440-621378/1002
Matrix: Water
Analysis Batch: 621378

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
1,2,3-Trichlorobenzene			25.0	26.7		ug/L		107	60 - 140		
Naphthalene			25.0	26.0		ug/L		104	60 - 140		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*101*		*80 - 120*
Dibromofluoromethane (Surr)	*94*		*76 - 132*
Toluene-d8 (Surr)	*105*		*80 - 128*

Lab Sample ID: 440-270547-A-15 MS
Matrix: Water
Analysis Batch: 621378

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
1,2,3-Trichlorobenzene	ND		10.0	11.2		ug/L		112	60 - 140		
Naphthalene	ND		10.0	11.0		ug/L		110	60 - 140		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*102*		*80 - 120*
Dibromofluoromethane (Surr)	*96*		*76 - 132*
Toluene-d8 (Surr)	*106*		*80 - 128*

Lab Sample ID: 440-270547-A-15 MSD
Matrix: Water
Analysis Batch: 621378

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,2,3-Trichlorobenzene	ND		10.0	10.7		ug/L		107	60 - 140	4	20
Naphthalene	ND		10.0	11.3		ug/L		113	60 - 140	3	30

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*104*		*80 - 120*
Dibromofluoromethane (Surr)	*97*		*76 - 132*
Toluene-d8 (Surr)	*104*		*80 - 128*

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 570-89056/1-A
Matrix: Water
Analysis Batch: 89478

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 89056

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,4-Trichlorobenzene	ND		0.20	0.059	ug/L		08/20/20 07:12	08/21/20 11:57	1
1,2-Dichlorobenzene	ND		0.20	0.045	ug/L		08/20/20 07:12	08/21/20 11:57	1
1,3-Dichlorobenzene	ND		0.20	0.044	ug/L		08/20/20 07:12	08/21/20 11:57	1
1,4-Dichlorobenzene	ND		0.20	0.053	ug/L		08/20/20 07:12	08/21/20 11:57	1
2,4,5-Trichlorophenol	ND		5.0	1.4	ug/L		08/20/20 07:12	08/21/20 11:57	1
2,4,6-Trichlorophenol	ND		5.0	1.4	ug/L		08/20/20 07:12	08/21/20 11:57	1
2,4-Dichlorophenol	ND		5.0	1.9	ug/L		08/20/20 07:12	08/21/20 11:57	1

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: MB 570-89056/1-A
Matrix: Water
Analysis Batch: 89478

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 89056

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-Dimethylphenol	ND		0.20	0.034	ug/L		08/20/20 07:12	08/21/20 11:57	1
2,4-Dinitrophenol	ND		5.0	1.0	ug/L		08/20/20 07:12	08/21/20 11:57	1
2,4-Dinitrotoluene	ND		0.20	0.030	ug/L		08/20/20 07:12	08/21/20 11:57	1
2,6-Dinitrotoluene	ND		0.20	0.038	ug/L		08/20/20 07:12	08/21/20 11:57	1
2-Chloronaphthalene	ND		0.20	0.057	ug/L		08/20/20 07:12	08/21/20 11:57	1
2-Chlorophenol	ND		0.20	0.047	ug/L		08/20/20 07:12	08/21/20 11:57	1
2-Methylnaphthalene	ND		0.20	0.041	ug/L		08/20/20 07:12	08/21/20 11:57	1
2-Methylphenol	ND		5.0	1.6	ug/L		08/20/20 07:12	08/21/20 11:57	1
2-Nitroaniline	ND		5.0	1.3	ug/L		08/20/20 07:12	08/21/20 11:57	1
2-Nitrophenol	ND		5.0	1.9	ug/L		08/20/20 07:12	08/21/20 11:57	1
3,3'-Dichlorobenzidine	ND		5.0	1.2	ug/L		08/20/20 07:12	08/21/20 11:57	1
3-Nitroaniline	ND		5.0	1.3	ug/L		08/20/20 07:12	08/21/20 11:57	1
4,6-Dinitro-2-methylphenol	ND		5.0	0.88	ug/L		08/20/20 07:12	08/21/20 11:57	1
4-Bromophenyl phenyl ether	ND		0.20	0.046	ug/L		08/20/20 07:12	08/21/20 11:57	1
4-Chloro-3-methylphenol	ND		5.0	1.8	ug/L		08/20/20 07:12	08/21/20 11:57	1
4-Chloroaniline	ND		5.0	1.7	ug/L		08/20/20 07:12	08/21/20 11:57	1
4-Chlorophenyl phenyl ether	ND		0.20	0.049	ug/L		08/20/20 07:12	08/21/20 11:57	1
4-Nitroaniline	ND		5.0	1.5	ug/L		08/20/20 07:12	08/21/20 11:57	1
4-Nitrophenol	ND		5.0	0.95	ug/L		08/20/20 07:12	08/21/20 11:57	1
Acenaphthene	ND		0.20	0.064	ug/L		08/20/20 07:12	08/21/20 11:57	1
Acenaphthylene	ND		0.20	0.054	ug/L		08/20/20 07:12	08/21/20 11:57	1
Aniline	ND		0.20	0.021	ug/L		08/20/20 07:12	08/21/20 11:57	1
Anthracene	ND		0.20	0.043	ug/L		08/20/20 07:12	08/21/20 11:57	1
Azobenzene	ND		0.20	0.046	ug/L		08/20/20 07:12	08/21/20 11:57	1
Benzidine	ND		5.0	0.76	ug/L		08/20/20 07:12	08/21/20 11:57	1
Benzo[a]anthracene	ND		0.20	0.050	ug/L		08/20/20 07:12	08/21/20 11:57	1
Benzo[a]pyrene	ND		0.20	0.052	ug/L		08/20/20 07:12	08/21/20 11:57	1
Benzo[b]fluoranthene	ND		0.20	0.043	ug/L		08/20/20 07:12	08/21/20 11:57	1
Benzo[g,h,i]perylene	ND		0.20	0.043	ug/L		08/20/20 07:12	08/21/20 11:57	1
Benzo[k]fluoranthene	ND		0.20	0.042	ug/L		08/20/20 07:12	08/21/20 11:57	1
Benzoic acid	ND		5.0	0.56	ug/L		08/20/20 07:12	08/21/20 11:57	1
Benzyl alcohol	ND		0.20	0.038	ug/L		08/20/20 07:12	08/21/20 11:57	1
bis (2-chloroisopropyl) ether	ND		0.20	0.042	ug/L		08/20/20 07:12	08/21/20 11:57	1
Bis(2-chloroethoxy)methane	ND		0.20	0.061	ug/L		08/20/20 07:12	08/21/20 11:57	1
Bis(2-chloroethyl)ether	ND		0.20	0.039	ug/L		08/20/20 07:12	08/21/20 11:57	1
Bis(2-ethylhexyl) phthalate	ND		5.0	3.4	ug/L		08/20/20 07:12	08/21/20 11:57	1
Butyl benzyl phthalate	ND		5.0	2.1	ug/L		08/20/20 07:12	08/21/20 11:57	1
Chrysene	ND		0.20	0.053	ug/L		08/20/20 07:12	08/21/20 11:57	1
Dibenz(a,h)anthracene	ND		0.20	0.037	ug/L		08/20/20 07:12	08/21/20 11:57	1
Dibenzofuran	ND		0.20	0.048	ug/L		08/20/20 07:12	08/21/20 11:57	1
Diethyl phthalate	ND		5.0	1.6	ug/L		08/20/20 07:12	08/21/20 11:57	1
Dimethyl phthalate	ND		5.0	1.5	ug/L		08/20/20 07:12	08/21/20 11:57	1
Di-n-butyl phthalate	ND		5.0	1.5	ug/L		08/20/20 07:12	08/21/20 11:57	1
Di-n-octyl phthalate	ND		5.0	1.5	ug/L		08/20/20 07:12	08/21/20 11:57	1
Fluoranthene	ND		0.20	0.044	ug/L		08/20/20 07:12	08/21/20 11:57	1
Fluorene	ND		0.20	0.052	ug/L		08/20/20 07:12	08/21/20 11:57	1
Hexachlorobenzene	ND		0.20	0.051	ug/L		08/20/20 07:12	08/21/20 11:57	1
Hexachlorobutadiene	ND		0.20	0.053	ug/L		08/20/20 07:12	08/21/20 11:57	1
Hexachlorocyclopentadiene	ND		0.20	0.035	ug/L		08/20/20 07:12	08/21/20 11:57	1

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: MB 570-89056/1-A
Matrix: Water
Analysis Batch: 89478

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 89056

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hexachloroethane	ND		0.20	0.054	ug/L		08/20/20 07:12	08/21/20 11:57	1
Indeno[1,2,3-cd]pyrene	ND		0.20	0.045	ug/L		08/20/20 07:12	08/21/20 11:57	1
Isophorone	ND		2.0	0.055	ug/L		08/20/20 07:12	08/21/20 11:57	1
Naphthalene	0.0677	J	0.20	0.050	ug/L		08/20/20 07:12	08/21/20 11:57	1
Nitrobenzene	ND		0.20	0.066	ug/L		08/20/20 07:12	08/21/20 11:57	1
N-Nitrosodimethylamine	ND		0.20	0.19	ug/L		08/20/20 07:12	08/21/20 11:57	1
N-Nitrosodi-n-propylamine	ND		0.20	0.035	ug/L		08/20/20 07:12	08/21/20 11:57	1
N-Nitrosodiphenylamine	ND		0.20	0.047	ug/L		08/20/20 07:12	08/21/20 11:57	1
Pentachlorophenol	ND		5.0	0.75	ug/L		08/20/20 07:12	08/21/20 11:57	1
Phenanthrene	ND		0.20	0.052	ug/L		08/20/20 07:12	08/21/20 11:57	1
Phenol	ND		0.20	0.032	ug/L		08/20/20 07:12	08/21/20 11:57	1
Pyrene	ND		0.20	0.049	ug/L		08/20/20 07:12	08/21/20 11:57	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*95*		*53 - 117*	*08/20/20 07:12*	*08/21/20 11:57*	*1*
2-Fluorophenol (Surr)	*63*		*21 - 80*	*08/20/20 07:12*	*08/21/20 11:57*	*1*
Nitrobenzene-d5 (Surr)	*92*		*43 - 114*	*08/20/20 07:12*	*08/21/20 11:57*	*1*
Phenol-d6 (Surr)	*39*		*3 - 63*	*08/20/20 07:12*	*08/21/20 11:57*	*1*

Lab Sample ID: LCS 570-89056/2-A
Matrix: Water
Analysis Batch: 89478

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 89056

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,2,4-Trichlorobenzene	20.0	15.9		ug/L		80	33 - 114
1,2-Dichlorobenzene	20.0	15.2		ug/L		76	29 - 110
1,3-Dichlorobenzene	20.0	14.9		ug/L		75	24 - 109
1,4-Dichlorobenzene	20.0	14.6		ug/L		73	25 - 108
2,4,5-Trichlorophenol	20.0	18.0		ug/L		90	57 - 114
2,4,6-Trichlorophenol	20.0	17.6		ug/L		88	51 - 114
2,4-Dichlorophenol	20.0	17.6		ug/L		88	58 - 117
2,4-Dimethylphenol	20.0	16.7		ug/L		83	66 - 109
2,4-Dinitrophenol	20.0	14.8		ug/L		74	1 - 183
2,4-Dinitrotoluene	20.0	21.1		ug/L		106	45 - 130
2,6-Dinitrotoluene	20.0	22.2		ug/L		111	55 - 139
2-Chloronaphthalene	20.0	17.1		ug/L		86	52 - 105
2-Chlorophenol	20.0	16.1		ug/L		81	66 - 105
2-Methylnaphthalene	20.0	17.0		ug/L		85	49 - 132
2-Methylphenol	20.0	14.7		ug/L		73	57 - 97
2-Nitroaniline	20.0	21.9		ug/L		109	42 - 112
2-Nitrophenol	20.0	19.4		ug/L		97	46 - 148
3,3'-Dichlorobenzidine	20.0	19.2		ug/L		96	55 - 127
3-Nitroaniline	20.0	19.1		ug/L		96	45 - 106
4,6-Dinitro-2-methylphenol	20.0	18.3		ug/L		91	37 - 153
4-Bromophenyl phenyl ether	20.0	19.2		ug/L		96	63 - 109
4-Chloro-3-methylphenol	20.0	17.2		ug/L		86	50 - 126
4-Chloroaniline	20.0	16.6		ug/L		83	61 - 93
4-Chlorophenyl phenyl ether	20.0	18.5		ug/L		93	54 - 102

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: LCS 570-89056/2-A
Matrix: Water
Analysis Batch: 89478

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 89056

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
4-Nitroaniline	20.0	18.1		ug/L		90	32 - 108
4-Nitrophenol	20.0	8.30		ug/L		42	9 - 51
Acenaphthene	20.0	19.1		ug/L		96	58 - 113
Acenaphthylene	20.0	20.2		ug/L		101	66 - 131
Aniline	20.0	15.5		ug/L		78	41 - 91
Anthracene	20.0	19.4		ug/L		97	68 - 127
Azobenzene	20.0	18.3		ug/L		92	72 - 103
Benzidine	20.0	7.88		ug/L		39	1 - 116
Benzo[a]anthracene	20.0	21.2		ug/L		106	71 - 132
Benzo[a]pyrene	20.0	19.9		ug/L		100	75 - 136
Benzo[b]fluoranthene	20.0	19.2		ug/L		96	72 - 131
Benzo[g,h,i]perylene	20.0	20.7		ug/L		104	75 - 133
Benzo[k]fluoranthene	20.0	19.5		ug/L		97	72 - 135
Benzoic acid	20.0	3.88	J	ug/L		19	1 - 68
Benzyl alcohol	20.0	15.3		ug/L		77	48 - 94
bis (2-chloroisopropyl) ether	20.0	17.3		ug/L		86	75 - 113
Bis(2-chloroethoxy)methane	20.0	17.5		ug/L		87	66 - 101
Bis(2-chloroethyl)ether	20.0	16.8		ug/L		84	69 - 102
Bis(2-ethylhexyl) phthalate	20.0	19.5		ug/L		97	60 - 132
Butyl benzyl phthalate	20.0	20.5		ug/L		103	63 - 151
Chrysene	20.0	20.1		ug/L		101	74 - 128
Dibenz(a,h)anthracene	20.0	20.2		ug/L		101	74 - 131
Dibenzofuran	20.0	17.7		ug/L		88	53 - 100
Diethyl phthalate	20.0	19.2		ug/L		96	55 - 114
Dimethyl phthalate	20.0	18.9		ug/L		95	55 - 110
Di-n-butyl phthalate	20.0	18.8		ug/L		94	66 - 110
Di-n-octyl phthalate	20.0	18.0		ug/L		90	54 - 139
Fluoranthene	20.0	18.6		ug/L		93	70 - 125
Fluorene	20.0	19.1		ug/L		96	63 - 115
Hexachlorobenzene	20.0	20.3		ug/L		102	65 - 106
Hexachlorobutadiene	20.0	15.8		ug/L		79	11 - 120
Hexachlorocyclopentadiene	20.0	18.1		ug/L		91	0.5 - 178
Hexachloroethane	20.0	13.8		ug/L		69	14 - 114
Indeno[1,2,3-cd]pyrene	20.0	20.2		ug/L		101	73 - 130
Isophorone	20.0	17.9		ug/L		90	65 - 107
Naphthalene	20.0	16.8		ug/L		84	47 - 123
Nitrobenzene	20.0	17.4		ug/L		87	67 - 105
N-Nitrosodimethylamine	20.0	12.5		ug/L		63	44 - 67
N-Nitrosodi-n-propylamine	20.0	16.8		ug/L		84	57 - 106
N-Nitrosodiphenylamine	20.0	22.2		ug/L		111	64 - 135
Pentachlorophenol	20.0	15.8		ug/L		79	26 - 115
Phenanthrene	20.0	19.4		ug/L		97	68 - 124
Phenol	20.0	7.52		ug/L		38	29 - 47
Pyrene	20.0	22.2		ug/L		111	62 - 146

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2,4,6-Tribromophenol (Surr)	*107*		*53 - 117*
2-Fluorophenol (Surr)	*63*		*21 - 80*

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: LCS 570-89056/2-A
Matrix: Water
Analysis Batch: 89478

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 89056

Surrogate	LCS %Recovery	LCS Qualifier	Limits
Nitrobenzene-d5 (Surr)	93		43 - 114
Phenol-d6 (Surr)	40		3 - 63

Lab Sample ID: LCSD 570-89056/3-A
Matrix: Water
Analysis Batch: 89478

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 89056

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,2,4-Trichlorobenzene			20.0	15.9		ug/L		80	33 - 114	0	18
1,2-Dichlorobenzene			20.0	15.0		ug/L		75	29 - 110	1	19
1,3-Dichlorobenzene			20.0	14.8		ug/L		74	24 - 109	1	21
1,4-Dichlorobenzene			20.0	14.5		ug/L		72	25 - 108	1	20
2,4,5-Trichlorophenol			20.0	18.4		ug/L		92	57 - 114	2	11
2,4,6-Trichlorophenol			20.0	17.9		ug/L		89	51 - 114	1	13
2,4-Dichlorophenol			20.0	17.9		ug/L		90	58 - 117	2	12
2,4-Dimethylphenol			20.0	16.7		ug/L		83	66 - 109	0	11
2,4-Dinitrophenol			20.0	15.3		ug/L		76	1 - 183	3	30
2,4-Dinitrotoluene			20.0	21.3		ug/L		107	45 - 130	1	14
2,6-Dinitrotoluene			20.0	22.3		ug/L		111	55 - 139	1	13
2-Chloronaphthalene			20.0	16.9		ug/L		85	52 - 105	1	13
2-Chlorophenol			20.0	16.0		ug/L		80	66 - 105	1	12
2-Methylnaphthalene			20.0	17.1		ug/L		85	49 - 132	0	14
2-Methylphenol			20.0	14.5		ug/L		72	57 - 97	1	12
2-Nitroaniline			20.0	21.8		ug/L		109	42 - 112	0	11
2-Nitrophenol			20.0	19.5		ug/L		98	46 - 148	1	11
3,3'-Dichlorobenzidine			20.0	19.1		ug/L		96	55 - 127	1	16
3-Nitroaniline			20.0	19.3		ug/L		96	45 - 106	1	15
4,6-Dinitro-2-methylphenol			20.0	19.0		ug/L		95	37 - 153	4	18
4-Bromophenyl phenyl ether			20.0	19.1		ug/L		96	63 - 109	1	12
4-Chloro-3-methylphenol			20.0	17.4		ug/L		87	50 - 126	1	16
4-Chloroaniline			20.0	16.7		ug/L		84	61 - 93	1	14
4-Chlorophenyl phenyl ether			20.0	18.5		ug/L		93	54 - 102	0	13
4-Nitroaniline			20.0	18.4		ug/L		92	32 - 108	2	14
4-Nitrophenol			20.0	8.48		ug/L		42	9 - 51	2	23
Acenaphthene			20.0	18.9		ug/L		94	58 - 113	1	11
Acenaphthylene			20.0	20.0		ug/L		100	66 - 131	1	14
Aniline			20.0	15.5		ug/L		77	41 - 91	0	26
Anthracene			20.0	19.4		ug/L		97	68 - 127	0	13
Azobenzene			20.0	18.1		ug/L		91	72 - 103	1	11
Benzidine			20.0	8.06		ug/L		40	1 - 116	2	30
Benzo[a]anthracene			20.0	20.9		ug/L		105	71 - 132	1	14
Benzo[a]pyrene			20.0	19.6		ug/L		98	75 - 136	2	18
Benzo[b]fluoranthene			20.0	19.4		ug/L		97	72 - 131	1	12
Benzo[g,h,i]perylene			20.0	20.4		ug/L		102	75 - 133	2	9
Benzo[k]fluoranthene			20.0	18.6		ug/L		93	72 - 135	5	17
Benzoic acid			20.0	3.83	J	ug/L		19	1 - 68	1	30
Benzyl alcohol			20.0	15.3		ug/L		77	48 - 94	0	13
bis (2-chloroisopropyl) ether			20.0	17.0		ug/L		85	75 - 113	2	13

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: LCSD 570-89056/3-A
Matrix: Water
Analysis Batch: 89478

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 89056

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Bis(2-chloroethoxy)methane	20.0	17.4		ug/L		87	66 - 101	1	12
Bis(2-chloroethyl)ether	20.0	16.4		ug/L		82	69 - 102	3	12
Bis(2-ethylhexyl) phthalate	20.0	19.2		ug/L		96	60 - 132	1	16
Butyl benzyl phthalate	20.0	20.4		ug/L		102	63 - 151	1	16
Chrysene	20.0	19.8		ug/L		99	74 - 128	2	14
Dibenz(a,h)anthracene	20.0	20.0		ug/L		100	74 - 131	1	11
Dibenzofuran	20.0	17.6		ug/L		88	53 - 100	1	13
Diethyl phthalate	20.0	19.2		ug/L		96	55 - 114	0	14
Dimethyl phthalate	20.0	18.8		ug/L		94	55 - 110	1	12
Di-n-butyl phthalate	20.0	19.3		ug/L		96	66 - 110	3	14
Di-n-octyl phthalate	20.0	18.2		ug/L		91	54 - 139	1	28
Fluoranthene	20.0	18.8		ug/L		94	70 - 125	1	12
Fluorene	20.0	19.0		ug/L		95	63 - 115	1	14
Hexachlorobenzene	20.0	20.3		ug/L		102	65 - 106	0	13
Hexachlorobutadiene	20.0	15.8		ug/L		79	11 - 120	0	22
Hexachlorocyclopentadiene	20.0	17.7		ug/L		88	0.5 - 178	3	22
Hexachloroethane	20.0	13.6		ug/L		68	14 - 114	1	23
Indeno[1,2,3-cd]pyrene	20.0	19.9		ug/L		99	73 - 130	2	11
Isophorone	20.0	18.1		ug/L		90	65 - 107	1	13
Naphthalene	20.0	16.7		ug/L		84	47 - 123	0	13
Nitrobenzene	20.0	17.2		ug/L		86	67 - 105	1	13
N-Nitrosodimethylamine	20.0	12.5		ug/L		63	44 - 67	0	14
N-Nitrosodi-n-propylamine	20.0	16.3		ug/L		82	57 - 106	3	13
N-Nitrosodiphenylamine	20.0	22.0		ug/L		110	64 - 135	1	13
Pentachlorophenol	20.0	16.3		ug/L		82	26 - 115	3	18
Phenanthrene	20.0	19.4		ug/L		97	68 - 124	0	12
Phenol	20.0	7.46		ug/L		37	29 - 47	1	13
Pyrene	20.0	21.8		ug/L		109	62 - 146	2	14

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2,4,6-Tribromophenol (Surr)	*108*		*53 - 117*
2-Fluorophenol (Surr)	*64*		*21 - 80*
Nitrobenzene-d5 (Surr)	*93*		*43 - 114*
Phenol-d6 (Surr)	*40*		*3 - 63*

Method: 8015B - Gasoline Range Organics - (GC)

Lab Sample ID: MB 440-621256/15
Matrix: Water
Analysis Batch: 621256

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	ND		50	25	ug/L			08/19/20 17:24	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*107*		*65 - 140*		*08/19/20 17:24*	*1*

Method: 8015B - Gasoline Range Organics - (GC) (Continued)

Lab Sample ID: LCS 440-621256/14
Matrix: Water
Analysis Batch: 621256

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
GRO (C4-C12)			800	769		ug/L		96	80 - 120		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*114*		*65 - 140*

Lab Sample ID: 440-270337-C-1 MS
Matrix: Water
Analysis Batch: 621256

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
GRO (C4-C12)	ND		800	755		ug/L		94	65 - 140		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*118*		*65 - 140*

Lab Sample ID: 440-270337-C-1 MSD
Matrix: Water
Analysis Batch: 621256

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
GRO (C4-C12)	ND		800	795		ug/L		99	65 - 140	5	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*118*		*65 - 140*

Method: 7199 - Chromium, Hexavalent (IC)

Lab Sample ID: MB 440-620991/6
Matrix: Water
Analysis Batch: 620991

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cr (VI)	ND		2.0	0.25	ug/L			08/18/20 07:30	1

Lab Sample ID: LCS 440-620991/5
Matrix: Water
Analysis Batch: 620991

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Cr (VI)			50.0	52.3		ug/L		105	90 - 110		

Lab Sample ID: MRL 440-620991/4
Matrix: Water
Analysis Batch: 620991

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits		
Cr (VI)			1.00	1.11	J	ug/L		111	50 - 150		

Method: 7199 - Chromium, Hexavalent (IC) (Continued)

Lab Sample ID: 440-270516-2 MS
Matrix: Water
Analysis Batch: 620991

Client Sample ID: G-4
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cr (VI)	ND		50.0	52.5		ug/L		105	85 - 115

Lab Sample ID: 440-270516-2 MSD
Matrix: Water
Analysis Batch: 620991

Client Sample ID: G-4
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cr (VI)	ND		50.0	52.5		ug/L		105	85 - 115	0	20

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 440-622041/1-A
Matrix: Water
Analysis Batch: 622194

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 622041

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 11:59	1
Arsenic	ND		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 11:59	1
Barium	ND		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 11:59	1
Beryllium	ND		0.50	0.25	ug/L		08/25/20 16:08	08/26/20 11:59	1
Cadmium	ND		1.0	0.25	ug/L		08/25/20 16:08	08/26/20 11:59	1
Chromium	ND		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 11:59	1
Cobalt	ND		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 11:59	1
Copper	ND		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 11:59	1
Lead	ND		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 11:59	1
Molybdenum	ND		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 11:59	1
Nickel	ND		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 11:59	1
Selenium	ND		2.0	0.50	ug/L		08/25/20 16:08	08/26/20 11:59	1
Silver	ND		1.0	0.50	ug/L		08/25/20 16:08	08/26/20 11:59	1
Thallium	ND		1.0	0.20	ug/L		08/25/20 16:08	08/26/20 11:59	1
Vanadium	ND		2.0	1.0	ug/L		08/25/20 16:08	08/26/20 11:59	1
Zinc	3.25	J	20	2.5	ug/L		08/25/20 16:08	08/26/20 11:59	1

Lab Sample ID: LCS 440-622041/2-A
Matrix: Water
Analysis Batch: 622194

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 622041

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	80.0	90.6		ug/L		113	80 - 120
Arsenic	80.0	74.9		ug/L		94	80 - 120
Barium	80.0	79.2		ug/L		99	80 - 120
Beryllium	80.0	75.4		ug/L		94	80 - 120
Cadmium	80.0	81.1		ug/L		101	80 - 120
Chromium	80.0	77.7		ug/L		97	80 - 120
Cobalt	80.0	74.8		ug/L		93	80 - 120
Copper	80.0	77.0		ug/L		96	80 - 120
Lead	80.0	77.7		ug/L		97	80 - 120
Molybdenum	80.0	82.2		ug/L		103	80 - 120
Nickel	80.0	77.9		ug/L		97	80 - 120

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 440-622041/2-A
Matrix: Water
Analysis Batch: 622194

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 622041

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Selenium	80.0	74.7		ug/L		93	80 - 120
Silver	80.0	83.0		ug/L		104	80 - 120
Thallium	80.0	77.9		ug/L		97	80 - 120
Vanadium	80.0	78.7		ug/L		98	80 - 120
Zinc	80.0	75.4		ug/L		94	80 - 120

Lab Sample ID: MB 440-622042/1-A
Matrix: Water
Analysis Batch: 622194

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 622042

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:35	1
Arsenic	ND		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:35	1
Barium	ND		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:35	1
Beryllium	ND		0.50	0.25	ug/L		08/25/20 16:10	08/26/20 11:35	1
Cadmium	ND		1.0	0.25	ug/L		08/25/20 16:10	08/26/20 11:35	1
Chromium	ND		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:35	1
Cobalt	ND		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:35	1
Copper	ND		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:35	1
Lead	ND		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:35	1
Molybdenum	ND		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:35	1
Nickel	ND		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:35	1
Selenium	ND		2.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:35	1
Silver	ND		1.0	0.50	ug/L		08/25/20 16:10	08/26/20 11:35	1
Thallium	ND		1.0	0.20	ug/L		08/25/20 16:10	08/26/20 11:35	1
Vanadium	ND		2.0	1.0	ug/L		08/25/20 16:10	08/26/20 11:35	1
Zinc	ND		20	2.5	ug/L		08/25/20 16:10	08/26/20 11:35	1

Lab Sample ID: LCS 440-622042/2-A
Matrix: Water
Analysis Batch: 622194

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 622042

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	80.0	88.9		ug/L		111	80 - 120
Arsenic	80.0	73.7		ug/L		92	80 - 120
Barium	80.0	77.0		ug/L		96	80 - 120
Beryllium	80.0	73.7		ug/L		92	80 - 120
Cadmium	80.0	78.9		ug/L		99	80 - 120
Chromium	80.0	76.3		ug/L		95	80 - 120
Cobalt	80.0	73.2		ug/L		92	80 - 120
Copper	80.0	75.0		ug/L		94	80 - 120
Lead	80.0	76.7		ug/L		96	80 - 120
Molybdenum	80.0	80.0		ug/L		100	80 - 120
Nickel	80.0	75.8		ug/L		95	80 - 120
Selenium	80.0	73.0		ug/L		91	80 - 120
Silver	80.0	80.3		ug/L		100	80 - 120
Thallium	80.0	76.3		ug/L		95	80 - 120
Vanadium	80.0	76.8		ug/L		96	80 - 120
Zinc	80.0	74.0		ug/L		92	80 - 120

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 440-270516-1 MS
Matrix: Water
Analysis Batch: 622194

Client Sample ID: MW-05A
Prep Type: Total Recoverable
Prep Batch: 622042

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.57	J	80.0	89.5		ug/L		111	75 - 125
Arsenic	8.2		80.0	82.4		ug/L		93	75 - 125
Barium	20		80.0	97.4		ug/L		97	75 - 125
Beryllium	1.7		80.0	67.2		ug/L		82	75 - 125
Cadmium	0.39	J	80.0	72.7		ug/L		90	75 - 125
Chromium	ND		80.0	70.7		ug/L		88	75 - 125
Cobalt	35		80.0	104		ug/L		86	75 - 125
Copper	2.1		80.0	66.8		ug/L		81	75 - 125
Lead	ND		80.0	68.6		ug/L		86	75 - 125
Molybdenum	3.5		80.0	86.6		ug/L		104	75 - 125
Nickel	13		80.0	78.5		ug/L		81	75 - 125
Selenium	1.7	J	80.0	77.2		ug/L		94	75 - 125
Silver	ND		80.0	73.7		ug/L		92	75 - 125
Thallium	0.31	J	80.0	71.3		ug/L		89	75 - 125
Vanadium	5.6		80.0	80.0		ug/L		93	75 - 125
Zinc	120	F1	80.0	171	F1	ug/L		68	75 - 125

Lab Sample ID: 440-270516-1 MSD
Matrix: Water
Analysis Batch: 622194

Client Sample ID: MW-05A
Prep Type: Total Recoverable
Prep Batch: 622042

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Antimony	0.57	J	80.0	93.6		ug/L		116	75 - 125	4	20
Arsenic	8.2		80.0	86.8		ug/L		98	75 - 125	5	20
Barium	20		80.0	102		ug/L		102	75 - 125	4	20
Beryllium	1.7		80.0	72.3		ug/L		88	75 - 125	7	20
Cadmium	0.39	J	80.0	76.3		ug/L		95	75 - 125	5	20
Chromium	ND		80.0	74.7		ug/L		93	75 - 125	6	20
Cobalt	35		80.0	111		ug/L		95	75 - 125	7	20
Copper	2.1		80.0	70.6		ug/L		86	75 - 125	6	20
Lead	ND		80.0	74.0		ug/L		92	75 - 125	8	20
Molybdenum	3.5		80.0	91.5		ug/L		110	75 - 125	5	20
Nickel	13		80.0	83.3		ug/L		87	75 - 125	6	20
Selenium	1.7	J	80.0	79.5		ug/L		97	75 - 125	3	20
Silver	ND		80.0	77.5		ug/L		97	75 - 125	5	20
Thallium	0.31	J	80.0	74.8		ug/L		93	75 - 125	5	20
Vanadium	5.6		80.0	84.6		ug/L		99	75 - 125	6	20
Zinc	120	F1	80.0	180		ug/L		79	75 - 125	5	20

Lab Sample ID: 440-270516-1 MS
Matrix: Water
Analysis Batch: 622194

Client Sample ID: MW-05A
Prep Type: Dissolved
Prep Batch: 622041

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.64	J	80.0	87.8		ug/L		109	75 - 125
Arsenic	7.1		80.0	79.3		ug/L		90	75 - 125
Barium	19		80.0	93.7		ug/L		93	75 - 125
Beryllium	1.7		80.0	67.0		ug/L		82	75 - 125
Cadmium	0.56	J	80.0	71.5		ug/L		89	75 - 125

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 440-270516-1 MS
Matrix: Water
Analysis Batch: 622194

Client Sample ID: MW-05A
Prep Type: Dissolved
Prep Batch: 622041

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chromium	ND		80.0	69.9		ug/L		87	75 - 125
Cobalt	39		80.0	110		ug/L		89	75 - 125
Copper	2.0		80.0	65.6		ug/L		79	75 - 125
Lead	ND		80.0	68.0		ug/L		85	75 - 125
Molybdenum	3.2		80.0	84.8		ug/L		102	75 - 125
Nickel	19		80.0	84.7		ug/L		82	75 - 125
Selenium	1.3	J	80.0	70.9		ug/L		87	75 - 125
Silver	ND		80.0	72.6		ug/L		91	75 - 125
Thallium	0.28	J	80.0	69.6		ug/L		87	75 - 125
Vanadium	4.0		80.0	77.6		ug/L		92	75 - 125
Zinc	89	F1 B	80.0	147	F1	ug/L		72	75 - 125

Lab Sample ID: 440-270516-1 MSD
Matrix: Water
Analysis Batch: 622194

Client Sample ID: MW-05A
Prep Type: Dissolved
Prep Batch: 622041

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Antimony	0.64	J	80.0	91.5		ug/L		114	75 - 125	4	20
Arsenic	7.1		80.0	81.8		ug/L		93	75 - 125	3	20
Barium	19		80.0	99.8		ug/L		101	75 - 125	6	20
Beryllium	1.7		80.0	71.6		ug/L		87	75 - 125	7	20
Cadmium	0.56	J	80.0	74.4		ug/L		92	75 - 125	4	20
Chromium	ND		80.0	72.1		ug/L		90	75 - 125	3	20
Cobalt	39		80.0	111		ug/L		91	75 - 125	1	20
Copper	2.0		80.0	67.7		ug/L		82	75 - 125	3	20
Lead	ND		80.0	69.4		ug/L		87	75 - 125	2	20
Molybdenum	3.2		80.0	88.9		ug/L		107	75 - 125	5	20
Nickel	19		80.0	87.2		ug/L		85	75 - 125	3	20
Selenium	1.3	J	80.0	74.4		ug/L		91	75 - 125	5	20
Silver	ND		80.0	76.3		ug/L		95	75 - 125	5	20
Thallium	0.28	J	80.0	72.8		ug/L		91	75 - 125	5	20
Vanadium	4.0		80.0	80.8		ug/L		96	75 - 125	4	20
Zinc	89	F1 B	80.0	151		ug/L		78	75 - 125	3	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 440-621288/1-A
Matrix: Water
Analysis Batch: 621418

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 621288

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/19/20 12:17	08/19/20 17:10	1

Lab Sample ID: LCS 440-621288/2-A
Matrix: Water
Analysis Batch: 621418

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 621288

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	4.00	4.33		ug/L		108	80 - 120

Method: 7470A - Mercury (CVAA) (Continued)

Lab Sample ID: 440-270516-1 MS
Matrix: Water
Analysis Batch: 621418

Client Sample ID: MW-05A
Prep Type: Total/NA
Prep Batch: 621288

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury	ND	F1	4.00	3.04		ug/L		76	75 - 125		

Lab Sample ID: 440-270516-1 MSD
Matrix: Water
Analysis Batch: 621418

Client Sample ID: MW-05A
Prep Type: Total/NA
Prep Batch: 621288

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND	F1	4.00	2.78	F1	ug/L		70	75 - 125	9	20

Lab Sample ID: MB 440-621291/1-A
Matrix: Water
Analysis Batch: 621418

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 621291

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/19/20 12:21	08/19/20 17:59	1

Lab Sample ID: LCS 440-621291/2-A
Matrix: Water
Analysis Batch: 621418

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 621291

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury			4.00	3.95		ug/L		99	80 - 120		

Lab Sample ID: 440-270516-1 MS
Matrix: Water
Analysis Batch: 621418

Client Sample ID: MW-05A
Prep Type: Dissolved
Prep Batch: 621291

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury	ND	F1	4.00	2.75	F1	ug/L		69	75 - 125		

Lab Sample ID: 440-270516-1 MSD
Matrix: Water
Analysis Batch: 621418

Client Sample ID: MW-05A
Prep Type: Dissolved
Prep Batch: 621291

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND	F1	4.00	2.59	F1	ug/L		65	75 - 125	6	20

Method: 9040B - pH

Lab Sample ID: 440-270516-1 DU
Matrix: Water
Analysis Batch: 621440

Client Sample ID: MW-05A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	6.7	HF		6.7		SU				0.1	2

Method: SM 4500 S2 D - Sulfide, Total

Lab Sample ID: MB 440-621667/3
Matrix: Water
Analysis Batch: 621667

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Sulfide	ND		50	27	ug/L			08/21/20 15:56	1

Lab Sample ID: LCS 440-621667/4
Matrix: Water
Analysis Batch: 621667

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Sulfide			501	453		ug/L		90	80 - 120		

Lab Sample ID: LCSD 440-621667/5
Matrix: Water
Analysis Batch: 621667

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Sulfide			501	442		ug/L		88	80 - 120	2	20

Lab Sample ID: 440-270516-1 MS
Matrix: Water
Analysis Batch: 621667

Client Sample ID: MW-05A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Sulfide	ND	F1	501	181	F1	ug/L		36	70 - 130		

Lab Sample ID: 440-270516-1 MSD
Matrix: Water
Analysis Batch: 621667

Client Sample ID: MW-05A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Sulfide	ND	F1	501	228	F1	ug/L		45	70 - 130	23	30

GC/MS VOA

Analysis Batch: 621204

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-1	MW-05A	Total/NA	Water	8260B	
440-270516-2	G-4	Total/NA	Water	8260B	
440-270516-3	MW-03B	Total/NA	Water	8260B	
440-270516-4	MW-03A	Total/NA	Water	8260B	
440-270516-5	TB-SUMP-20200818	Total/NA	Water	8260B	
440-270516-6	FB-SUMP-20200818	Total/NA	Water	8260B	
MB 440-621204/4	Method Blank	Total/NA	Water	8260B	
LCS 440-621204/1002	Lab Control Sample	Total/NA	Water	8260B	
440-270516-1 MS	MW-05A	Total/NA	Water	8260B	
440-270516-1 MSD	MW-05A	Total/NA	Water	8260B	

Analysis Batch: 621378

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-2 - RA	G-4	Total/NA	Water	8260B	
MB 440-621378/4	Method Blank	Total/NA	Water	8260B	
LCS 440-621378/1002	Lab Control Sample	Total/NA	Water	8260B	
440-270547-A-15 MS	Matrix Spike	Total/NA	Water	8260B	
440-270547-A-15 MSD	Matrix Spike Duplicate	Total/NA	Water	8260B	

GC/MS Semi VOA

Prep Batch: 89056

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-1	MW-05A	Total/NA	Water	3510C	
440-270516-2	G-4	Total/NA	Water	3510C	
440-270516-3	MW-03B	Total/NA	Water	3510C	
440-270516-4	MW-03A	Total/NA	Water	3510C	
MB 570-89056/1-A	Method Blank	Total/NA	Water	3510C	
LCS 570-89056/2-A	Lab Control Sample	Total/NA	Water	3510C	
LCSD 570-89056/3-A	Lab Control Sample Dup	Total/NA	Water	3510C	

Analysis Batch: 89478

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-1	MW-05A	Total/NA	Water	8270C SIM	89056
440-270516-2	G-4	Total/NA	Water	8270C SIM	89056
440-270516-3	MW-03B	Total/NA	Water	8270C SIM	89056
440-270516-4	MW-03A	Total/NA	Water	8270C SIM	89056
MB 570-89056/1-A	Method Blank	Total/NA	Water	8270C SIM	89056
LCS 570-89056/2-A	Lab Control Sample	Total/NA	Water	8270C SIM	89056
LCSD 570-89056/3-A	Lab Control Sample Dup	Total/NA	Water	8270C SIM	89056

GC VOA

Analysis Batch: 621256

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-1	MW-05A	Total/NA	Water	8015B	
440-270516-2	G-4	Total/NA	Water	8015B	
440-270516-3	MW-03B	Total/NA	Water	8015B	
440-270516-4	MW-03A	Total/NA	Water	8015B	
440-270516-5	TB-SUMP-20200818	Total/NA	Water	8015B	
440-270516-6	FB-SUMP-20200818	Total/NA	Water	8015B	
MB 440-621256/15	Method Blank	Total/NA	Water	8015B	

GC VOA (Continued)

Analysis Batch: 621256 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 440-621256/14	Lab Control Sample	Total/NA	Water	8015B	
440-270337-C-1 MS	Matrix Spike	Total/NA	Water	8015B	
440-270337-C-1 MSD	Matrix Spike Duplicate	Total/NA	Water	8015B	

HPLC/IC

Analysis Batch: 620991

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-1	MW-05A	Total/NA	Water	7199	
440-270516-2	G-4	Total/NA	Water	7199	
440-270516-3	MW-03B	Total/NA	Water	7199	
440-270516-4	MW-03A	Total/NA	Water	7199	
MB 440-620991/6	Method Blank	Total/NA	Water	7199	
LCS 440-620991/5	Lab Control Sample	Total/NA	Water	7199	
MRL 440-620991/4	Lab Control Sample	Total/NA	Water	7199	
440-270516-2 MS	G-4	Total/NA	Water	7199	
440-270516-2 MSD	G-4	Total/NA	Water	7199	

Metals

Prep Batch: 621288

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-1	MW-05A	Total/NA	Water	7470A	
440-270516-2	G-4	Total/NA	Water	7470A	
440-270516-3	MW-03B	Total/NA	Water	7470A	
440-270516-4	MW-03A	Total/NA	Water	7470A	
MB 440-621288/1-A	Method Blank	Total/NA	Water	7470A	
LCS 440-621288/2-A	Lab Control Sample	Total/NA	Water	7470A	
440-270516-1 MS	MW-05A	Total/NA	Water	7470A	
440-270516-1 MSD	MW-05A	Total/NA	Water	7470A	

Prep Batch: 621291

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-1	MW-05A	Dissolved	Water	7470A	
440-270516-2	G-4	Dissolved	Water	7470A	
440-270516-3	MW-03B	Dissolved	Water	7470A	
440-270516-4	MW-03A	Dissolved	Water	7470A	
MB 440-621291/1-A	Method Blank	Total/NA	Water	7470A	
LCS 440-621291/2-A	Lab Control Sample	Total/NA	Water	7470A	
440-270516-1 MS	MW-05A	Dissolved	Water	7470A	
440-270516-1 MSD	MW-05A	Dissolved	Water	7470A	

Analysis Batch: 621418

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-1	MW-05A	Dissolved	Water	7470A	621291
440-270516-1	MW-05A	Total/NA	Water	7470A	621288
440-270516-2	G-4	Dissolved	Water	7470A	621291
440-270516-2	G-4	Total/NA	Water	7470A	621288
440-270516-3	MW-03B	Dissolved	Water	7470A	621291
440-270516-3	MW-03B	Total/NA	Water	7470A	621288
440-270516-4	MW-03A	Dissolved	Water	7470A	621291
440-270516-4	MW-03A	Total/NA	Water	7470A	621288

Metals (Continued)

Analysis Batch: 621418 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 440-621288/1-A	Method Blank	Total/NA	Water	7470A	621288
MB 440-621291/1-A	Method Blank	Total/NA	Water	7470A	621291
LCS 440-621288/2-A	Lab Control Sample	Total/NA	Water	7470A	621288
LCS 440-621291/2-A	Lab Control Sample	Total/NA	Water	7470A	621291
440-270516-1 MS	MW-05A	Dissolved	Water	7470A	621291
440-270516-1 MS	MW-05A	Total/NA	Water	7470A	621288
440-270516-1 MSD	MW-05A	Dissolved	Water	7470A	621291
440-270516-1 MSD	MW-05A	Total/NA	Water	7470A	621288

Prep Batch: 622041

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-1	MW-05A	Dissolved	Water	3005A	
440-270516-2	G-4	Dissolved	Water	3005A	
440-270516-3	MW-03B	Dissolved	Water	3005A	
440-270516-4	MW-03A	Dissolved	Water	3005A	
MB 440-622041/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 440-622041/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
440-270516-1 MS	MW-05A	Dissolved	Water	3005A	
440-270516-1 MSD	MW-05A	Dissolved	Water	3005A	

Prep Batch: 622042

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-1	MW-05A	Total Recoverable	Water	3005A	
440-270516-2	G-4	Total Recoverable	Water	3005A	
440-270516-3	MW-03B	Total Recoverable	Water	3005A	
440-270516-4	MW-03A	Total Recoverable	Water	3005A	
MB 440-622042/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 440-622042/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
440-270516-1 MS	MW-05A	Total Recoverable	Water	3005A	
440-270516-1 MSD	MW-05A	Total Recoverable	Water	3005A	

Analysis Batch: 622171

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-2	G-4	Dissolved	Water	6020	622041
440-270516-2	G-4	Total Recoverable	Water	6020	622042
440-270516-3	MW-03B	Dissolved	Water	6020	622041
440-270516-3	MW-03B	Total Recoverable	Water	6020	622042
440-270516-4	MW-03A	Dissolved	Water	6020	622041
440-270516-4	MW-03A	Total Recoverable	Water	6020	622042

Analysis Batch: 622194

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-1	MW-05A	Dissolved	Water	6020	622041
440-270516-1	MW-05A	Total Recoverable	Water	6020	622042
MB 440-622041/1-A	Method Blank	Total Recoverable	Water	6020	622041
MB 440-622042/1-A	Method Blank	Total Recoverable	Water	6020	622042
LCS 440-622041/2-A	Lab Control Sample	Total Recoverable	Water	6020	622041
LCS 440-622042/2-A	Lab Control Sample	Total Recoverable	Water	6020	622042
440-270516-1 MS	MW-05A	Dissolved	Water	6020	622041
440-270516-1 MS	MW-05A	Total Recoverable	Water	6020	622042
440-270516-1 MSD	MW-05A	Dissolved	Water	6020	622041

Metals (Continued)

Analysis Batch: 622194 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-1 MSD	MW-05A	Total Recoverable	Water	6020	622042

General Chemistry

Analysis Batch: 621440

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-1	MW-05A	Total/NA	Water	9040B	
440-270516-2	G-4	Total/NA	Water	9040B	
440-270516-3	MW-03B	Total/NA	Water	9040B	
440-270516-4	MW-03A	Total/NA	Water	9040B	
440-270516-1 DU	MW-05A	Total/NA	Water	9040B	

Analysis Batch: 621667

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270516-1	MW-05A	Total/NA	Water	SM 4500 S2 D	
440-270516-2	G-4	Total/NA	Water	SM 4500 S2 D	
440-270516-3	MW-03B	Total/NA	Water	SM 4500 S2 D	
440-270516-4	MW-03A	Total/NA	Water	SM 4500 S2 D	
MB 440-621667/3	Method Blank	Total/NA	Water	SM 4500 S2 D	
LCS 440-621667/4	Lab Control Sample	Total/NA	Water	SM 4500 S2 D	
LCSD 440-621667/5	Lab Control Sample Dup	Total/NA	Water	SM 4500 S2 D	
440-270516-1 MS	MW-05A	Total/NA	Water	SM 4500 S2 D	
440-270516-1 MSD	MW-05A	Total/NA	Water	SM 4500 S2 D	

Lab Chronicle

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270516-1

Client Sample ID: MW-05A

Lab Sample ID: 440-270516-1

Date Collected: 08/18/20 07:20
Date Received: 08/18/20 18:00

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	621204	08/19/20 09:04	MML	TAL IRV
Total/NA	Prep	3510C			89056	08/20/20 07:12	OAJ3	ECL 1
Total/NA	Analysis	8270C SIM		1	89478	08/21/20 13:46	N8CZ	ECL 1
Total/NA	Analysis	8015B		1	621256	08/19/20 19:21	LMB	TAL IRV
Total/NA	Analysis	7199		1	620991	08/18/20 21:06	PS	TAL IRV
Dissolved	Prep	3005A			622041	08/25/20 16:08	A1M	TAL IRV
Dissolved	Analysis	6020		1	622194	08/26/20 12:04	B1H	TAL IRV
Total Recoverable	Prep	3005A			622042	08/25/20 16:10	A1M	TAL IRV
Total Recoverable	Analysis	6020		1	622194	08/26/20 11:40	B1H	TAL IRV
Dissolved	Prep	7470A			621291	08/19/20 12:21	EMS	TAL IRV
Dissolved	Analysis	7470A		1	621418	08/19/20 18:03	EMS	TAL IRV
Total/NA	Prep	7470A			621288	08/19/20 12:17	EMS	TAL IRV
Total/NA	Analysis	7470A		1	621418	08/19/20 17:15	EMS	TAL IRV
Total/NA	Analysis	9040B		1	621440	08/20/20 15:29	ST	TAL IRV
Total/NA	Analysis	SM 4500 S2 D		1	621667	08/21/20 15:56	KMY	TAL IRV

Client Sample ID: G-4

Lab Sample ID: 440-270516-2

Date Collected: 08/18/20 08:40
Date Received: 08/18/20 18:00

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	621204	08/19/20 10:26	MML	TAL IRV
Total/NA	Analysis	8260B	RA	1	621378	08/20/20 13:24	TCN	TAL IRV
Total/NA	Prep	3510C			89056	08/20/20 07:12	OAJ3	ECL 1
Total/NA	Analysis	8270C SIM		1	89478	08/21/20 14:05	N8CZ	ECL 1
Total/NA	Analysis	8015B		1	621256	08/19/20 19:49	LMB	TAL IRV
Total/NA	Analysis	7199		1	620991	08/18/20 21:45	PS	TAL IRV
Dissolved	Prep	3005A			622041	08/25/20 16:08	A1M	TAL IRV
Dissolved	Analysis	6020		1	622171	08/26/20 10:31	B1H	TAL IRV
Total Recoverable	Prep	3005A			622042	08/25/20 16:10	A1M	TAL IRV
Total Recoverable	Analysis	6020		1	622171	08/26/20 09:51	B1H	TAL IRV
Dissolved	Prep	7470A			621291	08/19/20 12:21	EMS	TAL IRV
Dissolved	Analysis	7470A		1	621418	08/19/20 18:10	EMS	TAL IRV
Total/NA	Prep	7470A			621288	08/19/20 12:17	EMS	TAL IRV
Total/NA	Analysis	7470A		1	621418	08/19/20 17:22	EMS	TAL IRV
Total/NA	Analysis	9040B		1	621440	08/20/20 15:29	ST	TAL IRV
Total/NA	Analysis	SM 4500 S2 D		1	621667	08/21/20 15:56	KMY	TAL IRV

Client Sample ID: MW-03B

Lab Sample ID: 440-270516-3

Date Collected: 08/18/20 09:44
Date Received: 08/18/20 18:00

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	621204	08/19/20 10:53	MML	TAL IRV

Client Sample ID: MW-03B

Lab Sample ID: 440-270516-3

Date Collected: 08/18/20 09:44

Matrix: Water

Date Received: 08/18/20 18:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3510C			89056	08/20/20 07:12	OAJ3	ECL 1
Total/NA	Analysis	8270C SIM		1	89478	08/21/20 14:23	N8CZ	ECL 1
Total/NA	Analysis	8015B		1	621256	08/19/20 20:16	LMB	TAL IRV
Total/NA	Analysis	7199		1	620991	08/18/20 22:24	PS	TAL IRV
Dissolved	Prep	3005A			622041	08/25/20 16:08	A1M	TAL IRV
Dissolved	Analysis	6020		1	622171	08/26/20 10:33	B1H	TAL IRV
Total Recoverable	Prep	3005A			622042	08/25/20 16:10	A1M	TAL IRV
Total Recoverable	Analysis	6020		1	622171	08/26/20 09:53	B1H	TAL IRV
Dissolved	Prep	7470A			621291	08/19/20 12:21	EMS	TAL IRV
Dissolved	Analysis	7470A		1	621418	08/19/20 18:12	EMS	TAL IRV
Total/NA	Prep	7470A			621288	08/19/20 12:17	EMS	TAL IRV
Total/NA	Analysis	7470A		1	621418	08/19/20 17:24	EMS	TAL IRV
Total/NA	Analysis	9040B		1	621440	08/20/20 15:29	ST	TAL IRV
Total/NA	Analysis	SM 4500 S2 D		1	621667	08/21/20 15:56	KMY	TAL IRV

Client Sample ID: MW-03A

Lab Sample ID: 440-270516-4

Date Collected: 08/18/20 10:14

Matrix: Water

Date Received: 08/18/20 18:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	621204	08/19/20 11:21	MML	TAL IRV
Total/NA	Prep	3510C			89056	08/20/20 07:12	OAJ3	ECL 1
Total/NA	Analysis	8270C SIM		1	89478	08/21/20 14:41	N8CZ	ECL 1
Total/NA	Analysis	8015B		1	621256	08/19/20 20:43	LMB	TAL IRV
Total/NA	Analysis	7199		1	620991	08/18/20 22:37	PS	TAL IRV
Dissolved	Prep	3005A			622041	08/25/20 16:08	A1M	TAL IRV
Dissolved	Analysis	6020		1	622171	08/26/20 10:35	B1H	TAL IRV
Total Recoverable	Prep	3005A			622042	08/25/20 16:10	A1M	TAL IRV
Total Recoverable	Analysis	6020		1	622171	08/26/20 09:55	B1H	TAL IRV
Dissolved	Prep	7470A			621291	08/19/20 12:21	EMS	TAL IRV
Dissolved	Analysis	7470A		1	621418	08/19/20 18:15	EMS	TAL IRV
Total/NA	Prep	7470A			621288	08/19/20 12:17	EMS	TAL IRV
Total/NA	Analysis	7470A		1	621418	08/19/20 17:26	EMS	TAL IRV
Total/NA	Analysis	9040B		1	621440	08/20/20 15:29	ST	TAL IRV
Total/NA	Analysis	SM 4500 S2 D		1	621667	08/21/20 15:56	KMY	TAL IRV

Client Sample ID: TB-SUMP-20200818

Lab Sample ID: 440-270516-5

Date Collected: 08/18/20 00:01

Matrix: Water

Date Received: 08/18/20 18:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	621204	08/19/20 11:49	MML	TAL IRV
Total/NA	Analysis	8015B		1	621256	08/19/20 22:06	LMB	TAL IRV

Lab Chronicle

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270516-1

Client Sample ID: FB-SUMP-20200818

Date Collected: 08/18/20 07:30
Date Received: 08/18/20 18:00

Lab Sample ID: 440-270516-6

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	621204	08/19/20 17:09	MML	TAL IRV
Total/NA	Analysis	8015B		1	621256	08/19/20 22:33	LMB	TAL IRV

Laboratory References:

ECL 1 = Eurofins Calscience LLC Lincoln, 7440 Lincoln Way, Garden Grove, CA 92841, TEL (714)895-5494

TAL IRV = Eurofins Calscience Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Accreditation/Certification Summary

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270516-1

Laboratory: Eurofins Calscience Irvine

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska	State	CA01531	06-30-21
Arizona	State	AZ0671	10-13-20
California	Los Angeles County Sanitation Districts	10256	06-30-21
California	State	2706	06-30-21
Guam	State	20-004R	01-23-21
Hawaii	State	CA01531	01-29-21
Kansas	NELAP	E-10420	07-31-20 *
Nevada	State	CA015312021-1	07-31-21
Oregon	NELAP	4028 - 008	01-29-21
USDA	US Federal Programs	P330-18-00214	07-09-21
Washington	State	C900	09-03-20

Laboratory: Eurofins Calscience LLC

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	Los Angeles County Sanitation Districts	10109	09-29-20
California	SCAQMD LAP	17LA0919	11-30-20
California	State	2944	09-29-20
Guam	State	20-003R	10-31-20
Oregon	NELAP	CA300001	01-29-21
USDA	US Federal Programs	P330-20-00034	02-10-23
Washington	State	C916-18	10-11-20

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270516-1

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL IRV
8270C SIM	Semivolatile Organic Compounds (GC/MS SIM)	SW846	ECL 1
8015B	Gasoline Range Organics - (GC)	SW846	TAL IRV
7199	Chromium, Hexavalent (IC)	SW846	TAL IRV
6020	Metals (ICP/MS)	SW846	TAL IRV
7470A	Mercury (CVAA)	SW846	TAL IRV
9040B	pH	SW846	TAL IRV
SM 4500 S2 D	Sulfide, Total	SM	TAL IRV
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL IRV
3510C	Liquid-Liquid Extraction (Separatory Funnel)	SW846	ECL 1
5030B	Purge and Trap	SW846	TAL IRV
7470A	Preparation, Mercury	SW846	TAL IRV

Protocol References:

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

ECL 1 = Eurofins Calscience LLC Lincoln, 7440 Lincoln Way, Garden Grove, CA 92841, TEL (714)895-5494

TAL IRV = Eurofins Calscience Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Sample Summary

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270516-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
440-270516-1	MW-05A	Water	08/18/20 07:20	08/18/20 18:00	
440-270516-2	G-4	Water	08/18/20 08:40	08/18/20 18:00	
440-270516-3	MW-03B	Water	08/18/20 09:44	08/18/20 18:00	
440-270516-4	MW-03A	Water	08/18/20 10:14	08/18/20 18:00	
440-270516-5	TB-SUMP-20200818	Water	08/18/20 00:01	08/18/20 18:00	
440-270516-6	FB-SUMP-20200818	Water	08/18/20 07:30	08/18/20 18:00	

bp rm

Laboratory Management Program LaMP Chain of Custody Record

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BP Site Node Path: Gardena Sumps
BP Facility No: SW Corner Artesia & Normandie
Req Due Date (mm/dd/yy): Regular Turn Around **Rush TAT:** Yes ___ No X
Lab Work Order Number:

Lab Name	Test America	BP/ARC Facility Address	1440 West Artesia Blvd	Consultant/Contractor	Stantec Consulting Services Inc
Lab Address	17461 Derian Ave, Ste 100, Irvine CA, 92614	City, State, ZIP Code	Gardena, CA 90247	Consultant/Contractor Project No:	185850766
Lab PM	Lena Davidkova	Lead Regulatory Agency	DTSC	Address	3777 Worsham Avenue Suite 200 Long Beach CA 90808-1774
Lab Phone	949-261-1022	California Global ID No..	19490135 - DTSC Envirostor	Consultant/Contractor PM	Kelly Brown
Lab Shipping Accnt		Enfos Proposal No	D011F-0011 / WR826935	Phone	562-354-2638 / 714-470-6494 cell
Lab Bottle Order No.		Accounting Mode	Provision X OOC-BU ___ OOC-RM ___	Email EDD To	kelly.brown@stantec.com and to lab.enfosdoc@bp.com
Other Info.		Stage	Execute (40) Activity: Project Spend (80)	Invoice To	BP X Contractor ___

BP Project Manager (PM) Wade Melton
BP PM Phone: 360 594-7978
BP PM Email: wade.melton@bp.com

Lab No.	Sample Description	Date	Time	Matrix: Soil / Solid	Matrix: Water / Liquid	Matrix: Air / Vapor	Matrix:	No. Containers / Preservative: Total Number of Containers	Unpreserved	NaOH+ZnAc	HNO_3	HCl	Methanol		Requested Analyses: GRO C4-C12 (8015M)	VOCs full list (8260B)	SVOCs + PAH's (8270C)	Total Sulfide (376.2/SM4500-S2	Title 22 Metal (Total metals)	Title 22 Metal (Dissolved metals	HexChrom (7199), pH (9045)		General Minerals + K + NO3		Report Type & QC Level
1	MW-05A	8-18-20	0720		6			6				6			3	3									(6) VOA's
2	MW-05A				3			3	3								3								(3) 1-Liter Ambers
3	MW-05A				1			1		1								1							(1) 500 ml Poly
4	MW-05A				1			1			1								1						(1) 500 ml Poly
5	MW-05A				1			1	1												1				(1) 500-ml Poly
6	MW-05A				1			1			1									1					(1) 500 ml Poly (Filtered in Field)

Report Type & QC Level: Standard X; Full Data Package ___

Comments
Note If sample not collected, indicate "No Sample" in comments and single-strike out and initial any preprinted sample description
DO NOT run separate PAH test by method 8310
SLL 8/18/20

	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Name: A.GASTELUM/RON BARRON						
Sampler's Company: Stantec Consulting Services Inc		8.18.20	1220	EC FRV	8-18	12:20
Shipment Method: Courier Ship Date.						
Shipment Tracking No	EC FRV	8-18	18:00	Olga Ornelas	8/18/20	1800

Special Instructions:

THIS LINE - LAB USE ONLY Custody Seals In Place Yes / No | Temp Blank. Yes / No | Cooler Temp on Receipt 4.3/4.3 °F/C | Trip Blank: Yes / No | MS/MSD Sample Submitted. Yes / No

BP Remediation Management COC - Effective Dates: August 23, 2011- June 30, 2012

4.2/4.2 EP.89

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440-270516 Chain of Custody

Laboratory Management Program LaMP Chain of Custody Record

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BP Site Node Path: Gardena Sumps
BP Facility No: SW Corner Artesia & Normandie
Req Due Date (mm/dd/yy): Regular Turn Around **Rush TAT:** Yes ___ No X
Lab Work Order Number:

Lab Name	Test America	BP/ARC Facility Address:	1440 West Artesia Blvd	Consultant/Contractor	Stantec Consulting Services Inc
Lab Address	17461 Derian Ave, Ste 100, Irvine CA, 92614	City, State, ZIP Code	Gardena, CA 90247	Consultant/Contractor Project No	185850766
Lab PM.	Lena Davidkova	Lead Regulatory Agency:	DTSC	Address	3777 Worsham Avenue Suite 200 Long Beach CA 90808-1774
Lab Phone:	949-261-1022	California Global ID No:	19490135 - DTSC Envirostor	Consultant/Contractor PM	Kelly Brown
Lab Shipping Accnt		Enfos Proposal No	D011F-0011 / WR826935	Phone	562-354-2638 / 714-470-6494 cell
Lab Bottle Order No:		Accounting Mode	Provision X OOC-BU ___ OOC-RM ___	Email EDD To	kelly.brown@stantec.com and to lab.enfosdoc@bp.com
Other Info:		Stage.	Execute (40) Activity Project Spend (80)	Invoice To:	BP X Contractor ___

BP Project Manager (PM): Wade Melton
BP PM Phone 360 594-7978
BP PM Email: wade.melton@bp.com

Report Type & QC Level
Standard X
Full Data Package ___

Comments
Note If sample not collected, indicate "No Sample" in comments and single-strike out and initial any preprinted sample description
DO NOT run separate PAH test by method 8310

Lab No.	Sample Description	Date	Time	Matrix: Soil / Solid	Matrix: Water / Liquid	Matrix: Air / Vapor		No. Containers / Preservative: Total Number of Containers	Unpreserved	NaOH+ZnAc	HNO_3	HCl	Methanol		Requested Analyses: GRO C4-C12 (8015M)	VOCs full list (8260B)	SVOCs + PAH's (8270C)	Total Sulfide (376 2/SM4500-S2	Title 22 Metal (Total metals)	Title 22 Metal (Dissolved metals)	HexChrom (7199), pH (9045)		General Minerals + K + NO3		Report Type & QC Level
1	G-4	8.18.20	0840		6			6				6			3	3									(6) VOA's
2	G-4				3			3	3								3								(3) 1-Liter Ambers
3	G-4				1			1		1								1							(1) 500 ml Poly
4	G-4				1			1			1								1						(1) 500 ml Poly
5	G-4				1			1	1												1				(1) 500-ml Poly
6	G-4				1			1			1									1					(1) 500 ml Poly (Filtered In Field)

		Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Name.	A. GASTELUM / RON BARRON						
Sampler's Company	Stantec Consulting Services Inc	[signature]	8 18 20	1220	[signature] EC-IRU	8-18	12:20
Shipment Method	Courier Ship Date.						
Shipment Tracking No		[signature] EC-IRU	8-18 18	18:00	[signature]	8/18/20	1800

Special Instructions:

THIS LINE - LAB USE ONLY: Custody Seals In Place Yes / No | Temp Blank. Yes / No | Cooler Temp on Receipt _____ °F/C | Trip Blank. Yes / No | MS/MSD Sample Submitted Yes / No

BP Remediation Management COC - Effective Dates August 23, 2011- June 30, 2012

BP LaMP COC Rev 7, Aug 23, 2011

Laboratory Management Program LaMP Chain of Custody Record

Page ___ of ___

BP Site Node Path: Gardena Sumps
BP Facility No: SW Corner Artesia & Normandie
Req Due Date (mm/dd/yy): Regular Turn Around **Rush TAT:** Yes ___ No X
Lab Work Order Number:

Lab Name.	Test America	BP/ARC Facility Address	1440 West Artesia Blvd	Consultant/Contractor:	Stantec Consulting Services Inc
Lab Address.	17461 Denan Ave, Ste 100, Irvine CA, 92614	City, State, ZIP Code.	Gardena, CA 90247	Consultant/Contractor Project No.	185850766
Lab PM:	Lena Davidkova	Lead Regulatory Agency.	DTSC	Address:	3777 Worsham Avenue Suite 200 Long Beach CA 90808-1774
Lab Phone	949-261-1022	California Global ID No ·	19490135 - DTSC Envirostor	Consultant/Contractor PM:	Kelly Brown
Lab Shipping Accnt		Enfos Proposal No	D011F-0011 / WR826935	Phone.	562-354-2638 / 714-470-6494 cell
Lab Bottle Order No·		Accounting Mode	Provision X OOC-BU ___ OOC-RM ___	Email EDD To	kelly.brown@stantec.com and to lab.enfosdoc@bp.com
Other Info·		Stage	Execute (40) Activity. Project Spend (80)	Invoice To:	BP X Contractor ___

BP Project Manager (PM): Wade Melton
BP PM Phone. 360 594-7978
BP PM Email· wade.melton@bp.com

Lab No.	Sample Description	Date	Time	Matrix: Soil / Solid	Matrix: Water / Liquid	Matrix: Air / Vapor	Matrix:	No. Containers / Preservative: Total Number of Containers	Unpreserved	NaOH+ZnAc	HNO_3	HCl	Methanol		Requested Analyses: GRO C4-C12 (8015M)	VOCs full list (8260B)	SVOCs + PAH's (8270C)	Total Sulfide (376.2/SM4500-S2	Title 22 Metal (Total metals)	Title 22 Metal (Dissolved metals	HexChrom (7199), pH (9045)		General Minerals + K + NO3	Report Type & QC Level
1	MW-03B	8-18-20	0944		6			6				6			3	3								(6) VOA's
2	MW-03B				3			3	3								3							(3) 1-Liter Ambers
3	MW-03B				1			1		1								1						(1) 500 ml Poly
4	MW-03B				1			1			1								1					(1) 500 ml Poly
5	MW-03B				1			1	1												1			(1) 500-ml Poly
6	MW-03B				1			1			1									1				(1) 500 ml Poly (Filtered In Field)

Standard X
Full Data Package ___

Comments
Note If sample not collected, indicate "No Sample" in comments and single-strike out and initial any preprinted sample description
DO NOT run separate PAH test by method 8310

	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Name: A. Gastelum / Ron Barron						
Sampler's Company: Stantec Consulting Services Inc	[signature]	8 18 20	1200	[signature] EC-FIRU	8-18	12:2
Shipment Method: Courier Ship Date:						
Shipment Tracking No.	[signature] EC-FIRU	8-18	1800	Olga Oinelas	8/18/20	1800

Special Instructions:

THIS LINE - LAB USE ONLY Custody Seals In Place: Yes / No | Temp Blank· Yes / No | Cooler Temp on Receipt _____ °F/C | Trip Blank: Yes / No | MS/MSD Sample Submitted Yes / No

BP Remediation Management COC - Effective Dates August 23, 2011- June 30, 2012

BP LaMP COC Rev. 7, Aug 23, 2011

Laboratory Management Program LaMP Chain of Custody Record

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BP Site Node Path: Gardena Sumps
BP Facility No: SW Corner Artesia & Normandie
Req Due Date (mm/dd/yy): Regular Turn Around **Rush TAT:** Yes ___ No X
Lab Work Order Number:

Lab Name:	Test America	BP/ARC Facility Address.	1440 West Artesia Blvd	Consultant/Contractor	Stantec Consulting Services Inc
Lab Address.	17461 Derian Ave, Ste 100, Irvine CA, 92614	City, State, ZIP Code	Gardena, CA 90247	Consultant/Contractor Project No.	185850766
Lab PM	Lena Davidkova	Lead Regulatory Agency	DTSC	Address.	3777 Worsham Avenue Suite 200 Long Beach CA 90808-1774
Lab Phone	949-261-1022	California Global ID No	19490135 - DTSC Envirostor	Consultant/Contractor PM	Kelly Brown
Lab Shipping Accnt:		Enfos Proposal No	D011F-0011 / WR826935	Phone	562-354-2638 / 714-470-6494 cell
Lab Bottle Order No		Accounting Mode.	Provision X OOC-BU ___ OOC-RM ___	Email EDD To	kelly.brown@stantec.com and to lab.enfosdoc@bp.com
Other Info:		Stage.	Execute (40) Activity: Project Spend (80)	Invoice To	BP X Contractor ___

BP Project Manager (PM). Wade Melton
BP PM Phone: 360 594-7978
BP PM Email: wade.melton@bp.com

Lab No.	Sample Description	Date	Time	Matrix: Soil / Solid	Matrix: Water / Liquid	Matrix: Air / Vapor	Matrix:	No. Containers / Preservative: Total Number of Containers	Unpreserved	NaOH+ZnAc	HNO_3	HCl	Methanol		Requested Analyses: GRO C4-C12 (8015M)	VOCs full list (8260B)	SVOCs + PAH's (8270C)	Total Sulfide (376.2/SM4500-S2	Title 22 Metal (Total metals)	Title 22 Metal (Dissolved metals	HexChrom (7199), pH (9045)		General Minerals + K + NO3		Report Type & QC Level
1	MW-03A	8.18.20	1014		6			6				6			3	3									(6) VOA's
2	MW-03A				3			3	3								3								(3) 1-Liter Ambers
3	MW-03A				1			1		1								1							(1) 500 ml Poly
4	MW-03A				1			1			1								1						(1) 500 ml Poly
5	MW-03A				1			1	1												1				(1) 500-ml Poly
6	MW-03A				1			1			1									1					(1) 500 ml Poly (Filtered In Field)

Standard X
Full Data Package ___

Comments
Note If sample not collected, indicate "No Sample" in comments and single-strike out and initial any preprinted sample description

DO NOT run separate PAH test by method 8310

	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Name: A. GASTELUM / RON BARRON						
Sampler's Company: Stantec Consulting Services Inc		8/18/20	1220	EC-TRV	8-18	12:20
Shipment Method: Courier Ship Date:						
Shipment Tracking No:	EC-TRV	8-18	18:00	Olga Olmedo	8/18/20	1800

Special Instructions:

THIS LINE - LAB USE ONLY Custody Seals In Place: Yes / No | Temp Blank Yes / No | Cooler Temp on Receipt: _____ °F/C | Trip Blank: Yes / No | MS/MSD Sample Submitted: Yes / No

BP Remediation Management COC - Effective Dates. August 23, 2011- June 30, 2012

BP LaMP COC Rev. 7, Aug 23, 2011

Laboratory Management Program LaMP Chain of Custody Record

Page ___ of ___

BP Site Node Path: Gardena Sumps | **Req Due Date (mm/dd/yy):** Regular Turn Around | **Rush TAT:** Yes ___ No X

BP Facility No: SW Corner Artesia & Normandie | **Lab Work Order Number:**

Lab Name	Test America	BP/ARC Facility Address	1440 West Artesia Blvd	Consultant/Contractor:	Stantec Consulting Services Inc.
Lab Address	17461 Derian Ave, Ste 100, Irvine CA, 92614	City, State, ZIP Code	Gardena, CA 90247	Consultant/Contractor Project No:	185850766
Lab PM:	Lena Davidkova	Lead Regulatory Agency.	DTSC	Address	3777 Worsham Avenue Suite 200 Long Beach CA 90808-1774
Lab Phone	949-261-1022	California Global ID No	19490135 - DTSC Envirostor	Consultant/Contractor PM	Kelly Brown
Lab Shipping Accnt:		Enfos Proposal No	D011F-0011 / WR826935	Phone:	562-354-2638 / 714-470-6494 cell
Lab Bottle Order No:		Accounting Mode	Provision X OOC-BU ___ OOC-RM ___	Email EDD To:	kelly.brown@stantec.com and to lab.enfosdoc@bp.com
Other Info:		Stage.	Execute (40) Activity Project Spend (80)	Invoice To:	BP X Contractor ___

BP Project Manager (PM): Wade Melton
BP PM Phone: 360 594-7978
BP PM Email: wade.melton@bp.com

Lab No.	Sample Description	Date	Time	Matrix: Soil / Solid	Water / Liquid	Air / Vapor		No. Containers / Preservative: Total Number of Containers	Unpreserved	NaOH+ZnAc	HNO_3	HCl	Methanol		Requested Analyses: GRO C4-C12 (8015M)	VOCs full list (8260B)	SVOCs + PAH's (8270C)	Total Sulfide (376.2/SM4500-S2	Title 22 Metal (Total metals)	Title 22 Metal (Dissolved metals)	HexChrom (7199), pH (9045)		General Minerals + K + NO3		Report Type & QC Level
1	TB-SUMP-2020**0818**	8/18/20	0000		6			6				6			3	3									(6) VOA's
2	FB-SUMP-2020**0818**	8/18/20	0730		6			6				6			3	3									(6) VOA's
3																									
4																									
5																									
6																									
7																									

Standard X
Full Data Package ___

Comments
Note If sample not collected, indicate "No Sample" in comments and single-strike out and initial any preprinted sample description

DO NOT run separate PAH test by method 8310

Sampler's Name: A. CASTELLUM/RON BARRON	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Company. Stantec Consulting Services Inc		8/18/20	1220	FEDEX	8-18-20	1320
Shipment Method. Courier Ship Date						
Shipment Tracking No	FEDEX	8-18-20	1800	Olga Oinolas	8/19/20	1800

Special Instructions:

THIS LINE - LAB USE ONLY: Custody Seals In Place: Yes / No | Temp Blank. Yes / No | Cooler Temp on Receipt. _____ °F/C | Trip Blank: Yes / No | MS/MSD Sample Submitted Yes / No

BP Remediation Management COC - Effective Dates August 23, 2011- June 30, 2012

BP LaMP COC Rev. 7, Aug 23, 2011

L1.3/4.3 4.2/4.2 12-89

Eurofins Calscience Irvine
17461 Derian Ave Suite 100
Irvine, CA 92614-5817
Phone: 949-261-1022 Fax: 949-260-3297

Chain of Custody Record

eurofins | Environment Testing America

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Davidkov, Lena	Carrier Tracking No(s):	COC No: 440-160172.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Lena.Davidkova@Eurofinset.com	State of Origin: California	Page: Page 1 of 1
Company: Eurofins Calscience LLC		Accreditations Required (See note):		Job #: 440-270516-1
Address: 7440 Lincoln Way, ,	Due Date Requested: 8/31/2020	Analysis Requested		Preservation Codes:
City: Garden Grove	TAT Requested (days):			A - HCL M - Hexane B - NaOH N - None C - Zn Acetate O - AsNaO2 D - Nitric Acid P - Na2O4S E - NaHSO4 Q - Na2SO3 F - MeOH R - Na2S2O3 G - Amchlor S - H2SO4 H - Ascorbic Acid T - TSP Dodecahydrate I - Ice U - Acetone J - DI Water V - MCAA K - EDTA W - pH 4-5 L - EDA Z - other (specify) Other:
State, Zip: CA, 92841				
Phone: 714-895-5494(Tel) 714-894-7501(Fax)	PO #:			
Email:	WO #:			
Project Name: BP Gardena Sumps	Project #: 44003536			
Site: BP Gardena Sumps	SSOW#:			

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8270C_SIM/3510C (MOD) 8270C+NDMA-LL	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
MW-05A (440-270516-1)	8/18/20	07:20 Pacific		Water			X	2	BP, J flag; MS/MSD if >10 splsBP requirements; immediate PM notification
G-4 (440-270516-2)	8/18/20	08:40 Pacific		Water			X	2	BP, J flag; MS/MSD if >10 splsBP requirements; immediate PM notification
MW-03B (440-270516-3)	8/18/20	09:44 Pacific		Water			X	2	BP, J flag; MS/MSD if >10 splsBP requirements; immediate PM notification
MW-03A (440-270516-4)	8/18/20	10:14 Pacific		Water			X	2	BP, J flag; MS/MSD if >10 splsBP requirements; immediate PM notification

Note: Since laboratory accreditations are subject to change, Eurofins Calscience places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Calscience laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Calscience attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Calscience.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	8-19-20 8:25			8/19/2020 0824	
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact:	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:
	N/A	3-9/3.5 ~~4.6~~ 5.6

Ver: 01/16/2019

Login Sample Receipt Checklist

Client: Stantec Consulting Corp.

Job Number: 440-270516-1

Login Number: 270516
List Number: 1
Creator: Escalante, Maria I

List Source: Eurofins Irvine

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	Not present
Sample custody seals, if present, are intact.	N/A	Not Present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Stantec Consulting Corp.

Job Number: 440-270516-1

Login Number: 270516
List Number: 2
Creator: Cortez Diaz, Antonio

List Source: Eurofins Calscience
List Creation: 08/19/20 02:57 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

GC/MS VOA BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270516-1

SDG No.:

Batch Number: 621204 Batch Start Date: 08/19/20 07:15 Batch Analyst: Loznianu, Maria M

Batch Method: 8260B Batch End Date:

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	FinalAmount	Initial pH	VMW8260T1CCV1 00171	VMWNU8260ISS 00202	
MB 440-621204/4		8260B		10 mL	10 mL			5 uL	
440-270516-A-1	MW-05A	8260B	T	10 mL	10 mL	<2 SU		5 uL	
440-270516-A-1 MS	MW-05A	8260B	T	10 mL	10 mL	<2 SU	2 uL	5 uL	
440-270516-A-1 MSD	MW-05A	8260B	T	10 mL	10 mL	<2 SU	2 uL	5 uL	
440-270516-A-2	G-4	8260B	T	10 mL	10 mL	<2 SU		5 uL	
440-270516-A-3	MW-03B	8260B	T	10 mL	10 mL	<2 SU		5 uL	
440-270516-A-4	MW-03A	8260B	T	10 mL	10 mL	<2 SU		5 uL	
440-270516-A-5	TB-SUMP	8260B	T	10 mL	10 mL	<2 SU		5 uL	
440-270516-A-6	FB-SUMP	8260B	T	10 mL	10 mL	<2 SU		5 uL	
LCS 440-621204/1002		8260B		10 mL	10 mL		5 uL	5 uL	

Batch Notes	
pH Indicator ID	220416A
Pipette/Syringe/Dispenser ID	voa-02
Vial Lot Number	0103101F

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GC/MS VOA BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270516-1

SDG No.:

Batch Number: 621378 Batch Start Date: 08/20/20 07:20 Batch Analyst: Nguyen, Tammy C

Batch Method: 8260B Batch End Date:

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	FinalAmount	Initial pH	VMW8260T1CCV1 00171	VMWNU8260ISS 00203	
MB 440-621378/4		8260B		10 mL	10 mL			5 uL	
440-270547-A-15	MW-39C1-081820	8260B	T	10 mL	10 mL	<2 SU		5 uL	
440-270547-A-15 MS		8260B	T	10 mL	10 mL	<2 SU	2 uL	5 uL	
440-270547-A-15 MSD		8260B	T	10 mL	10 mL	<2 SU	2 uL	5 uL	
440-270516-C-2	G-4	8260B	T	10 mL	10 mL	<2 SU		5 uL	
LCS 440-621378/1002		8260B		10 mL	10 mL		5 uL	5 uL	

Batch Notes	
pH Indicator ID	220416A
Pipette/Syringe/Dispenser ID	BT10ml, VOA-03
Vial Lot Number	0103101F

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GASOLINE RANGE ORGANICS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270516-1

SDG No.:

Batch Number: 621256 Batch Start Date: 08/19/20 10:12 Batch Analyst: Barnett, Lisa M

Batch Method: 8015B Batch End Date:

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	FinalAmount	Initial pH	Headspace	VG-LCSTPH1000 00483	VG-SURR500PPM 00036
LCS 440-621256/14		8015B		10 mL	10 mL			8 uL	1 uL
MB 440-621256/15		8015B		10 mL	10 mL				1 uL
440-270337-D-1	CW-12C	8015B	T	10 mL	10 mL	<2 SU	NO		1 uL
440-270337-C-1 MS	CW-12C	8015B	T	10 mL	10 mL	<2 SU	NO	8 uL	1 uL
440-270337-C-1 MSD	CW-12C	8015B	T	10 mL	10 mL	<2 SU	NO	8 uL	1 uL
440-270516-B-1	MW-05A	8015B	T	10 mL	10 mL				1 uL
440-270516-B-2	G-4	8015B	T	10 mL	10 mL				1 uL
440-270516-B-3	MW-03B	8015B	T	10 mL	10 mL				1 uL
440-270516-B-4	MW-03A	8015B	T	10 mL	10 mL				1 uL
440-270516-B-5	TB-SUMP	8015B	T	10 mL	10 mL				1 uL
440-270516-B-6	FB-SUMP	8015B	T	10 mL	10 mL				1 uL

Batch Notes	
pH Indicator ID	HC 904495
Pipette/Syringe/Dispenser ID	BT10ML
Vial Lot Number	0103101F

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

HPLC/IC BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270516-1

SDG No.:

Batch Number: 620991 Batch Start Date: 08/18/20 06:21 Batch Analyst: Saraubon, Phakchaya

Batch Method: 7199 Batch End Date:

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	WCCR6LCS5PPM 00134				
MRL 440-620991/4		7199		10 mL	2 uL				
LCS 440-620991/5		7199		10 mL	100 uL				
MB 440-620991/6		7199		10 mL					
440-270516-J-1	MW-05A	7199	T	10 mL					
440-270516-J-2	G-4	7199	T	10 mL					
440-270516-J-2 MS	G-4	7199	T	10 mL	100 uL				
440-270516-J-2 MSD	G-4	7199	T	10 mL	100 uL				
440-270516-J-3	MW-03B	7199	T	10 mL					
440-270516-J-4	MW-03A	7199	T	10 mL					

Batch Notes	
Buffer Lot #	6306422
Eluent 1 ID	6310832
Filter ID	91622103
pH Meter ID	06
Post Column Reagent ID	6310833

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270516-1

SDG No.:

Batch Number: 622041 Batch Start Date: 08/25/20 16:08 Batch Analyst: Maldonado, Andy 1

Batch Method: 3005A Batch End Date: 08/25/20 20:40

Lab Sample ID	Client Sample ID	Method Chain	Basis	Initial pH	InitialAmount	FinalAmount	ME 1:1 HCl 00067	ME 1:1 HNO3 00302	ME ICPMS ICV 00237
MB 440-622041/1		3005A, 6020			25 mL	25 mL	0.25 mL	0.5 mL	
LCS 440-622041/2		3005A, 6020			25 mL	25 mL	0.25 mL	0.5 mL	0.2 mL
440-270516-L-1	MW-05A	3005A, 6020	D	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	
440-270516-L-1 MS	MW-05A	3005A, 6020	D	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	0.2 mL
440-270516-L-1 MSD	MW-05A	3005A, 6020	D	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	0.2 mL
440-270516-L-2	G-4	3005A, 6020	D	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	
440-270516-L-3	MW-03B	3005A, 6020	D	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	
440-270516-L-4	MW-03A	3005A, 6020	D	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	

Batch Notes	
Temperature - Corrected - End	92 Degrees C
Temperature - Corrected - Start	92 Degrees C
Digestion End Time	08/25/2020 20:30
Digestion Start Time	08/25/2020 16:30
Digestion Unit ID	1
Hydrochloric Acid ID	6300732
Nitric Acid ID	6300731
Pipette/Syringe/Dispenser ID	MET100
Analyst ID - Spike Analyst	AM
Thermometer ID	P-135 (Loc.#B12) CF=0
Digestion Tube/Cup ID	2001329
Temperature - Uncorrected - End	92 Degrees C
Temperature - Uncorrected - Start	92 Degrees C

Basis	Basis Description
D	Dissolved

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270516-1

SDG No.:

Batch Number: 622042 Batch Start Date: 08/25/20 16:10 Batch Analyst: Maldonado, Andy 1

Batch Method: 3005A Batch End Date: 08/25/20 20:40

Lab Sample ID	Client Sample ID	Method Chain	Basis	Initial pH	InitialAmount	FinalAmount	ME 1:1 HCl 00067	ME 1:1 HNO3 00302	ME ICPMS ICV 00237
MB 440-622042/1		3005A, 6020			25 mL	25 mL	0.25 mL	0.5 mL	
LCS 440-622042/2		3005A, 6020			25 mL	25 mL	0.25 mL	0.5 mL	0.2 mL
440-270516-K-1	MW-05A	3005A, 6020	R	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	
440-270516-K-1 MS	MW-05A	3005A, 6020	R	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	0.2 mL
440-270516-K-1 MSD	MW-05A	3005A, 6020	R	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	0.2 mL
440-270516-K-2	G-4	3005A, 6020	R	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	
440-270516-K-3	MW-03B	3005A, 6020	R	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	
440-270516-K-4	MW-03A	3005A, 6020	R	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	

Batch Notes	
Temperature - Corrected - End	92 Degrees C
Temperature - Corrected - Start	92 Degrees C
Digestion End Time	08/25/2020 20:30
Digestion Start Time	08/25/2020 16:30
Digestion Unit ID	1
Hydrochloric Acid ID	6300732
Nitric Acid ID	6300731
Pipette/Syringe/Dispenser ID	MET100
Analyst ID - Spike Analyst	AM
Thermometer ID	P-135 (Loc.#B12) CF=0
Digestion Tube/Cup ID	2001329
Temperature - Uncorrected - End	92 Degrees C
Temperature - Uncorrected - Start	92 Degrees C

Basis	Basis Description
R	Total Recoverable

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270516-1

SDG No.:

Batch Number: 621288 Batch Start Date: 08/19/20 12:17 Batch Analyst: Suico, Ethel M

Batch Method: 7470A Batch End Date: 08/19/20 16:45

Lab Sample ID	Client Sample ID	Method Chain	Basis	Initial pH	InitialAmount	FinalAmount	ME 1 PPM HG1 00462	ME H2SO4 00097	ME HNO3 00577
MB 440-621288/1		7470A, 7470A			20 mL	20 mL		1 mL	0.5 mL
LCS 440-621288/2		7470A, 7470A			20 mL	20 mL	80 uL	1 mL	0.5 mL
440-270516-K-1	MW-05A	7470A, 7470A	T	<2 SU	20 mL	20 mL		1 mL	0.5 mL
440-270516-K-1 MS	MW-05A	7470A, 7470A	T	<2 SU	20 mL	20 mL	80 uL	1 mL	0.5 mL
440-270516-K-1 MSD	MW-05A	7470A, 7470A	T	<2 SU	20 mL	20 mL	80 uL	1 mL	0.5 mL
440-270516-K-2	G-4	7470A, 7470A	T	<2 SU	20 mL	20 mL		1 mL	0.5 mL
440-270516-K-3	MW-03B	7470A, 7470A	T	<2 SU	20 mL	20 mL		1 mL	0.5 mL
440-270516-K-4	MW-03A	7470A, 7470A	T	<2 SU	20 mL	20 mL		1 mL	0.5 mL

Lab Sample ID	Client Sample ID	Method Chain	Basis	ME HYDROX SOL 00125	ME K2S2O8 00096	ME KMN04 00198			
MB 440-621288/1		7470A, 7470A		2 mL	1.6 mL	3 mL			
LCS 440-621288/2		7470A, 7470A		2 mL	1.6 mL	3 mL			
440-270516-K-1	MW-05A	7470A, 7470A	T	2 mL	1.6 mL	3 mL			
440-270516-K-1 MS	MW-05A	7470A, 7470A	T	2 mL	1.6 mL	3 mL			
440-270516-K-1 MSD	MW-05A	7470A, 7470A	T	2 mL	1.6 mL	3 mL			
440-270516-K-2	G-4	7470A, 7470A	T	2 mL	1.6 mL	3 mL			
440-270516-K-3	MW-03B	7470A, 7470A	T	2 mL	1.6 mL	3 mL			
440-270516-K-4	MW-03A	7470A, 7470A	T	2 mL	1.6 mL	3 mL			

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270516-1

SDG No.:

Batch Number: 621288 Batch Start Date: 08/19/20 12:17 Batch Analyst: Suico, Ethel M

Batch Method: 7470A Batch End Date: 08/19/20 16:45

Batch Notes	
Batch Comment	MB Loc:B6
Temperature - Corrected - End	97 Degrees C
Temperature - Corrected - Start	97 Degrees C
Digestion End Time	08/19/20 15:40
Digestion Start Time	08/19/20 13:40
Digestion Unit ID	8
Sulfuric Acid ID	6301633
Nitric Acid ID	6277174
Hydroxylamine ID	6273438 @16:30
Potassium Persulfate ID	6156783
Potassium Permanganate ID	6246272
Pipette/Syringe/Dispenser ID	800
Analyst ID - Spike Analyst	es
Thermometer ID	P-120 Loc:B8 CF = +1
Digestion Tube/Cup ID	1909231
Temperature - Uncorrected - End	96 Degrees C
Temperature - Uncorrected - Start	96 Degrees C

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270516-1

SDG No.:

Batch Number: 621291 Batch Start Date: 08/19/20 12:20 Batch Analyst: Suico, Ethel M

Batch Method: 7470A Batch End Date: 08/19/20 16:45

Lab Sample ID	Client Sample ID	Method Chain	Basis	Initial pH	InitialAmount	FinalAmount	ME 1 PPM HG1 00462	ME H2SO4 00097	ME HNO3 00577
MB 440-621291/1		7470A, 7470A			20 mL	20 mL		1 mL	0.5 mL
LCS 440-621291/2		7470A, 7470A			20 mL	20 mL	80 uL	1 mL	0.5 mL
440-270516-L-1	MW-05A	7470A, 7470A	D	<2 SU	20 mL	20 mL		1 mL	0.5 mL
440-270516-L-1 MS	MW-05A	7470A, 7470A	D	<2 SU	20 mL	20 mL	80 uL	1 mL	0.5 mL
440-270516-L-1 MSD	MW-05A	7470A, 7470A	D	<2 SU	20 mL	20 mL	80 uL	1 mL	0.5 mL
440-270516-L-2	G-4	7470A, 7470A	D	<2 SU	20 mL	20 mL		1 mL	0.5 mL
440-270516-L-3	MW-03B	7470A, 7470A	D	<2 SU	20 mL	20 mL		1 mL	0.5 mL
440-270516-L-4	MW-03A	7470A, 7470A	D	<2 SU	20 mL	20 mL		1 mL	0.5 mL

Lab Sample ID	Client Sample ID	Method Chain	Basis	ME HYDROX SOL 00125	ME K2S2O8 00096	ME KMN04 00198			
MB 440-621291/1		7470A, 7470A		2 mL	1.6 mL	3 mL			
LCS 440-621291/2		7470A, 7470A		2 mL	1.6 mL	3 mL			
440-270516-L-1	MW-05A	7470A, 7470A	D	2 mL	1.6 mL	3 mL			
440-270516-L-1 MS	MW-05A	7470A, 7470A	D	2 mL	1.6 mL	3 mL			
440-270516-L-1 MSD	MW-05A	7470A, 7470A	D	2 mL	1.6 mL	3 mL			
440-270516-L-2	G-4	7470A, 7470A	D	2 mL	1.6 mL	3 mL			
440-270516-L-3	MW-03B	7470A, 7470A	D	2 mL	1.6 mL	3 mL			
440-270516-L-4	MW-03A	7470A, 7470A	D	2 mL	1.6 mL	3 mL			

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270516-1

SDG No.:

Batch Number: 621291 Batch Start Date: 08/19/20 12:20 Batch Analyst: Suico, Ethel M

Batch Method: 7470A Batch End Date: 08/19/20 16:45

Batch Notes	
Batch Comment	MB Loc: A6
Temperature - Corrected - End	97 Degrees C
Temperature - Corrected - Start	97 Degrees C
Digestion End Time	08/19/20 15:40
Digestion Start Time	08/19/20 13:40
Digestion Unit ID	8
Sulfuric Acid ID	6301633
Nitric Acid ID	6277174
Hydroxylamine ID	6273438 @16:30
Potassium Persulfate ID	6156783
Potassium Permanganate ID	6246272
Pipette/Syringe/Dispenser ID	800
Analyst ID - Spike Analyst	es
Thermometer ID	P-120 Loc:B8 CF = +1
Digestion Tube/Cup ID	1909231
Temperature - Uncorrected - End	96 Degrees C
Temperature - Uncorrected - Start	96 Degrees C

Basis	Basis Description
D	Dissolved

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GENERAL CHEMISTRY BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270516-1

SDG No.:

Batch Number: 621667 Batch Start Date: 08/21/20 15:56 Batch Analyst: Young, Katrina M

Batch Method: SM 4500 S2 D Batch End Date:

Lab Sample ID	Client Sample ID	Method Chain	Basis	Initial pH	InitialAmount	FinalAmount	Na2S_Acros 00812		
MB 440-621667/3		SM 4500 S2 D			7.5 mL	7.5 mL			
LCS 440-621667/4		SM 4500 S2 D			43.5 mL	43.5 mL	0.218 mL		
LCSD 440-621667/5		SM 4500 S2 D			43.5 mL	43.5 mL	0.218 mL		
440-270516-M-1	MW-05A	SM 4500 S2 D	T	10 SU	7.5 mL	7.5 mL			
440-270516-M-1 MS	MW-05A	SM 4500 S2 D	T	10 SU	43.5 mL	43.5 mL	0.218 mL		
440-270516-M-1 MSD	MW-05A	SM 4500 S2 D	T	10 SU	43.5 mL	43.5 mL	0.218 mL		
440-270516-M-2	G-4	SM 4500 S2 D	T	12 SU	7.5 mL	7.5 mL			
440-270516-M-3	MW-03B	SM 4500 S2 D	T	13 SU	7.5 mL	7.5 mL			
440-270516-M-4	MW-03A	SM 4500 S2 D	T	12 SU	7.5 mL	7.5 mL			

Batch Notes	
1:1 Sulfuric + Water Lot ID	5925263
Amine Sulfuric Acid ID	6294517
Ammonium Phosphate ID	6312497
Ferric Chloride ID	6163807
Sodium Hydroxide ID	6312498
Pipette ID	wc010 wc027 wc036
Zinc Acetate Buffer ID	6283047

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GENERAL CHEMISTRY BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270516-1

SDG No.:

Batch Number: 621440 Batch Start Date: 08/20/20 15:29 Batch Analyst: Tan, Sarah

Batch Method: 9040B Batch End Date: 08/20/20 15:48

Lab Sample ID	Client Sample ID	Method Chain	Basis	FinalAmount	pHRead1	TempRead1	pHRead2	TempRead2	
440-270516-J-1	MW-05A	9040B	T	50 mL	6.66 SU	20.2 Celsius	6.69 SU	20.2 Celsius	
440-270516-J-1 DU	MW-05A	9040B	T	50 mL	6.70 SU	20.1 Celsius	6.70 SU	20.1 Celsius	
440-270516-J-2	G-4	9040B	T	50 mL	7.65 SU	19.9 Celsius	7.65 SU	19.9 Celsius	
440-270516-J-3	MW-03B	9040B	T	50 mL	7.88 SU	19.8 Celsius	7.88 SU	19.8 Celsius	
440-270516-J-4	MW-03A	9040B	T	50 mL	7.53 SU	19.7 Celsius	7.53 SU	19.7 Celsius	

Batch Notes	
Calibration Date and Time	08/20/2020 15:29
pH Meter Calibration Slope	98.4
pH Meter ID	15

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GC/MS SEMI VOA BATCH WORKSHEET

Lab Name: Eurofins Calscience Job No.: 440-270516-1

SDG No.:

Batch Number: 89056 Batch Start Date: 08/20/20 08:14 Batch Analyst: Pastrano, Darian

Batch Method: 3510C Batch End Date: 08/20/20 10:44

Lab Sample ID	Client Sample ID	Method Chain	Basis	GrossWeight	TareWeight	InitialAmount	FinalAmount	ReceivedpH	FirstAdjustpH
MB 570-89056/1		3510C, 8270C SIM				1000 mL	2 mL	6 SU	2 SU
LCS 570-89056/2		3510C, 8270C SIM				1000 mL	2 mL	6 SU	2 SU
LCSD 570-89056/3		3510C, 8270C SIM				1000 mL	2 mL	6 SU	2 SU
440-270516-H-1	MW-05A	3510C, 8270C SIM	T	1569.9 g	516.3 g	1053.6 mL	2 mL	6 SU	2 SU
440-270516-H-2	G-4	3510C, 8270C SIM	T	1568.0 g	514.4 g	1053.6 mL	2 mL	6 SU	2 SU
440-270516-H-3	MW-03B	3510C, 8270C SIM	T	1566.6 g	514.2 g	1052.4 mL	2 mL	6 SU	2 SU
440-270516-H-4	MW-03A	3510C, 8270C SIM	T	1567.0 g	515.8 g	1051.2 mL	2 mL	6 SU	2 SU

Lab Sample ID	Client Sample ID	Method Chain	Basis	SecondAdjustpH	E_625 Sim SR 00003	E_82FQC-Spk 00002	AnalysisComment		
MB 570-89056/1		3510C, 8270C SIM		11 SU	0.5 mL				
LCS 570-89056/2		3510C, 8270C SIM		11 SU	0.5 mL	0.2 mL			
LCSD 570-89056/3		3510C, 8270C SIM		11 SU	0.5 mL	0.2 mL			
440-270516-H-1	MW-05A	3510C, 8270C SIM	T	11 SU	0.5 mL		Light yellow		
440-270516-H-2	G-4	3510C, 8270C SIM	T	11 SU	0.5 mL		Clear water		
440-270516-H-3	MW-03B	3510C, 8270C SIM	T	11 SU	0.5 mL		Clear water		
440-270516-H-4	MW-03A	3510C, 8270C SIM	T	11 SU	0.5 mL		Clear water		

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GC/MS SEMI VOA BATCH WORKSHEET

Lab Name: Eurofins Calscience Job No.: 440-270516-1

SDG No.:

Batch Number: 89056 Batch Start Date: 08/20/20 08:14 Batch Analyst: Pastrano, Darian

Batch Method: 3510C Batch End Date: 08/20/20 10:44

Batch Notes	
Acid Used for pH Adjustment ID	586577
Balance ID	57
Base Used to Adjust pH ID	109345
Batch Comment	8270 FV=2 mL.
Analyst ID - Concentration	OM8w/ L6IE
Concentration 1 Corrected Temperature	60.5 Degrees C
Equipment ID - Concentration 1	KD-06/ KD-10
Analyst ID - Extraction	OAJ3
Method/Fraction	8270
Na2SO4 ID	551850
pH Indicator ID	25396
Pipette/Syringe/Dispenser ID	D-097
Prep Solvent ID	802367
Prep Solvent Volume Used	360 mL
Analyst ID - Spike Analyst	OAJ3
Analyst ID - Spike Witness Analyst	JS
Sufficient Volume for Batch QC	See NCM
Thermometer ID - Concentration 1	Y20-59
Concentration 1 Uncorrected Temperature	60.0 Degrees C
Vial Lot Number	00291984 (4 ml vials)
Reagent Water ID	DI water

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

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ANALYTICAL REPORT

Eurofins Calscience Irvine
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Laboratory Job ID: 440-270581-1
Client Project/Site: BP Gardena Sumps

For:
Stantec Consulting Corp.
290 Conejo Ridge Avenue, Suite 200
Thousand Oaks, California 91361

Attn: Kelly Brown

Authorized for release by:
8/27/2020 11:27:29 AM

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Results relate only to the items tested and the sample(s) as received by the laboratory.

The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the BPLAMP Technical Specifications, applicable federal, state, local regulations and certification requirements as well as the methodologies as described in laboratory SOPs reviewed by the BPLAMP. This Laboratory Report is confidential and is intended for the sole use of Eurofins TestAmerica and its client. This report shall not be reproduced, except in full, without written permission from TestAmerica. The signature on the cover page extends to the case narrative and all the data and forms in the package. The Chain of Custody is included and is an integral part of this report.

Lena Davidkov
Project Manager II
8/27/2020 11:27:29 AM

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Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

HPLC/IC

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
F1	MS and/or MSD recovery exceeds control limits.
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 440-270581-1

Laboratory: Eurofins Calscience Irvine

Narrative

Job Narrative
440-270581-1

Comments
No additional comments.

Receipt
The samples were received on 8/19/2020 5:00 PM; the samples arrived in good condition, and where required, properly preserved and on ice. The temperatures of the 2 coolers at receipt time were 1.5º C and 4.2º C.

GC/MS VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC/MS Semi VOA
Method 8270C SIM: The laboratory control sample (LCS) and / or laboratory control sample duplicate (LCSD) for preparation batch 570-89524 and analytical batch 570-89863 recovered outside control limits for the following analytes: 4-Chloroaniline, Aniline, and N-Nitrosodimethylamine. These analytes were biased high in the LCS and were not detected in the associated samples; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

HPLC/IC
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
Method SM 4500 S2 D: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for analytical batch 440-622049 were outside control limits. Sample matrix interference is suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
Method 3510C: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with preparation batch 570-89524. LCS/LCSD was performed to meet QC requirements.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOA Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Client Sample ID: MW-02A — Lab Sample ID: 440-270581-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Benzoic acid	1.8	J	4.8	0.53	ug/L	1		8270C SIM	Total/NA
Arsenic	0.55	J	1.0	0.50	ug/L	1		6020	Total Recoverable
Barium	96		1.0	0.50	ug/L	1		6020	Total Recoverable
Cadmium	0.52	J	1.0	0.25	ug/L	1		6020	Total Recoverable
Cobalt	2.2		1.0	0.50	ug/L	1		6020	Total Recoverable
Copper	1.3	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Molybdenum	8.4		2.0	0.50	ug/L	1		6020	Total Recoverable
Nickel	0.68	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Selenium	0.77	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Vanadium	6.2		2.0	1.0	ug/L	1		6020	Total Recoverable
Antimony	0.57	J	2.0	0.50	ug/L	1		6020	Dissolved
Arsenic	0.51	J	1.0	0.50	ug/L	1		6020	Dissolved
Barium	92		1.0	0.50	ug/L	1		6020	Dissolved
Cadmium	0.46	J	1.0	0.25	ug/L	1		6020	Dissolved
Cobalt	2.6		1.0	0.50	ug/L	1		6020	Dissolved
Copper	1.4	J	2.0	0.50	ug/L	1		6020	Dissolved
Molybdenum	8.4		2.0	0.50	ug/L	1		6020	Dissolved
Nickel	0.75	J	2.0	0.50	ug/L	1		6020	Dissolved
Selenium	0.67	J	2.0	0.50	ug/L	1		6020	Dissolved
Vanadium	6.2		2.0	1.0	ug/L	1		6020	Dissolved
pH	7.4	HF	0.1	0.1	SU	1		9040B	Total/NA

Client Sample ID: MW-02B — Lab Sample ID: 440-270581-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Benzoic acid	1.0	J	4.8	0.53	ug/L	1		8270C SIM	Total/NA
Bis(2-ethylhexyl) phthalate	4.3	J	4.8	3.2	ug/L	1		8270C SIM	Total/NA
Di-n-octyl phthalate	3.6	J	4.8	1.4	ug/L	1		8270C SIM	Total/NA
Antimony	0.61	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Arsenic	0.95	J	1.0	0.50	ug/L	1		6020	Total Recoverable
Barium	41		1.0	0.50	ug/L	1		6020	Total Recoverable
Molybdenum	7.0		2.0	0.50	ug/L	1		6020	Total Recoverable
Zinc	26		20	2.5	ug/L	1		6020	Total Recoverable
Antimony	0.79	J	2.0	0.50	ug/L	1		6020	Dissolved
Arsenic	0.95	J	1.0	0.50	ug/L	1		6020	Dissolved
Barium	43		1.0	0.50	ug/L	1		6020	Dissolved
Cobalt	0.91	J	1.0	0.50	ug/L	1		6020	Dissolved
Molybdenum	7.1		2.0	0.50	ug/L	1		6020	Dissolved
Nickel	11		2.0	0.50	ug/L	1		6020	Dissolved
pH	7.6	HF	0.1	0.1	SU	1		9040B	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Client Sample ID: MW-04A — Lab Sample ID: 440-270581-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Benzoic acid	1.2	J	4.8	0.53	ug/L	1		8270C SIM	Total/NA
Cr (VI)	0.27	J	2.0	0.25	ug/L	1		7199	Total/NA
Arsenic	0.79	J	1.0	0.50	ug/L	1		6020	Total Recoverable
Barium	23		1.0	0.50	ug/L	1		6020	Total Recoverable
Cadmium	0.36	J	1.0	0.25	ug/L	1		6020	Total Recoverable
Cobalt	0.56	J	1.0	0.50	ug/L	1		6020	Total Recoverable
Copper	0.71	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Molybdenum	5.8		2.0	0.50	ug/L	1		6020	Total Recoverable
Nickel	2.2		2.0	0.50	ug/L	1		6020	Total Recoverable
Selenium	0.68	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Vanadium	11		2.0	1.0	ug/L	1		6020	Total Recoverable
Antimony	0.55	J	2.0	0.50	ug/L	1		6020	Dissolved
Arsenic	0.80	J	1.0	0.50	ug/L	1		6020	Dissolved
Barium	23		1.0	0.50	ug/L	1		6020	Dissolved
Cadmium	0.34	J	1.0	0.25	ug/L	1		6020	Dissolved
Cobalt	1.7		1.0	0.50	ug/L	1		6020	Dissolved
Copper	0.85	J	2.0	0.50	ug/L	1		6020	Dissolved
Molybdenum	5.7		2.0	0.50	ug/L	1		6020	Dissolved
Nickel	2.4		2.0	0.50	ug/L	1		6020	Dissolved
Selenium	0.61	J	2.0	0.50	ug/L	1		6020	Dissolved
Vanadium	11		2.0	1.0	ug/L	1		6020	Dissolved
Mercury	0.14	J	0.20	0.10	ug/L	1		7470A	Dissolved
pH	7.3	HF	0.1	0.1	SU	1		9040B	Total/NA

Client Sample ID: MW-04B — Lab Sample ID: 440-270581-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Benzoic acid	0.99	J	4.7	0.53	ug/L	1		8270C SIM	Total/NA
Arsenic	3.2		1.0	0.50	ug/L	1		6020	Total Recoverable
Barium	53		1.0	0.50	ug/L	1		6020	Total Recoverable
Molybdenum	3.1		2.0	0.50	ug/L	1		6020	Total Recoverable
Nickel	0.63	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Selenium	0.65	J	2.0	0.50	ug/L	1		6020	Total Recoverable
Zinc	4.0	J	20	2.5	ug/L	1		6020	Total Recoverable
Arsenic	3.1		1.0	0.50	ug/L	1		6020	Dissolved
Barium	53		1.0	0.50	ug/L	1		6020	Dissolved
Cobalt	0.71	J	1.0	0.50	ug/L	1		6020	Dissolved
Molybdenum	3.2		2.0	0.50	ug/L	1		6020	Dissolved
Nickel	0.56	J	2.0	0.50	ug/L	1		6020	Dissolved
pH	7.5	HF	0.1	0.1	SU	1		9040B	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Client Sample ID: RS-SUMP-2020819 — Lab Sample ID: 440-270581-5

No Detections.

Client Sample ID: TB-SUMP-2020819 — Lab Sample ID: 440-270581-6

No Detections.

Client Sample ID: FB-SUMP-2020819 — Lab Sample ID: 440-270581-7

No Detections.

This Detection Summary does not include radiochemical test results.

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Client Sample ID: MW-02A
Date Collected: 08/19/20 08:58
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-1
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/21/20 01:40	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/21/20 01:40	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/21/20 01:40	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/21/20 01:40	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/21/20 01:40	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Benzene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Bromobenzene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Bromoform	ND		1.0	0.40	ug/L			08/21/20 01:40	1
Bromomethane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Chloroethane	ND		1.0	0.40	ug/L			08/21/20 01:40	1
Chloroform	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Chloromethane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Dibromochloromethane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Dibromomethane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/21/20 01:40	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/21/20 01:40	1
Methylene Chloride	ND		1.0	0.88	ug/L			08/21/20 01:40	1
Naphthalene	ND		1.0	0.40	ug/L			08/21/20 01:40	1
n-Butylbenzene	ND		1.0	0.40	ug/L			08/21/20 01:40	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
o-Xylene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/21/20 01:40	1

Client Sample ID: MW-02A
Date Collected: 08/19/20 08:58
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-1
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Styrene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Toluene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Trichloroethene	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/21/20 01:40	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/21/20 01:40	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*100*		*80 - 120*		*08/21/20 01:40*	*1*
Dibromofluoromethane (Surr)	*101*		*76 - 132*		*08/21/20 01:40*	*1*
Toluene-d8 (Surr)	*104*		*80 - 128*		*08/21/20 01:40*	*1*

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,4-Trichlorobenzene	ND		0.19	0.056	ug/L		08/21/20 12:58	08/24/20 14:14	1
1,2-Dichlorobenzene	ND		0.19	0.043	ug/L		08/21/20 12:58	08/24/20 14:14	1
1,3-Dichlorobenzene	ND		0.19	0.042	ug/L		08/21/20 12:58	08/24/20 14:14	1
1,4-Dichlorobenzene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:14	1
2,4,5-Trichlorophenol	ND		4.8	1.4	ug/L		08/21/20 12:58	08/24/20 14:14	1
2,4,6-Trichlorophenol	ND		4.8	1.3	ug/L		08/21/20 12:58	08/24/20 14:14	1
2,4-Dichlorophenol	ND		4.8	1.8	ug/L		08/21/20 12:58	08/24/20 14:14	1
2,4-Dimethylphenol	ND		0.19	0.032	ug/L		08/21/20 12:58	08/24/20 14:14	1
2,4-Dinitrophenol	ND		4.8	0.96	ug/L		08/21/20 12:58	08/24/20 14:14	1
2,4-Dinitrotoluene	ND		0.19	0.028	ug/L		08/21/20 12:58	08/24/20 14:14	1
2,6-Dinitrotoluene	ND		0.19	0.036	ug/L		08/21/20 12:58	08/24/20 14:14	1
2-Chloronaphthalene	ND		0.19	0.054	ug/L		08/21/20 12:58	08/24/20 14:14	1
2-Chlorophenol	ND		0.19	0.045	ug/L		08/21/20 12:58	08/24/20 14:14	1
2-Methylnaphthalene	ND		0.19	0.039	ug/L		08/21/20 12:58	08/24/20 14:14	1
2-Methylphenol	ND		4.8	1.5	ug/L		08/21/20 12:58	08/24/20 14:14	1
2-Nitroaniline	ND		4.8	1.2	ug/L		08/21/20 12:58	08/24/20 14:14	1
2-Nitrophenol	ND		4.8	1.8	ug/L		08/21/20 12:58	08/24/20 14:14	1
3,3'-Dichlorobenzidine	ND		4.8	1.2	ug/L		08/21/20 12:58	08/24/20 14:14	1
3-Nitroaniline	ND		4.8	1.2	ug/L		08/21/20 12:58	08/24/20 14:14	1
4,6-Dinitro-2-methylphenol	ND		4.8	0.84	ug/L		08/21/20 12:58	08/24/20 14:14	1
4-Bromophenyl phenyl ether	ND		0.19	0.043	ug/L		08/21/20 12:58	08/24/20 14:14	1
4-Chloro-3-methylphenol	ND		4.8	1.8	ug/L		08/21/20 12:58	08/24/20 14:14	1
4-Chloroaniline	ND	*	4.8	1.6	ug/L		08/21/20 12:58	08/24/20 14:14	1
4-Chlorophenyl phenyl ether	ND		0.19	0.047	ug/L		08/21/20 12:58	08/24/20 14:14	1
4-Nitroaniline	ND		4.8	1.5	ug/L		08/21/20 12:58	08/24/20 14:14	1
4-Nitrophenol	ND		4.8	0.90	ug/L		08/21/20 12:58	08/24/20 14:14	1
Acenaphthene	ND		0.19	0.061	ug/L		08/21/20 12:58	08/24/20 14:14	1
Acenaphthylene	ND		0.19	0.051	ug/L		08/21/20 12:58	08/24/20 14:14	1
Aniline	ND	*	0.19	0.020	ug/L		08/21/20 12:58	08/24/20 14:14	1
Anthracene	ND		0.19	0.041	ug/L		08/21/20 12:58	08/24/20 14:14	1
Azobenzene	ND		0.19	0.044	ug/L		08/21/20 12:58	08/24/20 14:14	1

Client Sample ID: MW-02A

Date Collected: 08/19/20 08:58
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-1

Matrix: Water

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzidine	ND		4.8	0.72	ug/L		08/21/20 12:58	08/24/20 14:14	1
Benzo[a]anthracene	ND		0.19	0.047	ug/L		08/21/20 12:58	08/24/20 14:14	1
Benzo[a]pyrene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:14	1
Benzo[b]fluoranthene	ND		0.19	0.041	ug/L		08/21/20 12:58	08/24/20 14:14	1
Benzo[g,h,i]perylene	ND		0.19	0.040	ug/L		08/21/20 12:58	08/24/20 14:14	1
Benzo[k]fluoranthene	ND		0.19	0.040	ug/L		08/21/20 12:58	08/24/20 14:14	1
Benzoic acid	**1.8**	**J**	4.8	0.53	ug/L		08/21/20 12:58	08/24/20 14:14	1
Benzyl alcohol	ND		0.19	0.036	ug/L		08/21/20 12:58	08/24/20 14:14	1
bis (2-chloroisopropyl) ether	ND		0.19	0.040	ug/L		08/21/20 12:58	08/24/20 14:14	1
Bis(2-chloroethoxy)methane	ND		0.19	0.058	ug/L		08/21/20 12:58	08/24/20 14:14	1
Bis(2-chloroethyl)ether	ND		0.19	0.037	ug/L		08/21/20 12:58	08/24/20 14:14	1
Bis(2-ethylhexyl) phthalate	ND		4.8	3.2	ug/L		08/21/20 12:58	08/24/20 14:14	1
Butyl benzyl phthalate	ND		4.8	2.0	ug/L		08/21/20 12:58	08/24/20 14:14	1
Chrysene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:14	1
Dibenz(a,h)anthracene	ND		0.19	0.035	ug/L		08/21/20 12:58	08/24/20 14:14	1
Dibenzofuran	ND		0.19	0.046	ug/L		08/21/20 12:58	08/24/20 14:14	1
Diethyl phthalate	ND		4.8	1.5	ug/L		08/21/20 12:58	08/24/20 14:14	1
Dimethyl phthalate	ND		4.8	1.4	ug/L		08/21/20 12:58	08/24/20 14:14	1
Di-n-butyl phthalate	ND		4.8	1.4	ug/L		08/21/20 12:58	08/24/20 14:14	1
Di-n-octyl phthalate	ND		4.8	1.4	ug/L		08/21/20 12:58	08/24/20 14:14	1
Fluoranthene	ND		0.19	0.042	ug/L		08/21/20 12:58	08/24/20 14:14	1
Fluorene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:14	1
Hexachlorobenzene	ND		0.19	0.049	ug/L		08/21/20 12:58	08/24/20 14:14	1
Hexachlorobutadiene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:14	1
Hexachlorocyclopentadiene	ND		0.19	0.034	ug/L		08/21/20 12:58	08/24/20 14:14	1
Hexachloroethane	ND		0.19	0.051	ug/L		08/21/20 12:58	08/24/20 14:14	1
Indeno[1,2,3-cd]pyrene	ND		0.19	0.042	ug/L		08/21/20 12:58	08/24/20 14:14	1
Isophorone	ND		1.9	0.052	ug/L		08/21/20 12:58	08/24/20 14:14	1
Naphthalene	ND		0.19	0.048	ug/L		08/21/20 12:58	08/24/20 14:14	1
Nitrobenzene	ND		0.19	0.063	ug/L		08/21/20 12:58	08/24/20 14:14	1
N-Nitrosodimethylamine	ND	*	0.19	0.18	ug/L		08/21/20 12:58	08/24/20 14:14	1
N-Nitrosodi-n-propylamine	ND		0.19	0.033	ug/L		08/21/20 12:58	08/24/20 14:14	1
N-Nitrosodiphenylamine	ND		0.19	0.045	ug/L		08/21/20 12:58	08/24/20 14:14	1
Pentachlorophenol	ND		4.8	0.72	ug/L		08/21/20 12:58	08/24/20 14:14	1
Phenanthrene	ND		0.19	0.049	ug/L		08/21/20 12:58	08/24/20 14:14	1
Phenol	ND		0.19	0.031	ug/L		08/21/20 12:58	08/24/20 14:14	1
Pyrene	ND		0.19	0.047	ug/L		08/21/20 12:58	08/24/20 14:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*106*		*53 - 117*	*08/21/20 12:58*	*08/24/20 14:14*	*1*
2-Fluorophenol (Surr)	*59*		*21 - 80*	*08/21/20 12:58*	*08/24/20 14:14*	*1*
Nitrobenzene-d5 (Surr)	*84*		*43 - 114*	*08/21/20 12:58*	*08/24/20 14:14*	*1*
Phenol-d6 (Surr)	*41*		*3 - 63*	*08/21/20 12:58*	*08/24/20 14:14*	*1*

Method: 8015B - Gasoline Range Organics - (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	ND		50	25	ug/L			08/22/20 00:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*97*		*65 - 140*		*08/22/20 00:31*	*1*

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Client Sample ID: MW-02A

Date Collected: 08/19/20 08:58
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-1

Matrix: Water

Method: 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cr (VI)	ND		2.0	0.25	ug/L			08/19/20 23:00	1

Method: 6020 - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:49	1
Arsenic	**0.55**	**J**	1.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:49	1
Barium	**96**		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:49	1
Beryllium	ND		0.50	0.25	ug/L		08/26/20 12:00	08/26/20 17:49	1
Cadmium	**0.52**	**J**	1.0	0.25	ug/L		08/26/20 12:00	08/26/20 17:49	1
Chromium	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:49	1
Cobalt	**2.2**		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:49	1
Copper	**1.3**	**J**	2.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:49	1
Lead	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:49	1
Molybdenum	**8.4**		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:49	1
Nickel	**0.68**	**J**	2.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:49	1
Selenium	**0.77**	**J**	2.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:49	1
Silver	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:49	1
Thallium	ND		1.0	0.20	ug/L		08/26/20 12:00	08/26/20 17:49	1
Vanadium	**6.2**		2.0	1.0	ug/L		08/26/20 12:00	08/26/20 17:49	1
Zinc	ND		20	2.5	ug/L		08/26/20 12:00	08/26/20 17:49	1

Method: 6020 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	**0.57**	**J**	2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:45	1
Arsenic	**0.51**	**J**	1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:45	1
Barium	**92**		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:45	1
Beryllium	ND		0.50	0.25	ug/L		08/26/20 11:58	08/26/20 16:45	1
Cadmium	**0.46**	**J**	1.0	0.25	ug/L		08/26/20 11:58	08/26/20 16:45	1
Chromium	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:45	1
Cobalt	**2.6**		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:45	1
Copper	**1.4**	**J**	2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:45	1
Lead	ND		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:45	1
Molybdenum	**8.4**		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:45	1
Nickel	**0.75**	**J**	2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:45	1
Selenium	**0.67**	**J**	2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:45	1
Silver	ND		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:45	1
Thallium	ND		1.0	0.20	ug/L		08/26/20 11:58	08/26/20 16:45	1
Vanadium	**6.2**		2.0	1.0	ug/L		08/26/20 11:58	08/26/20 16:45	1
Zinc	ND		20	2.5	ug/L		08/26/20 11:58	08/26/20 16:45	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/20/20 14:14	08/21/20 11:23	1

Method: 7470A - Mercury (CVAA) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/20/20 14:17	08/21/20 15:39	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Sulfide	ND	F1	50	27	ug/L			08/25/20 16:53	1

Client Sample ID: MW-02A

Date Collected: 08/19/20 08:58
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-1
Matrix: Water

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.4	HF	0.1	0.1	SU			08/24/20 13:06	1

Client Sample ID: MW-02B

Date Collected: 08/19/20 09:18
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-2
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/21/20 02:08	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/21/20 02:08	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/21/20 02:08	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/21/20 02:08	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/21/20 02:08	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Benzene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Bromobenzene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Bromoform	ND		1.0	0.40	ug/L			08/21/20 02:08	1
Bromomethane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Chloroethane	ND		1.0	0.40	ug/L			08/21/20 02:08	1
Chloroform	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Chloromethane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Dibromochloromethane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Dibromomethane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/21/20 02:08	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/21/20 02:08	1

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Client Sample ID: MW-02B
Date Collected: 08/19/20 09:18
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-2
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Methylene Chloride	ND		1.0	0.88	ug/L			08/21/20 02:08	1
Naphthalene	ND		1.0	0.40	ug/L			08/21/20 02:08	1
n-Butylbenzene	ND		1.0	0.40	ug/L			08/21/20 02:08	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
o-Xylene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Styrene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Toluene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Trichloroethene	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/21/20 02:08	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/21/20 02:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*99*		*80 - 120*		*08/21/20 02:08*	*1*
Dibromofluoromethane (Surr)	*101*		*76 - 132*		*08/21/20 02:08*	*1*
Toluene-d8 (Surr)	*104*		*80 - 128*		*08/21/20 02:08*	*1*

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,4-Trichlorobenzene	ND		0.19	0.056	ug/L		08/21/20 12:58	08/24/20 14:32	1
1,2-Dichlorobenzene	ND		0.19	0.043	ug/L		08/21/20 12:58	08/24/20 14:32	1
1,3-Dichlorobenzene	ND		0.19	0.042	ug/L		08/21/20 12:58	08/24/20 14:32	1
1,4-Dichlorobenzene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:32	1
2,4,5-Trichlorophenol	ND		4.8	1.4	ug/L		08/21/20 12:58	08/24/20 14:32	1
2,4,6-Trichlorophenol	ND		4.8	1.3	ug/L		08/21/20 12:58	08/24/20 14:32	1
2,4-Dichlorophenol	ND		4.8	1.8	ug/L		08/21/20 12:58	08/24/20 14:32	1
2,4-Dimethylphenol	ND		0.19	0.032	ug/L		08/21/20 12:58	08/24/20 14:32	1
2,4-Dinitrophenol	ND		4.8	0.96	ug/L		08/21/20 12:58	08/24/20 14:32	1
2,4-Dinitrotoluene	ND		0.19	0.028	ug/L		08/21/20 12:58	08/24/20 14:32	1
2,6-Dinitrotoluene	ND		0.19	0.036	ug/L		08/21/20 12:58	08/24/20 14:32	1
2-Chloronaphthalene	ND		0.19	0.054	ug/L		08/21/20 12:58	08/24/20 14:32	1
2-Chlorophenol	ND		0.19	0.045	ug/L		08/21/20 12:58	08/24/20 14:32	1
2-Methylnaphthalene	ND		0.19	0.039	ug/L		08/21/20 12:58	08/24/20 14:32	1
2-Methylphenol	ND		4.8	1.5	ug/L		08/21/20 12:58	08/24/20 14:32	1
2-Nitroaniline	ND		4.8	1.2	ug/L		08/21/20 12:58	08/24/20 14:32	1
2-Nitrophenol	ND		4.8	1.8	ug/L		08/21/20 12:58	08/24/20 14:32	1
3,3'-Dichlorobenzidine	ND		4.8	1.2	ug/L		08/21/20 12:58	08/24/20 14:32	1
3-Nitroaniline	ND		4.8	1.2	ug/L		08/21/20 12:58	08/24/20 14:32	1
4,6-Dinitro-2-methylphenol	ND		4.8	0.84	ug/L		08/21/20 12:58	08/24/20 14:32	1
4-Bromophenyl phenyl ether	ND		0.19	0.043	ug/L		08/21/20 12:58	08/24/20 14:32	1
4-Chloro-3-methylphenol	ND		4.8	1.8	ug/L		08/21/20 12:58	08/24/20 14:32	1
4-Chloroaniline	ND	*	4.8	1.6	ug/L		08/21/20 12:58	08/24/20 14:32	1
4-Chlorophenyl phenyl ether	ND		0.19	0.047	ug/L		08/21/20 12:58	08/24/20 14:32	1
4-Nitroaniline	ND		4.8	1.5	ug/L		08/21/20 12:58	08/24/20 14:32	1

Client Sample ID: MW-02B

Date Collected: 08/19/20 09:18
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-2

Matrix: Water

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4-Nitrophenol	ND		4.8	0.90	ug/L		08/21/20 12:58	08/24/20 14:32	1
Acenaphthene	ND		0.19	0.061	ug/L		08/21/20 12:58	08/24/20 14:32	1
Acenaphthylene	ND		0.19	0.051	ug/L		08/21/20 12:58	08/24/20 14:32	1
Aniline	ND	*	0.19	0.020	ug/L		08/21/20 12:58	08/24/20 14:32	1
Anthracene	ND		0.19	0.041	ug/L		08/21/20 12:58	08/24/20 14:32	1
Azobenzene	ND		0.19	0.044	ug/L		08/21/20 12:58	08/24/20 14:32	1
Benzidine	ND		4.8	0.72	ug/L		08/21/20 12:58	08/24/20 14:32	1
Benzo[a]anthracene	ND		0.19	0.047	ug/L		08/21/20 12:58	08/24/20 14:32	1
Benzo[a]pyrene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:32	1
Benzo[b]fluoranthene	ND		0.19	0.041	ug/L		08/21/20 12:58	08/24/20 14:32	1
Benzo[g,h,i]perylene	ND		0.19	0.040	ug/L		08/21/20 12:58	08/24/20 14:32	1
Benzo[k]fluoranthene	ND		0.19	0.040	ug/L		08/21/20 12:58	08/24/20 14:32	1
Benzoic acid	**1.0**	**J**	4.8	0.53	ug/L		08/21/20 12:58	08/24/20 14:32	1
Benzyl alcohol	ND		0.19	0.036	ug/L		08/21/20 12:58	08/24/20 14:32	1
bis (2-chloroisopropyl) ether	ND		0.19	0.040	ug/L		08/21/20 12:58	08/24/20 14:32	1
Bis(2-chloroethoxy)methane	ND		0.19	0.058	ug/L		08/21/20 12:58	08/24/20 14:32	1
Bis(2-chloroethyl)ether	ND		0.19	0.037	ug/L		08/21/20 12:58	08/24/20 14:32	1
Bis(2-ethylhexyl) phthalate	**4.3**	**J**	4.8	3.2	ug/L		08/21/20 12:58	08/24/20 14:32	1
Butyl benzyl phthalate	ND		4.8	2.0	ug/L		08/21/20 12:58	08/24/20 14:32	1
Chrysene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:32	1
Dibenz(a,h)anthracene	ND		0.19	0.035	ug/L		08/21/20 12:58	08/24/20 14:32	1
Dibenzofuran	ND		0.19	0.046	ug/L		08/21/20 12:58	08/24/20 14:32	1
Diethyl phthalate	ND		4.8	1.5	ug/L		08/21/20 12:58	08/24/20 14:32	1
Dimethyl phthalate	ND		4.8	1.4	ug/L		08/21/20 12:58	08/24/20 14:32	1
Di-n-butyl phthalate	ND		4.8	1.4	ug/L		08/21/20 12:58	08/24/20 14:32	1
Di-n-octyl phthalate	**3.6**	**J**	4.8	1.4	ug/L		08/21/20 12:58	08/24/20 14:32	1
Fluoranthene	ND		0.19	0.042	ug/L		08/21/20 12:58	08/24/20 14:32	1
Fluorene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:32	1
Hexachlorobenzene	ND		0.19	0.049	ug/L		08/21/20 12:58	08/24/20 14:32	1
Hexachlorobutadiene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:32	1
Hexachlorocyclopentadiene	ND		0.19	0.034	ug/L		08/21/20 12:58	08/24/20 14:32	1
Hexachloroethane	ND		0.19	0.051	ug/L		08/21/20 12:58	08/24/20 14:32	1
Indeno[1,2,3-cd]pyrene	ND		0.19	0.042	ug/L		08/21/20 12:58	08/24/20 14:32	1
Isophorone	ND		1.9	0.052	ug/L		08/21/20 12:58	08/24/20 14:32	1
Naphthalene	ND		0.19	0.048	ug/L		08/21/20 12:58	08/24/20 14:32	1
Nitrobenzene	ND		0.19	0.063	ug/L		08/21/20 12:58	08/24/20 14:32	1
N-Nitrosodimethylamine	ND	*	0.19	0.18	ug/L		08/21/20 12:58	08/24/20 14:32	1
N-Nitrosodi-n-propylamine	ND		0.19	0.033	ug/L		08/21/20 12:58	08/24/20 14:32	1
N-Nitrosodiphenylamine	ND		0.19	0.045	ug/L		08/21/20 12:58	08/24/20 14:32	1
Pentachlorophenol	ND		4.8	0.72	ug/L		08/21/20 12:58	08/24/20 14:32	1
Phenanthrene	ND		0.19	0.049	ug/L		08/21/20 12:58	08/24/20 14:32	1
Phenol	ND		0.19	0.031	ug/L		08/21/20 12:58	08/24/20 14:32	1
Pyrene	ND		0.19	0.047	ug/L		08/21/20 12:58	08/24/20 14:32	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*89*		*53 - 117*	*08/21/20 12:58*	*08/24/20 14:32*	*1*
2-Fluorophenol (Surr)	*56*		*21 - 80*	*08/21/20 12:58*	*08/24/20 14:32*	*1*
Nitrobenzene-d5 (Surr)	*83*		*43 - 114*	*08/21/20 12:58*	*08/24/20 14:32*	*1*
Phenol-d6 (Surr)	*37*		*3 - 63*	*08/21/20 12:58*	*08/24/20 14:32*	*1*

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Client Sample ID: MW-02B

Date Collected: 08/19/20 09:18
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-2

Matrix: Water

Method: 8015B - Gasoline Range Organics - (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	ND		50	25	ug/L			08/22/20 01:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*98*		*65 - 140*		*08/22/20 01:00*	*1*

Method: 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cr (VI)	ND		2.0	0.25	ug/L			08/19/20 23:13	1

Method: 6020 - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	**0.61**	**J**	2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:01	1
Arsenic	**0.95**	**J**	1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:01	1
Barium	**41**		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:01	1
Beryllium	ND		0.50	0.25	ug/L		08/26/20 12:00	08/26/20 18:01	1
Cadmium	ND		1.0	0.25	ug/L		08/26/20 12:00	08/26/20 18:01	1
Chromium	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:01	1
Cobalt	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:01	1
Copper	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:01	1
Lead	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:01	1
Molybdenum	**7.0**		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:01	1
Nickel	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:01	1
Selenium	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:01	1
Silver	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:01	1
Thallium	ND		1.0	0.20	ug/L		08/26/20 12:00	08/26/20 18:01	1
Vanadium	ND		2.0	1.0	ug/L		08/26/20 12:00	08/26/20 18:01	1
Zinc	**26**		20	2.5	ug/L		08/26/20 12:00	08/26/20 18:01	1

Method: 6020 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	**0.79**	**J**	2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:57	1
Arsenic	**0.95**	**J**	1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:57	1
Barium	**43**		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:57	1
Beryllium	ND		0.50	0.25	ug/L		08/26/20 11:58	08/26/20 16:57	1
Cadmium	ND		1.0	0.25	ug/L		08/26/20 11:58	08/26/20 16:57	1
Chromium	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:57	1
Cobalt	**0.91**	**J**	1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:57	1
Copper	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:57	1
Lead	ND		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:57	1
Molybdenum	**7.1**		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:57	1
Nickel	**11**		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:57	1
Selenium	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:57	1
Silver	ND		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:57	1
Thallium	ND		1.0	0.20	ug/L		08/26/20 11:58	08/26/20 16:57	1
Vanadium	ND		2.0	1.0	ug/L		08/26/20 11:58	08/26/20 16:57	1
Zinc	ND		20	2.5	ug/L		08/26/20 11:58	08/26/20 16:57	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/20/20 14:14	08/21/20 11:29	1

Client Sample ID: MW-02B

Date Collected: 08/19/20 09:18
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-2

Matrix: Water

Method: 7470A - Mercury (CVAA) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/20/20 14:17	08/21/20 15:51	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Sulfide	ND		50	27	ug/L			08/25/20 16:53	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH	**7.6**	**HF**	0.1	0.1	SU			08/24/20 13:06	1

Client Sample ID: MW-04A

Date Collected: 08/19/20 08:11
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-3

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/21/20 02:37	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/21/20 02:37	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/21/20 02:37	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/21/20 02:37	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/21/20 02:37	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Benzene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Bromobenzene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Bromoform	ND		1.0	0.40	ug/L			08/21/20 02:37	1
Bromomethane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Chloroethane	ND		1.0	0.40	ug/L			08/21/20 02:37	1
Chloroform	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Chloromethane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 02:37	1

Client Sample ID: MW-04A

Date Collected: 08/19/20 08:11
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-3

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibromochloromethane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Dibromomethane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/21/20 02:37	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/21/20 02:37	1
Methylene Chloride	ND		1.0	0.88	ug/L			08/21/20 02:37	1
Naphthalene	ND		1.0	0.40	ug/L			08/21/20 02:37	1
n-Butylbenzene	ND		1.0	0.40	ug/L			08/21/20 02:37	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
o-Xylene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Styrene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Toluene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Trichloroethene	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/21/20 02:37	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/21/20 02:37	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*99*		*80 - 120*		*08/21/20 02:37*	*1*
Dibromofluoromethane (Surr)	*101*		*76 - 132*		*08/21/20 02:37*	*1*
Toluene-d8 (Surr)	*103*		*80 - 128*		*08/21/20 02:37*	*1*

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,4-Trichlorobenzene	ND		0.19	0.056	ug/L		08/21/20 12:58	08/24/20 14:51	1
1,2-Dichlorobenzene	ND		0.19	0.043	ug/L		08/21/20 12:58	08/24/20 14:51	1
1,3-Dichlorobenzene	ND		0.19	0.042	ug/L		08/21/20 12:58	08/24/20 14:51	1
1,4-Dichlorobenzene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:51	1
2,4,5-Trichlorophenol	ND		4.8	1.4	ug/L		08/21/20 12:58	08/24/20 14:51	1
2,4,6-Trichlorophenol	ND		4.8	1.3	ug/L		08/21/20 12:58	08/24/20 14:51	1
2,4-Dichlorophenol	ND		4.8	1.8	ug/L		08/21/20 12:58	08/24/20 14:51	1
2,4-Dimethylphenol	ND		0.19	0.032	ug/L		08/21/20 12:58	08/24/20 14:51	1
2,4-Dinitrophenol	ND		4.8	0.96	ug/L		08/21/20 12:58	08/24/20 14:51	1
2,4-Dinitrotoluene	ND		0.19	0.028	ug/L		08/21/20 12:58	08/24/20 14:51	1
2,6-Dinitrotoluene	ND		0.19	0.036	ug/L		08/21/20 12:58	08/24/20 14:51	1
2-Chloronaphthalene	ND		0.19	0.054	ug/L		08/21/20 12:58	08/24/20 14:51	1
2-Chlorophenol	ND		0.19	0.045	ug/L		08/21/20 12:58	08/24/20 14:51	1
2-Methylnaphthalene	ND		0.19	0.039	ug/L		08/21/20 12:58	08/24/20 14:51	1
2-Methylphenol	ND		4.8	1.5	ug/L		08/21/20 12:58	08/24/20 14:51	1
2-Nitroaniline	ND		4.8	1.2	ug/L		08/21/20 12:58	08/24/20 14:51	1
2-Nitrophenol	ND		4.8	1.8	ug/L		08/21/20 12:58	08/24/20 14:51	1
3,3'-Dichlorobenzidine	ND		4.8	1.2	ug/L		08/21/20 12:58	08/24/20 14:51	1

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Client Sample ID: MW-04A
Date Collected: 08/19/20 08:11
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-3
Matrix: Water

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
3-Nitroaniline	ND		4.8	1.2	ug/L		08/21/20 12:58	08/24/20 14:51	1
4,6-Dinitro-2-methylphenol	ND		4.8	0.84	ug/L		08/21/20 12:58	08/24/20 14:51	1
4-Bromophenyl phenyl ether	ND		0.19	0.043	ug/L		08/21/20 12:58	08/24/20 14:51	1
4-Chloro-3-methylphenol	ND		4.8	1.8	ug/L		08/21/20 12:58	08/24/20 14:51	1
4-Chloroaniline	ND	*	4.8	1.6	ug/L		08/21/20 12:58	08/24/20 14:51	1
4-Chlorophenyl phenyl ether	ND		0.19	0.047	ug/L		08/21/20 12:58	08/24/20 14:51	1
4-Nitroaniline	ND		4.8	1.5	ug/L		08/21/20 12:58	08/24/20 14:51	1
4-Nitrophenol	ND		4.8	0.90	ug/L		08/21/20 12:58	08/24/20 14:51	1
Acenaphthene	ND		0.19	0.061	ug/L		08/21/20 12:58	08/24/20 14:51	1
Acenaphthylene	ND		0.19	0.051	ug/L		08/21/20 12:58	08/24/20 14:51	1
Aniline	ND	*	0.19	0.020	ug/L		08/21/20 12:58	08/24/20 14:51	1
Anthracene	ND		0.19	0.041	ug/L		08/21/20 12:58	08/24/20 14:51	1
Azobenzene	ND		0.19	0.044	ug/L		08/21/20 12:58	08/24/20 14:51	1
Benzidine	ND		4.8	0.72	ug/L		08/21/20 12:58	08/24/20 14:51	1
Benzo[a]anthracene	ND		0.19	0.047	ug/L		08/21/20 12:58	08/24/20 14:51	1
Benzo[a]pyrene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:51	1
Benzo[b]fluoranthene	ND		0.19	0.041	ug/L		08/21/20 12:58	08/24/20 14:51	1
Benzo[g,h,i]perylene	ND		0.19	0.040	ug/L		08/21/20 12:58	08/24/20 14:51	1
Benzo[k]fluoranthene	ND		0.19	0.040	ug/L		08/21/20 12:58	08/24/20 14:51	1
Benzoic acid	**1.2**	**J**	4.8	0.53	ug/L		08/21/20 12:58	08/24/20 14:51	1
Benzyl alcohol	ND		0.19	0.036	ug/L		08/21/20 12:58	08/24/20 14:51	1
bis (2-chloroisopropyl) ether	ND		0.19	0.040	ug/L		08/21/20 12:58	08/24/20 14:51	1
Bis(2-chloroethoxy)methane	ND		0.19	0.058	ug/L		08/21/20 12:58	08/24/20 14:51	1
Bis(2-chloroethyl)ether	ND		0.19	0.037	ug/L		08/21/20 12:58	08/24/20 14:51	1
Bis(2-ethylhexyl) phthalate	ND		4.8	3.2	ug/L		08/21/20 12:58	08/24/20 14:51	1
Butyl benzyl phthalate	ND		4.8	2.0	ug/L		08/21/20 12:58	08/24/20 14:51	1
Chrysene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:51	1
Dibenz(a,h)anthracene	ND		0.19	0.035	ug/L		08/21/20 12:58	08/24/20 14:51	1
Dibenzofuran	ND		0.19	0.046	ug/L		08/21/20 12:58	08/24/20 14:51	1
Diethyl phthalate	ND		4.8	1.5	ug/L		08/21/20 12:58	08/24/20 14:51	1
Dimethyl phthalate	ND		4.8	1.4	ug/L		08/21/20 12:58	08/24/20 14:51	1
Di-n-butyl phthalate	ND		4.8	1.4	ug/L		08/21/20 12:58	08/24/20 14:51	1
Di-n-octyl phthalate	ND		4.8	1.4	ug/L		08/21/20 12:58	08/24/20 14:51	1
Fluoranthene	ND		0.19	0.042	ug/L		08/21/20 12:58	08/24/20 14:51	1
Fluorene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:51	1
Hexachlorobenzene	ND		0.19	0.049	ug/L		08/21/20 12:58	08/24/20 14:51	1
Hexachlorobutadiene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 14:51	1
Hexachlorocyclopentadiene	ND		0.19	0.034	ug/L		08/21/20 12:58	08/24/20 14:51	1
Hexachloroethane	ND		0.19	0.051	ug/L		08/21/20 12:58	08/24/20 14:51	1
Indeno[1,2,3-cd]pyrene	ND		0.19	0.042	ug/L		08/21/20 12:58	08/24/20 14:51	1
Isophorone	ND		1.9	0.052	ug/L		08/21/20 12:58	08/24/20 14:51	1
Naphthalene	ND		0.19	0.048	ug/L		08/21/20 12:58	08/24/20 14:51	1
Nitrobenzene	ND		0.19	0.063	ug/L		08/21/20 12:58	08/24/20 14:51	1
N-Nitrosodimethylamine	ND	*	0.19	0.18	ug/L		08/21/20 12:58	08/24/20 14:51	1
N-Nitrosodi-n-propylamine	ND		0.19	0.033	ug/L		08/21/20 12:58	08/24/20 14:51	1
N-Nitrosodiphenylamine	ND		0.19	0.045	ug/L		08/21/20 12:58	08/24/20 14:51	1
Pentachlorophenol	ND		4.8	0.72	ug/L		08/21/20 12:58	08/24/20 14:51	1
Phenanthrene	ND		0.19	0.049	ug/L		08/21/20 12:58	08/24/20 14:51	1
Phenol	ND		0.19	0.031	ug/L		08/21/20 12:58	08/24/20 14:51	1

Client Sample ID: MW-04A

Date Collected: 08/19/20 08:11
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-3

Matrix: Water

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Pyrene	ND		0.19	0.047	ug/L		08/21/20 12:58	08/24/20 14:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*102*		*53 - 117*	*08/21/20 12:58*	*08/24/20 14:51*	*1*
2-Fluorophenol (Surr)	*58*		*21 - 80*	*08/21/20 12:58*	*08/24/20 14:51*	*1*
Nitrobenzene-d5 (Surr)	*85*		*43 - 114*	*08/21/20 12:58*	*08/24/20 14:51*	*1*
Phenol-d6 (Surr)	*37*		*3 - 63*	*08/21/20 12:58*	*08/24/20 14:51*	*1*

Method: 8015B - Gasoline Range Organics - (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	ND		50	25	ug/L			08/22/20 01:30	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*101*		*65 - 140*		*08/22/20 01:30*	*1*

Method: 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cr (VI)	**0.27**	**J**	2.0	0.25	ug/L			08/19/20 22:08	1

Method: 6020 - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:03	1
Arsenic	**0.79**	**J**	1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:03	1
Barium	**23**		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:03	1
Beryllium	ND		0.50	0.25	ug/L		08/26/20 12:00	08/26/20 18:03	1
Cadmium	**0.36**	**J**	1.0	0.25	ug/L		08/26/20 12:00	08/26/20 18:03	1
Chromium	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:03	1
Cobalt	**0.56**	**J**	1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:03	1
Copper	**0.71**	**J**	2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:03	1
Lead	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:03	1
Molybdenum	**5.8**		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:03	1
Nickel	**2.2**		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:03	1
Selenium	**0.68**	**J**	2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:03	1
Silver	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:03	1
Thallium	ND		1.0	0.20	ug/L		08/26/20 12:00	08/26/20 18:03	1
Vanadium	**11**		2.0	1.0	ug/L		08/26/20 12:00	08/26/20 18:03	1
Zinc	ND		20	2.5	ug/L		08/26/20 12:00	08/26/20 18:03	1

Method: 6020 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	**0.55**	**J**	2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:59	1
Arsenic	**0.80**	**J**	1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:59	1
Barium	**23**		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:59	1
Beryllium	ND		0.50	0.25	ug/L		08/26/20 11:58	08/26/20 16:59	1
Cadmium	**0.34**	**J**	1.0	0.25	ug/L		08/26/20 11:58	08/26/20 16:59	1
Chromium	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:59	1
Cobalt	**1.7**		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:59	1
Copper	**0.85**	**J**	2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:59	1
Lead	ND		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:59	1
Molybdenum	**5.7**		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:59	1
Nickel	**2.4**		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:59	1

Client Sample ID: MW-04A

Lab Sample ID: 440-270581-3

Date Collected: 08/19/20 08:11

Matrix: Water

Date Received: 08/19/20 17:00

Method: 6020 - Metals (ICP/MS) - Dissolved (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Selenium	**0.61**	**J**	2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:59	1
Silver	ND		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:59	1
Thallium	ND		1.0	0.20	ug/L		08/26/20 11:58	08/26/20 16:59	1
Vanadium	**11**		2.0	1.0	ug/L		08/26/20 11:58	08/26/20 16:59	1
Zinc	ND		20	2.5	ug/L		08/26/20 11:58	08/26/20 16:59	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/20/20 14:14	08/21/20 11:32	1

Method: 7470A - Mercury (CVAA) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	**0.14**	**J**	0.20	0.10	ug/L		08/20/20 14:17	08/21/20 15:53	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Sulfide	ND		50	27	ug/L			08/25/20 16:53	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH	**7.3**	**HF**	0.1	0.1	SU			08/24/20 13:06	1

Client Sample ID: MW-04B

Lab Sample ID: 440-270581-4

Date Collected: 08/19/20 07:41

Matrix: Water

Date Received: 08/19/20 17:00

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/21/20 03:05	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/21/20 03:05	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/21/20 03:05	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/21/20 03:05	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/21/20 03:05	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Benzene	ND		0.50	0.25	ug/L			08/21/20 03:05	1

Client Sample ID: MW-04B
Date Collected: 08/19/20 07:41
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-4
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bromobenzene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Bromoform	ND		1.0	0.40	ug/L			08/21/20 03:05	1
Bromomethane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Chloroethane	ND		1.0	0.40	ug/L			08/21/20 03:05	1
Chloroform	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Chloromethane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Dibromochloromethane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Dibromomethane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/21/20 03:05	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/21/20 03:05	1
Methylene Chloride	ND		1.0	0.88	ug/L			08/21/20 03:05	1
Naphthalene	ND		1.0	0.40	ug/L			08/21/20 03:05	1
n-Butylbenzene	ND		1.0	0.40	ug/L			08/21/20 03:05	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
o-Xylene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Styrene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Toluene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Trichloroethene	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/21/20 03:05	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/21/20 03:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*100*		*80 - 120*		*08/21/20 03:05*	*1*
Dibromofluoromethane (Surr)	*100*		*76 - 132*		*08/21/20 03:05*	*1*
Toluene-d8 (Surr)	*105*		*80 - 128*		*08/21/20 03:05*	*1*

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,4-Trichlorobenzene	ND		0.19	0.056	ug/L		08/21/20 12:58	08/24/20 15:10	1
1,2-Dichlorobenzene	ND		0.19	0.043	ug/L		08/21/20 12:58	08/24/20 15:10	1
1,3-Dichlorobenzene	ND		0.19	0.042	ug/L		08/21/20 12:58	08/24/20 15:10	1
1,4-Dichlorobenzene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 15:10	1
2,4,5-Trichlorophenol	ND		4.7	1.4	ug/L		08/21/20 12:58	08/24/20 15:10	1
2,4,6-Trichlorophenol	ND		4.7	1.3	ug/L		08/21/20 12:58	08/24/20 15:10	1

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Client Sample ID: MW-04B
Date Collected: 08/19/20 07:41
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-4
Matrix: Water

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-Dichlorophenol	ND		4.7	1.8	ug/L		08/21/20 12:58	08/24/20 15:10	1
2,4-Dimethylphenol	ND		0.19	0.032	ug/L		08/21/20 12:58	08/24/20 15:10	1
2,4-Dinitrophenol	ND		4.7	0.96	ug/L		08/21/20 12:58	08/24/20 15:10	1
2,4-Dinitrotoluene	ND		0.19	0.028	ug/L		08/21/20 12:58	08/24/20 15:10	1
2,6-Dinitrotoluene	ND		0.19	0.036	ug/L		08/21/20 12:58	08/24/20 15:10	1
2-Chloronaphthalene	ND		0.19	0.054	ug/L		08/21/20 12:58	08/24/20 15:10	1
2-Chlorophenol	ND		0.19	0.045	ug/L		08/21/20 12:58	08/24/20 15:10	1
2-Methylnaphthalene	ND		0.19	0.039	ug/L		08/21/20 12:58	08/24/20 15:10	1
2-Methylphenol	ND		4.7	1.5	ug/L		08/21/20 12:58	08/24/20 15:10	1
2-Nitroaniline	ND		4.7	1.2	ug/L		08/21/20 12:58	08/24/20 15:10	1
2-Nitrophenol	ND		4.7	1.8	ug/L		08/21/20 12:58	08/24/20 15:10	1
3,3'-Dichlorobenzidine	ND		4.7	1.2	ug/L		08/21/20 12:58	08/24/20 15:10	1
3-Nitroaniline	ND		4.7	1.2	ug/L		08/21/20 12:58	08/24/20 15:10	1
4,6-Dinitro-2-methylphenol	ND		4.7	0.84	ug/L		08/21/20 12:58	08/24/20 15:10	1
4-Bromophenyl phenyl ether	ND		0.19	0.043	ug/L		08/21/20 12:58	08/24/20 15:10	1
4-Chloro-3-methylphenol	ND		4.7	1.8	ug/L		08/21/20 12:58	08/24/20 15:10	1
4-Chloroaniline	ND	*	4.7	1.6	ug/L		08/21/20 12:58	08/24/20 15:10	1
4-Chlorophenyl phenyl ether	ND		0.19	0.046	ug/L		08/21/20 12:58	08/24/20 15:10	1
4-Nitroaniline	ND		4.7	1.5	ug/L		08/21/20 12:58	08/24/20 15:10	1
4-Nitrophenol	ND		4.7	0.90	ug/L		08/21/20 12:58	08/24/20 15:10	1
Acenaphthene	ND		0.19	0.061	ug/L		08/21/20 12:58	08/24/20 15:10	1
Acenaphthylene	ND		0.19	0.051	ug/L		08/21/20 12:58	08/24/20 15:10	1
Aniline	ND	*	0.19	0.020	ug/L		08/21/20 12:58	08/24/20 15:10	1
Anthracene	ND		0.19	0.041	ug/L		08/21/20 12:58	08/24/20 15:10	1
Azobenzene	ND		0.19	0.044	ug/L		08/21/20 12:58	08/24/20 15:10	1
Benzidine	ND		4.7	0.72	ug/L		08/21/20 12:58	08/24/20 15:10	1
Benzo[a]anthracene	ND		0.19	0.047	ug/L		08/21/20 12:58	08/24/20 15:10	1
Benzo[a]pyrene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 15:10	1
Benzo[b]fluoranthene	ND		0.19	0.041	ug/L		08/21/20 12:58	08/24/20 15:10	1
Benzo[g,h,i]perylene	ND		0.19	0.040	ug/L		08/21/20 12:58	08/24/20 15:10	1
Benzo[k]fluoranthene	ND		0.19	0.040	ug/L		08/21/20 12:58	08/24/20 15:10	1
Benzoic acid	**0.99**	**J**	4.7	0.53	ug/L		08/21/20 12:58	08/24/20 15:10	1
Benzyl alcohol	ND		0.19	0.036	ug/L		08/21/20 12:58	08/24/20 15:10	1
bis (2-chloroisopropyl) ether	ND		0.19	0.040	ug/L		08/21/20 12:58	08/24/20 15:10	1
Bis(2-chloroethoxy)methane	ND		0.19	0.058	ug/L		08/21/20 12:58	08/24/20 15:10	1
Bis(2-chloroethyl)ether	ND		0.19	0.037	ug/L		08/21/20 12:58	08/24/20 15:10	1
Bis(2-ethylhexyl) phthalate	ND		4.7	3.2	ug/L		08/21/20 12:58	08/24/20 15:10	1
Butyl benzyl phthalate	ND		4.7	1.9	ug/L		08/21/20 12:58	08/24/20 15:10	1
Chrysene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 15:10	1
Dibenz(a,h)anthracene	ND		0.19	0.035	ug/L		08/21/20 12:58	08/24/20 15:10	1
Dibenzofuran	ND		0.19	0.046	ug/L		08/21/20 12:58	08/24/20 15:10	1
Diethyl phthalate	ND		4.7	1.5	ug/L		08/21/20 12:58	08/24/20 15:10	1
Dimethyl phthalate	ND		4.7	1.4	ug/L		08/21/20 12:58	08/24/20 15:10	1
Di-n-butyl phthalate	ND		4.7	1.4	ug/L		08/21/20 12:58	08/24/20 15:10	1
Di-n-octyl phthalate	ND		4.7	1.4	ug/L		08/21/20 12:58	08/24/20 15:10	1
Fluoranthene	ND		0.19	0.042	ug/L		08/21/20 12:58	08/24/20 15:10	1
Fluorene	ND		0.19	0.049	ug/L		08/21/20 12:58	08/24/20 15:10	1
Hexachlorobenzene	ND		0.19	0.049	ug/L		08/21/20 12:58	08/24/20 15:10	1
Hexachlorobutadiene	ND		0.19	0.050	ug/L		08/21/20 12:58	08/24/20 15:10	1

Client Sample ID: MW-04B

Date Collected: 08/19/20 07:41
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-4

Matrix: Water

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hexachlorocyclopentadiene	ND		0.19	0.034	ug/L		08/21/20 12:58	08/24/20 15:10	1
Hexachloroethane	ND		0.19	0.051	ug/L		08/21/20 12:58	08/24/20 15:10	1
Indeno[1,2,3-cd]pyrene	ND		0.19	0.042	ug/L		08/21/20 12:58	08/24/20 15:10	1
Isophorone	ND		1.9	0.052	ug/L		08/21/20 12:58	08/24/20 15:10	1
Naphthalene	ND		0.19	0.047	ug/L		08/21/20 12:58	08/24/20 15:10	1
Nitrobenzene	ND		0.19	0.063	ug/L		08/21/20 12:58	08/24/20 15:10	1
N-Nitrosodimethylamine	ND	*	0.19	0.18	ug/L		08/21/20 12:58	08/24/20 15:10	1
N-Nitrosodi-n-propylamine	ND		0.19	0.033	ug/L		08/21/20 12:58	08/24/20 15:10	1
N-Nitrosodiphenylamine	ND		0.19	0.045	ug/L		08/21/20 12:58	08/24/20 15:10	1
Pentachlorophenol	ND		4.7	0.72	ug/L		08/21/20 12:58	08/24/20 15:10	1
Phenanthrene	ND		0.19	0.049	ug/L		08/21/20 12:58	08/24/20 15:10	1
Phenol	ND		0.19	0.031	ug/L		08/21/20 12:58	08/24/20 15:10	1
Pyrene	ND		0.19	0.047	ug/L		08/21/20 12:58	08/24/20 15:10	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*97*		*53 - 117*	*08/21/20 12:58*	*08/24/20 15:10*	*1*
2-Fluorophenol (Surr)	*59*		*21 - 80*	*08/21/20 12:58*	*08/24/20 15:10*	*1*
Nitrobenzene-d5 (Surr)	*90*		*43 - 114*	*08/21/20 12:58*	*08/24/20 15:10*	*1*
Phenol-d6 (Surr)	*38*		*3 - 63*	*08/21/20 12:58*	*08/24/20 15:10*	*1*

Method: 8015B - Gasoline Range Organics - (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	ND		50	25	ug/L			08/22/20 01:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*98*		*65 - 140*		*08/22/20 01:59*	*1*

Method: 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cr (VI)	ND		2.0	0.25	ug/L			08/19/20 21:55	1

Method: 6020 - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:06	1
Arsenic	**3.2**		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:06	1
Barium	**53**		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:06	1
Beryllium	ND		0.50	0.25	ug/L		08/26/20 12:00	08/26/20 18:06	1
Cadmium	ND		1.0	0.25	ug/L		08/26/20 12:00	08/26/20 18:06	1
Chromium	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:06	1
Cobalt	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:06	1
Copper	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:06	1
Lead	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:06	1
Molybdenum	**3.1**		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:06	1
Nickel	**0.63**	**J**	2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:06	1
Selenium	**0.65**	**J**	2.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:06	1
Silver	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 18:06	1
Thallium	ND		1.0	0.20	ug/L		08/26/20 12:00	08/26/20 18:06	1
Vanadium	ND		2.0	1.0	ug/L		08/26/20 12:00	08/26/20 18:06	1
Zinc	**4.0**	**J**	20	2.5	ug/L		08/26/20 12:00	08/26/20 18:06	1

Client Sample ID: MW-04B

Date Collected: 08/19/20 07:41
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-4

Matrix: Water

Method: 6020 - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 17:02	1
Arsenic	**3.1**		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 17:02	1
Barium	**53**		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 17:02	1
Beryllium	ND		0.50	0.25	ug/L		08/26/20 11:58	08/26/20 17:02	1
Cadmium	ND		1.0	0.25	ug/L		08/26/20 11:58	08/26/20 17:02	1
Chromium	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 17:02	1
Cobalt	**0.71**	**J**	1.0	0.50	ug/L		08/26/20 11:58	08/26/20 17:02	1
Copper	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 17:02	1
Lead	ND		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 17:02	1
Molybdenum	**3.2**		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 17:02	1
Nickel	**0.56**	**J**	2.0	0.50	ug/L		08/26/20 11:58	08/26/20 17:02	1
Selenium	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 17:02	1
Silver	ND		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 17:02	1
Thallium	ND		1.0	0.20	ug/L		08/26/20 11:58	08/26/20 17:02	1
Vanadium	ND		2.0	1.0	ug/L		08/26/20 11:58	08/26/20 17:02	1
Zinc	ND		20	2.5	ug/L		08/26/20 11:58	08/26/20 17:02	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/20/20 14:14	08/21/20 11:34	1

Method: 7470A - Mercury (CVAA) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/20/20 14:17	08/21/20 15:55	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Sulfide	ND		50	27	ug/L			08/25/20 16:53	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH	**7.5**	**HF**	0.1	0.1	SU			08/24/20 13:06	1

Client Sample ID: RS-SUMP-2020819

Date Collected: 08/19/20 07:00
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-5

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/21/20 03:33	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/21/20 03:33	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/21/20 03:33	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/21/20 03:33	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/21/20 03:33	1

Client Sample ID: RS-SUMP-2020819
Date Collected: 08/19/20 07:00
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-5
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/21/20 03:33	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Benzene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Bromobenzene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Bromoform	ND		1.0	0.40	ug/L			08/21/20 03:33	1
Bromomethane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Chloroethane	ND		1.0	0.40	ug/L			08/21/20 03:33	1
Chloroform	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Chloromethane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Dibromochloromethane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Dibromomethane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/21/20 03:33	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/21/20 03:33	1
Methylene Chloride	ND		1.0	0.88	ug/L			08/21/20 03:33	1
Naphthalene	ND		1.0	0.40	ug/L			08/21/20 03:33	1
n-Butylbenzene	ND		1.0	0.40	ug/L			08/21/20 03:33	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
o-Xylene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Styrene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Toluene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Trichloroethene	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/21/20 03:33	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/21/20 03:33	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*102*		*80 - 120*		*08/21/20 03:33*	*1*

Client Sample ID: RS-SUMP-2020819

Lab Sample ID: 440-270581-5

Date Collected: 08/19/20 07:00

Matrix: Water

Date Received: 08/19/20 17:00

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dibromofluoromethane (Surr)	*100*		*76 - 132*		*08/21/20 03:33*	*1*
Toluene-d8 (Surr)	*104*		*80 - 128*		*08/21/20 03:33*	*1*

Method: 8015B - Gasoline Range Organics - (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	ND		50	25	ug/L			08/22/20 02:28	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*98*		*65 - 140*		*08/22/20 02:28*	*1*

Client Sample ID: TB-SUMP-2020819

Lab Sample ID: 440-270581-6

Date Collected: 08/19/20 00:01

Matrix: Water

Date Received: 08/19/20 17:00

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/21/20 04:03	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/21/20 04:03	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/21/20 04:03	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/21/20 04:03	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/21/20 04:03	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/21/20 04:03	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Benzene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Bromobenzene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Bromoform	ND		1.0	0.40	ug/L			08/21/20 04:03	1
Bromomethane	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Chloroethane	ND		1.0	0.40	ug/L			08/21/20 04:03	1
Chloroform	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Chloromethane	ND		0.50	0.25	ug/L			08/21/20 04:03	1

Client Sample ID: TB-SUMP-2020819

Lab Sample ID: 440-270581-6

Date Collected: 08/19/20 00:01

Matrix: Water

Date Received: 08/19/20 17:00

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Dibromochloromethane	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Dibromomethane	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/21/20 04:03	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/21/20 04:03	1
Methylene Chloride	ND		1.0	0.88	ug/L			08/21/20 04:03	1
Naphthalene	ND		1.0	0.40	ug/L			08/21/20 04:03	1
n-Butylbenzene	ND		1.0	0.40	ug/L			08/21/20 04:03	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
o-Xylene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Styrene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Toluene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Trichloroethene	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/21/20 04:03	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/21/20 04:03	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*100*		*80 - 120*		*08/21/20 04:03*	*1*
Dibromofluoromethane (Surr)	*99*		*76 - 132*		*08/21/20 04:03*	*1*
Toluene-d8 (Surr)	*105*		*80 - 128*		*08/21/20 04:03*	*1*

Method: 8015B - Gasoline Range Organics - (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	ND		50	25	ug/L			08/22/20 03:57	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*95*		*65 - 140*		*08/22/20 03:57*	*1*

Client Sample ID: FB-SUMP-2020819

Lab Sample ID: 440-270581-7

Date Collected: 08/19/20 07:50

Matrix: Water

Date Received: 08/19/20 17:00

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 04:31	1

Client Sample ID: FB-SUMP-2020819
Date Collected: 08/19/20 07:50
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-7
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/21/20 04:31	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/21/20 04:31	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/21/20 04:31	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/21/20 04:31	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/21/20 04:31	1
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/21/20 04:31	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Benzene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Bromobenzene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Bromoform	ND		1.0	0.40	ug/L			08/21/20 04:31	1
Bromomethane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Chloroethane	ND		1.0	0.40	ug/L			08/21/20 04:31	1
Chloroform	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Chloromethane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Dibromochloromethane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Dibromomethane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/21/20 04:31	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/21/20 04:31	1
Methylene Chloride	ND		1.0	0.88	ug/L			08/21/20 04:31	1
Naphthalene	ND		1.0	0.40	ug/L			08/21/20 04:31	1
n-Butylbenzene	ND		1.0	0.40	ug/L			08/21/20 04:31	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
o-Xylene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Styrene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Toluene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/21/20 04:31	1

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Client Sample ID: FB-SUMP-2020819
Date Collected: 08/19/20 07:50
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-7
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Trichloroethene	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/21/20 04:31	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/21/20 04:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*98*		*80 - 120*		*08/21/20 04:31*	*1*
Dibromofluoromethane (Surr)	*99*		*76 - 132*		*08/21/20 04:31*	*1*
Toluene-d8 (Surr)	*105*		*80 - 128*		*08/21/20 04:31*	*1*

Method: 8015B - Gasoline Range Organics - (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	ND		50	25	ug/L			08/22/20 04:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*96*		*65 - 140*		*08/22/20 04:26*	*1*

Surrogate Summary

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Water — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)		
		BFB	DBFM	TOL
Lab Sample ID	Client Sample ID	(80-120)	(76-132)	(80-128)
440-270581-1	MW-02A	100	101	104
440-270581-2	MW-02B	99	101	104
440-270581-3	MW-04A	99	101	103
440-270581-4	MW-04B	100	100	105
440-270581-5	RS-SUMP-2020819	102	100	104
440-270581-6	TB-SUMP-2020819	100	99	105
440-270581-7	FB-SUMP-2020819	98	99	105
LCS 440-621508/1002	Lab Control Sample	91	102	95
MB 440-621508/4	Method Blank	97	101	101

Surrogate Legend

BFB = 4-Bromofluorobenzene (Surr)
DBFM = Dibromofluoromethane (Surr)
TOL = Toluene-d8 (Surr)

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM)

Matrix: Water — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)			
		TBP	2FP	NBZ	PHL6
Lab Sample ID	Client Sample ID	(53-117)	(21-80)	(43-114)	(3-63)
440-270581-1	MW-02A	106	59	84	41
440-270581-2	MW-02B	89	56	83	37
440-270581-3	MW-04A	102	58	85	37
440-270581-4	MW-04B	97	59	90	38
LCS 570-89524/2-A	Lab Control Sample	96	67	85	45
LCSD 570-89524/3-A	Lab Control Sample Dup	101	71	93	45
MB 570-89524/1-A	Method Blank	71	54	75	37

Surrogate Legend

TBP = 2,4,6-Tribromophenol (Surr)
2FP = 2-Fluorophenol (Surr)
NBZ = Nitrobenzene-d5 (Surr)
PHL6 = Phenol-d6 (Surr)

Method: 8015B - Gasoline Range Organics - (GC)

Matrix: Water — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)
		BFB1
Lab Sample ID	Client Sample ID	(65-140)
440-270307-D-3 MS	Matrix Spike	95
440-270307-D-3 MSD	Matrix Spike Duplicate	97
440-270581-1	MW-02A	97
440-270581-2	MW-02B	98
440-270581-3	MW-04A	101
440-270581-4	MW-04B	98
440-270581-5	RS-SUMP-2020819	98
440-270581-6	TB-SUMP-2020819	95
440-270581-7	FB-SUMP-2020819	96
LCS 440-621651/5	Lab Control Sample	101

Surrogate Summary

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Method: 8015B - Gasoline Range Organics - (GC) (Continued)

Matrix: Water

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)								
		BFB1								
Lab Sample ID	Client Sample ID	(65-140)								
MB 440-621651/6	Method Blank	99								

Surrogate Legend

BFB = 4-Bromofluorobenzene (Surr)

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 440-621508/4
Matrix: Water
Analysis Batch: 621508

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,1,1-Trichloroethane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,1,2,2-Tetrachloroethane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,1,2-Trichloroethane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,1-Dichloroethane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,1-Dichloroethene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,1-Dichloropropene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,2,3-Trichlorobenzene	ND		1.0	0.40	ug/L			08/20/20 19:59	1
1,2,3-Trichloropropane	ND		1.0	0.40	ug/L			08/20/20 19:59	1
1,2,4-Trichlorobenzene	ND		1.0	0.40	ug/L			08/20/20 19:59	1
1,2,4-Trimethylbenzene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.50	ug/L			08/20/20 19:59	1
1,2-Dibromoethane (EDB)	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,2-Dichlorobenzene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,2-Dichloroethane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,2-Dichloropropane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,3,5-Trimethylbenzene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,3-Dichlorobenzene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,3-Dichloropropane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
1,4-Dichlorobenzene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
2,2-Dichloropropane	ND		1.0	0.40	ug/L			08/20/20 19:59	1
2-Chlorotoluene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
4-Chlorotoluene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Benzene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Bromobenzene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Bromochloromethane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Bromodichloromethane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Bromoform	ND		1.0	0.40	ug/L			08/20/20 19:59	1
Bromomethane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Carbon tetrachloride	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Chlorobenzene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Chloroethane	ND		1.0	0.40	ug/L			08/20/20 19:59	1
Chloroform	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Chloromethane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
cis-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
cis-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Dibromochloromethane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Dibromomethane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Dichlorodifluoromethane	ND		1.0	0.40	ug/L			08/20/20 19:59	1
Ethylbenzene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Hexachlorobutadiene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Isopropylbenzene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
m,p-Xylene	ND		1.0	0.50	ug/L			08/20/20 19:59	1
Methylene Chloride	ND		1.0	0.88	ug/L			08/20/20 19:59	1
Naphthalene	ND		1.0	0.40	ug/L			08/20/20 19:59	1
n-Butylbenzene	ND		1.0	0.40	ug/L			08/20/20 19:59	1
N-Propylbenzene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
o-Xylene	ND		0.50	0.25	ug/L			08/20/20 19:59	1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 440-621508/4
Matrix: Water
Analysis Batch: 621508

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
p-Isopropyltoluene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
sec-Butylbenzene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Styrene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
tert-Butylbenzene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Tetrachloroethene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Toluene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
trans-1,2-Dichloroethene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
trans-1,3-Dichloropropene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Trichloroethene	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Trichlorofluoromethane	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Vinyl chloride	ND		0.50	0.25	ug/L			08/20/20 19:59	1
Xylenes, Total	ND		1.0	0.50	ug/L			08/20/20 19:59	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*97*		*80 - 120*		*08/20/20 19:59*	*1*
Dibromofluoromethane (Surr)	*101*		*76 - 132*		*08/20/20 19:59*	*1*
Toluene-d8 (Surr)	*101*		*80 - 128*		*08/20/20 19:59*	*1*

Lab Sample ID: LCS 440-621508/1002
Matrix: Water
Analysis Batch: 621508

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1,2-Tetrachloroethane	25.0	23.2		ug/L		93	60 - 141
1,1,1-Trichloroethane	25.0	22.7		ug/L		91	70 - 130
1,1,2,2-Tetrachloroethane	25.0	24.7		ug/L		99	63 - 130
1,1,2-Trichloroethane	25.0	22.5		ug/L		90	70 - 130
1,1-Dichloroethane	25.0	23.2		ug/L		93	64 - 130
1,1-Dichloroethene	25.0	22.4		ug/L		90	70 - 130
1,1-Dichloropropene	25.0	22.5		ug/L		90	70 - 130
1,2,3-Trichlorobenzene	25.0	27.7		ug/L		111	60 - 140
1,2,3-Trichloropropane	25.0	24.2		ug/L		97	63 - 130
1,2,4-Trichlorobenzene	25.0	28.3		ug/L		113	60 - 140
1,2,4-Trimethylbenzene	25.0	23.1		ug/L		92	70 - 135
1,2-Dibromo-3-Chloropropane	25.0	23.0		ug/L		92	52 - 140
1,2-Dibromoethane (EDB)	25.0	23.6		ug/L		95	70 - 130
1,2-Dichlorobenzene	25.0	24.4		ug/L		98	70 - 130
1,2-Dichloroethane	25.0	23.6		ug/L		94	57 - 138
1,2-Dichloropropane	25.0	23.6		ug/L		94	67 - 130
1,3,5-Trimethylbenzene	25.0	22.7		ug/L		91	70 - 136
1,3-Dichlorobenzene	25.0	24.8		ug/L		99	70 - 130
1,3-Dichloropropane	25.0	23.2		ug/L		93	70 - 130
1,4-Dichlorobenzene	25.0	24.2		ug/L		97	70 - 130
2,2-Dichloropropane	25.0	20.6		ug/L		82	68 - 141
2-Chlorotoluene	25.0	22.6		ug/L		90	70 - 130
4-Chlorotoluene	25.0	22.5		ug/L		90	70 - 130
Benzene	25.0	22.9		ug/L		92	68 - 130
Bromobenzene	25.0	24.4		ug/L		98	70 - 130

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 440-621508/1002
Matrix: Water
Analysis Batch: 621508

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Bromochloromethane	25.0	25.9		ug/L		104	70 - 130
Bromodichloromethane	25.0	23.1		ug/L		92	70 - 132
Bromoform	25.0	21.4		ug/L		86	60 - 148
Bromomethane	25.0	25.0		ug/L		100	64 - 139
Carbon tetrachloride	25.0	21.7		ug/L		87	60 - 150
Chlorobenzene	25.0	24.1		ug/L		96	70 - 130
Chloroethane	25.0	21.7		ug/L		87	64 - 135
Chloroform	25.0	24.4		ug/L		98	70 - 130
Chloromethane	25.0	21.6		ug/L		86	47 - 140
cis-1,2-Dichloroethene	25.0	24.6		ug/L		98	70 - 133
cis-1,3-Dichloropropene	25.0	21.6		ug/L		87	70 - 133
Dibromochloromethane	25.0	22.7		ug/L		91	69 - 145
Dibromomethane	25.0	24.9		ug/L		99	70 - 130
Dichlorodifluoromethane	25.0	22.1		ug/L		89	29 - 150
Ethylbenzene	25.0	21.5		ug/L		86	70 - 130
Hexachlorobutadiene	25.0	23.7		ug/L		95	10 - 150
Isopropylbenzene	25.0	21.7		ug/L		87	70 - 136
m,p-Xylene	25.0	22.9		ug/L		92	70 - 130
Methylene Chloride	25.0	23.8		ug/L		95	52 - 130
Naphthalene	25.0	26.1		ug/L		105	60 - 140
n-Butylbenzene	25.0	23.4		ug/L		94	65 - 150
N-Propylbenzene	25.0	21.5		ug/L		86	67 - 139
o-Xylene	25.0	23.4		ug/L		94	70 - 130
p-Isopropyltoluene	25.0	23.4		ug/L		94	70 - 132
sec-Butylbenzene	25.0	22.6		ug/L		91	70 - 138
Styrene	25.0	24.2		ug/L		97	70 - 134
tert-Butylbenzene	25.0	22.1		ug/L		89	70 - 130
Tetrachloroethene	25.0	22.8		ug/L		91	70 - 130
Toluene	25.0	21.5		ug/L		86	70 - 130
trans-1,2-Dichloroethene	25.0	23.5		ug/L		94	70 - 130
trans-1,3-Dichloropropene	25.0	22.2		ug/L		89	70 - 132
Trichloroethene	25.0	23.7		ug/L		95	70 - 130
Trichlorofluoromethane	25.0	21.8		ug/L		87	60 - 150
Vinyl chloride	25.0	23.2		ug/L		93	59 - 133

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*91*		*80 - 120*
Dibromofluoromethane (Surr)	*102*		*76 - 132*
Toluene-d8 (Surr)	*95*		*80 - 128*

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM)

Lab Sample ID: MB 570-89524/1-A
Matrix: Water
Analysis Batch: 89863

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 89524

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,4-Trichlorobenzene	ND		0.20	0.059	ug/L		08/21/20 12:58	08/24/20 13:18	1
1,2-Dichlorobenzene	ND		0.20	0.045	ug/L		08/21/20 12:58	08/24/20 13:18	1

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: MB 570-89524/1-A
Matrix: Water
Analysis Batch: 89863

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 89524

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,3-Dichlorobenzene	ND		0.20	0.044	ug/L		08/21/20 12:58	08/24/20 13:18	1
1,4-Dichlorobenzene	ND		0.20	0.053	ug/L		08/21/20 12:58	08/24/20 13:18	1
2,4,5-Trichlorophenol	ND		5.0	1.4	ug/L		08/21/20 12:58	08/24/20 13:18	1
2,4,6-Trichlorophenol	ND		5.0	1.4	ug/L		08/21/20 12:58	08/24/20 13:18	1
2,4-Dichlorophenol	ND		5.0	1.9	ug/L		08/21/20 12:58	08/24/20 13:18	1
2,4-Dimethylphenol	ND		0.20	0.034	ug/L		08/21/20 12:58	08/24/20 13:18	1
2,4-Dinitrophenol	ND		5.0	1.0	ug/L		08/21/20 12:58	08/24/20 13:18	1
2,4-Dinitrotoluene	ND		0.20	0.030	ug/L		08/21/20 12:58	08/24/20 13:18	1
2,6-Dinitrotoluene	ND		0.20	0.038	ug/L		08/21/20 12:58	08/24/20 13:18	1
2-Chloronaphthalene	ND		0.20	0.057	ug/L		08/21/20 12:58	08/24/20 13:18	1
2-Chlorophenol	ND		0.20	0.047	ug/L		08/21/20 12:58	08/24/20 13:18	1
2-Methylnaphthalene	ND		0.20	0.041	ug/L		08/21/20 12:58	08/24/20 13:18	1
2-Methylphenol	ND		5.0	1.6	ug/L		08/21/20 12:58	08/24/20 13:18	1
2-Nitroaniline	ND		5.0	1.3	ug/L		08/21/20 12:58	08/24/20 13:18	1
2-Nitrophenol	ND		5.0	1.9	ug/L		08/21/20 12:58	08/24/20 13:18	1
3,3'-Dichlorobenzidine	ND		5.0	1.2	ug/L		08/21/20 12:58	08/24/20 13:18	1
3-Nitroaniline	ND		5.0	1.3	ug/L		08/21/20 12:58	08/24/20 13:18	1
4,6-Dinitro-2-methylphenol	ND		5.0	0.88	ug/L		08/21/20 12:58	08/24/20 13:18	1
4-Bromophenyl phenyl ether	ND		0.20	0.046	ug/L		08/21/20 12:58	08/24/20 13:18	1
4-Chloro-3-methylphenol	ND		5.0	1.8	ug/L		08/21/20 12:58	08/24/20 13:18	1
4-Chloroaniline	ND		5.0	1.7	ug/L		08/21/20 12:58	08/24/20 13:18	1
4-Chlorophenyl phenyl ether	ND		0.20	0.049	ug/L		08/21/20 12:58	08/24/20 13:18	1
4-Nitroaniline	ND		5.0	1.5	ug/L		08/21/20 12:58	08/24/20 13:18	1
4-Nitrophenol	ND		5.0	0.95	ug/L		08/21/20 12:58	08/24/20 13:18	1
Acenaphthene	ND		0.20	0.064	ug/L		08/21/20 12:58	08/24/20 13:18	1
Acenaphthylene	ND		0.20	0.054	ug/L		08/21/20 12:58	08/24/20 13:18	1
Aniline	ND		0.20	0.021	ug/L		08/21/20 12:58	08/24/20 13:18	1
Anthracene	ND		0.20	0.043	ug/L		08/21/20 12:58	08/24/20 13:18	1
Azobenzene	ND		0.20	0.046	ug/L		08/21/20 12:58	08/24/20 13:18	1
Benzidine	ND		5.0	0.76	ug/L		08/21/20 12:58	08/24/20 13:18	1
Benzo[a]anthracene	ND		0.20	0.050	ug/L		08/21/20 12:58	08/24/20 13:18	1
Benzo[a]pyrene	ND		0.20	0.052	ug/L		08/21/20 12:58	08/24/20 13:18	1
Benzo[b]fluoranthene	ND		0.20	0.043	ug/L		08/21/20 12:58	08/24/20 13:18	1
Benzo[g,h,i]perylene	ND		0.20	0.043	ug/L		08/21/20 12:58	08/24/20 13:18	1
Benzo[k]fluoranthene	ND		0.20	0.042	ug/L		08/21/20 12:58	08/24/20 13:18	1
Benzoic acid	ND		5.0	0.56	ug/L		08/21/20 12:58	08/24/20 13:18	1
Benzyl alcohol	ND		0.20	0.038	ug/L		08/21/20 12:58	08/24/20 13:18	1
bis (2-chloroisopropyl) ether	ND		0.20	0.042	ug/L		08/21/20 12:58	08/24/20 13:18	1
Bis(2-chloroethoxy)methane	ND		0.20	0.061	ug/L		08/21/20 12:58	08/24/20 13:18	1
Bis(2-chloroethyl)ether	ND		0.20	0.039	ug/L		08/21/20 12:58	08/24/20 13:18	1
Bis(2-ethylhexyl) phthalate	ND		5.0	3.4	ug/L		08/21/20 12:58	08/24/20 13:18	1
Butyl benzyl phthalate	ND		5.0	2.1	ug/L		08/21/20 12:58	08/24/20 13:18	1
Chrysene	ND		0.20	0.053	ug/L		08/21/20 12:58	08/24/20 13:18	1
Dibenz(a,h)anthracene	ND		0.20	0.037	ug/L		08/21/20 12:58	08/24/20 13:18	1
Dibenzofuran	ND		0.20	0.048	ug/L		08/21/20 12:58	08/24/20 13:18	1
Diethyl phthalate	ND		5.0	1.6	ug/L		08/21/20 12:58	08/24/20 13:18	1
Dimethyl phthalate	ND		5.0	1.5	ug/L		08/21/20 12:58	08/24/20 13:18	1
Di-n-butyl phthalate	ND		5.0	1.5	ug/L		08/21/20 12:58	08/24/20 13:18	1
Di-n-octyl phthalate	ND		5.0	1.5	ug/L		08/21/20 12:58	08/24/20 13:18	1

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: MB 570-89524/1-A
Matrix: Water
Analysis Batch: 89863

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 89524

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoranthene	ND		0.20	0.044	ug/L		08/21/20 12:58	08/24/20 13:18	1
Fluorene	ND		0.20	0.052	ug/L		08/21/20 12:58	08/24/20 13:18	1
Hexachlorobenzene	ND		0.20	0.051	ug/L		08/21/20 12:58	08/24/20 13:18	1
Hexachlorobutadiene	ND		0.20	0.053	ug/L		08/21/20 12:58	08/24/20 13:18	1
Hexachlorocyclopentadiene	ND		0.20	0.035	ug/L		08/21/20 12:58	08/24/20 13:18	1
Hexachloroethane	ND		0.20	0.054	ug/L		08/21/20 12:58	08/24/20 13:18	1
Indeno[1,2,3-cd]pyrene	ND		0.20	0.045	ug/L		08/21/20 12:58	08/24/20 13:18	1
Isophorone	ND		2.0	0.055	ug/L		08/21/20 12:58	08/24/20 13:18	1
Naphthalene	ND		0.20	0.050	ug/L		08/21/20 12:58	08/24/20 13:18	1
Nitrobenzene	ND		0.20	0.066	ug/L		08/21/20 12:58	08/24/20 13:18	1
N-Nitrosodimethylamine	ND		0.20	0.19	ug/L		08/21/20 12:58	08/24/20 13:18	1
N-Nitrosodi-n-propylamine	ND		0.20	0.035	ug/L		08/21/20 12:58	08/24/20 13:18	1
N-Nitrosodiphenylamine	ND		0.20	0.047	ug/L		08/21/20 12:58	08/24/20 13:18	1
Pentachlorophenol	ND		5.0	0.75	ug/L		08/21/20 12:58	08/24/20 13:18	1
Phenanthrene	ND		0.20	0.052	ug/L		08/21/20 12:58	08/24/20 13:18	1
Phenol	ND		0.20	0.032	ug/L		08/21/20 12:58	08/24/20 13:18	1
Pyrene	ND		0.20	0.049	ug/L		08/21/20 12:58	08/24/20 13:18	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*71*		*53 - 117*	*08/21/20 12:58*	*08/24/20 13:18*	*1*
2-Fluorophenol (Surr)	*54*		*21 - 80*	*08/21/20 12:58*	*08/24/20 13:18*	*1*
Nitrobenzene-d5 (Surr)	*75*		*43 - 114*	*08/21/20 12:58*	*08/24/20 13:18*	*1*
Phenol-d6 (Surr)	*37*		*3 - 63*	*08/21/20 12:58*	*08/24/20 13:18*	*1*

Lab Sample ID: LCS 570-89524/2-A
Matrix: Water
Analysis Batch: 89863

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 89524

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,2,4-Trichlorobenzene	20.0	14.7		ug/L		74	33 - 114
1,2-Dichlorobenzene	20.0	14.8		ug/L		74	29 - 110
1,3-Dichlorobenzene	20.0	14.6		ug/L		73	24 - 109
1,4-Dichlorobenzene	20.0	14.4		ug/L		72	25 - 108
2,4,5-Trichlorophenol	20.0	16.5		ug/L		83	57 - 114
2,4,6-Trichlorophenol	20.0	16.7		ug/L		84	51 - 114
2,4-Dichlorophenol	20.0	18.2		ug/L		91	58 - 117
2,4-Dimethylphenol	20.0	17.5		ug/L		87	66 - 109
2,4-Dinitrophenol	20.0	12.2		ug/L		61	1 - 183
2,4-Dinitrotoluene	20.0	19.6		ug/L		98	45 - 130
2,6-Dinitrotoluene	20.0	18.8		ug/L		94	55 - 139
2-Chloronaphthalene	20.0	16.9		ug/L		84	52 - 105
2-Chlorophenol	20.0	18.6		ug/L		93	66 - 105
2-Methylnaphthalene	20.0	17.8		ug/L		89	49 - 132
2-Methylphenol	20.0	17.9		ug/L		90	57 - 97
2-Nitroaniline	20.0	16.4		ug/L		82	42 - 112
2-Nitrophenol	20.0	14.6		ug/L		73	46 - 148
3,3'-Dichlorobenzidine	20.0	20.3		ug/L		101	55 - 127
3-Nitroaniline	20.0	18.3		ug/L		92	45 - 106

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: LCS 570-89524/2-A
Matrix: Water
Analysis Batch: 89863

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 89524

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
4,6-Dinitro-2-methylphenol	20.0	13.9		ug/L		70	37 - 153
4-Bromophenyl phenyl ether	20.0	18.6		ug/L		93	63 - 109
4-Chloro-3-methylphenol	20.0	18.0		ug/L		90	50 - 126
4-Chloroaniline	20.0	18.2		ug/L		91	61 - 93
4-Chlorophenyl phenyl ether	20.0	18.4		ug/L		92	54 - 102
4-Nitroaniline	20.0	18.1		ug/L		91	32 - 108
4-Nitrophenol	20.0	7.62		ug/L		38	9 - 51
Acenaphthene	20.0	19.1		ug/L		95	58 - 113
Acenaphthylene	20.0	20.5		ug/L		102	66 - 131
Aniline	20.0	18.8	*	ug/L		94	41 - 91
Anthracene	20.0	20.4		ug/L		102	68 - 127
Azobenzene	20.0	19.0		ug/L		95	72 - 103
Benzidine	20.0	10.6		ug/L		53	1 - 116
Benzo[a]anthracene	20.0	23.7		ug/L		119	71 - 132
Benzo[a]pyrene	20.0	21.0		ug/L		105	75 - 136
Benzo[b]fluoranthene	20.0	20.0		ug/L		100	72 - 131
Benzo[g,h,i]perylene	20.0	22.3		ug/L		112	75 - 133
Benzo[k]fluoranthene	20.0	21.5		ug/L		108	72 - 135
Benzoic acid	20.0	4.15	J	ug/L		21	1 - 68
Benzyl alcohol	20.0	17.8		ug/L		89	48 - 94
bis (2-chloroisopropyl) ether	20.0	20.7		ug/L		103	75 - 113
Bis(2-chloroethoxy)methane	20.0	18.7		ug/L		94	66 - 101
Bis(2-chloroethyl)ether	20.0	19.5		ug/L		97	69 - 102
Bis(2-ethylhexyl) phthalate	20.0	19.8		ug/L		99	60 - 132
Butyl benzyl phthalate	20.0	20.1		ug/L		101	63 - 151
Chrysene	20.0	20.9		ug/L		105	74 - 128
Dibenz(a,h)anthracene	20.0	20.3		ug/L		101	74 - 131
Dibenzofuran	20.0	17.8		ug/L		89	53 - 100
Diethyl phthalate	20.0	20.6		ug/L		103	55 - 114
Dimethyl phthalate	20.0	19.8		ug/L		99	55 - 110
Di-n-butyl phthalate	20.0	20.8		ug/L		104	66 - 110
Di-n-octyl phthalate	20.0	20.7		ug/L		103	54 - 139
Fluoranthene	20.0	19.8		ug/L		99	70 - 125
Fluorene	20.0	19.9		ug/L		100	63 - 115
Hexachlorobenzene	20.0	19.2		ug/L		96	65 - 106
Hexachlorobutadiene	20.0	13.7		ug/L		69	11 - 120
Hexachlorocyclopentadiene	20.0	16.8		ug/L		84	0.5 - 178
Hexachloroethane	20.0	12.7		ug/L		63	14 - 114
Indeno[1,2,3-cd]pyrene	20.0	19.9		ug/L		100	73 - 130
Isophorone	20.0	20.1		ug/L		101	65 - 107
Naphthalene	20.0	16.9		ug/L		85	47 - 123
Nitrobenzene	20.0	18.1		ug/L		90	67 - 105
N-Nitrosodimethylamine	20.0	15.1	*	ug/L		76	44 - 67
N-Nitrosodi-n-propylamine	20.0	20.1		ug/L		101	57 - 106
N-Nitrosodiphenylamine	20.0	22.6		ug/L		113	64 - 135
Pentachlorophenol	20.0	14.8		ug/L		74	26 - 115
Phenanthrene	20.0	19.5		ug/L		98	68 - 124
Phenol	20.0	9.23		ug/L		46	29 - 47
Pyrene	20.0	24.1		ug/L		120	62 - 146

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Surrogate	LCS %Recovery	LCS Qualifier	Limits
2,4,6-Tribromophenol (Surr)	*96*		*53 - 117*
2-Fluorophenol (Surr)	*67*		*21 - 80*
Nitrobenzene-d5 (Surr)	*85*		*43 - 114*
Phenol-d6 (Surr)	*45*		*3 - 63*

Lab Sample ID: LCSD 570-89524/3-A
Matrix: Water
Analysis Batch: 89863

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 89524

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,2,4-Trichlorobenzene			20.0	16.0		ug/L		80	33 - 114	8	18
1,2-Dichlorobenzene			20.0	15.6		ug/L		78	29 - 110	5	19
1,3-Dichlorobenzene			20.0	15.5		ug/L		77	24 - 109	6	21
1,4-Dichlorobenzene			20.0	15.1		ug/L		76	25 - 108	5	20
2,4,5-Trichlorophenol			20.0	17.7		ug/L		89	57 - 114	7	11
2,4,6-Trichlorophenol			20.0	18.2		ug/L		91	51 - 114	9	13
2,4-Dichlorophenol			20.0	19.0		ug/L		95	58 - 117	5	12
2,4-Dimethylphenol			20.0	18.5		ug/L		92	66 - 109	5	11
2,4-Dinitrophenol			20.0	14.5		ug/L		72	1 - 183	17	30
2,4-Dinitrotoluene			20.0	20.5		ug/L		103	45 - 130	5	14
2,6-Dinitrotoluene			20.0	19.9		ug/L		100	55 - 139	6	13
2-Chloronaphthalene			20.0	18.4		ug/L		92	52 - 105	8	13
2-Chlorophenol			20.0	19.6		ug/L		98	66 - 105	5	12
2-Methylnaphthalene			20.0	18.7		ug/L		94	49 - 132	5	14
2-Methylphenol			20.0	18.2		ug/L		91	57 - 97	1	12
2-Nitroaniline			20.0	17.6		ug/L		88	42 - 112	7	11
2-Nitrophenol			20.0	16.3		ug/L		82	46 - 148	11	11
3,3'-Dichlorobenzidine			20.0	20.7		ug/L		104	55 - 127	2	16
3-Nitroaniline			20.0	19.5		ug/L		97	45 - 106	6	15
4,6-Dinitro-2-methylphenol			20.0	15.6		ug/L		78	37 - 153	11	18
4-Bromophenyl phenyl ether			20.0	19.4		ug/L		97	63 - 109	4	12
4-Chloro-3-methylphenol			20.0	18.4		ug/L		92	50 - 126	2	16
4-Chloroaniline			20.0	19.0	*	ug/L		95	61 - 93	4	14
4-Chlorophenyl phenyl ether			20.0	19.5		ug/L		98	54 - 102	6	13
4-Nitroaniline			20.0	19.4		ug/L		97	32 - 108	7	14
4-Nitrophenol			20.0	8.26		ug/L		41	9 - 51	8	23
Acenaphthene			20.0	20.6		ug/L		103	58 - 113	8	11
Acenaphthylene			20.0	22.4		ug/L		112	66 - 131	9	14
Aniline			20.0	19.5	*	ug/L		97	41 - 91	4	26
Anthracene			20.0	21.6		ug/L		108	68 - 127	6	13
Azobenzene			20.0	20.0		ug/L		100	72 - 103	5	11
Benzidine			20.0	10.2		ug/L		51	1 - 116	4	30
Benzo[a]anthracene			20.0	24.3		ug/L		122	71 - 132	2	14
Benzo[a]pyrene			20.0	21.8		ug/L		109	75 - 136	4	18
Benzo[b]fluoranthene			20.0	21.8		ug/L		109	72 - 131	9	12
Benzo[g,h,i]perylene			20.0	23.2		ug/L		116	75 - 133	4	9
Benzo[k]fluoranthene			20.0	21.6		ug/L		108	72 - 135	0	17
Benzoic acid			20.0	5.45		ug/L		27	1 - 68	27	30
Benzyl alcohol			20.0	17.9		ug/L		90	48 - 94	1	13
bis (2-chloroisopropyl) ether			20.0	21.6		ug/L		108	75 - 113	5	13
Bis(2-chloroethoxy)methane			20.0	20.0		ug/L		100	66 - 101	7	12

Method: 8270C SIM - Semivolatile Organic Compounds (GC/MS SIM) (Continued)

Lab Sample ID: LCSD 570-89524/3-A
Matrix: Water
Analysis Batch: 89863

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 89524

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Bis(2-chloroethyl)ether	20.0	20.4		ug/L		102	69 - 102	4	12
Bis(2-ethylhexyl) phthalate	20.0	19.3		ug/L		97	60 - 132	2	16
Butyl benzyl phthalate	20.0	20.0		ug/L		100	63 - 151	1	16
Chrysene	20.0	21.9		ug/L		109	74 - 128	4	14
Dibenz(a,h)anthracene	20.0	21.1		ug/L		106	74 - 131	4	11
Dibenzofuran	20.0	19.2		ug/L		96	53 - 100	8	13
Diethyl phthalate	20.0	21.2		ug/L		106	55 - 114	3	14
Dimethyl phthalate	20.0	21.0		ug/L		105	55 - 110	6	12
Di-n-butyl phthalate	20.0	21.3		ug/L		106	66 - 110	2	14
Di-n-octyl phthalate	20.0	20.3		ug/L		102	54 - 139	2	28
Fluoranthene	20.0	21.4		ug/L		107	70 - 125	8	12
Fluorene	20.0	21.1		ug/L		105	63 - 115	6	14
Hexachlorobenzene	20.0	20.1		ug/L		100	65 - 106	4	13
Hexachlorobutadiene	20.0	15.0		ug/L		75	11 - 120	9	22
Hexachlorocyclopentadiene	20.0	19.3		ug/L		97	0.5 - 178	14	22
Hexachloroethane	20.0	13.4		ug/L		67	14 - 114	6	23
Indeno[1,2,3-cd]pyrene	20.0	20.8		ug/L		104	73 - 130	4	11
Isophorone	20.0	21.4		ug/L		107	65 - 107	6	13
Naphthalene	20.0	18.2		ug/L		91	47 - 123	8	13
Nitrobenzene	20.0	19.6		ug/L		98	67 - 105	8	13
N-Nitrosodimethylamine	20.0	16.8	*	ug/L		84	44 - 67	11	14
N-Nitrosodi-n-propylamine	20.0	20.1		ug/L		101	57 - 106	0	13
N-Nitrosodiphenylamine	20.0	23.8		ug/L		119	64 - 135	5	13
Pentachlorophenol	20.0	15.8		ug/L		79	26 - 115	7	18
Phenanthrene	20.0	21.0		ug/L		105	68 - 124	7	12
Phenol	20.0	9.46		ug/L		47	29 - 47	2	13
Pyrene	20.0	23.4		ug/L		117	62 - 146	3	14

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2,4,6-Tribromophenol (Surr)	*101*		*53 - 117*
2-Fluorophenol (Surr)	*71*		*21 - 80*
Nitrobenzene-d5 (Surr)	*93*		*43 - 114*
Phenol-d6 (Surr)	*45*		*3 - 63*

Method: 8015B - Gasoline Range Organics - (GC)

Lab Sample ID: MB 440-621651/6
Matrix: Water
Analysis Batch: 621651

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C4-C12)	ND		50	25	ug/L			08/21/20 17:30	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*99*		*65 - 140*		*08/21/20 17:30*	*1*

Method: 8015B - Gasoline Range Organics - (GC) (Continued)

Lab Sample ID: LCS 440-621651/5
Matrix: Water
Analysis Batch: 621651

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
GRO (C4-C12)			800	831		ug/L		104	80 - 120		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*101*		*65 - 140*

Lab Sample ID: 440-270307-D-3 MS
Matrix: Water
Analysis Batch: 621651

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
GRO (C4-C12)	ND		800	804		ug/L		100	65 - 140		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*95*		*65 - 140*

Lab Sample ID: 440-270307-D-3 MSD
Matrix: Water
Analysis Batch: 621651

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
GRO (C4-C12)	ND		800	800		ug/L		100	65 - 140	0	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*97*		*65 - 140*

Method: 7199 - Chromium, Hexavalent (IC)

Lab Sample ID: MB 440-621184/6
Matrix: Water
Analysis Batch: 621184

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cr (VI)	ND		2.0	0.25	ug/L			08/19/20 06:58	1

Lab Sample ID: LCS 440-621184/5
Matrix: Water
Analysis Batch: 621184

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Cr (VI)			50.0	51.9		ug/L		104	90 - 110		

Lab Sample ID: MRL 440-621184/4
Matrix: Water
Analysis Batch: 621184

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits		
Cr (VI)			1.00	1.07	J	ug/L		107	50 - 150		

Method: 7199 - Chromium, Hexavalent (IC) (Continued)

Lab Sample ID: 440-270581-3 MS
Matrix: Water
Analysis Batch: 621184

Client Sample ID: MW-04A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cr (VI)	0.27	J	50.0	52.5		ug/L		105	85 - 115

Lab Sample ID: 440-270581-3 MSD
Matrix: Water
Analysis Batch: 621184

Client Sample ID: MW-04A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cr (VI)	0.27	J	50.0	53.3		ug/L		106	85 - 115	1	20

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 440-622182/1-A
Matrix: Water
Analysis Batch: 622307

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 622182

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:41	1
Arsenic	ND		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:41	1
Barium	ND		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:41	1
Beryllium	ND		0.50	0.25	ug/L		08/26/20 11:58	08/26/20 16:41	1
Cadmium	ND		1.0	0.25	ug/L		08/26/20 11:58	08/26/20 16:41	1
Chromium	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:41	1
Cobalt	ND		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:41	1
Copper	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:41	1
Lead	ND		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:41	1
Molybdenum	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:41	1
Nickel	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:41	1
Selenium	ND		2.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:41	1
Silver	ND		1.0	0.50	ug/L		08/26/20 11:58	08/26/20 16:41	1
Thallium	ND		1.0	0.20	ug/L		08/26/20 11:58	08/26/20 16:41	1
Vanadium	ND		2.0	1.0	ug/L		08/26/20 11:58	08/26/20 16:41	1
Zinc	ND		20	2.5	ug/L		08/26/20 11:58	08/26/20 16:41	1

Lab Sample ID: LCS 440-622182/2-A
Matrix: Water
Analysis Batch: 622307

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 622182

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	80.0	90.4		ug/L		113	80 - 120
Arsenic	80.0	74.2		ug/L		93	80 - 120
Barium	80.0	79.4		ug/L		99	80 - 120
Beryllium	80.0	82.9		ug/L		104	80 - 120
Cadmium	80.0	82.4		ug/L		103	80 - 120
Chromium	80.0	78.2		ug/L		98	80 - 120
Cobalt	80.0	75.9		ug/L		95	80 - 120
Copper	80.0	78.3		ug/L		98	80 - 120
Lead	80.0	77.3		ug/L		97	80 - 120
Molybdenum	80.0	83.9		ug/L		105	80 - 120
Nickel	80.0	79.2		ug/L		99	80 - 120

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 440-622182/2-A
Matrix: Water
Analysis Batch: 622307

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 622182

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Selenium	80.0	73.0		ug/L		91	80 - 120
Silver	80.0	83.8		ug/L		105	80 - 120
Thallium	80.0	80.5		ug/L		101	80 - 120
Vanadium	80.0	79.2		ug/L		99	80 - 120
Zinc	80.0	75.4		ug/L		94	80 - 120

Lab Sample ID: MB 440-622183/1-A
Matrix: Water
Analysis Batch: 622308

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 622183

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:44	1
Arsenic	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:44	1
Barium	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:44	1
Beryllium	ND		0.50	0.25	ug/L		08/26/20 12:00	08/26/20 17:44	1
Cadmium	ND		1.0	0.25	ug/L		08/26/20 12:00	08/26/20 17:44	1
Chromium	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:44	1
Cobalt	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:44	1
Copper	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:44	1
Lead	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:44	1
Molybdenum	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:44	1
Nickel	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:44	1
Selenium	ND		2.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:44	1
Silver	ND		1.0	0.50	ug/L		08/26/20 12:00	08/26/20 17:44	1
Thallium	ND		1.0	0.20	ug/L		08/26/20 12:00	08/26/20 17:44	1
Vanadium	ND		2.0	1.0	ug/L		08/26/20 12:00	08/26/20 17:44	1
Zinc	ND		20	2.5	ug/L		08/26/20 12:00	08/26/20 17:44	1

Lab Sample ID: LCS 440-622183/2-A
Matrix: Water
Analysis Batch: 622308

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 622183

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	80.0	91.6		ug/L		115	80 - 120
Arsenic	80.0	75.2		ug/L		94	80 - 120
Barium	80.0	80.4		ug/L		101	80 - 120
Beryllium	80.0	79.4		ug/L		99	80 - 120
Cadmium	80.0	81.8		ug/L		102	80 - 120
Chromium	80.0	78.4		ug/L		98	80 - 120
Cobalt	80.0	76.4		ug/L		95	80 - 120
Copper	80.0	78.7		ug/L		98	80 - 120
Lead	80.0	78.7		ug/L		98	80 - 120
Molybdenum	80.0	84.4		ug/L		106	80 - 120
Nickel	80.0	79.4		ug/L		99	80 - 120
Selenium	80.0	74.8		ug/L		94	80 - 120
Silver	80.0	84.2		ug/L		105	80 - 120
Thallium	80.0	81.1		ug/L		101	80 - 120
Vanadium	80.0	79.5		ug/L		99	80 - 120
Zinc	80.0	75.9		ug/L		95	80 - 120

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 440-270581-1 MS
Matrix: Water
Analysis Batch: 622308

Client Sample ID: MW-02A
Prep Type: Total Recoverable
Prep Batch: 622183

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	ND		80.0	90.0		ug/L		113	75 - 125
Arsenic	0.55	J	80.0	74.0		ug/L		92	75 - 125
Barium	96		80.0	169		ug/L		92	75 - 125
Beryllium	ND		80.0	75.8		ug/L		95	75 - 125
Cadmium	0.52	J	80.0	78.4		ug/L		97	75 - 125
Chromium	ND		80.0	75.3		ug/L		94	75 - 125
Cobalt	2.2		80.0	73.0		ug/L		88	75 - 125
Copper	1.3	J	80.0	73.5		ug/L		90	75 - 125
Lead	ND		80.0	73.7		ug/L		92	75 - 125
Molybdenum	8.4		80.0	91.4		ug/L		104	75 - 125
Nickel	0.68	J	80.0	73.4		ug/L		91	75 - 125
Selenium	0.77	J	80.0	70.0		ug/L		87	75 - 125
Silver	ND		80.0	79.8		ug/L		100	75 - 125
Thallium	ND		80.0	76.1		ug/L		95	75 - 125
Vanadium	6.2		80.0	83.2		ug/L		96	75 - 125
Zinc	ND		80.0	69.8		ug/L		87	75 - 125

Lab Sample ID: 440-270581-1 MSD
Matrix: Water
Analysis Batch: 622308

Client Sample ID: MW-02A
Prep Type: Total Recoverable
Prep Batch: 622183

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Antimony	ND		80.0	91.5		ug/L		114	75 - 125	2	20
Arsenic	0.55	J	80.0	74.6		ug/L		93	75 - 125	1	20
Barium	96		80.0	171		ug/L		93	75 - 125	1	20
Beryllium	ND		80.0	76.1		ug/L		95	75 - 125	0	20
Cadmium	0.52	J	80.0	79.2		ug/L		98	75 - 125	1	20
Chromium	ND		80.0	76.6		ug/L		96	75 - 125	2	20
Cobalt	2.2		80.0	74.5		ug/L		90	75 - 125	2	20
Copper	1.3	J	80.0	75.3		ug/L		92	75 - 125	2	20
Lead	ND		80.0	76.0		ug/L		95	75 - 125	3	20
Molybdenum	8.4		80.0	92.6		ug/L		105	75 - 125	1	20
Nickel	0.68	J	80.0	74.8		ug/L		93	75 - 125	2	20
Selenium	0.77	J	80.0	71.8		ug/L		89	75 - 125	3	20
Silver	ND		80.0	81.1		ug/L		101	75 - 125	2	20
Thallium	ND		80.0	78.5		ug/L		98	75 - 125	3	20
Vanadium	6.2		80.0	84.6		ug/L		98	75 - 125	2	20
Zinc	ND		80.0	70.9		ug/L		89	75 - 125	2	20

Lab Sample ID: 440-270581-1 MS
Matrix: Water
Analysis Batch: 622307

Client Sample ID: MW-02A
Prep Type: Dissolved
Prep Batch: 622182

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.57	J	80.0	89.5		ug/L		111	75 - 125
Arsenic	0.51	J	80.0	72.4		ug/L		90	75 - 125
Barium	92		80.0	166		ug/L		93	75 - 125
Beryllium	ND		80.0	76.0		ug/L		95	75 - 125
Cadmium	0.46	J	80.0	79.0		ug/L		98	75 - 125

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 440-270581-1 MS
Matrix: Water
Analysis Batch: 622307

Client Sample ID: MW-02A
Prep Type: Dissolved
Prep Batch: 622182

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chromium	ND		80.0	74.1		ug/L		93	75 - 125
Cobalt	2.6		80.0	73.3		ug/L		88	75 - 125
Copper	1.4	J	80.0	73.5		ug/L		90	75 - 125
Lead	ND		80.0	72.4		ug/L		90	75 - 125
Molybdenum	8.4		80.0	90.8		ug/L		103	75 - 125
Nickel	0.75	J	80.0	73.1		ug/L		90	75 - 125
Selenium	0.67	J	80.0	67.9		ug/L		84	75 - 125
Silver	ND		80.0	79.8		ug/L		100	75 - 125
Thallium	ND		80.0	75.5		ug/L		94	75 - 125
Vanadium	6.2		80.0	81.6		ug/L		94	75 - 125
Zinc	ND		80.0	70.1		ug/L		88	75 - 125

Lab Sample ID: 440-270581-1 MSD
Matrix: Water
Analysis Batch: 622307

Client Sample ID: MW-02A
Prep Type: Dissolved
Prep Batch: 622182

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Antimony	0.57	J	80.0	91.4		ug/L		114	75 - 125	2	20
Arsenic	0.51	J	80.0	74.5		ug/L		93	75 - 125	3	20
Barium	92		80.0	168		ug/L		95	75 - 125	1	20
Beryllium	ND		80.0	78.3		ug/L		98	75 - 125	3	20
Cadmium	0.46	J	80.0	79.4		ug/L		99	75 - 125	0	20
Chromium	ND		80.0	76.1		ug/L		95	75 - 125	3	20
Cobalt	2.6		80.0	75.0		ug/L		91	75 - 125	2	20
Copper	1.4	J	80.0	75.8		ug/L		93	75 - 125	3	20
Lead	ND		80.0	75.2		ug/L		94	75 - 125	4	20
Molybdenum	8.4		80.0	93.0		ug/L		106	75 - 125	2	20
Nickel	0.75	J	80.0	74.8		ug/L		93	75 - 125	2	20
Selenium	0.67	J	80.0	70.8		ug/L		88	75 - 125	4	20
Silver	ND		80.0	81.3		ug/L		102	75 - 125	2	20
Thallium	ND		80.0	77.0		ug/L		96	75 - 125	2	20
Vanadium	6.2		80.0	84.5		ug/L		98	75 - 125	3	20
Zinc	ND		80.0	72.2		ug/L		90	75 - 125	3	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 440-621486/1-A
Matrix: Water
Analysis Batch: 621685

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 621486

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/20/20 14:14	08/21/20 11:18	1

Lab Sample ID: LCS 440-621486/2-A
Matrix: Water
Analysis Batch: 621685

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 621486

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	4.00	4.71		ug/L		118	80 - 120

Method: 7470A - Mercury (CVAA) (Continued)

Lab Sample ID: 440-270581-1 MS
Matrix: Water
Analysis Batch: 621685

Client Sample ID: MW-02A
Prep Type: Total/NA
Prep Batch: 621486

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury	ND		4.00	4.24		ug/L		106	75 - 125		

Lab Sample ID: 440-270581-1 MSD
Matrix: Water
Analysis Batch: 621685

Client Sample ID: MW-02A
Prep Type: Total/NA
Prep Batch: 621486

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		4.00	4.17		ug/L		104	75 - 125	2	20

Lab Sample ID: MB 440-621487/1-A
Matrix: Water
Analysis Batch: 621685

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 621487

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.10	ug/L		08/20/20 14:17	08/21/20 15:35	1

Lab Sample ID: LCS 440-621487/2-A
Matrix: Water
Analysis Batch: 621685

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 621487

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury			4.00	4.15		ug/L		104	80 - 120		

Lab Sample ID: 440-270581-1 MS
Matrix: Water
Analysis Batch: 621685

Client Sample ID: MW-02A
Prep Type: Dissolved
Prep Batch: 621487

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury	ND		4.00	4.34		ug/L		108	75 - 125		

Lab Sample ID: 440-270581-1 MSD
Matrix: Water
Analysis Batch: 621685

Client Sample ID: MW-02A
Prep Type: Dissolved
Prep Batch: 621487

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		4.00	4.30		ug/L		107	75 - 125	1	20

Method: 9040B - pH

Lab Sample ID: 440-270581-1 DU
Matrix: Water
Analysis Batch: 621822

Client Sample ID: MW-02A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	7.4	HF		7.4		SU				0.1	2

Method: SM 4500 S2 D - Sulfide, Total

Lab Sample ID: MB 440-622049/3
Matrix: Water
Analysis Batch: 622049

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Sulfide	ND		50	27	ug/L			08/25/20 16:53	1

Lab Sample ID: LCS 440-622049/4
Matrix: Water
Analysis Batch: 622049

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Sulfide			501	441		ug/L		88	80 - 120		

Lab Sample ID: 440-270581-1 MS
Matrix: Water
Analysis Batch: 622049

Client Sample ID: MW-02A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Sulfide	ND	F1	501	201	F1	ug/L		40	70 - 130		

Lab Sample ID: 440-270581-1 MSD
Matrix: Water
Analysis Batch: 622049

Client Sample ID: MW-02A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Sulfide	ND	F1	501	195	F1	ug/L		39	70 - 130	3	30

GC/MS VOA

Analysis Batch: 621508

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1	MW-02A	Total/NA	Water	8260B	
440-270581-2	MW-02B	Total/NA	Water	8260B	
440-270581-3	MW-04A	Total/NA	Water	8260B	
440-270581-4	MW-04B	Total/NA	Water	8260B	
440-270581-5	RS-SUMP-2020819	Total/NA	Water	8260B	
440-270581-6	TB-SUMP-2020819	Total/NA	Water	8260B	
440-270581-7	FB-SUMP-2020819	Total/NA	Water	8260B	
MB 440-621508/4	Method Blank	Total/NA	Water	8260B	
LCS 440-621508/1002	Lab Control Sample	Total/NA	Water	8260B	

GC/MS Semi VOA

Prep Batch: 89524

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1	MW-02A	Total/NA	Water	3510C	
440-270581-2	MW-02B	Total/NA	Water	3510C	
440-270581-3	MW-04A	Total/NA	Water	3510C	
440-270581-4	MW-04B	Total/NA	Water	3510C	
MB 570-89524/1-A	Method Blank	Total/NA	Water	3510C	
LCS 570-89524/2-A	Lab Control Sample	Total/NA	Water	3510C	
LCSD 570-89524/3-A	Lab Control Sample Dup	Total/NA	Water	3510C	

Analysis Batch: 89863

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1	MW-02A	Total/NA	Water	8270C SIM	89524
440-270581-2	MW-02B	Total/NA	Water	8270C SIM	89524
440-270581-3	MW-04A	Total/NA	Water	8270C SIM	89524
440-270581-4	MW-04B	Total/NA	Water	8270C SIM	89524
MB 570-89524/1-A	Method Blank	Total/NA	Water	8270C SIM	89524
LCS 570-89524/2-A	Lab Control Sample	Total/NA	Water	8270C SIM	89524
LCSD 570-89524/3-A	Lab Control Sample Dup	Total/NA	Water	8270C SIM	89524

GC VOA

Analysis Batch: 621651

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1	MW-02A	Total/NA	Water	8015B	
440-270581-2	MW-02B	Total/NA	Water	8015B	
440-270581-3	MW-04A	Total/NA	Water	8015B	
440-270581-4	MW-04B	Total/NA	Water	8015B	
440-270581-5	RS-SUMP-2020819	Total/NA	Water	8015B	
440-270581-6	TB-SUMP-2020819	Total/NA	Water	8015B	
440-270581-7	FB-SUMP-2020819	Total/NA	Water	8015B	
MB 440-621651/6	Method Blank	Total/NA	Water	8015B	
LCS 440-621651/5	Lab Control Sample	Total/NA	Water	8015B	
440-270307-D-3 MS	Matrix Spike	Total/NA	Water	8015B	
440-270307-D-3 MSD	Matrix Spike Duplicate	Total/NA	Water	8015B	

HPLC/IC

Analysis Batch: 621184

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1	MW-02A	Total/NA	Water	7199	
440-270581-2	MW-02B	Total/NA	Water	7199	
440-270581-3	MW-04A	Total/NA	Water	7199	
440-270581-4	MW-04B	Total/NA	Water	7199	
MB 440-621184/6	Method Blank	Total/NA	Water	7199	
LCS 440-621184/5	Lab Control Sample	Total/NA	Water	7199	
MRL 440-621184/4	Lab Control Sample	Total/NA	Water	7199	
440-270581-3 MS	MW-04A	Total/NA	Water	7199	
440-270581-3 MSD	MW-04A	Total/NA	Water	7199	

Metals

Prep Batch: 621486

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1	MW-02A	Total/NA	Water	7470A	
440-270581-2	MW-02B	Total/NA	Water	7470A	
440-270581-3	MW-04A	Total/NA	Water	7470A	
440-270581-4	MW-04B	Total/NA	Water	7470A	
MB 440-621486/1-A	Method Blank	Total/NA	Water	7470A	
LCS 440-621486/2-A	Lab Control Sample	Total/NA	Water	7470A	
440-270581-1 MS	MW-02A	Total/NA	Water	7470A	
440-270581-1 MSD	MW-02A	Total/NA	Water	7470A	

Prep Batch: 621487

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1	MW-02A	Dissolved	Water	7470A	
440-270581-2	MW-02B	Dissolved	Water	7470A	
440-270581-3	MW-04A	Dissolved	Water	7470A	
440-270581-4	MW-04B	Dissolved	Water	7470A	
MB 440-621487/1-A	Method Blank	Total/NA	Water	7470A	
LCS 440-621487/2-A	Lab Control Sample	Total/NA	Water	7470A	
440-270581-1 MS	MW-02A	Dissolved	Water	7470A	
440-270581-1 MSD	MW-02A	Dissolved	Water	7470A	

Analysis Batch: 621685

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1	MW-02A	Dissolved	Water	7470A	621487
440-270581-1	MW-02A	Total/NA	Water	7470A	621486
440-270581-2	MW-02B	Dissolved	Water	7470A	621487
440-270581-2	MW-02B	Total/NA	Water	7470A	621486
440-270581-3	MW-04A	Dissolved	Water	7470A	621487
440-270581-3	MW-04A	Total/NA	Water	7470A	621486
440-270581-4	MW-04B	Dissolved	Water	7470A	621487
440-270581-4	MW-04B	Total/NA	Water	7470A	621486
MB 440-621486/1-A	Method Blank	Total/NA	Water	7470A	621486
MB 440-621487/1-A	Method Blank	Total/NA	Water	7470A	621487
LCS 440-621486/2-A	Lab Control Sample	Total/NA	Water	7470A	621486
LCS 440-621487/2-A	Lab Control Sample	Total/NA	Water	7470A	621487
440-270581-1 MS	MW-02A	Dissolved	Water	7470A	621487
440-270581-1 MS	MW-02A	Total/NA	Water	7470A	621486
440-270581-1 MSD	MW-02A	Dissolved	Water	7470A	621487

Metals (Continued)

Analysis Batch: 621685 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1 MSD	MW-02A	Total/NA	Water	7470A	621486

Prep Batch: 622182

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1	MW-02A	Dissolved	Water	3005A	
440-270581-2	MW-02B	Dissolved	Water	3005A	
440-270581-3	MW-04A	Dissolved	Water	3005A	
440-270581-4	MW-04B	Dissolved	Water	3005A	
MB 440-622182/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 440-622182/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
440-270581-1 MS	MW-02A	Dissolved	Water	3005A	
440-270581-1 MSD	MW-02A	Dissolved	Water	3005A	

Prep Batch: 622183

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1	MW-02A	Total Recoverable	Water	3005A	
440-270581-2	MW-02B	Total Recoverable	Water	3005A	
440-270581-3	MW-04A	Total Recoverable	Water	3005A	
440-270581-4	MW-04B	Total Recoverable	Water	3005A	
MB 440-622183/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 440-622183/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
440-270581-1 MS	MW-02A	Total Recoverable	Water	3005A	
440-270581-1 MSD	MW-02A	Total Recoverable	Water	3005A	

Analysis Batch: 622307

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1	MW-02A	Dissolved	Water	6020	622182
440-270581-2	MW-02B	Dissolved	Water	6020	622182
440-270581-3	MW-04A	Dissolved	Water	6020	622182
440-270581-4	MW-04B	Dissolved	Water	6020	622182
MB 440-622182/1-A	Method Blank	Total Recoverable	Water	6020	622182
LCS 440-622182/2-A	Lab Control Sample	Total Recoverable	Water	6020	622182
440-270581-1 MS	MW-02A	Dissolved	Water	6020	622182
440-270581-1 MSD	MW-02A	Dissolved	Water	6020	622182

Analysis Batch: 622308

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1	MW-02A	Total Recoverable	Water	6020	622183
440-270581-2	MW-02B	Total Recoverable	Water	6020	622183
440-270581-3	MW-04A	Total Recoverable	Water	6020	622183
440-270581-4	MW-04B	Total Recoverable	Water	6020	622183
MB 440-622183/1-A	Method Blank	Total Recoverable	Water	6020	622183
LCS 440-622183/2-A	Lab Control Sample	Total Recoverable	Water	6020	622183
440-270581-1 MS	MW-02A	Total Recoverable	Water	6020	622183
440-270581-1 MSD	MW-02A	Total Recoverable	Water	6020	622183

General Chemistry

Analysis Batch: 621822

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1	MW-02A	Total/NA	Water	9040B	

General Chemistry (Continued)

Analysis Batch: 621822 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-2	MW-02B	Total/NA	Water	9040B	
440-270581-3	MW-04A	Total/NA	Water	9040B	
440-270581-4	MW-04B	Total/NA	Water	9040B	
440-270581-1 DU	MW-02A	Total/NA	Water	9040B	

Analysis Batch: 622049

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-270581-1	MW-02A	Total/NA	Water	SM 4500 S2 D	
440-270581-2	MW-02B	Total/NA	Water	SM 4500 S2 D	
440-270581-3	MW-04A	Total/NA	Water	SM 4500 S2 D	
440-270581-4	MW-04B	Total/NA	Water	SM 4500 S2 D	
MB 440-622049/3	Method Blank	Total/NA	Water	SM 4500 S2 D	
LCS 440-622049/4	Lab Control Sample	Total/NA	Water	SM 4500 S2 D	
440-270581-1 MS	MW-02A	Total/NA	Water	SM 4500 S2 D	
440-270581-1 MSD	MW-02A	Total/NA	Water	SM 4500 S2 D	

Client Sample ID: MW-02A

Lab Sample ID: 440-270581-1

Date Collected: 08/19/20 08:58

Matrix: Water

Date Received: 08/19/20 17:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	621508	08/21/20 01:40	JB	TAL IRV
Total/NA	Prep	3510C			89524	08/21/20 12:58	OAJ3	ECL 1
Total/NA	Analysis	8270C SIM		1	89863	08/24/20 14:14	ULLI	ECL 1
Total/NA	Analysis	8015B		1	621651	08/22/20 00:31	LMB	TAL IRV
Total/NA	Analysis	7199		1	621184	08/19/20 23:00	MN	TAL IRV
Dissolved	Prep	3005A			622182	08/26/20 11:58	A1M	TAL IRV
Dissolved	Analysis	6020		1	622307	08/26/20 16:45	B1H	TAL IRV
Total Recoverable	Prep	3005A			622183	08/26/20 12:00	A1M	TAL IRV
Total Recoverable	Analysis	6020		1	622308	08/26/20 17:49	B1H	TAL IRV
Dissolved	Prep	7470A			621487	08/20/20 14:17	EMS	TAL IRV
Dissolved	Analysis	7470A		1	621685	08/21/20 15:39	EMS	TAL IRV
Total/NA	Prep	7470A			621486	08/20/20 14:14	EMS	TAL IRV
Total/NA	Analysis	7470A		1	621685	08/21/20 11:23	EMS	TAL IRV
Total/NA	Analysis	9040B		1	621822	08/24/20 13:06	ST	TAL IRV
Total/NA	Analysis	SM 4500 S2 D		1	622049	08/25/20 16:53	KMY	TAL IRV

Client Sample ID: MW-02B

Lab Sample ID: 440-270581-2

Date Collected: 08/19/20 09:18

Matrix: Water

Date Received: 08/19/20 17:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	621508	08/21/20 02:08	JB	TAL IRV
Total/NA	Prep	3510C			89524	08/21/20 12:58	OAJ3	ECL 1
Total/NA	Analysis	8270C SIM		1	89863	08/24/20 14:32	ULLI	ECL 1
Total/NA	Analysis	8015B		1	621651	08/22/20 01:00	LMB	TAL IRV
Total/NA	Analysis	7199		1	621184	08/19/20 23:13	MN	TAL IRV
Dissolved	Prep	3005A			622182	08/26/20 11:58	A1M	TAL IRV
Dissolved	Analysis	6020		1	622307	08/26/20 16:57	B1H	TAL IRV
Total Recoverable	Prep	3005A			622183	08/26/20 12:00	A1M	TAL IRV
Total Recoverable	Analysis	6020		1	622308	08/26/20 18:01	B1H	TAL IRV
Dissolved	Prep	7470A			621487	08/20/20 14:17	EMS	TAL IRV
Dissolved	Analysis	7470A		1	621685	08/21/20 15:51	EMS	TAL IRV
Total/NA	Prep	7470A			621486	08/20/20 14:14	EMS	TAL IRV
Total/NA	Analysis	7470A		1	621685	08/21/20 11:29	EMS	TAL IRV
Total/NA	Analysis	9040B		1	621822	08/24/20 13:06	ST	TAL IRV
Total/NA	Analysis	SM 4500 S2 D		1	622049	08/25/20 16:53	KMY	TAL IRV

Client Sample ID: MW-04A

Lab Sample ID: 440-270581-3

Date Collected: 08/19/20 08:11

Matrix: Water

Date Received: 08/19/20 17:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	621508	08/21/20 02:37	JB	TAL IRV

Lab Chronicle

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Client Sample ID: MW-04A
Date Collected: 08/19/20 08:11
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3510C			89524	08/21/20 12:58	OAJ3	ECL 1
Total/NA	Analysis	8270C SIM		1	89863	08/24/20 14:51	ULLI	ECL 1
Total/NA	Analysis	8015B		1	621651	08/22/20 01:30	LMB	TAL IRV
Total/NA	Analysis	7199		1	621184	08/19/20 22:08	MN	TAL IRV
Dissolved	Prep	3005A			622182	08/26/20 11:58	A1M	TAL IRV
Dissolved	Analysis	6020		1	622307	08/26/20 16:59	B1H	TAL IRV
Total Recoverable	Prep	3005A			622183	08/26/20 12:00	A1M	TAL IRV
Total Recoverable	Analysis	6020		1	622308	08/26/20 18:03	B1H	TAL IRV
Dissolved	Prep	7470A			621487	08/20/20 14:17	EMS	TAL IRV
Dissolved	Analysis	7470A		1	621685	08/21/20 15:53	EMS	TAL IRV
Total/NA	Prep	7470A			621486	08/20/20 14:14	EMS	TAL IRV
Total/NA	Analysis	7470A		1	621685	08/21/20 11:32	EMS	TAL IRV
Total/NA	Analysis	9040B		1	621822	08/24/20 13:06	ST	TAL IRV
Total/NA	Analysis	SM 4500 S2 D		1	622049	08/25/20 16:53	KMY	TAL IRV

Client Sample ID: MW-04B
Date Collected: 08/19/20 07:41
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	621508	08/21/20 03:05	JB	TAL IRV
Total/NA	Prep	3510C			89524	08/21/20 12:58	OAJ3	ECL 1
Total/NA	Analysis	8270C SIM		1	89863	08/24/20 15:10	ULLI	ECL 1
Total/NA	Analysis	8015B		1	621651	08/22/20 01:59	LMB	TAL IRV
Total/NA	Analysis	7199		1	621184	08/19/20 21:55	MN	TAL IRV
Dissolved	Prep	3005A			622182	08/26/20 11:58	A1M	TAL IRV
Dissolved	Analysis	6020		1	622307	08/26/20 17:02	B1H	TAL IRV
Total Recoverable	Prep	3005A			622183	08/26/20 12:00	A1M	TAL IRV
Total Recoverable	Analysis	6020		1	622308	08/26/20 18:06	B1H	TAL IRV
Dissolved	Prep	7470A			621487	08/20/20 14:17	EMS	TAL IRV
Dissolved	Analysis	7470A		1	621685	08/21/20 15:55	EMS	TAL IRV
Total/NA	Prep	7470A			621486	08/20/20 14:14	EMS	TAL IRV
Total/NA	Analysis	7470A		1	621685	08/21/20 11:34	EMS	TAL IRV
Total/NA	Analysis	9040B		1	621822	08/24/20 13:06	ST	TAL IRV
Total/NA	Analysis	SM 4500 S2 D		1	622049	08/25/20 16:53	KMY	TAL IRV

Client Sample ID: RS-SUMP-2020819
Date Collected: 08/19/20 07:00
Date Received: 08/19/20 17:00

Lab Sample ID: 440-270581-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	621508	08/21/20 03:33	JB	TAL IRV
Total/NA	Analysis	8015B		1	621651	08/22/20 02:28	LMB	TAL IRV

Lab Chronicle

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Client Sample ID: TB-SUMP-2020819

Lab Sample ID: 440-270581-6

Date Collected: 08/19/20 00:01

Matrix: Water

Date Received: 08/19/20 17:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	621508	08/21/20 04:03	JB	TAL IRV
Total/NA	Analysis	8015B		1	621651	08/22/20 03:57	LMB	TAL IRV

Client Sample ID: FB-SUMP-2020819

Lab Sample ID: 440-270581-7

Date Collected: 08/19/20 07:50

Matrix: Water

Date Received: 08/19/20 17:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	621508	08/21/20 04:31	JB	TAL IRV
Total/NA	Analysis	8015B		1	621651	08/22/20 04:26	LMB	TAL IRV

Laboratory References:

ECL 1 = Eurofins Calscience LLC Lincoln, 7440 Lincoln Way, Garden Grove, CA 92841, TEL (714)895-5494

TAL IRV = Eurofins Calscience Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Accreditation/Certification Summary

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Laboratory: Eurofins Calscience Irvine

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska	State	CA01531	06-30-21
Arizona	State	AZ0671	10-13-20
California	Los Angeles County Sanitation Districts	10256	06-30-21
California	State	2706	06-30-21
Guam	State	20-004R	01-23-21
Hawaii	State	CA01531	01-29-21
Kansas	NELAP	E-10420	07-31-20 *
Nevada	State	CA015312021-1	07-31-21
Oregon	NELAP	4028 - 008	01-29-21
USDA	US Federal Programs	P330-18-00214	07-09-21
Washington	State	C900	09-03-20

Laboratory: Eurofins Calscience LLC

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	Los Angeles County Sanitation Districts	10109	09-29-20
California	SCAQMD LAP	17LA0919	11-30-20
California	State	2944	09-29-20
Guam	State	20-003R	10-31-20
Oregon	NELAP	CA300001	01-29-21
USDA	US Federal Programs	P330-20-00034	02-10-23
Washington	State	C916-18	10-11-20

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL IRV
8270C SIM	Semivolatile Organic Compounds (GC/MS SIM)	SW846	ECL 1
8015B	Gasoline Range Organics - (GC)	SW846	TAL IRV
7199	Chromium, Hexavalent (IC)	SW846	TAL IRV
6020	Metals (ICP/MS)	SW846	TAL IRV
7470A	Mercury (CVAA)	SW846	TAL IRV
9040B	pH	SW846	TAL IRV
SM 4500 S2 D	Sulfide, Total	SM	TAL IRV
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL IRV
3510C	Liquid-Liquid Extraction (Separatory Funnel)	SW846	ECL 1
5030B	Purge and Trap	SW846	TAL IRV
7470A	Preparation, Mercury	SW846	TAL IRV

Protocol References:

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

ECL 1 = Eurofins Calscience LLC Lincoln, 7440 Lincoln Way, Garden Grove, CA 92841, TEL (714)895-5494

TAL IRV = Eurofins Calscience Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Sample Summary

Client: Stantec Consulting Corp.
Project/Site: BP Gardena Sumps

Job ID: 440-270581-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
440-270581-1	MW-02A	Water	08/19/20 08:58	08/19/20 17:00	
440-270581-2	MW-02B	Water	08/19/20 09:18	08/19/20 17:00	
440-270581-3	MW-04A	Water	08/19/20 08:11	08/19/20 17:00	
440-270581-4	MW-04B	Water	08/19/20 07:41	08/19/20 17:00	
440-270581-5	RS-SUMP-2020819	Water	08/19/20 07:00	08/19/20 17:00	
440-270581-6	TB-SUMP-2020819	Water	08/19/20 00:01	08/19/20 17:00	
440-270581-7	FB-SUMP-2020819	Water	08/19/20 07:50	08/19/20 17:00	

440-270581 Chain of Custody

JW 8/19/20

Laboratory Management Program LaMP Chain of Custody Record

BP Site Node Path: Gardena Sumps
BP Facility No: SW Corner Artesia & Normandie
Req Due Date (mm/dd/yy): Regular Turn Around **Rush TAT:** Yes ____ No X
Lab Work Order Number:

Lab Name:	Test America	BP/ARC Facility Address:	1440 West Artesia Blvd	Consultant/Contractor	Stantec Consulting Services Inc
Lab Address:	17461 Derian Ave, Ste 100, Irvine CA, 92614	City, State, ZIP Code:	Gardena, CA 90247	Consultant/Contractor Project No.	185850766
Lab PM	Lena Davidkova	Lead Regulatory Agency:	DTSC	Address:	3777 Worsham Avenue Suite 200 Long Beach CA 90808-1774
Lab Phone	949-261-1022	California Global ID No.:	19490135 - DTSC Envirostor	Consultant/Contractor PM	Kelly Brown
ab Shipping Accnt:		Enfos Proposal No:	D011F-0011 / WR826935	Phone:	562-354-2638 / 714-470-6494 cell
Lab Bottle Order No:		Accounting Mode:	Provision X OOC-BU ____ OOC-RM ____	Email EDD To:	kelly.brown@stantec.com and to lab.enfosdoc@bp.com
Other Info:		Stage:	Execute (40) Activity: Project Spend (80)	Invoice To:	BP X Contractor ____

BP Project Manager (PM): Wade Melton
BP PM Phone: 360 594-7978
BP PM Email: wade.melton@bp.com

Lab No.	Sample Description	Date	Time	Matrix: Soil / Solid	Matrix: Water / Liquid	Matrix: Air / Vapor	Matrix:	No. Containers / Preservative: Total Number of Containers	Unpreserved	NaOH+ZnAc	HNO_3	HCl	Methanol		Requested Analyses: GRO C4-C12 (8015M)	VOCs full list (8260B)	SVOCs + PAH's (8270C)	Total Sulfide (376.2/SM4500-S2	Title 22 Metal (Total metals)	Title 22 Metal (Dissolved metals)	HexChrom (7199), pH (9045)		General Minerals + K + NO3		Report Type & QC Level
1	MW-02A	8 19 20	0858		6			6				6			3	3									(6) VOA's
2	MW-02A				3			3	3								3								(3) 1-Liter Ambers
3	MW-02A				1			1		1								1							(1) 500 ml Poly
4	MW-02A				1			1			1								1						(1) 500 ml Poly
5	MW-02A				1			1	1												1				(1) 500-ml Poly
6	MW-02A				1			1			1									1					(1) 500 ml Poly (Filtered In Field)

Standard X
Full Data Package ____

Comments
Note: If sample not collected, indicate "No Sample" in comments and single-strike out and initial any preprinted sample description.
DO NOT run separate PAH test by method 8310

			Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Name	RON BARRON	A. CASTELLUM						
Sampler's Company:	Stantec Consulting Services Inc			8 19 20	1200	EC-IRV	8-19	12-20
Shipment Method:	Courier	Ship Date:						
Shipment Tracking No:			EC-IRV	8/19	1700	EC-IRV	8/19/20	1900

Special Instructions:

THIS LINE - LAB USE ONLY: Custody Seals In Place: Yes / No | Temp Blank: Yes / No | Cooler Temp on Receipt: 4.2 | 4.2 °F/C | Trip Blank: Yes / No | MS/MSD Sample Submitted: Yes / No

1.5 | 1.5 IR-89 LD

Laboratory Management Program LaMP Chain of Custody Record

Page ___ of ___

BP Site Node Path: Gardena Sumps
BP Facility No: SW Corner Artesia & Normandie
Req Due Date (mm/dd/yy): Regular Turn Around **Rush TAT:** Yes ___ No X
Lab Work Order Number:

Lab Name:	Test America	BP/ARC Facility Address.	1440 West Artesia Blvd	Consultant/Contractor	Stantec Consulting Services Inc
Lab Address	17461 Derian Ave, Ste 100, Irvine CA, 92614	City, State, ZIP Code	Gardena, CA 90247	Consultant/Contractor Project No.	185850766
Lab PM	Lena Davidkova	Lead Regulatory Agency	DTSC	Address:	3777 Worsham Avenue Suite 200 Long Beach CA 90808-1774
Lab Phone:	949-261-1022	California Global ID No :	19490135 - DTSC Envirostor	Consultant/Contractor PM	Kelly Brown
ab Shipping Accnt		Enfos Proposal No.	D011F-0011 / WR826935	Phone.	562-354-2638 / 714-470-6494 cell
Lab Bottle Order No		Accounting Mode:	Provision X OOC-BU ___ OOC-RM ___	Email EDD To	kelly.brown@stantec.com and to lab.enfosdoc@bp.com
Other Info.		Stage:	Execute (40) Activity Project Spend (80)	Invoice To.	BP X Contractor ___

BP Project Manager (PM). Wade Melton
BP PM Phone 360 594-7978
BP PM Email wade.melton@bp.com

Lab No.	Sample Description	Date	Time	Matrix: Soil / Solid	Matrix: Water / Liquid	Matrix: Air / Vapor	Matrix:	No. Containers / Preservative: Total Number of Containers	Unpreserved	NaOH+ZnAc	HNO_3	HCl	Methanol		Requested Analyses: GRO C4-C12 (8015M)	VOCs full list (8260B)	SVOCs + PAH's (8270C)	Total Sulfide (376.2/SM4500-S2	Title 22 Metal (Total metals)	Title 22 Metal (Dissolved metals)	HexChrom (7199), pH (9045)		General Minerals + K + NO3		Report Type & QC Level
1	MW-02B	8 19 20	0918		6			6				6			3	3									(6) VOA's
2	MW-02B				3			3	3								3								(3) 1-Liter Ambers
3	MW-02B				1			1		1								1							(1) 500 ml Poly
4	MW-02B				1			1			1								1						(1) 500 ml Poly
5	MW-02B				1			1	1												1				(1) 500-ml Poly
6	MW-02B				1			1			1									1					(1) 500 ml Poly (Filtered In Field)

Standard X
Full Data Package ___

Comments
Note If sample not collected, indicate "No Sample" in comments and single-strike out and initial any preprinted sample description

DO NOT run separate PAH test by method 8310

	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Name: RON BARRON A. GASTELUM						
Sampler's Company: Stantec Consulting Services Inc		8/19/20	1200	EC-IRV	8-19	12:00
Shipment Method: Courier Ship Date.						
Shipment Tracking No	EC-IRV	8-19	1700	EC-IRV	8/19/20	1700

Special Instructions:

THIS LINE - LAB USE ONLY Custody Seals In Place: Yes (No) | Temp Blank Yes / No | Cooler Temp on Receipt 4.2 | 4.2 °F/C | Trip Blank Yes / No | MS/MSD Sample Submitted Yes / No

15/15 IR-89

BP Remediation Management COC - Effective Dates: August 23, 2011- June 30, 2012

BP LaMP COC Rev 7, Aug 23, 2011

bp rm Laboratory Management Program LaMP Chain of Custody Record

Page ___ of ___

BP Site Node Path: Gardena Sumps | **Req Due Date (mm/dd/yy):** Regular Turn Around | **Rush TAT:** Yes ___ No X

BP Facility No: SW Corner Artesia & Normandie | **Lab Work Order Number:**

Lab Name	Test America	BP/ARC Facility Address	1440 West Artesia Blvd	Consultant/Contractor	Stantec Consulting Services Inc
Lab Address	17461 Derian Ave, Ste 100, Irvine CA, 92614	City, State, ZIP Code	Gardena, CA 90247	Consultant/Contractor Project No	185850766
Lab PM:	Lena Davidkova	Lead Regulatory Agency	DTSC	Address	3777 Worsham Avenue Suite 200 Long Beach CA 90808-1774
Lab Phone	949-261-1022	California Global ID No	19490135 - DTSC Envirostor	Consultant/Contractor PM:	Kelly Brown
Lab Shipping Accnt		Enfos Proposal No.	D011F-0011 / WR826935	Phone	562-354-2638 / 714-470-6494 cell
Lab Bottle Order No		Accounting Mode.	Provision X OOC-BU ___ OOC-RM ___	Email EDD To.	kelly.brown@stantec.com and to lab.enfosdoc@bp.com
Other Info		Stage:	Execute (40) Activity Project Spend (80)	Invoice To	BP X Contractor ___

BP Project Manager (PM). Wade Melton

BP PM Phone 360 594-7978

BP PM Email wade.melton@bp.com

Lab No.	Sample Description	Date	Time	Matrix: Soil / Solid	Matrix: Water / Liquid	Matrix: Air / Vapor	Matrix:	No. Containers / Preservative: Total Number of Containers	Unpreserved	NaOH+ZnAc	HNO_3	HCl	Methanol		Requested Analyses: GRO C4-C12 (8015M)	VOCs full list (8260B)	SVOCs + PAH's (8270C)	Total Sulfide (376.2/SM4500-S2	Title 22 Metal (Total metals)	Title 22 Metal (Dissolved metals)	HexChrom (7199), pH (9045)		General Minerals + K + NO3		Report Type & QC Level
1	MW-04A	8/19/20	0811		6			6				6			3	3									(6) VOA's
2	MW-04A	↓	↓		3			3	3								3								(3) 1-Liter Ambers
3	MW-04A				1			1		1								1							(1) 500 ml Poly
4	MW-04A				1			1			1								1						(1) 500 ml Poly
5	MW-04A				1			1	1												1				(1) 500-ml Poly
6	MW-04A	↓	↓		1			1			1									1					(1) 500 ml Poly (Filtered in Field)

Standard X

Full Data Package ___

Comments

Note If sample not collected, indicate "No Sample" in comments and single-strike out and initial any preprinted sample description

DO NOT run separate PAH test by method 8310

			Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Name	Ron Barron	A. Gastelum						
Sampler's Company.	Stantec Consulting Services Inc			8/19/20	1200	EC-1RV	8-19	12:00
Shipment Method	Courier	Ship Date						
Shipment Tracking No.			EC-1RV	8/19	1700	SQ / EC-1RV	8/19/20	1700

Special Instructions:

THIS LINE - LAB USE ONLY Custody Seals In Place Yes (No) | Temp Blank: Yes (No) | Cooler Temp on Receipt. 4.2/4.2 °F/C | Trip Blank (Yes) No | MS/MSD Sample Submitted Yes (No)

15/15 12-89

BP Remediation Management COC - Effective Dates. August 23, 2011- June 30, 2012

BP LaMP COC Rev 7, Aug 23, 2011

Laboratory Management Program LaMP Chain of Custody Record

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BP Site Node Path: Gardena Sumps
BP Facility No: SW Corner Artesia & Normandie
Req Due Date (mm/dd/yy): Regular Turn Around **Rush TAT:** Yes ___ No X
Lab Work Order Number:

Lab Name:	Test America	BP/ARC Facility Address	1440 West Artesia Blvd	Consultant/Contractor	Stantec Consulting Services Inc
Lab Address:	17461 Derian Ave, Ste 100, Irvine CA, 92614	City, State, ZIP Code.	Gardena, CA 90247	Consultant/Contractor Project No	185850766
Lab PM	Lena Davidkova	Lead Regulatory Agency:	DTSC	Address:	3777 Worsham Avenue Suite 200 Long Beach CA 90808-1774
Lab Phone	949-261-1022	California Global ID No	19490135 - DTSC Envirostor	Consultant/Contractor PM:	Kelly Brown
Lab Shipping Accnt		Enfos Proposal No	D011F-0011 / WR826935	Phone:	562-354-2638 / 714-470-6494 cell
Lab Bottle Order No:		Accounting Mode.	Provision X OOC-BU ___ OOC-RM ___	Email EDD To:	kelly.brown@stantec.com and to lab.enfosdoc@bp.com
Other Info		Stage.	Execute (40) Activity. Project Spend (80)	Invoice To	BP X Contractor ___

BP Project Manager (PM): Wade Melton
BP PM Phone. 360 594-7978
BP PM Email: wade.melton@bp.com

Report Type & QC Level: Standard X; Full Data Package ___

Comments
Note If sample not collected, indicate "No Sample" in comments and single-strike out and initial any preprinted sample description

DO NOT run separate PAH test by method 8310

Lab No.	Sample Description	Date	Time	Matrix: Soil / Solid	Water / Liquid	Air / Vapor		No. Containers / Preservative: Total Number of Containers	Unpreserved	NaOH+ZnAc	HNO_3	HCl	Methanol		Requested Analyses: GRO C4-C12 (8015M)	VOCs full list (8260B)	SVOCs + PAH's (8270C)	Total Sulfide (376.2/SM4500-S2	Title 22 Metal (Total metals)	Title 22 Metal (Dissolved metals)	HexChrom (7199), pH (9045)		General Minerals + K + NO3		Report Type & QC Level
1	MW-04B	8 19 20	0741		6			6				6			3	3									(6) VOA's
2	MW-04B				3			3	3								3									(3) 1-Liter Ambers
3	MW-04B				1			1		1								1								(1) 500 ml Poly
4	MW-04B				1			1			1								1							(1) 500 ml Poly
5	MW-04B				1			1	1												1					(1) 500-ml Poly
6	MW-04B				1			1			1									1						(1) 500 ml Poly (Filtered In Field)

	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Name: Ron Barron A. Castellum						
Sampler's Company: Stantec Consulting Services Inc		8 19 20	1200	EC-IRV	8-19	12.20
Shipment Method: Courier Ship Date						
Shipment Tracking No:	EC-IRV	8/19	1720	EC-IRV	8/19/20	1900

Special Instructions:

THIS LINE - LAB USE ONLY Custody Seals In Place: Yes / No | Temp Blank. Yes / No | Cooler Temp on Receipt 4.2 4.2 °F/C | Trip Blank: Yes / No | MS/MSD Sample Submitted: Yes / No

1.5 1.5 1R.89

BP Remediation Management COC - Effective Dates August 23, 2011- June 30, 2012

BP LaMP COC Rev 7, Aug 23, 2011

bp rm

Laboratory Management Program LaMP Chain of Custody Record

Page ___ of ___

BP Site Node Path: Gardena Sumps
BP Facility No: SW Corner Artesia & Normandie
Req Due Date (mm/dd/yy): Regular Turn Around **Rush TAT:** Yes ___ No X
Lab Work Order Number:

Lab Name	Test America	BP/ARC Facility Address.	1440 West Artesia Blvd	Consultant/Contractor:	Stantec Consulting Services Inc
Lab Address:	17461 Derian Ave. Ste. 100, Irvine CA, 92614	City, State, ZIP Code:	Gardena, CA 90247	Consultant/Contractor Project No	185850766
Lab PM:	Lena Davidkova	Lead Regulatory Agency	DTSC	Address:	3777 Worsham Avenue Suite 200 Long Beach CA 90808-1774
Lab Phone.	949-261-1022	California Global ID No.	19490135 - DTSC Envirostor	Consultant/Contractor PM	Kelly Brown
Lab Shipping Accnt		Enfos Proposal No:	D011F-0011 / WR826935	Phone:	562-354-2638 / 714-470-6494 cell
Lab Bottle Order No		Accounting Mode:	Provision X OOC-BU ___ OOC-RM ___	Email EDD To:	kelly.brown@stantec.com and to lab enfosdoc@bp com
Other Info.		Stage:	Execute (40) Activity Project Spend (80)	Invoice To:	BP X Contractor ___

BP Project Manager (PM). Wade Melton
BP PM Phone 360 594-7978
BP PM Email: wade.melton@bp.com

Lab No.	Sample Description	Date	Time	Matrix: Soil / Solid	Water / Liquid	Air / Vapor		No. Containers / Preservative: Total Number of Containers	Unpreserved	NaOH+ZnAc	HNO_3	HCl	Methanol		Requested Analyses: GRO C4-C12 (8015M)	VOCs full list (8260B)	SVOCs + PAH's (8270C)	Total Sulfide (376.2/SM4500-S2	Title 22 Metal (Total metals)	Title 22 Metal (Dissolved metals	HexChrom (7199), pH (9045)		General Minerals + K + NO3		Report Type & QC Level
1	RS-SUMP-2020 0819	8 19 20	0700		6			6				6			3	3									(6) VOA's
2	TB-SUMP-2020 0819	8 19 20	0000		6			6				6			3	3									(6) VOA's
3	FB-SUMP-2020 0819	8 19 20	0750		6			6				6			3	3									(6) VOA's
4																									
5																									
6																									
7																									

Standard X
Full Data Package ___

Comments
Note If sample not collected, indicate "No Sample" in comments and single-strike out and initial any preprinted sample description

DO NOT run separate PAH test by method 8310

		Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Name	RON BARDON A. GASTELUM						
Sampler's Company	Stantec Consulting Services Inc		8 19 20	1200	EC-IRV	8-19	12:00
Shipment Method:	Courier Ship Date.						
Shipment Tracking No.		EC-IRV	8-19	1700	SD / EC-IRV	8/19/20	1900

Special Instructions:

THIS LINE - LAB USE ONLY. Custody Seals In Place. Yes / No | Temp Blank Yes / No | Cooler Temp on Receipt. ___ °F/C | Trip Blank Yes / No | MS/MSD Sample Submitted Yes / No

BP Remediation Management COC - Effective Dates August 23, 2011- June 30, 2012

4-2/4-2 1-5/1.5 12-89

BP LaMP COC Rev. 7, Aug 23, 2011

Eurofins Calscience Irvine
17461 Derian Ave Suite 100
Irvine, CA 92614-5817
Phone: 949-261-1022 Fax: 949-260-3297

Chain of Custody Record

eurofins | Environment Testing America

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Davidkov, Lena	Carrier Tracking No(s):	COC No: 440-160274.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Lena.Davidkova@Eurofinset.com	State of Origin: California	Page: Page 1 of 1
Company: Eurofins Calscience LLC		Accreditations Required (See note):		Job #: 440-270581-1
Address: 7440 Lincoln Way, ,	Due Date Requested: 9/1/2020			
City: Garden Grove	TAT Requested (days):			
State, Zip: CA, 92841				
Phone: 714-895-5494(Tel) 714-894-7501(Fax)	PO #:			
Email:	WO #:			
Project Name: BP Gardena Sumps	Project #: 44003536			
Site: BP Gardena Sumps	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8270C_SIM/3510C (MOD) 8270C+NDMA-LL	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
MW-02A (440-270581-1)	8/19/20	08:58 Pacific		Water			X	2	BP, J flag; MS/MSD if >10 splsBP requirements; immediate PM notification
MW-02B (440-270581-2)	8/19/20	09:18 Pacific		Water			X	2	BP, J flag; MS/MSD if >10 splsBP requirements; immediate PM notification
MW-04A (440-270581-3)	8/19/20	08:11 Pacific		Water			X	2	BP, J flag; MS/MSD if >10 splsBP requirements; immediate PM notification
MW-04B (440-270581-4)	8/19/20	07:41 Pacific		Water			X	2	BP, J flag; MS/MSD if >10 splsBP requirements; immediate PM notification

Note: Since laboratory accreditations are subject to change, Eurofins Calscience places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Calscience laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Calscience attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins Calscience.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
1	Teresa Ortiz	8.20.20 1110	EC-IRV		8/20/2020 1110	ECI
2	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
3	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 3.2/2.8 SC6

Ver: 01/16/2019

Login Sample Receipt Checklist

Client: Stantec Consulting Corp. Job Number: 440-270581-1

Login Number: 270581 **List Source: Eurofins Irvine**
List Number: 1
Creator: Skinner, Alma D

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	Not present
Sample custody seals, if present, are intact.	N/A	Not Present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	False	Headspace larger than 1/4".
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Stantec Consulting Corp.

Job Number: 440-270581-1

Login Number: 270581
List Number: 2
Creator: Cortez Diaz, Antonio

List Source: Eurofins Calscience
List Creation: 08/20/20 07:40 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

GC/MS VOA BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270581-1

SDG No.:

Batch Number: 621508 Batch Start Date: 08/20/20 18:33 Batch Analyst: Bui, Jack

Batch Method: 8260B Batch End Date:

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	FinalAmount	Initial pH	vmw8260t1ccv1 00171	VMWNU8260ISS 00203	
MB 440-621508/4		8260B		10 mL	10 mL			5 uL	
440-270581-A-1	MW-02A	8260B	T	10 mL	10 mL	<2 SU		5 uL	
440-270581-A-2	MW-02B	8260B	T	10 mL	10 mL	<2 SU		5 uL	
440-270581-A-3	MW-04A	8260B	T	10 mL	10 mL	<2 SU		5 uL	
440-270581-A-4	MW-04B	8260B	T	10 mL	10 mL	<2 SU		5 uL	
440-270581-A-5	RS-SUMP-2020819	8260B	T	10 mL	10 mL	<2 SU		5 uL	
440-270581-A-6	TB-SUMP-2020819	8260B	T	10 mL	10 mL	<2 SU		5 uL	
440-270581-A-7	FB-SUMP-2020819	8260B	T	10 mL	10 mL	<2 SU		5 uL	
LCS 440-621508/1002		8260B		10 mL	10 mL	n/a SU	25 uL	5 uL	

Batch Notes	
pH Indicator ID	220416A
Pipette/Syringe/Dispenser ID	VOA-06
Vial Lot Number	0103101F

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GASOLINE RANGE ORGANICS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270581-1

SDG No.:

Batch Number: 621651 Batch Start Date: 08/21/20 15:03 Batch Analyst: Barnett, Lisa M

Batch Method: 8015B Batch End Date:

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	FinalAmount	Initial pH	Headspace	VG-LCSTPH1000 00484	VG-SURR500PPM 00037
LCS 440-621651/5		8015B		10 mL	10 mL	N/A SU	N/A	8 uL	1 uL
MB 440-621651/6		8015B		10 mL	10 mL	N/A SU	N/A		1 uL
440-270307-D-3	BC-4_2020812	8015B	T	10 mL	10 mL	<2 SU	NO		1 uL
440-270307-D-3 MS		8015B	T	10 mL	10 mL	<2 SU	NO	8 uL	1 uL
440-270307-D-3 MSD		8015B	T	10 mL	10 mL	<2 SU	NO	8 uL	1 uL
440-270581-C-1	MW-02A	8015B	T	10 mL	10 mL	<2 SU	NO		1 uL
440-270581-C-2	MW-02B	8015B	T	10 mL	10 mL	<2 SU	NO		1 uL
440-270581-C-3	MW-04A	8015B	T	10 mL	10 mL	<2 SU	NO		1 uL
440-270581-C-4	MW-04B	8015B	T	10 mL	10 mL	<2 SU	NO		1 uL
440-270581-D-5	RS-SUMP-2020819	8015B	T	10 mL	10 mL	<2 SU	NO		1 uL
440-270581-F-6	TB-SUMP-2020819	8015B	T	10 mL	10 mL	<2 SU	NO		1 uL
440-270581-F-7	FB-SUMP-2020819	8015B	T	10 mL	10 mL	<2 SU	NO		1 uL

Batch Notes	
pH Indicator ID	HC 904495
Pipette/Syringe/Dispenser ID	BT10ML
Vial Lot Number	0103101F

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

HPLC/IC BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270581-1

SDG No.:

Batch Number: 621184 Batch Start Date: 08/19/20 05:45 Batch Analyst: Nikbakht-Sangari, Maryam

Batch Method: 7199 Batch End Date:

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	WCCR6LCS5PPM 00134				
MRL 440-621184/4		7199		10 mL	2 uL				
LCS 440-621184/5		7199		10 mL	100 uL				
MB 440-621184/6		7199		10 mL					
440-270581-G-4	MW-04B	7199	T	10 mL					
440-270581-G-3	MW-04A	7199	T	10 mL					
440-270581-G-3 MS	MW-04A	7199	T	10 mL	100 uL				
440-270581-G-3 MSD	MW-04A	7199	T	10 mL	100 uL				
440-270581-G-1	MW-02A	7199	T	10 mL					
440-270581-G-2	MW-02B	7199	T	10 mL					

Batch Notes	
Buffer Lot #	6306422
Eluent 1 ID	6310832
Filter ID	lot # 91622103
pH Meter ID	06
Post Column Reagent ID	6310833

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270581-1

SDG No.:

Batch Number: 622182 Batch Start Date: 08/26/20 11:58 Batch Analyst: Maldonado, Andy 1

Batch Method: 3005A Batch End Date: 08/26/20 16:10

Lab Sample ID	Client Sample ID	Method Chain	Basis	Initial pH	InitialAmount	FinalAmount	ME 1:1 HCl 00067	ME 1:1 HNO3 00302	ME ICPMS ICV 00237
MB 440-622182/1		3005A, 6020			25 mL	25 mL	0.25 mL	0.5 mL	
LCS 440-622182/2		3005A, 6020			25 mL	25 mL	0.25 mL	0.5 mL	0.2 mL
440-270581-I-1	MW-02A	3005A, 6020	D	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	
440-270581-I-1 MS	MW-02A	3005A, 6020	D	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	0.2 mL
440-270581-I-1 MSD	MW-02A	3005A, 6020	D	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	0.2 mL
440-270581-I-2	MW-02B	3005A, 6020	D	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	
440-270581-I-3	MW-04A	3005A, 6020	D	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	
440-270581-I-4	MW-04B	3005A, 6020	D	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	

Lab Sample ID	Client Sample ID	Method Chain	Basis	AnalysisComment					
MB 440-622182/1		3005A, 6020							
LCS 440-622182/2		3005A, 6020							
440-270581-I-1	MW-02A	3005A, 6020	D	BP					
440-270581-I-1 MS	MW-02A	3005A, 6020	D	BP					
440-270581-I-1 MSD	MW-02A	3005A, 6020	D	BP					
440-270581-I-2	MW-02B	3005A, 6020	D	BP					
440-270581-I-3	MW-04A	3005A, 6020	D	BP					
440-270581-I-4	MW-04B	3005A, 6020	D	BP					

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270581-1

SDG No.:

Batch Number: 622182 Batch Start Date: 08/26/20 11:58 Batch Analyst: Maldonado, Andy 1

Batch Method: 3005A Batch End Date: 08/26/20 16:10

Batch Notes	
Temperature - Corrected - End	91 Degrees C
Temperature - Corrected - Start	91 Degrees C
Digestion End Time	08/26/2020 16:00
Digestion Start Time	08/26/2020 12:00
Digestion Unit ID	1
Hydrochloric Acid ID	6300732
Nitric Acid ID	6300731
Pipette/Syringe/Dispenser ID	MET100
Analyst ID - Spike Analyst	AM
Thermometer ID	P-135 (Loc.#B13) CF=0
Digestion Tube/Cup ID	2001329
Temperature - Uncorrected - End	91 Fahrenheit
Temperature - Uncorrected - Start	91 Degrees C

Basis	Basis Description
D	Dissolved

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270581-1

SDG No.:

Batch Number: 622183 Batch Start Date: 08/26/20 11:58 Batch Analyst: Maldonado, Andy 1

Batch Method: 3005A Batch End Date: 08/26/20 16:10

Lab Sample ID	Client Sample ID	Method Chain	Basis	Initial pH	InitialAmount	FinalAmount	ME 1:1 HCl 00067	ME 1:1 HNO3 00302	ME ICPMS ICV 00237
MB 440-622183/1		3005A, 6020			25 mL	25 mL	0.25 mL	0.5 mL	
LCS 440-622183/2		3005A, 6020			25 mL	25 mL	0.25 mL	0.5 mL	0.2 mL
440-270581-H-1	MW-02A	3005A, 6020	R	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	
440-270581-H-1 MS	MW-02A	3005A, 6020	R	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	0.2 mL
440-270581-H-1 MSD	MW-02A	3005A, 6020	R	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	0.2 mL
440-270581-H-2	MW-02B	3005A, 6020	R	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	
440-270581-H-3	MW-04A	3005A, 6020	R	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	
440-270581-H-4	MW-04B	3005A, 6020	R	<2 SU	25 mL	25 mL	0.25 mL	0.5 mL	

Lab Sample ID	Client Sample ID	Method Chain	Basis	AnalysisComment
MB 440-622183/1		3005A, 6020		
LCS 440-622183/2		3005A, 6020		
440-270581-H-1	MW-02A	3005A, 6020	R	BP
440-270581-H-1 MS	MW-02A	3005A, 6020	R	BP
440-270581-H-1 MSD	MW-02A	3005A, 6020	R	BP
440-270581-H-2	MW-02B	3005A, 6020	R	BP
440-270581-H-3	MW-04A	3005A, 6020	R	BP
440-270581-H-4	MW-04B	3005A, 6020	R	BP

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270581-1

SDG No.:

Batch Number: 622183 Batch Start Date: 08/26/20 11:58 Batch Analyst: Maldonado, Andy 1

Batch Method: 3005A Batch End Date: 08/26/20 16:10

Batch Notes	
Temperature - Corrected - End	91 Degrees C
Temperature - Corrected - Start	91 Degrees C
Digestion End Time	08/26/2020 16:00
Digestion Start Time	08/26/2020 12:00
Digestion Unit ID	1
Hydrochloric Acid ID	6300732
Nitric Acid ID	6300731
Pipette/Syringe/Dispenser ID	MET100
Analyst ID - Spike Analyst	AM
Thermometer ID	P-135 (Loc.#B13) CF=0
Digestion Tube/Cup ID	2001329
Temperature - Uncorrected - End	91 Degrees C
Temperature - Uncorrected - Start	91 Degrees C

Basis	Basis Description
R	Total Recoverable

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

6020

METALS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270581-1

SDG No.:

Batch Number: 621486 Batch Start Date: 08/20/20 14:11 Batch Analyst: Suico, Ethel M

Batch Method: 7470A Batch End Date: 08/21/20 09:45

Lab Sample ID	Client Sample ID	Method Chain	Basis	Initial pH	InitialAmount	FinalAmount	ME 1 PPM HG1 00462	ME H2SO4 00097	ME HNO3 00577
MB 440-621486/1		7470A, 7470A			20 mL	20 mL		1 mL	0.5 mL
LCS 440-621486/2		7470A, 7470A			20 mL	20 mL	80 uL	1 mL	0.5 mL
440-270581-H-1	MW-02A	7470A, 7470A	T	<2 SU	20 mL	20 mL		1 mL	0.5 mL
440-270581-H-1 MS	MW-02A	7470A, 7470A	T	<2 SU	20 mL	20 mL	80 uL	1 mL	0.5 mL
440-270581-H-1 MSD	MW-02A	7470A, 7470A	T	<2 SU	20 mL	20 mL	80 uL	1 mL	0.5 mL
440-270581-H-2	MW-02B	7470A, 7470A	T	<2 SU	20 mL	20 mL		1 mL	0.5 mL
440-270581-H-3	MW-04A	7470A, 7470A	T	<2 SU	20 mL	20 mL		1 mL	0.5 mL
440-270581-H-4	MW-04B	7470A, 7470A	T	<2 SU	20 mL	20 mL		1 mL	0.5 mL

Lab Sample ID	Client Sample ID	Method Chain	Basis	ME HYDROX SOL 00125	ME KMN04 00198				
MB 440-621486/1		7470A, 7470A		2 mL	3 mL				
LCS 440-621486/2		7470A, 7470A		2 mL	3 mL				
440-270581-H-1	MW-02A	7470A, 7470A	T	2 mL	3 mL				
440-270581-H-1 MS	MW-02A	7470A, 7470A	T	2 mL	3 mL				
440-270581-H-1 MSD	MW-02A	7470A, 7470A	T	2 mL	3 mL				
440-270581-H-2	MW-02B	7470A, 7470A	T	2 mL	3 mL				
440-270581-H-3	MW-04A	7470A, 7470A	T	2 mL	3 mL				
440-270581-H-4	MW-04B	7470A, 7470A	T	2 mL	3 mL				

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270581-1

SDG No.:

Batch Number: 621486 Batch Start Date: 08/20/20 14:11 Batch Analyst: Suico, Ethel M

Batch Method: 7470A Batch End Date: 08/21/20 09:45

Batch Notes	
Batch Comment	MB Loc:b6
Temperature - Corrected - End	97 Degrees C
Temperature - Corrected - Start	97 Degrees C
Digestion End Time	08/20/20 18:10
Digestion Start Time	08/20/20 16:10
Digestion Unit ID	8
Sulfuric Acid ID	6301633
Nitric Acid ID	6277174
Hydroxylamine ID	6273438 @8-21-20@9:30
Potassium Persulfate ID	6156783
Potassium Permanganate ID	6246272
Pipette/Syringe/Dispenser ID	800
Analyst ID - Spike Analyst	es
Thermometer ID	P-120 Loc B9 Cf=+1
Digestion Tube/Cup ID	2001329
Temperature - Uncorrected - End	96 Degrees C
Temperature - Uncorrected - Start	96 Degrees C

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270581-1

SDG No.:

Batch Number: 621487 Batch Start Date: 08/20/20 14:16 Batch Analyst: Suico, Ethel M

Batch Method: 7470A Batch End Date: 08/21/20 12:10

Lab Sample ID	Client Sample ID	Method Chain	Basis	Initial pH	InitialAmount	FinalAmount	ME 1 PPM HG1 00462	ME H2SO4 00097	ME HNO3 00577
MB 440-621487/1		7470A, 7470A			20 mL	20 mL		0.5 mL	0.5 mL
LCS 440-621487/2		7470A, 7470A			20 mL	20 mL	80 uL	0.5 mL	0.5 mL
440-270581-I-1	MW-02A	7470A, 7470A	D	<2 SU	20 mL	20 mL		0.5 mL	0.5 mL
440-270581-I-1 MS	MW-02A	7470A, 7470A	D	<2 SU	20 mL	20 mL	80 uL	0.5 mL	0.5 mL
440-270581-I-1 MSD	MW-02A	7470A, 7470A	D	<2 SU	20 mL	20 mL	80 uL	0.5 mL	0.5 mL
440-270581-I-2	MW-02B	7470A, 7470A	D	<2 SU	20 mL	20 mL		0.5 mL	0.5 mL
440-270581-I-3	MW-04A	7470A, 7470A	D	<2 SU	20 mL	20 mL		0.5 mL	0.5 mL
440-270581-I-4	MW-04B	7470A, 7470A	D	<2 SU	20 mL	20 mL		0.5 mL	0.5 mL

Lab Sample ID	Client Sample ID	Method Chain	Basis	ME HYDROX SOL 00125	ME K2S2O8 00096	ME KMN04 00198			
MB 440-621487/1		7470A, 7470A		2 mL	1.6 mL	3 mL			
LCS 440-621487/2		7470A, 7470A		2 mL	1.6 mL	3 mL			
440-270581-I-1	MW-02A	7470A, 7470A	D	2 mL	1.6 mL	3 mL			
440-270581-I-1 MS	MW-02A	7470A, 7470A	D	2 mL	1.6 mL	3 mL			
440-270581-I-1 MSD	MW-02A	7470A, 7470A	D	2 mL	1.6 mL	3 mL			
440-270581-I-2	MW-02B	7470A, 7470A	D	2 mL	1.6 mL	3 mL			
440-270581-I-3	MW-04A	7470A, 7470A	D	2 mL	1.6 mL	3 mL			
440-270581-I-4	MW-04B	7470A, 7470A	D	2 mL	1.6 mL	3 mL			

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270581-1

SDG No.:

Batch Number: 621487 Batch Start Date: 08/20/20 14:16 Batch Analyst: Suico, Ethel M

Batch Method: 7470A Batch End Date: 08/21/20 12:10

Batch Notes	
Batch Comment	MB Loc: b17
Temperature - Corrected - End	97 Degrees C
Temperature - Corrected - Start	97 Degrees C
Digestion End Time	08/20/20 18:10
Digestion Start Time	08/20/20 16:10
Digestion Unit ID	8
Sulfuric Acid ID	6301633
Nitric Acid ID	6277174
Hydroxylamine ID	6273438 @8-21-20@11:30
Potassium Persulfate ID	6156783
Potassium Permanganate ID	6246272
Pipette/Syringe/Dispenser ID	800
Analyst ID - Spike Analyst	es
Thermometer ID	P-120 Loc B9 Cf=+1
Digestion Tube/Cup ID	2001329
Temperature - Uncorrected - End	96 Degrees C
Temperature - Uncorrected - Start	96 Degrees C

Basis	Basis Description
D	Dissolved

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GENERAL CHEMISTRY BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270581-1

SDG No.:

Batch Number: 622049 Batch Start Date: 08/25/20 16:52 Batch Analyst: Young, Katrina M

Batch Method: SM 4500 S2 D Batch End Date:

Lab Sample ID	Client Sample ID	Method Chain	Basis	Initial pH	InitialAmount	FinalAmount	Na2S_Acros 00814		
MB 440-622049/3		SM 4500 S2 D			7.5 mL	7.5 mL			
LCS 440-622049/4		SM 4500 S2 D			43.5 mL	43.5 mL	0.218 mL		
440-270581-J-1	MW-02A	SM 4500 S2 D	T	12 SU	7.5 mL	7.5 mL			
440-270581-J-1 MS	MW-02A	SM 4500 S2 D	T	12 SU	43.5 mL	43.5 mL	0.218 mL		
440-270581-J-1 MSD	MW-02A	SM 4500 S2 D	T	12 SU	43.5 mL	43.5 mL	0.218 mL		
440-270581-J-2	MW-02B	SM 4500 S2 D	T	12 SU	7.5 mL	7.5 mL			
440-270581-J-3	MW-04A	SM 4500 S2 D	T	12 SU	7.5 mL	7.5 mL			
440-270581-J-4	MW-04B	SM 4500 S2 D	T	12 SU	7.5 mL	7.5 mL			

Batch Notes	
1:1 Sulfuric + Water Lot ID	5925263
Amine Sulfuric Acid ID	6294517
Ammonium Phosphate ID	6312497
Ferric Chloride ID	6163807
Sodium Hydroxide ID	6312498
Pipette ID	wc010 wc027 wc036
Zinc Acetate Buffer ID	6283047

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GENERAL CHEMISTRY BATCH WORKSHEET

Lab Name: Eurofins Irvine Job No.: 440-270581-1

SDG No.:

Batch Number: 621822 Batch Start Date: 08/24/20 13:06 Batch Analyst: Tan, Sarah

Batch Method: 9040B Batch End Date: 08/24/20 14:24

Lab Sample ID	Client Sample ID	Method Chain	Basis	FinalAmount	pHRead1	TempRead1	pHRead2	TempRead2	
440-270581-G-1	MW-02A	9040B	T	50 mL	7.33 SU	18.1 Celsius	7.35 SU	18.0 Celsius	
440-270581-G-1 DU	MW-02A	9040B	T	50 mL	7.37 SU	17.9 Celsius	7.36 SU	17.8 Celsius	
440-270581-G-2	MW-02B	9040B	T	50 mL	7.63 SU	17.6 Celsius	7.63 SU	17.6 Celsius	
440-270581-G-3	MW-04A	9040B	T	50 mL	7.33 SU	17.7 Celsius	7.32 SU	17.7 Celsius	
440-270581-G-4	MW-04B	9040B	T	50 mL	7.48 SU	17.7 Celsius	7.52 SU	17.7 Celsius	

Batch Notes	
Calibration Date and Time	08/24/2020 13:06
pH Meter Calibration Slope	(pH 4-pH 7) 99.2 (pH 1-pH 4) 100.8
pH Meter ID	15

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GC/MS SEMI VOA BATCH WORKSHEET

Lab Name: Eurofins Calscience Job No.: 440-270581-1

SDG No.:

Batch Number: 89524 Batch Start Date: 08/21/20 13:37 Batch Analyst: Pastrano, Darian

Batch Method: 3510C Batch End Date: 08/21/20 15:20

Lab Sample ID	Client Sample ID	Method Chain	Basis	GrossWeight	TareWeight	InitialAmount	FinalAmount	ReceivedpH	FirstAdjustpH
MB 570-89524/1		3510C, 8270C SIM				1000 mL	2 mL	6 SU	2 SU
LCS 570-89524/2		3510C, 8270C SIM				1000 mL	2 mL	6 SU	2 SU
LCSD 570-89524/3		3510C, 8270C SIM				1000 mL	2 mL	6 SU	2 SU
440-270581-M-1	MW-02A	3510C, 8270C SIM	T	1562.6 g	510.9 g	1051.7 mL	2 mL	6 SU	2 SU
440-270581-M-2	MW-02B	3510C, 8270C SIM	T	1567.1 g	515.7 g	1051.4 mL	2 mL	6 SU	2 SU
440-270581-M-3	MW-04A	3510C, 8270C SIM	T	1569.0 g	516.8 g	1052.2 mL	2 mL	6 SU	2 SU
440-270581-M-4	MW-04B	3510C, 8270C SIM	T	1565.8 g	511.3 g	1054.5 mL	2 mL	6 SU	2 SU

Lab Sample ID	Client Sample ID	Method Chain	Basis	SecondAdjustpH	E_625 Sim SR 00003	E_82FQC-Spk 00002	AnalysisComment		
MB 570-89524/1		3510C, 8270C SIM		11 SU	0.5 mL				
LCS 570-89524/2		3510C, 8270C SIM		11 SU	0.5 mL	0.2 mL			
LCSD 570-89524/3		3510C, 8270C SIM		11 SU	0.5 mL	0.2 mL			
440-270581-M-1	MW-02A	3510C, 8270C SIM	T	11 SU	0.5 mL		Clear water		
440-270581-M-2	MW-02B	3510C, 8270C SIM	T	11 SU	0.5 mL		Clear water		
440-270581-M-3	MW-04A	3510C, 8270C SIM	T	11 SU	0.5 mL		Clear water		
440-270581-M-4	MW-04B	3510C, 8270C SIM	T	11 SU	0.5 mL		Clear water		

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GC/MS SEMI VOA BATCH WORKSHEET

Lab Name: Eurofins Calscience Job No.: 440-270581-1

SDG No.:

Batch Number: 89524 Batch Start Date: 08/21/20 13:37 Batch Analyst: Pastrano, Darian

Batch Method: 3510C Batch End Date: 08/21/20 15:20

Batch Notes	
Acid Used for pH Adjustment ID	586577
Balance ID	57
Base Used to Adjust pH ID	109345
Batch Comment	8270 SIM FV=2 mL.
Analyst ID - Concentration	om8w/l6ie
Concentration 1 Corrected Temperature	60.5 Degrees C
Equipment ID - Concentration 1	KD-06/ KD-10
Analyst ID - Extraction	OAJ3
Method/Fraction	8270 SIM
Na2SO4 ID	551850
pH Indicator ID	25396
Pipette/Syringe/Dispenser ID	D-097
Prep Solvent ID	802367
Prep Solvent Volume Used	360 mL
Analyst ID - Spike Analyst	OAJ3
Analyst ID - Spike Witness Analyst	OM8W
Sufficient Volume for Batch QC	See NCM
Thermometer ID - Concentration 1	Y20-59
Concentration 1 Uncorrected Temperature	60.0 Degrees C
Vial Lot Number	00291984 (4 ml vials)
Reagent Water ID	DI water

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

NO. 756594 -D

NON-HAZARDOUS WASTE DATA FORM

BESI # 322147

GENERATOR

Generator's Name and Mailing Address

ATLANTIC RICHFIELD COMPANY
4 CENTERPOINTE DRIVE, 2ND FLOOR
ATTN: KYLE CHRISTIE
LA PALMA, CA 90623

Generator's Site Address (if different than mailing address)

GARDENA SUMPS
S/W CORNER OF ARTESIA & NORMANDIE
GARDENA, CA 90248

Generator's Phone:

Container type removed from site:

☒ Drums ☐ Vacuum Truck ☐ Roll-off Truck ☐ Dump Truck ☐ Other

Quantity 1

Container type transported to receiving facility:

☐ Drums ☒ Vacuum Truck ☐ Roll-off Truck ☐ Dump Truck ☐ Other

Quantity 1 Volume 25 GAL

WASTE DESCRIPTION NON-HAZARDOUS WATER

GENERATING PROCESS WELL PURGING / DECON WATER

COMPONENTS OF WASTE	PPM	%
1. WATER		99-100%
2. TPH		<1%
3.		
4.		

Waste Profile

PROPERTIES: pH 7-10 ☐ SOLID ☒ LIQUID ☐ SLUDGE ☐ SLURRY ☐ OTHER

HANDLING INSTRUCTIONS:

Generator Printed/Typed Name: Larry Moothart of BESI on behalf of generator

Signature

Month Day Year: 9 2 20

The Generator certifies that the waste as described is 100% non-hazardous

TRANSPORTER

Transporter 1 Company Name: BELSHIRE

Phone#: 949-460-5200

Transporter 1 Printed/Typed Name: Jayson Johnson

Signature

Month Day Year: 9 2 20

Transporter Acknowledgment of Receipt of Materials

Transporter 2 Company Name: NIETO & SONS TRUCKING, INC.

Phone#: 714-990-6855

Transporter 2 Printed/Typed Name: Miguel Ibarra

Signature

Month Day Year: 9 16 20

Transporter Acknowledgment of Receipt of Materials

RECEIVING FACILITY

Designated Facility Name and Site Address

WORLD OIL RECYCLING
2000 N. ALAMEDA ST.
COMPTON, CA 90222

Phone#: 310-537-7100

Printed/Typed Name: Cristian Bustanilla

Signature

Month Day Year: 09 16 20

Designated Facility Owner or Operator: Certification of receipt of materials covered by this data form.

ARTESIA
2383597

Table 1
Groundwater Monitoring Well Construction Specifications
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Date Installed	Date Abandoned	Well Diameter (inches)	Well Material	Top of Casing Elevation (ft MSL)	Surface Elevation (ft MSL)	Total Depth of Boring (ft bgs)	Total Depth of Well (ft bgs)	Screen Interval (ft bgs)	Screen Interval (ft MSL)
MW-01A	02/16/94	--	4"	sch. 40 PVC	23.55	23.55	40	40	27-37	-2.95 to -12.95
MW-01B	02/14/94	--	4"	sch. 40 PVC	23.69	23.69	92	86	80-85	-55.73 to -60.73
MW-02A	01/26/94	--	4"	sch. 40 PVC	19.15	17.38	31.5	31.5	15.5-25.5	1.88 to -8.12
MW-02B	01/23/94	--	4"	sch. 40 PVC	19.36	17.08	90	83	75.5-80.5	-58.42 to -63.42
MW-03A	01/21/94	--	4"	sch. 40 PVC	25.45	23.46	31.5	27	15.5-25.5	7.96 to -2.04
MW-03B	01/18/94	--	4"	sch. 40 PVC	25.51	23.54	90	83.5	76.5-81.5	-52.96 to -57.96
MW-04A	02/15/07	--	4"	sch. 40 PVC	24.02	21.16	30	28	18-28	6.02 to -3.98
MW-04B	02/16/07	--	4"	sch. 40 PVC	23.99	21.19	88	85	75-80	-51.01 to 56.01
MW-05A	07/20/09	--	4"	sch. 40 PVC	20.21	20.50	30.5	28	13-23	7.5 to -2.5
G-1	12/1/1982*	1987 or 1988	4"	PVC*	--	--	70	62	50-55	-25.92 to -30.92
G-2	12/1/1982*	1987 or 1988	4"	PVC*	--	--	70	65	40-50	-14.91 to -24.91
G-3	12/1/1982*	1987 or 1988	4"	PVC*	--	--	65	65	50-60	-24.94 to -34.94
G-4	12/01/82	--	2"	PVC	26.79**	25.14	65	65	45-55	-19.86 to -29.86

Notes
ft bgs = Feet below ground surface
ft MSL = Feet Mean Sea Level
-- = Not applicable / Not analylized
* = Assumed from data for G-4
Total depth of well and screen intervals determined from downhole camera inspection conducted on December, 15, 2005
** = Well G-4 casing was damaged in early 2017. It was repaired in 2018 and resurveyed on May 5, 2018. Former elevation was 27.12' AMSL.

References
California Department of Health Services, 1987: *Site Inspection Report Gardena Sumps, Gardena, California.*
URS Consultants, Inc., 1994: *Groundwater Remedial Investigation Technical Memorandum, Gardena Sumps City of Gardena, California.*
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.
Top of well casing and surface elevation surveyed by WM Holdings, Incorporated on September 7, 2005 and March 1, 2007.
During the first quarter 2010 the screened interval for MW-05A was edited to show the correct MSL interval.
3-5-2018 elevation survey by Stantec PLS survey

Table 2
Summary of Groundwater Gauging and Elevation Data
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-01A	24.19	05/11/94	15.22	39.00	8.97	--	175	0.0053	0.044	--	
MW-01A	24.19	10/22/99	14.02	37.20	10.17	1.20	160	0.00499	0.041	--	Gauged on either 10/22 or 11/4/99
MW-01A	24.19	04/03/01	12.82	37.40	11.37	1.20	158	0.00553	0.046	--	
MW-01A	24.19	06/12/01	13.12	37.40	11.07	-0.30	156.5	0.0036	0.030	--	
MW-01A	24.19	02/28/02	14.28	37.38	9.91	-1.16	159.5	0.00477	0.039	--	
MW-01A	24.19	01/06/05	--	--	--	--	--	--	--	--	Well inaccessible
MW-01A	24.05	02/16/06	13.12	37.30	10.93	1.02	146.5	0.0038	0.031	--	
MW-01A	24.05	05/17/06	12.74	37.25	11.31	0.38	149	0.00476	0.039	--	
MW-01A	24.05	08/21/06	13.08	37.57	10.97	-0.34	147	0.0047	0.039	--	
MW-01A	24.05	11/20/06	13.42	37.57	10.63	-0.34	147	0.0043	0.035	--	
MW-01A	24.05	03/01/07	13.76	NM	10.29	-0.34	192	NC	NC	--	Not calculated off site
MW-01A	24.05	05/17/07	13.99	37.17	10.06	-0.23	180	NC	NC	--	"
MW-01A	24.05	08/23/07	13.88	37.38	10.17	0.11	180	NC	NC	--	"
MW-01A	24.05	11/15/07	14.27	37.26	9.78	-0.39	180	NC	NC	--	"
MW-01A	24.05	02/19/08	13.40	NM	10.65	0.87	190	NC	NC	--	"
MW-01A	24.05	05/19/08	13.24	37.36	10.81	0.16	180	NC	NC	--	"
MW-01A	24.05	08/18/08	13.65	NM	10.40	-0.41	179	NC	NC	--	"
MW-01A	24.05	11/10/08	14.16	37.35	9.89	-0.51	182	NC	NC	--	"
MW-01A	24.05	02/18/09	13.14	37.30	10.91	1.02	215	NC	NC	--	"
MW-01A	24.05	05/27/09	13.97	37.34	10.08	-0.83	180	NC	NC	--	"
MW-01A	24.05	08/25/09	14.36	37.20	9.69	-0.39	179	NC	NC	--	"
MW-01A	24.05	11/23/09	14.63	37.33	9.42	-0.27	182	NC	NC	--	"
MW-01A	24.05	02/22/10	13.26	37.17	10.79	1.37	189	NC	NC	--	"
MW-01A	24.05	05/27/10	13.50	37.19	10.55	-0.24	185	NC	NC	--	"
MW-01A	24.05	08/31/10	13.91	37.44	10.14	-0.41	177	NC	NC	--	"
MW-01A	24.05	09/29/10	13.72	37.40	10.33	0.19	NC	NC	NC	--	re-sampled for SVOC's
MW-01A	24.05	11/18/10	14.15	37.32	9.90	-0.43	179	NC	NC	--	Not calculated off site
MW-01A	24.05	02/15/11	12.60	37.35	11.45	1.55	183	NC	NC	--	
MW-01A	24.05	05/09/11	12.50	37.27	11.55	0.10	180	NC	NC	--	
MW-01A	24.05	07/20/11	12.88	37.20	11.17	-0.38	177	NC	NC	--	
MW-01A	24.05	11/21/11	13.23	39.40	10.82	-0.35	196	NC	NC	--	
MW-01A	24.05	02/15/12	13.79	38.33	10.26	-0.56	184	NC	NC	--	
MW-01A	24.05	05/22/12	13.74	37.20	10.31	0.05	184	NC	NC	--	
MW-01A	24.05	08/06/12	13.60	37.13	10.45	0.14	184	NC	NC	--	
MW-01A	24.05	11/13/12	13.79	37.55	10.26	-0.19	180	NC	NC	--	
MW-01A	24.05	02/19/13	13.95	37.25	10.10	-0.16	181	NC	NC	--	
MW-01A	24.05	05/21/13	14.00	37.08	10.05	-0.05	182	NC	NC	--	
MW-01A	24.05	08/06/13	14.25	NM	9.80	-0.25	191	NC	NC	--	
MW-01A	24.05	11/13/13	NM	NM	NM	NM	NC	NC	NC	NC	No Access to Well this quarter
MW-01A	24.05	02/20/14	NM	NM	NM	NM	NC	NC	NC	NC	No Access to Well this quarter
MW-01A	24.05	05/21/14	NM	NM	NM	NM	NC	NC	NC	NC	No Access to Well this quarter
MW-01A	24.05	08/12/14	NM	NM	NM	NM	NC	NC	NC	NC	No Access to Well this quarter
MW-01A	24.05	11/18/14	NM	NM	NM	NM	NC	NC	NC	NC	Well has been removed from sampling plan
MW-01A	24.05	02/19/15	NM	NM	NM	NM	NC	NC	NC	NC	
MW-01A	24.05	05/18/15	14.41	37.40	9.64	-0.16	NC	NC	NC	NC	Well is Gauged Only, 2nd quarter event each year
MW-01A	24.05	05/25/16	15.08	NM	8.97	-0.67	NC	NC	NC	NC	
MW-01A	24.05	05/22/17	13.14	37.45	10.91	1.94	NC	NC	NC	NC	
MW-01A	24.05	02/21/18	14.22	37.43	9.83	-1.08	NC	NC	NC	NC	Well is Gauged Only, Changed to 1st quarter each year
MW-01A	24.05	02/12/19	12.40	37.50	11.65	1.82	NC	NC	NC	NC	Well is Gauged Only, 1st quarter each year
MW-01A	24.05	02/18/20	NM	37.50	NM	NM	NC	NC	NC	NC	Measurement not taken
MW-01A	24.05	08/18/20	13.11	NM	10.94	-0.71	NC	NC	NC	NC	Well Gauged Only
MW-01B	24.52	05/11/94	19.60	86.00	4.92	--	102.5	0.00557	0.207	0.076	
MW-01B	24.52	10/22/99	17.89	84.70	6.63	1.71	100	0.0056	0.208	0.067	Gauged on either 10/22 or 11/4/99
MW-01B	24.52	04/03/01	16.49	85.10	8.03	1.40	101	0.00617	0.229	0.063	
MW-01B	24.52	06/12/01	16.79	84.90	7.73	-0.30	100	0.0063	0.234	0.063	
MW-01B	24.52	02/28/02	17.62	84.90	6.90	-0.83	99.5	0.00549	0.204	0.057	
MW-01B	24.52	01/06/05	--	--	--	--	--	--	--	--	Well inaccessible
MW-01B	24.27	02/16/06	16.40	85.10	7.87	0.97	104	0.00462	0.171	0.058	
MW-01B	24.27	05/17/06	16.02	85.00	8.25	0.38	101	0.0053	0.197	0.058	
MW-01B	24.27	08/21/06	16.39	85.27	7.88	-0.37	103	0.0045	0.167	0.058	
MW-01B	24.27	11/20/06	16.61	85.27	7.66	-0.22	103	0.0042	0.156	0.056	
MW-01B	24.27	03/01/07	16.46	84.93	7.81	0.15	92.5	NC	NC	0.047	Not calculated off site
MW-01B	24.27	05/17/07	16.94	84.95	7.33	-0.48	97	NC	NC	0.052	"
MW-01B	24.27	08/23/07	17.04	85.23	7.23	-0.10	105	NC	NC	0.055	"
MW-01B	24.27	11/15/07	17.22	85.23	7.05	-0.18	103	NC	NC	0.052	"
MW-01B	24.27	02/19/08	16.47	NM	7.80	0.75	105	NC	NC	0.054	"
MW-01B	24.27	05/19/08	16.50	85.26	7.77	-0.03	102	NC	NC	0.057	"
MW-01B	24.27	08/18/08	16.89	NM	7.38	-0.39	102	NC	NC	0.057	"
MW-01B	24.27	11/10/08	17.08	85.20	7.19	-0.19	105	NC	NC	0.051	"
MW-01B	24.27	02/18/09	16.62	84.91	7.65	0.46	100	NC	NC	0.062	"
MW-01B	24.27	05/27/09	17.11	85.10	7.16	-0.49	100	NC	NC	0.055	"
MW-01B	24.27	08/25/09	17.50	85.30	6.77	-0.39	98	NC	NC	0.055	"
MW-01B	24.27	11/23/09	17.59	84.91	6.68	-0.09	99	NC	NC	0.052	"
MW-01B	24.27	02/22/10	16.48	85.24	7.79	1.11	102	NC	NC	0.057	"
MW-01B	24.27	05/27/10	16.54	85.00	7.73	-0.06	100	NC	NC	0.053	"
MW-01B	24.27	08/31/10	16.94	NM	7.33	-0.40	100	NC	NC	0.053	"
MW-01B	24.27	09/29/10	16.93	85.02	7.34	0.01	NC	NC	NC	0.056	re-sampled for SVOC's
MW-01B	24.27	11/18/10	17.09	85.00	7.18	-0.16	94	NC	NC	0.051	Not calculated off site
MW-01B	24.27	02/15/11	15.77	85.00	8.50	1.32	102	NC	NC	0.056	
MW-01B	24.27	05/09/11	15.60	85.00	8.67	0.17	100	NC	NC	0.054	
MW-01B	24.27	07/20/11	16.10	85.08	8.17	-0.50	104	NC	NC	0.057	
MW-01B	24.27	11/21/11	16.58	85.32	7.69	-0.48	99	NC	NC	0.059	
MW-01B	24.27	02/15/12	16.85	85.10	7.42	-0.27	97	NC	NC	0.054	
MW-01B	24.27	05/22/12	16.90	85.10	7.37	-0.05	101	NC	NC	0.055	
MW-01B	24.27	08/06/12	16.94	84.85	7.33	-0.04	104	NC	NC	0.059	
MW-01B	24.27	11/13/12	17.22	85.17	7.05	-0.28	100	NC	NC	0.061	
MW-01B	24.27	02/19/13	17.17	84.90	7.10	0.05	93	NC	NC	0.057	
MW-01B	24.27	05/21/13	17.41	85.18	6.86	-0.24	104	NC	NC	0.060	
MW-01B	24.27	08/06/13	17.46	NM	6.81	-0.05	98	NC	NC	0.056	
MW-01B	24.27	11/13/13	NM	NM	NM	NM	NM	NC	NC	NM	No Access to Well this quarter
MW-01B	24.27	02/20/14	NM	NM	NM	NM	NM	NC	NC	NM	No Access to Well this quarter
MW-01B	24.27	05/21/14	NM	NM	NM	NM	NM	NC	NC	NM	No Access to Well this quarter
MW-01B	24.27	08/12/14	NM	NM	NM	NM	NM	NC	NC	NM	No Access to Well this quarter
MW-01B	24.27	11/18/14	NM	NM	NM	NM	NM	NC	NC	NM	Well has been removed from sampling plan
MW-01B	24.27	02/19/15	NM	NM	NM	NM	NM	NC	NC	NM	
MW-01B	24.27	05/18/15	17.53	84.91	6.74	-0.07	NM	NC	NC	NM	Well is Gauged Only, 2nd quarter each year
MW-01B	24.27	05/25/16	17.70	NM	6.57	-0.17	NM	NC	NC	NM	
MW-01B	24.27	05/22/17	15.90	85.15	8.37	1.80	NM	NC	NC	NM	
MW-01B	24.27	02/21/18	16.76	85.16	7.51	-0.86	NM	NC	NC	NM	Well is Gauged Only, Changed to 1st quarter each year
MW-01B	24.27	02/12/19	15.70	85.15	8.57	1.06	NM	NC	NC	NM	Well is Gauged Only, 1st quarter each year

Table 2
Summary of Groundwater Gauging and Elevation Data
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-01B	24.27	02/18/20	NM	85.15	NM	NM	NM	NC	NC	NM	Measurement not taken
MW-01B	24.27	08/18/20	15.30	NM	8.97	0.40	NM	NC	NC	NM	

Table 2
Summary of Groundwater Gauging and Elevation Data
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-02A	19.22	05/11/94	12.90	27.00	6.32	--	175	0.0053	0.044	--	
MW-02A	19.22	10/22/99	12.72	28.10	6.50	0.18	160	0.00499	0.041	--	Gauged on either 10/22 or 11/4/99
MW-02A	19.22	04/03/01	12.13	28.34	7.09	0.59	158	0.00553	0.046	--	
MW-02A	19.22	06/12/01	12.50	28.21	6.72	-0.37	156.5	0.0036	0.030	--	
MW-02A	19.22	02/28/02	12.87	28.20	6.35	-0.37	159.5	0.00477	0.039	--	
MW-02A	19.22	01/06/05	10.81	28.52	8.41	2.06	--	--	--	--	
MW-02A	19.15	02/16/06	12.70	28.25	6.45	-1.96	146.5	0.0038	0.031	--	
MW-02A	19.15	05/17/06	12.39	28.25	6.76	0.31	149	0.00476	0.039	--	
MW-02A	19.15	08/21/06	12.80	28.52	6.35	-0.41	147	0.0047	0.039	--	
MW-02A	19.15	11/20/06	12.76	28.52	6.39	0.04	147	0.0043	0.035	--	
MW-02A	19.15	03/01/07	12.96	25.50	6.19	-0.20	192	0.0034	0.028	--	
MW-02A	19.15	05/17/07	12.91	28.15	6.24	0.05	180	0.0038	0.031	--	
MW-02A	19.15	08/23/07	12.87	28.25	6.28	0.04	180	0.0044	0.036	--	
MW-02A	19.15	11/15/07	12.94	28.25	6.21	-0.07	180	0.004	0.033	--	
MW-02A	19.15	02/19/08	12.34	28.21	6.81	0.60	190	0.0048	0.040	--	
MW-02A	19.15	05/19/08	12.68	28.29	6.47	-0.34	180	0.0042	0.035	--	
MW-02A	19.15	08/18/08	12.88	28.21	6.27	-0.20	179	0.0036	0.030	--	
MW-02A	19.15	11/10/08	12.87	28.25	6.28	0.01	182	0.0041	0.034	--	
MW-02A	19.15	02/18/09	11.50	28.28	7.65	1.37	215	0.0087	0.072	--	
MW-02A	19.15	05/27/09	12.92	28.25	6.23	-1.42	180	0.0040	0.033	--	
MW-02A	19.15	08/25/09	13.02	NM	6.13	-0.10	179	0.0040	0.033	--	
MW-02A	19.15	11/24/09	12.86	28.15	6.29	0.16	182	0.0041	0.034	--	
MW-02A	19.15	02/22/10	12.00	28.17	7.15	0.86	189	0.0048	0.040	--	
MW-02A	19.15	05/27/10	12.52	28.98	6.63	-0.52	185	0.0042	0.035	--	
MW-02A	19.15	08/31/10	12.84	28.28	6.31	-0.32	177	0.0039	0.032	--	
MW-02A	19.15	09/29/10	12.81	28.31	6.34	0.03	NC	NC	NC	--	re-sampled for SVOC's
MW-02A	19.15	11/18/10	12.76	28.32	6.39	0.05	179	0.0040	0.033	--	
MW-02A	19.15	02/15/11	12.21	28.33	6.94	0.55	183	0.0048	0.040	--	
MW-02A	19.15	05/09/11	12.30	28.20	6.85	-0.09	180	0.0048	0.040	--	
MW-02A	19.15	07/20/11	12.58	28.24	6.57	-0.28	177	0.0045	0.037	--	
MW-02A	19.15	11/21/11	12.08	NM	7.07	0.50	196	0.0110	0.091	--	
MW-02A	19.15	02/15/12	12.72	NM	6.43	-0.64	184	0.0028	0.023	--	
MW-02A	19.15	05/22/12	12.68	28.24	6.47	0.04	184	0.0041	0.034	--	
MW-02A	19.15	08/06/12	12.69	28.28	6.46	-0.01	184	0.0043	0.035	--	
MW-02A	19.15	11/13/12	12.90	28.11	6.25	-0.21	180	0.0041	0.034	--	
MW-02A	19.15	02/19/13	12.78	28.19	6.37	0.12	181	0.0044	0.036	--	
MW-02A	19.15	05/21/13	12.95	28.18	6.20	-0.17	182	0.0046	0.038	--	
MW-02A	19.15	08/06/13	12.58	NM	6.57	0.37	191	0.0050	0.041	--	
MW-02A	19.15	11/13/13	12.90	28.40	6.25	-0.32	184	0.0042	0.035	--	
MW-02A	19.15	02/20/14	13.24	28.22	5.91	-0.34	175	0.0040	0.033	--	
MW-02A	19.15	05/21/14	13.02	28.22	6.13	0.22	180	0.0040	0.033	--	
MW-02A	19.15	08/12/14	13.30	28.22	5.85	-0.28	174	0.0037	0.030	--	
MW-02A	19.15	11/18/14	13.25	28.30	5.90	0.05	178	0.0042	0.035	--	
MW-02A	19.15	02/19/15	12.95	28.44	6.20	0.30	182	0.0041	0.034	--	
MW-02A	19.15	05/18/15	12.95	28.41	6.20	0.00	175	0.0029	0.024	--	
MW-02A	19.15	08/18/15	13.20	28.40	5.95	-0.25	173	0.0036	0.030	--	
MW-02A	19.15	11/02/15	13.09	28.45	6.06	0.11	183	0.0036	0.030	--	
MW-02A	19.15	03/03/16	13.06	28.40	6.09	0.03	181	0.0039	0.032	--	
MW-02A	19.15	05/25/16	13.16	28.40	5.99	-0.10	179	0.0038	0.031	--	
MW-02A	19.15	08/23/16	13.37	28.41	5.78	-0.21	177	0.0032	0.026	--	
MW-02A	19.15	11/21/16	12.92	28.40	6.23	0.45	192	0.0049	0.040	--	
MW-02A	19.15	02/22/17	10.90	28.43	8.25	2.02	206	0.0086	0.071	--	
MW-02A	19.15	05/22/17	12.47	28.43	6.68	-1.57	179	0.0044	0.036	--	Well vandalized, locks cut-off
MW-02A	19.15	08/17/17	12.78	28.40	6.37	-0.31	174	0.0041	0.034	--	
MW-02A	19.15	02/21/18	12.93	28.40	6.22	-0.15	175	0.0039	0.032	--	Wells are now sampled only 1st and 3rd quarters each year
MW-02A	19.15	08/21/18	13.11	28.42	6.04	-0.18	164	0.0034	0.028	--	
MW-02A	19.15	02/12/19	11.33	28.41	7.82	1.78	199	0.0065	0.054	--	
MW-02A	19.15	08/20/19	12.69	NM	6.46	-1.36	170	0.0041	0.034	--	TD not measured
MW-02A	19.15	02/18/20	12.63	NM	6.52	-1.30	169	0.0038	0.031	--	Data recorded incorrectly
MW-02A	19.15	08/18/20	12.51	32.10	6.64	0.12	180	0.0041	0.034	--	

Table 2
Summary of Groundwater Gauging and Elevation Data
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-02B	19.49	05/11/94	21.11	83.00	-1.62	--	102.5	0.00557	0.207	0.132	
MW-02B	19.49	10/22/99	19.42	81.76	0.07	1.69	100	0.0056	0.208	0.107	Gauged on either 10/22 or 11/4/99
MW-02B	19.49	04/03/01	18.66	82.92	0.83	0.76	101	0.00617	0.229	0.104	
MW-02B	19.49	06/12/01	18.87	82.90	0.62	-0.21	100	0.0063	0.234	0.102	
MW-02B	19.49	02/28/02	19.00	82.91	0.49	-0.13	99.5	0.00549	0.204	0.098	
MW-02B	19.49	01/06/05	18.93	82.91	0.56	0.07	--	--	--	--	
MW-02B	19.36	02/16/06	17.62	82.95	1.74	1.18	104	0.00462	0.171	0.079	
MW-02B	19.36	05/17/06	17.33	82.85	2.03	0.29	101	0.0053	0.197	0.079	
MW-02B	19.36	08/21/06	17.50	83.16	1.86	-0.17	103	0.0045	0.167	0.075	
MW-02B	19.36	11/20/06	17.35	83.16	2.01	0.15	103	0.0042	0.156	0.073	
MW-02B	19.36	03/01/07	17.56	80.50	1.80	-0.21	92.5	0.0054	0.200	0.073	
MW-02B	19.36	05/17/07	17.71	82.79	1.65	-0.15	97	0.005	0.186	0.077	
MW-02B	19.36	08/23/07	17.80	83.00	1.56	-0.09	105	0.0045	0.167	0.079	
MW-02B	19.36	11/15/07	17.90	83.00	1.46	-0.10	103	0.0044	0.163	0.079	
MW-02B	19.36	02/19/08	17.32	83.02	2.04	0.58	105	0.0045	0.167	0.080	
MW-02B	19.36	05/19/08	17.43	83.05	1.93	-0.11	102	0.0045	0.167	0.076	
MW-02B	19.36	08/18/08	17.68	82.97	1.68	-0.25	102	0.0046	0.171	0.077	
MW-02B	19.36	11/10/08	17.65	82.70	1.71	0.03	105	0.0044	0.163	0.076	
MW-02B	19.36	02/18/09	17.42	82.90	1.94	0.23	100	0.0043	0.160	0.095	
MW-02B	19.36	05/27/09	17.89	82.98	1.47	-0.47	100	0.0046	0.171	0.079	
MW-02B	19.36	08/25/09	18.14	28.18	1.22	-0.25	98	0.0047	0.174	0.082	
MW-02B	19.36	11/24/09	18.20	82.74	1.16	-0.06	99	0.0048	0.178	0.086	
MW-02B	19.36	02/22/10	17.54	83.03	1.82	0.66	102	0.0048	0.178	0.089	
MW-02B	19.36	05/27/10	17.43	82.86	1.93	0.11	100	0.0044	0.163	0.078	
MW-02B	19.36	08/31/10	17.79	82.83	1.57	-0.36	100	0.0048	0.178	0.079	
MW-02B	19.36	09/29/10	17.72	82.86	1.64	0.07	NC	NC	NC	0.078	re-sampled for SVOC's
MW-02B	19.36	11/18/10	17.84	82.82	1.52	-0.12	94	0.0048	0.178	0.081	
MW-02B	19.36	02/15/11	16.96	82.80	2.40	0.88	102	0.0049	0.182	0.076	
MW-02B	19.36	05/09/11	16.89	NM	2.47	0.07	100	0.0048	0.178	0.073	
MW-02B	19.36	07/20/11	17.25	82.84	2.11	-0.36	104	0.0046	0.171	0.074	
MW-02B	19.36	11/21/11	17.63	NM	1.73	-0.38	99	0.0044	0.163	0.089	
MW-02B	19.36	02/15/12	17.77	82.87	1.59	-0.14	97	0.0046	0.171	0.081	
MW-02B	19.36	05/22/12	17.85	83.00	1.51	-0.08	101	0.0046	0.171	0.083	
MW-02B	19.36	08/06/12	17.98	82.70	1.38	-0.13	104	0.0048	0.178	0.085	
MW-02B	19.36	11/13/12	18.19	82.98	1.17	-0.21	100	0.0048	0.178	0.085	
MW-02B	19.36	02/19/13	17.89	82.90	1.47	0.30	93	0.0045	0.167	0.082	
MW-02B	19.36	05/21/13	18.20	82.75	1.16	-0.31	104	0.0041	0.152	0.084	
MW-02B	19.36	08/06/13	18.36	NM	1.00	-0.16	98	0.0050	0.186	0.093	
MW-02B	19.36	11/13/13	18.48	83.00	0.88	-0.12	99	0.0049	0.182	0.090	
MW-02B	19.36	02/20/14	18.52	82.60	0.84	-0.04	98	0.0048	0.178	0.085	
MW-02B	19.36	05/21/14	18.43	82.60	0.93	0.09	107	0.0048	0.178	0.087	
MW-02B	19.36	08/12/14	18.75	82.60	0.61	-0.32	94	0.0046	0.171	0.087	
MW-02B	19.36	11/18/14	18.65	82.90	0.71	0.10	99	0.0047	0.174	0.087	
MW-02B	19.36	02/19/15	18.05	83.00	1.31	0.60	107	0.0043	0.160	0.082	
MW-02B	19.36	05/18/15	18.20	83.00	1.16	-0.15	99	0.0045	0.167	0.084	
MW-02B	19.36	08/18/15	18.36	83.05	1.00	-0.16	105	0.0046	0.171	0.083	
MW-02B	19.36	11/02/15	18.26	83.00	1.10	0.10	103	0.0046	0.171	0.083	
MW-02B	19.36	03/03/16	18.23	82.99	1.13	0.03	100	0.0048	0.178	0.083	
MW-02B	19.36	05/25/16	17.81	84.60	1.55	0.42	108	0.0039	0.145	0.074	
MW-02B	19.36	08/23/16	17.93	82.92	1.43	-0.12	101	0.0042	0.156	0.073	
MW-02B	19.36	11/21/16	17.80	78.00	1.56	0.13	103	0.0041	0.152	0.078	
MW-02B	19.36	02/22/17	16.50	83.00	2.86	1.30	104	0.0045	0.167	0.090	
MW-02B	19.36	05/22/17	16.50	83.10	2.86	0.00	103	0.0036	0.134	0.064	Well vandalized, locks cut-off
MW-02B	19.36	08/17/17	16.93	83.00	2.43	-0.43	102	0.0042	0.156	0.066	
MW-02B	19.36	02/21/18	17.02	83.00	2.34	-0.09	104	0.0041	0.152	0.065	Wells are now sampled only 1st and 3rd quarters each year
MW-02B	19.36	08/21/18	17.13	83.00	2.23	-0.11	102	0.0042	0.156	0.064	
MW-02B	19.36	02/12/19	16.18	83.00	3.18	0.95	111	0.0042	0.156	0.077	
MW-02B	19.36	08/20/19	15.85	83.04	3.51	0.33	107	0.0037	0.137	0.049	
MW-02B	19.36	02/18/20	15.35	83.12	4.01	0.83	123	0.0024	0.089	0.042	
MW-02B	19.36	08/18/20	15.41	83.11	3.95	-0.06	108	0.0019	0.071	0.045	

Table 2
Summary of Groundwater Gauging and Elevation Data
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Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-03A	25.54	05/11/94	20.31	28.50	5.23	--	175	0.0053	0.044	--	
MW-03A	25.54	10/22/99	19.98	28.36	5.56	0.33	160	0.00499	0.041	--	Gauged on either 10/22 or 11/4/99
MW-03A	25.54	04/03/01	19.47	28.45	6.07	0.51	158	0.00553	0.046	--	
MW-03A	25.54	06/12/01	19.76	28.45	5.78	-0.29	156.5	0.0036	0.030	--	
MW-03A	25.54	02/28/02	20.08	28.45	5.46	-0.32	159.5	0.00477	0.039	--	
MW-03A	25.54	01/06/05	19.32	28.42	6.22	0.76	--	--	--	--	
MW-03A	25.45	02/16/06	19.88	28.50	5.57	-0.65	146.5	0.0038	0.031	--	
MW-03A	25.45	05/17/06	19.61	28.45	5.84	0.27	149	0.00476	0.039	--	
MW-03A	25.45	08/21/06	20.02	28.67	5.43	-0.41	147	0.0047	0.039	--	
MW-03A	25.45	11/20/06	19.90	28.67	5.55	0.12	147	0.0043	0.035	--	
MW-03A	25.45	03/01/07	19.95	25.50	5.50	-0.05	192	0.0034	0.028	--	
MW-03A	25.45	05/17/07	20.03	28.40	5.42	-0.08	180	0.0038	0.031	--	
MW-03A	25.45	08/23/07	20.12	28.49	5.33	-0.09	180	0.0044	0.036	--	
MW-03A	25.45	11/15/07	20.12	28.47	5.33	0.00	180	0.004	0.033	--	
MW-03A	25.45	02/19/08	19.71	28.47	5.74	0.41	190	0.0048	0.040	--	
MW-03A	25.45	05/19/08	19.91	28.46	5.54	-0.20	180	0.0042	0.035	--	
MW-03A	25.45	08/18/08	20.04	28.48	5.41	-0.13	179	0.0036	0.030	--	
MW-03A	25.45	11/10/08	20.04	28.51	5.41	0.00	182	0.0041	0.034	--	
MW-03A	25.45	02/18/09	19.55	28.37	5.90	0.49	215	0.0087	0.072	--	
MW-03A	25.45	05/27/09	20.08	28.48	5.37	-0.53	180	0.0040	0.033	--	
MW-03A	25.45	08/25/09	20.19	28.49	5.26	-0.11	179	0.0040	0.033	--	
MW-03A	25.45	11/23/09	20.70	28.61	4.75	-0.51	182	0.0041	0.034	--	
MW-03A	25.45	02/22/10	19.42	28.40	6.03	1.28	189	0.0048	0.040	--	
MW-03A	25.45	05/27/10	19.75	28.44	5.70	-0.33	185	0.0042	0.035	--	
MW-03A	25.45	08/31/10	20.03	28.50	5.42	-0.28	177	0.0039	0.032	--	
MW-03A	25.45	09/29/10	20.03	28.52	5.42	0.00	NC	NC	NC	--	re-sampled for SVOC's
MW-03A	25.45	11/18/10	19.89	28.55	5.56	0.14	179	0.0040	0.033	--	
MW-03A	25.45	02/15/11	19.55	28.55	5.90	0.48	183	0.0048	0.040	--	
MW-03A	25.45	05/09/11	19.60	28.43	5.85	-0.05	180	0.0048	0.040	--	
MW-03A	25.45	07/20/11	19.82	28.49	5.63	-0.22	177	0.0045	0.037	--	
MW-03A	25.45	11/21/11	20.77	28.63	4.68	-0.95	196	0.0110	0.091	--	
MW-03A	25.45	02/15/12	20.02	28.50	5.43	0.75	184	0.0028	0.023	--	
MW-03A	25.45	05/22/12	19.89	28.45	5.56	0.13	184	0.0041	0.034	--	
MW-03A	25.45	08/06/12	19.95	28.37	5.50	-0.06	184	0.0043	0.035	--	
MW-03A	25.45	11/13/12	20.12	28.35	5.33	-0.17	180	0.0041	0.034	--	
MW-03A	25.45	02/19/13	20.06	NM	5.39	0.06	181	0.0044	0.036	--	Not Sampled, well vandalized, pump removed
MW-03A	25.45	05/21/13	20.12	28.40	5.33	-0.06	182	0.0046	0.038	--	
MW-03A	25.45	08/06/13	19.95	NM	5.50	0.17	191	0.0050	0.041	--	
MW-03A	25.45	11/12/13	20.13	28.30	5.32	-0.18	184	0.0042	0.035	--	
MW-03A	25.45	02/20/14	20.39	28.42	5.06	-0.26	175	0.0040	0.033	--	
MW-03A	25.45	05/21/14	20.18	28.41	5.27	0.21	180	0.0040	0.033	--	
MW-03A	25.45	08/12/14	20.41	28.44	5.04	-0.23	174	0.0037	0.030	--	
MW-03A	25.45	11/18/14	20.45	28.60	5.00	-0.04	178	0.0042	0.035	--	Not Sampled, well vandalized, pump stolen
MW-03A	25.45	02/19/15	20.13	25.30	5.32	0.32	182	0.0041	0.034	--	
MW-03A	25.45	05/18/15	19.87	28.49	5.58	0.26	175	0.0029	0.024	--	
MW-03A	25.45	08/18/15	20.24	25.55	5.21	-0.37	173	0.0036	0.030	--	
MW-03A	25.45	11/02/15	20.24	28.61	5.21	0.00	183	0.0036	0.030	--	
MW-03A	25.45	03/03/16	20.20	28.61	5.25	0.04	181	0.0039	0.032	--	
MW-03A	25.45	05/25/16	20.23	28.61	5.22	-0.03	179	0.0038	0.031	--	
MW-03A	25.45	08/23/16	20.41	28.55	5.04	-0.18	177	0.0032	0.026	--	
MW-03A	25.45	11/21/16	20.32	28.64	5.13	0.09	192	0.0049	0.040	--	
MW-03A	25.45	02/22/17	19.07	28.50	6.38	1.25	206	0.0086	0.071	--	
MW-03A	25.45	05/22/17	19.70	28.65	5.75	-0.63	179	0.0044	0.036	--	
MW-03A	25.45	08/16/17	19.94	28.62	5.51	-0.24	174	0.0041	0.034	--	
MW-03A	25.45	02/21/18	20.07	28.60	5.38	-0.13	175	0.0039	0.032	--	Wells are now sampled only 1st and 3rd quarters each year
MW-03A	25.45	08/21/18	20.08	28.55	5.37	-0.01	164	0.0034	0.028	--	
MW-03A	25.45	02/12/19	19.08	28.50	6.37	1.00	199	0.0065	0.054	--	
MW-03A	25.45	08/20/19	19.83	28.65	5.62	-0.75	170	0.0041	0.034	--	
MW-03A	25.45	02/18/20	19.74	28.63	5.71	-0.66	169	0.0038	0.031	--	
MW-03A	25.45	08/18/20	19.70	28.61	5.75	0.04	180	0.0041	0.034	--	

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WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-03B	25.60	05/11/94	27.20	84.00	-1.60	--	102.5	0.00557	0.207	0.112	
MW-03B	25.60	10/22/99	25.44	82.94	0.16	1.76	100	0.0056	0.208	0.089	Gauged on either 10/22 or 11/4/99
MW-03B	25.60	04/03/01	24.72	83.15	0.88	0.72	101	0.00617	0.229	0.085	
MW-03B	25.60	06/12/01	24.92	82.90	0.68	-0.20	100	0.0063	0.234	0.084	
MW-03B	25.60	02/28/02	25.02	82.89	0.58	-0.10	99.5	0.00549	0.204	0.080	
MW-03B	25.60	01/06/05	25.00	83.41	0.60	0.02	--	--	--	--	
MW-03B	25.51	02/16/06	23.71	83.10	1.80	1.20	104	0.00462	0.171	0.062	
MW-03B	25.51	05/17/06	23.45	83.00	2.06	0.26	101	0.0053	0.197	0.062	
MW-03B	25.51	08/21/06	23.60	83.31	1.91	-0.15	103	0.0045	0.167	0.058	
MW-03B	25.51	11/20/06	23.45	83.31	2.06	0.15	103	0.0042	0.156	0.057	
MW-03B	25.51	03/01/07	23.62	82.92	1.89	-0.17	92.5	0.0054	0.200	0.059	
MW-03B	25.51	05/17/07	23.79	82.97	1.72	-0.17	97	0.005	0.186	0.061	
MW-03B	25.51	08/23/07	23.95	83.20	1.56	-0.16	105	0.0045	0.167	0.062	
MW-03B	25.51	11/15/07	24.01	83.24	1.50	-0.06	103	0.0044	0.163	0.063	
MW-03B	25.51	02/19/08	23.48	83.15	2.03	0.53	105	0.0045	0.167	0.061	
MW-03B	25.51	05/19/08	23.54	83.20	1.97	-0.06	102	0.0045	0.167	0.059	
MW-03B	25.51	08/18/08	23.81	83.13	1.70	-0.27	102	0.0046	0.171	0.061	
MW-03B	25.51	11/10/08	23.79	83.22	1.72	0.02	105	0.0044	0.163	0.060	
MW-03B	25.51	02/18/09	23.52	82.90	1.99	0.27	100	0.0043	0.160	0.064	
MW-03B	25.51	05/27/09	23.99	83.14	1.52	-0.47	100	0.0046	0.171	0.063	
MW-03B	25.51	08/25/09	24.23	83.00	1.28	-0.24	98	0.0047	0.174	0.065	
MW-03B	25.51	11/23/09	24.29	82.93	1.22	-0.06	99	0.0048	0.178	0.058	
MW-03B	25.51	02/22/10	23.65	83.20	1.86	0.64	102	0.0048	0.178	0.068	
MW-03B	25.51	05/27/10	23.52	83.33	1.99	0.13	100	0.0044	0.163	0.061	
MW-03B	25.51	08/31/10	23.88	83.00	1.63	-0.36	100	0.0048	0.178	0.062	
MW-03B	25.51	09/29/10	23.81	83.02	1.70	0.07	NC	NC	NC	0.061	re-sampled for SVOC's
MW-03B	25.51	11/18/10	23.90	83.00	1.61	-0.09	94	0.0048	0.178	0.065	
MW-03B	25.51	02/15/11	23.12	83.00	2.39	0.78	102	0.0049	0.182	0.058	
MW-03B	25.51	05/09/11	23.02	83.00	2.49	0.10	100	0.0048	0.178	0.055	
MW-03B	25.51	07/20/11	23.40	83.00	2.11	-0.38	104	0.0046	0.171	0.058	
MW-03B	25.51	11/21/11	23.71	NM	1.80	-0.31	99	0.0044	0.163	0.047	
MW-03B	25.51	02/15/12	23.79	83.09	1.72	-0.08	97	0.0046	0.171	0.061	
MW-03B	25.51	05/22/12	23.97	83.11	1.54	-0.18	101	0.0046	0.171	0.066	
MW-03B	25.51	08/06/12	24.17	83.09	1.34	-0.20	104	0.0048	0.178	0.068	
MW-03B	25.51	11/13/12	24.29	80.70	1.22	-0.12	100	0.0048	0.178	0.067	
MW-03B	25.51	02/19/13	23.89	82.70	1.62	0.40	93	0.0045	0.167	0.062	
MW-03B	25.51	05/21/13	24.35	83.24	1.16	-0.46	104	0.0041	0.152	0.068	
MW-03B	25.51	08/06/13	24.43	NM	1.08	-0.08	98	0.0050	0.186	0.072	
MW-03B	25.51	11/12/13	24.55	83.05	0.96	-0.12	99	0.0049	0.182	0.071	
MW-03B	25.51	02/20/14	24.59	83.04	0.92	-0.04	98	0.0048	0.178	0.068	
MW-03B	25.51	05/21/14	24.64	82.98	0.87	-0.05	107	0.0048	0.178	0.072	
MW-03B	25.51	08/12/14	24.75	82.80	0.76	-0.11	94	0.0046	0.171	0.070	
MW-03B	25.51	11/18/14	24.73	82.80	0.78	0.02	99	0.0047	0.174	0.069	Well vandalized, lock cut-off
MW-03B	25.51	02/19/15	24.27	82.10	1.24	0.46	107	0.0043	0.160	0.067	
MW-03B	25.51	05/18/15	24.29	83.20	1.22	-0.02	99	0.0045	0.167	0.071	
MW-03B	25.51	08/18/15	24.44	83.20	1.07	-0.15	105	0.0046	0.171	0.068	
MW-03B	25.51	11/02/15	24.40	83.20	1.11	0.04	103	0.0046	0.171	0.067	
MW-03B	25.51	03/03/16	24.34	83.20	1.17	0.06	100	0.0048	0.178	0.067	
MW-03B	25.51	05/25/16	24.05	83.05	1.46	0.29	108	0.0039	0.145	0.062	
MW-03B	25.51	08/23/16	24.05	83.15	1.46	0.00	101	0.0042	0.156	0.059	
MW-03B	25.51	11/21/16	23.95	83.00	1.56	0.10	103	0.0041	0.152	0.059	
MW-03B	25.51	02/22/17	22.67	83.15	2.84	1.28	104	0.0045	0.167	0.058	
MW-03B	25.51	05/22/17	22.68	83.15	2.83	-0.01	103	0.0036	0.134	0.048	
MW-03B	25.51	08/16/17	23.05	83.15	2.46	-0.37	102	0.0042	0.156	0.050	
MW-03B	25.51	02/21/18	23.16	83.10	2.35	-0.11	104	0.0041	0.152	0.050	Wells are now sampled only 1st and 3rd quarters each year
MW-03B	25.51	08/21/18	23.30	83.11	2.21	-0.14	102	0.0042	0.156	0.052	
MW-03B	25.51	02/12/19	22.40	83.15	3.11	0.90	111	0.0042	0.156	0.053	
MW-03B	25.51	08/20/19	22.07	83.10	3.44	0.33	107	0.0037	0.137	0.036	
MW-03B	25.51	02/18/20	21.68	83.04	3.83	0.72	123	0.0024	0.089	0.031	
MW-03B	25.51	08/18/20	21.61	83.04	3.90	0.07	108	0.0019		0.030	

Table 2
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Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-04A	24.02	03/02/07	17.61	31.06	6.41	--	192	--	--	--	New Well
MW-04A	24.02	05/17/07	17.68	31.08	6.34	-0.07	180	--	--	--	
MW-04A	24.02	08/23/07	17.65	31.20	6.37	0.03	180	0.0044	0.036	--	
MW-04A	24.02	11/15/07	17.71	37.18	6.31	-0.06	180	0.004	0.033	--	
MW-04A	24.02	02/19/08	17.30	31.30	6.72	0.41	190	0.0048	0.040	--	
MW-04A	24.02	05/19/08	17.47	31.20	6.55	-0.17	180	0.0042	0.035	--	
MW-04A	24.02	08/18/08	17.64	31.22	6.38	-0.17	179	0.0036	0.030	--	
MW-04A	24.02	11/10/08	17.70	31.12	6.32	-0.06	182	0.0041	0.034	--	
MW-04A	24.02	02/18/09	17.43	31.15	6.59	0.27	215	0.0087	0.072	--	
MW-04A	24.02	05/27/09	17.69	31.11	6.33	-0.26	180	0.0040	0.033	--	
MW-04A	24.02	08/25/09	17.79	31.12	6.23	-0.10	179	0.0040	0.033	--	
MW-04A	24.02	11/24/09	17.72	31.12	6.30	0.07	182	0.0041	0.034	--	
MW-04A	24.02	02/22/10	17.01	31.04	7.01	0.71	189	0.0048	0.040	--	
MW-04A	24.02	05/27/10	17.39	31.05	6.63	-0.38	185	0.0042	0.035	--	
MW-04A	24.02	08/31/10	17.62	31.10	6.40	-0.23	177	0.0039	0.032	--	
MW-04A	24.02	09/29/10	17.60	31.20	6.42	0.02	NC	NC	NC	--	re-sampled for SVOC's
MW-04A	24.02	11/19/10	17.49	31.19	6.53	0.11	179	0.0040	0.033	--	
MW-04A	24.02	02/15/11	17.02	31.19	7.00	0.47	183	0.0048	0.040	--	
MW-04A	24.02	05/09/11	17.09	31.05	6.93	-0.07	180	0.0048	0.040	--	
MW-04A	24.02	07/20/11	17.32	31.12	6.70	-0.23	177	0.0045	0.037	--	
MW-04A	24.02	11/21/11	17.50	NM	6.52	-0.18	196	0.0110	0.091	--	
MW-04A	24.02	02/15/12	17.60	31.14	6.42	-0.10	184	0.0028	0.023	--	
MW-04A	24.02	05/22/12	17.54	31.11	6.48	0.06	184	0.0041	0.034	--	
MW-04A	24.02	08/06/12	17.52	31.18	6.50	0.02	184	0.0043	0.035	--	
MW-04A	24.02	11/13/12	17.69	27.90	6.33	-0.17	180	0.0041	0.034	--	
MW-04A	24.02	02/19/13	17.51	31.06	6.51	0.18	181	0.0044	0.036	--	
MW-04A	24.02	05/21/13	17.74	31.06	6.28	-0.23	182	0.0046	0.038	--	
MW-04A	24.02	08/06/13	17.68	NM	6.34	0.06	191	0.0050	0.041	--	
MW-04A	24.02	11/12/13	17.75	31.26	6.27	-0.07	184	0.0042	0.035	--	
MW-04A	24.02	02/20/14	18.01	31.03	6.01	-0.26	175	0.0040	0.033	--	
MW-04A	24.02	05/21/14	17.80	31.10	6.22	0.21	180	0.0040	0.033	--	
MW-04A	24.02	08/12/14	18.05	31.09	5.97	-0.25	174	0.0037	0.030	--	
MW-04A	24.02	11/18/14	17.94	31.15	6.08	0.11	178	0.0042	0.035	--	Well vandalized, lock cut-off
MW-04A	24.02	02/19/15	17.74	31.12	6.28	0.20	182	0.0041	0.034	--	
MW-04A	24.02	05/18/15	17.79	31.29	6.23	-0.05	175	0.0029	0.024	--	
MW-04A	24.02	08/18/15	17.88	31.26	6.14	-0.09	173	0.0036	0.030	--	
MW-04A	24.02	11/02/15	17.89	31.30	6.13	-0.01	183	0.0036	0.030	--	
MW-04A	24.02	03/03/16	17.86	31.30	6.16	0.03	181	0.0039	0.032	--	
MW-04A	24.02	05/25/16	17.92	31.25	6.10	-0.06	179	0.0038	0.031	--	
MW-04A	24.02	08/23/16	18.10	31.30	5.92	-0.18	177	0.0032	0.026	--	
MW-04A	24.02	11/21/16	18.08	31.28	5.94	0.02	192	0.0049	0.040	--	
MW-04A	24.02	02/22/17	16.60	31.26	7.42	1.48	206	0.0086	0.071	--	
MW-04A	24.02	05/22/17	17.21	31.28	6.81	-0.61	179	0.0044	0.036	--	
MW-04A	24.02	08/17/17	17.48	31.25	6.54	-0.27	174	0.0041	0.034	--	
MW-04A	24.02	02/21/18	17.66	31.25	6.36	-0.18	175	0.0039	0.032	--	Wells are now sampled only 1st and 3rd quarters each year
MW-04A	24.02	08/21/18	17.74	31.26	6.28	-0.08	164	0.0034	0.028	--	
MW-04A	24.02	02/12/19	16.63	31.29	7.39	1.11	199	0.0065	0.054	--	
MW-04A	24.02	08/20/19	17.29	31.25	6.73	-0.66	170	0.0041	0.034	--	
MW-04A	24.02	02/18/20	17.25	31.25	6.77	-0.62	169	0.0038	0.031	--	
MW-04A	24.02	08/18/20	17.32	31.26	6.70	-0.07	180	0.0041	0.034	--	

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WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-04B	23.99	03/02/07	20.71	88.30	3.28	---	92.5	0.0054	0.200	0.055	New Well
MW-04B	23.99	05/17/07	21.02	88.00	2.97	-0.31	97	0.005	0.186	0.059	
MW-04B	23.99	08/23/07	21.14	88.55	2.85	-0.12	105	0.0045	0.167	0.062	
MW-04B	23.99	11/15/07	21.23	88.40	2.76	-0.09	103	0.0044	0.163	0.062	
MW-04B	23.99	02/19/08	20.65	88.47	3.34	0.58	105	0.0045	0.167	0.059	
MW-04B	23.99	05/19/08	20.76	88.46	3.23	-0.11	102	0.0045	0.167	0.058	
MW-04B	23.99	08/18/08	21.01	90.68	2.98	-0.25	102	0.0046	0.171	0.060	
MW-04B	23.99	11/10/08	21.02	88.42	2.97	-0.01	105	0.0044	0.163	0.059	
MW-04B	23.99	02/18/09	20.74	88.12	3.25	0.28	100	0.0043	0.160	0.059	
MW-04B	23.99	05/27/09	21.20	88.41	2.79	-0.46	100	0.0046	0.171	0.062	
MW-04B	23.99	08/25/09	21.42	88.20	2.57	-0.22	98	0.0047	0.174	0.064	
MW-04B	23.99	11/24/09	21.51	88.10	2.48	-0.09	99	0.0048	0.178	0.067	
MW-04B	23.99	02/22/10	20.79	88.38	3.20	0.72	102	0.0048	0.178	0.067	
MW-04B	23.99	05/27/10	20.72	88.22	3.27	0.07	100	0.0044	0.163	0.059	
MW-04B	23.99	08/31/10	21.05	88.21	2.94	-0.33	100	0.0048	0.178	0.061	
MW-04B	23.99	09/29/10	21.01	88.28	2.98	0.04	NC	NC	NC	0.060	re-sampled for SVOC's
MW-04B	23.99	11/18/10	21.12	88.30	2.87	-0.11	94	0.0048	0.178	0.064	
MW-04B	23.99	02/15/11	20.24	88.20	3.75	0.88	102	0.0049	0.182	0.057	
MW-04B	23.99	05/09/11	20.17	88.20	3.82	0.07	100	0.0048	0.178	0.055	
MW-04B	23.99	07/20/11	20.58	88.28	3.41	-0.41	104	0.0046	0.171	0.058	
MW-04B	23.99	11/21/11	20.95	NM	3.04	-0.37	99	0.0044	0.163	0.061	
MW-04B	23.99	02/15/12	21.10	89.30	2.89	-0.15	97	0.0046	0.171	0.062	
MW-04B	23.99	05/22/12	21.16	84.20	2.83	-0.06	101	0.0046	0.171	0.064	
MW-04B	23.99	08/06/12	21.25	88.00	2.74	-0.09	104	0.0048	0.178	0.066	
MW-04B	23.99	11/13/12	21.44	88.41	2.55	-0.19	100	0.0048	0.178	0.066	
MW-04B	23.99	02/19/13	21.19	84.90	2.80	0.25	93	0.0045	0.167	0.065	
MW-04B	23.99	05/21/13	21.62	88.00	2.37	-0.43	104	0.0041	0.152	0.069	
MW-04B	23.99	08/06/13	21.57	NM	2.42	0.05	98	0.0050	0.186	0.069	
MW-04B	23.99	11/12/13	21.71	88.35	2.28	-0.14	99	0.0049	0.182	0.070	
MW-04B	23.99	02/20/14	21.80	88.00	2.19	-0.09	98	0.0048	0.178	0.067	
MW-04B	23.99	05/21/14	21.70	88.10	2.29	0.10	107	0.0048	0.178	0.069	
MW-04B	23.99	08/12/14	22.03	88.00	1.96	-0.33	94	0.0046	0.171	0.070	
MW-04B	23.99	11/18/14	21.93	88.00	2.06	0.10	99	0.0047	0.174	0.071	
MW-04B	23.99	02/19/15	21.45	88.20	2.54	0.48	107	0.0043	0.160	0.066	
MW-04B	23.99	05/18/15	21.51	88.35	2.48	-0.06	99	0.0045	0.167	0.066	
MW-04B	23.99	08/18/15	21.66	88.35	2.33	-0.15	105	0.0046	0.171	0.067	
MW-04B	23.99	11/02/15	21.59	88.32	2.40	0.07	103	0.0046	0.171	0.065	
MW-04B	23.99	03/03/16	21.57	88.31	2.42	0.02	100	0.0048	0.178	0.066	
MW-04B	23.99	05/25/16	21.35	88.35	2.64	0.22	108	0.0039	0.145	0.061	
MW-04B	23.99	08/23/16	21.36	88.30	2.63	-0.01	101	0.0042	0.156	0.058	
MW-04B	23.99	11/21/16	21.25	88.30	2.74	0.11	103	0.0041	0.152	0.056	
MW-04B	23.99	02/22/17	19.88	88.41	4.11	1.37	104	0.0045	0.167	0.058	
MW-04B	23.99	05/22/17	19.93	88.40	4.06	-0.05	103	0.0036	0.134	0.048	Well vandalized, lock cut-off, pump stolen
MW-04B	23.99	08/17/17	20.35	88.30	3.64	-0.42	102	0.0042	0.156	0.051	use rental pump to sample
MW-04B	23.99	02/21/18	20.49	88.35	3.50	-0.14	104	0.0041	0.152	0.050	use rental pump to sample
MW-04B	23.99	08/21/18	20.63	88.30	3.36	-0.14	102	0.0042	0.156	0.051	use rental pump to sample
MW-04B	23.99	02/12/19	19.64	88.35	4.35	0.99	111	0.0042	0.156	0.053	well is sampled with rental pump
MW-04B	23.99	08/20/19	19.43	88.30	4.56	0.21	107	0.0037	0.137	0.038	
MW-04B	23.99	02/18/20	19.39	87.12	4.60	0.25	123	0.0024	0.089	0.038	
MW-04B	23.99	08/18/20	19.51	87.10	4.48	-0.12	108	0.0019	0.071	0.039	

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WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
MW-05A	20.21	08/25/09	13.45	28.11	6.76	3.56	179	0.0040	0.033	--	New Well, 3Q09
MW-05A	20.21	11/23/09	13.48	--	6.73	-0.03	182	0.0041	0.034	--	
MW-05A	20.21	02/22/10	12.74	28.04	7.47	0.74	189	0.0048	0.040	--	
MW-05A	20.21	05/27/10	13.04	28.10	7.17	-0.30	185	0.0042	0.035	--	
MW-05A	20.21	08/31/10	13.28	28.12	6.93	-0.24	177	0.0039	0.032	--	
MW-05A	20.21	09/29/10	13.25	28.24	6.96	0.03	NC	NC	NC	--	re-sampled for SVOC's
MW-05A	20.21	11/18/10	13.23	28.25	6.98	0.02	179	0.0040	0.033	--	
MW-05A	20.21	02/15/11	12.59	28.27	7.62	0.64	183	0.0048	0.040	--	
MW-05A	20.21	05/09/11	12.69	28.15	7.52	-0.10	180	0.0048	0.040	--	
MW-05A	20.21	07/20/11	12.92	28.12	7.29	-0.23	177	0.0045	0.037	--	
MW-05A	20.21	11/21/11	13.55	28.20	6.66	-0.63	196	0.0110	0.091	--	
MW-05A	20.21	02/15/12	13.25	28.15	6.96	0.30	184	0.0028	0.023	--	
MW-05A	20.21	05/22/12	13.22	28.18	6.99	0.03	184	0.0041	0.034	--	
MW-05A	20.21	08/06/12	13.22	27.99	6.99	0.00	184	0.0043	0.035	--	
MW-05A	20.21	11/13/12	13.34	28.35	6.87	-0.12	180	0.0041	0.034	--	
MW-05A	20.21	02/19/13	13.25	28.00	6.96	0.09	181	0.0044	0.036	--	
MW-05A	20.21	05/21/13	13.40	28.11	6.81	-0.15	182	0.0046	0.038	--	
MW-05A	20.21	08/06/13	13.35	NM	6.86	0.05	191	0.0050	0.041	--	
MW-05A	20.21	11/12/13	13.49	28.20	6.72	-0.14	184	0.0042	0.035	--	
MW-05A	20.21	02/20/14	13.55	28.14	6.66	-0.06	175	0.0040	0.033	--	
MW-05A	20.21	05/21/14	13.49	28.50	6.72	0.06	180	0.0040	0.033	--	
MW-05A	20.21	08/12/14	13.64	28.12	6.57	-0.15	174	0.0037	0.030	--	
MW-05A	20.21	11/18/14	13.67	28.10	6.54	-0.03	178	0.0042	0.035	--	
MW-05A	20.21	02/19/15	13.48	28.20	6.73	0.19	182	0.0041	0.034	--	
MW-05A	20.21	05/18/15	13.50	28.35	6.71	-0.02	175	0.0029	0.024	--	
MW-05A	20.21	08/18/15	13.54	28.25	6.67	-0.04	173	0.0036	0.030	--	
MW-05A	20.21	11/02/15	13.47	28.19	6.74	0.07	183	0.0036	0.030	--	
MW-05A	20.21	03/03/16	13.59	28.19	6.62	-0.12	181	0.0039	0.032	--	
MW-05A	20.21	05/25/16	13.63	28.18	6.58	-0.04	179	0.0038	0.031	--	
MW-05A	20.21	08/23/16	13.75	28.00	6.46	-0.12	177	0.0032	0.026	--	
MW-05A	20.21	11/21/16	13.73	28.13	6.48	0.02	192	0.0049	0.040	--	
MW-05A	20.21	02/22/17	12.35	28.34	7.86	1.38	206	0.0086	0.071	--	
MW-05A	20.21	05/22/17	12.83	28.35	7.38	-0.48	179	0.0044	0.036	--	
MW-05A	20.21	08/16/17	13.07	28.18	7.14	-0.24	174	0.0041	0.034	--	
MW-05A	20.21	02/21/18	13.32	28.34	6.89	-0.25	175	0.0039	0.032	--	Wells are now sampled only 1st and 3rd quarters each year
MW-05A	20.21	08/21/18	13.35	28.36	6.86	-0.03	164	0.0034	0.028	--	
MW-05A	20.21	02/12/19	12.40	28.30	7.81	0.95	199	0.0065	0.054	--	
MW-05A	20.21	08/20/19	12.83	28.28	7.38	-0.43	170	0.0041	0.034	--	
MW-05A	20.21	02/18/20	12.83	28.24	7.38	-0.43	169	0.0038	0.031	--	
MW-05A	20.21	08/18/20	12.96	28.21	7.25	-0.13	180	0.0041	0.034	--	

Table 2
Summary of Groundwater Gauging and Elevation Data
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

WELL ID	Top of Casing Elevation (ft MSL)	Date Measured	Depth to Water (ft btoc)	Total Well Depth (ft btoc)	Groundwater Elevation (ft MSL)	Relative Change Since Previous Measurement (feet)	Flow Direction (Azimuth)	Ground-water Gradient	GW Velocity (ft/day)	Vertical Gradient Between A and B Zone Wells (- = upwards)	Comments
G-1	24.08	12/87	19.20	NM	4.88	--	--	--	--	--	Well abandoned in 1987 or 1988
G-2	25.09	12/87	21.40	NM	3.69	--	--	--	--	--	Well abandoned in 1987 or 1988
G-3	25.06	12/87	21.60	NM	3.46	--	--	--	--	--	Well abandoned in 1987 or 1988
G-4	27.35	12/87	24.70	NM	2.65	--	--	--	--	--	
G-4	27.15	05/11/94	NM	NM	NM	--	--	--	--	--	
G-4	27.15	10/22/99	21.77	67.44	5.38	--	--	--	--	--	Gauged on either 10/22 or 11/4/99
G-4	27.15	04/03/01	21.32	67.95	5.83	0.45	--	--	--	--	
G-4	27.15	06/12/01	21.57	68.00	5.58	-0.25	--	--	--	--	
G-4	27.15	02/28/02	21.86	68.00	5.29	-0.29	--	--	--	--	
G-4	27.15	01/06/05	21.25	68.65	5.90	0.61	--	--	--	--	
G-4	27.12	02/16/06	21.69	NM	5.43	-0.47	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	05/17/06	21.38	NM	5.74	0.31	--	--	--	--	"
G-4	27.12	08/21/06	21.72	NM	5.40	-0.34	--	--	--	--	"
G-4	27.12	11/20/06	21.65	NM	5.47	0.07	--	--	--	--	"
G-4	27.12	03/01/07	21.67	NM	5.45	-0.02	--	--	--	--	"
G-4	27.12	05/17/07	21.76	NM	5.36	-0.09	--	--	--	--	"
G-4	27.12	08/23/07	21.87	NM	5.25	-0.11	--	--	--	--	"
G-4	27.12	11/15/07	21.84	NM	5.28	0.03	--	--	--	--	"
G-4	27.12	02/19/08	21.47	NM	5.65	0.37	--	--	--	--	"
G-4	27.12	05/19/08	21.63	NM	5.49	-0.16	--	--	--	--	"
G-4	27.12	08/18/08	21.80	NM	5.32	-0.17	--	--	--	--	"
G-4	27.12	11/10/08	21.83	NM	5.29	-0.03	--	--	--	--	"
G-4	27.12	02/18/09	21.34	NM	5.78	0.49	--	--	--	--	"
G-4	27.12	05/27/09	21.81	NM	5.31	-0.47	--	--	--	--	"
G-4	27.12	08/25/09	21.90	NM	5.22	-0.09	--	--	--	--	"
G-4	27.12	11/23/09	21.81	NM	5.31	0.09	--	--	--	--	"
G-4	27.12	02/22/10	21.40	NM	5.72	0.41	--	--	--	--	"
G-4	27.12	05/27/10	21.48	NM	5.64	-0.08	--	--	--	--	"
G-4	27.12	08/31/10	21.69	NM	5.43	-0.21	--	--	--	--	"
G-4	27.12	09/29/10	21.74	NM	5.38	-0.05	--	--	--	--	re-sampled for SVOC's
G-4	27.12	11/18/10	21.63	NM	5.49	0.11	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	02/15/11	21.27	NM	5.85	0.36	--	--	--	--	"
G-4	27.12	05/09/11	21.30	NM	5.82	-0.03	--	--	--	--	"
G-4	27.12	07/20/11	21.52	NM	5.60	-0.22	--	--	--	--	"
G-4	27.12	11/21/11	21.52	NM	5.60	0.00	--	--	--	--	"
G-4	27.12	02/15/12	21.73	NM	5.39	-0.21	--	--	--	--	"
G-4	27.12	05/22/12	21.82	NM	5.30	-0.09	--	--	--	--	"
G-4	27.12	08/06/12	21.67	NM	5.45	0.15	--	--	--	--	"
G-4	27.12	11/13/12	21.87	NM	5.25	-0.20	--	--	--	--	"
G-4	27.12	02/19/13	21.82	NM	5.30	0.05	--	--	--	--	"
G-4	27.12	05/21/13	21.94	NM	5.18	-0.12	--	--	--	--	"
G-4	27.12	08/06/13	21.85	NM	5.27	0.09	--	--	--	--	"
G-4	27.12	11/12/13	22.03	NM	5.09	-0.18	--	--	--	--	"
G-4	27.12	02/20/14	22.11	NM	5.01	-0.08	--	--	--	--	"
G-4	27.12	05/21/14	22.04	NM	5.08	0.07	--	--	--	--	"
G-4	27.12	08/12/14	22.11	NM	5.01	-0.07	--	--	--	--	"
G-4	27.12	11/18/14	22.22	NM	4.90	-0.11	--	--	--	--	Well vandalized, lock cut-off
G-4	27.12	02/19/15	21.89	NM	5.23	0.33	--	--	--	--	2" well w/pump prevents TD measurement
G-4	27.12	05/18/15	21.69	NM	5.43	0.20	--	--	--	--	"
G-4	27.12	08/18/15	22.00	NM	5.12	-0.31	--	--	--	--	"
G-4	27.12	11/02/15	21.99	NM	5.13	0.01	--	--	--	--	"
G-4	27.12	03/03/16	21.98	NM	5.14	0.01	--	--	--	--	"
G-4	27.12	05/25/16	21.98	NM	5.14	0.00	--	--	--	--	"
G-4	27.12	08/23/16	22.15	NM	4.97	-0.17	--	--	--	--	"
G-4	27.12	11/21/16	22.00	NM	5.12	0.15	--	--	--	--	"
G-4	27.12	02/22/17	20.90	NM	6.22	1.10	--	--	--	--	"
G-4	27.12	05/22/17	21.40	64.45	5.72	-0.50	--	--	--	--	Well vandalized, lock cut-off, pump stolen
G-4**	27.12	08/16/17	21.15	63.50	**	--	--	--	--	--	No-purge sample collected with bailer, monument and casing found damaged
G-4***	26.79	02/21/18	21.40	67.32	5.39	-0.33	--	--	--	--	well pump repaired/replaced
G-4	26.79	08/21/18	21.54	NM	5.25	-0.14	--	--	--	--	2" well w/pump prevents TD measurement
G-4	26.79	02/12/19	20.62	NM	6.17	0.92	--	--	--	--	2" well w/pump prevents TD measurement
G-4	26.79	08/20/19	21.13	NM	5.66	-0.51	--	--	--	--	2" well w/pump prevents TD measurement
G-4	26.79	02/18/20	21.10	NM	5.69	-0.48	--	--	--	--	2" well w/pump prevents TD measurement
G-4	26.79	08/18/20	21.09	NM	5.70	0.01	--	--	--	--	2" well w/pump prevents TD measurement

Notes:
During 3Q-2010 wells were re-sampled 09-29-10 for SVOC's
ft MSL = Feet Mean Sea Level
ft btoc = Feet below top of casing
NM = Not Measured
NC = Horizontal Groundwater Gradient & Velocity Not calculated off of Cooper Sump Site
-- = Not applicable / Not analyzed
Groundwater Monitoring Well Elevations, Surveyed by M.W. Holdings Inc., September 9, 2005 and March 1, 2007.
New Groundwater Monitoring Well (MW-05A) Elevation, Surveyed by M.W. Holdings Inc., August 10, 2009
Groundwater velocity calculations based on an assumed average porosity (n) and hydraulic conductivity (K) of the upper and lower monitored zones of 0.34 and 2.8 f/d, and 0.458 and 17 f/d respectively.
On October 30, 2014, DTSC approved the removal of MW-01A and MW-01B from the groundwater sampling plan.
** = Casing height changed by damage prior to the 8/16/17 sampling event. Groundwater elevation not calculated.
*** = repaired casing height, casing resurveyed on 3-5-2018 by Stantec PLS Survey
On October 12, 2017, the DTSC approved sampling reduction to Semi-Annually, 1st and 3rd quarters only

References:

EEI, 1987: *Site Inspection Report Gardena Sumps, Gardena, California.*
DTSC, 2000 and 2001: *2002 Groundwater Sampling Report for Gardena Sumps.*
DTSC, 2002: *2002 Groundwater Sampling Report for Gardena Sumps.*
URS Consultants, Inc., 1994: *Groundwater Remedial Investigation Technical Memorandum, Gardena Sumps City of Gardena, California.*
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps City of Gardena, California.

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-01A	05/11/94		--	ND	ND	ND	ND	ND	ND	1.8*	1.9*	ND	ND	ND	ND
MW-01A	06/15/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-01A	06/22/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01A	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01A	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01A	02/16/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	05/17/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	08/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	03/02/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	05/18/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20070518	05/18/07	Duplicate	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	08/23/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	02/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	08/18/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	11/10/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	02/18/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01A	05/27/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	08/25/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	11/23/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	02/22/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	05/27/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	08/31/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	11/18/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	02/15/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	05/09/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	07/20/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	11/21/11		32 J	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	02/15/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	05/22/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	08/06/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	11/14/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	02/19/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	05/21/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	08/06/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01A	11/12/13	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	02/20/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	05/21/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	08/12/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-01B	01/21/94		--	ND	ND	1.5*	1.5*	1.7*	ND	ND	ND	ND	ND	ND	ND
MW-01B	05/11/94		--	ND	ND	ND	ND	ND	ND	2.3*	ND	1.6*	1.4*	ND	ND
MW-01B	06/15/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-01B	06/22/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01B	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01B	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-01B	02/16/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	05/17/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	08/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	03/02/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	05/18/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	08/23/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	02/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	08/18/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	11/10/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	02/18/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-01B	05/27/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	08/25/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	11/23/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	02/22/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	05/27/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	08/31/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	11/18/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	02/15/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	05/09/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	07/20/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	11/21/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	02/15/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	05/22/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	08/06/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	11/14/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	02/19/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	05/21/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	08/06/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-01B	11/12/13	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	02/20/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	05/21/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	08/12/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-02A	01/21/94		--	45*	ND	ND	2.7*	ND	ND	ND	ND	ND	ND	ND	ND
MW-02A	05/10/94		--	--	ND	ND	2.7*	ND	ND	2.4*	--	1.4*	1.3*	ND	ND
MW-02A	05/11/94		--	ND	ND	ND	ND	ND	ND	2.5*	1.0*	1.1*	1.4*	ND	ND
MW-02A	06/15/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-02A	06/25/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02A	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02A	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02A	02/16/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	05/18/06		26 J,MB	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-02A	05/18/06	Duplicate	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	0.37 J	<2.0	<2.0	<2.0	<2.0
MW-02A	08/22/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-02A	08/22/06	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	11/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	08/24/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20070824	08/24/07	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	11/16/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20080220	02/20/08	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20080520	05/20/08	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	08/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20080819	08/19/08	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	11/11/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20081111	11/11/08	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	02/19/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20090219	02/19/09	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02A	05/28/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20090528	05/28/09	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	08/26/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20090826	08/26/09	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	11/24/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20091124	11/24/09	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	02/23/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20100223	02/23/10	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	05/28/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20100528	05/28/10	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	09/01/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20100901	09/01/10	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	11/19/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20101119	11/19/10	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-02A	02/17/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20110217	02/17/11	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	07/21/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20110721	07/21/11	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	11/22/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20111122	11/22/11	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	02/16/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20120216	02/16/12	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	05/23/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20120523	05/23/12	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	08/07/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20120807	08/07/12	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	11/14/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20121114	11/14/12	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	02/20/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20130220	02/20/13	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	05/22/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20130522	05/22/13	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	08/07/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-2013-0807	08/07/13	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	11/13/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20131113	11/13/13	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	02/20/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20140220	02/20/14	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	05/22/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20140522	05/22/14	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	08/13/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20140813	08/13/14	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	11/19/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20141119	11/19/14	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	02/20/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20150220	02/20/15	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	05/19/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20150519	05/19/15	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	08/19/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20150819	08/19/15	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	11/03/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20151103	11/03/15	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	03/04/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20160304	03/04/16	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	05/26/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20160526	05/26/16	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	08/24/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20160824	08/24/16	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-02A	11/22/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
DUP-SUMP-20161122	11/22/16	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	02/23/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-2017	02/23/17	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	05/22/17	Well vandalised, locks cut	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20170522	05/22/17	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	08/17/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20170817	08/17/17	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	02/22/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20180222	02/22/18	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	08/22/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20180822	08/22/18	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	02/13/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20190213	02/13/19	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	08/21/19		<50	--	<0.50	<0.50	<0.50	<0.50	**2.2**	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20190821	08/21/19	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	02/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20200219	02/19/20	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02A	08/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
RS-SUMP-20200819	08/19/20	Duplicate	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-02B	05/11/94		--	ND	ND	ND	ND	ND	ND	2.0*	ND	ND	ND	ND	ND
MW-02B	06/19/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-02B	06/25/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02B	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02B	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02B	02/16/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-02B	02/16/06	Duplicate	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	05/17/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	08/22/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	11/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	08/24/07		**290 LH,AY**	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	11/16/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
RS-SUMP-20071116	11/16/07	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	0.34 J	<2.0	<2.0
MW-02B	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	08/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	0.42 J	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	11/11/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	02/19/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-02B	05/28/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	08/26/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	11/24/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50
MW-02B	02/23/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50
MW-02B	05/28/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	09/01/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	11/19/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	02/17/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	05/10/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	07/21/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	11/22/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-02B	02/16/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	08/07/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	11/14/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	02/20/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	05/22/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	08/07/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	11/13/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	02/20/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	05/22/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	08/13/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	11/19/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	02/20/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	05/19/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	08/19/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	11/03/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	03/04/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	05/26/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	08/24/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	11/22/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	02/23/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	05/22/17	Well vandalised, locks cut	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	08/17/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	02/22/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	08/22/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	02/13/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	08/21/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	02/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-02B	08/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-03A	05/10/94		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03A	06/15/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-03A	6/22/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03A	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03A	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03A	02/17/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	05/18/06		27 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	08/22/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-03A	11/20/06	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2MW-03A	03/01/07	Duplicate	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	08/24/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	02/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	08/18/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	11/10/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-03A	02/18/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03A	05/27/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/25/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	11/23/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	02/22/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	05/27/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/31/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	11/18/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	02/17/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	05/09/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	07/20/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	11/21/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	02/16/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	05/22/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/06/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	11/13/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	02/20/13	Not Sampled	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-03A	05/21/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/06/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	11/12/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	02/19/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	05/21/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/12/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	11/18/14	Not Sampled, well vandalized, pump stolen	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-03A	02/19/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	05/18/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/18/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	11/02/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	03/03/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	05/25/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/23/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	11/21/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	02/22/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	05/23/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/16/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	02/21/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/21/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	02/12/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/20/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	02/18/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03A	08/18/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-03B	05/10/94		--	ND	1.1*	ND	ND	ND	ND	ND	3.7*	**8.9**	**8.9**	1.1*	1.5*
MW-03B	07/05/00		--	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND
MW-03B	06/25/01		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03B	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03B	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-03B	02/17/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	05/18/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	0.54 J	<2.0	<2.0	<2.0	<2.0
MW-03B	08/22/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	08/24/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	02/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	08/18/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	11/10/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	02/18/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-03B	05/27/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/25/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	11/23/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	02/22/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	05/27/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/31/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	11/18/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	02/17/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	05/09/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	07/20/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	11/21/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	02/16/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	05/22/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/06/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	11/13/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	02/20/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	05/21/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/06/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	11/12/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.34 J	<1.0	<0.50	<0.50	<0.50
MW-03B	02/19/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	05/21/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/12/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	11/18/14		<50	--	**1.6**	<0.50	<0.50	<0.50	**2.9**	<0.50	<0.50	**1.4**	<0.50	**2.4**	**30**
MW-03B	02/19/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	0.32 J	<1.0	<0.50	<0.50	<0.50

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GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-03B	05/18/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/18/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	11/02/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	03/03/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	05/25/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/23/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	11/21/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	02/22/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	05/23/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/16/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	02/21/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/21/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	02/12/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/20/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	02/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-03B	08/18/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-04A	03/02/07	New Well	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	08/23/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	11/16/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	08/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	11/11/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	02/19/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04A	05/28/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	08/26/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	11/24/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	02/23/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	05/28/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	09/01/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	11/19/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	02/17/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	05/10/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	07/21/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	11/22/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	02/16/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	05/23/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	08/07/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	11/14/12		29 J	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	02/20/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	05/22/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	08/07/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	11/12/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	02/20/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	05/22/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	08/13/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	11/19/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	02/20/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	05/19/15		<50	--	<0.50	<0.50	<0.50	<0.50	0.40 J	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	08/19/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	11/03/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	03/04/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	05/26/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	08/24/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	11/22/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	02/23/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	05/23/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	08/17/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-04A	02/22/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	08/22/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	02/13/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	08/21/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	02/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04A	08/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

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Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
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Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-04B	03/02/07	New Well	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	05/17/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	08/23/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	11/16/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	05/20/08		30 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	08/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	11/11/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	02/19/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
MW-04B	05/28/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	08/26/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	11/24/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	02/23/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	05/28/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	09/01/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	11/19/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	02/17/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	05/10/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	07/21/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	11/22/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	02/16/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	05/23/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	08/07/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	11/14/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	02/20/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	05/22/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	0.29 J	<0.50
MW-04B	08/07/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	11/12/13		<50	--	<0.50	<0.50	<0.50	<0.50	0.28 J	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	02/20/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	05/22/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	08/13/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	11/19/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	02/20/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	05/19/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	08/19/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	11/03/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

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EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-04B	03/04/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	05/26/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	08/24/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	11/22/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	02/23/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	05/23/17	well vandalised, pump stolen	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	08/17/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	02/22/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	08/22/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	02/13/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	08/21/19		<50	--	<0.50	<0.50	<0.50	<0.50	**16**	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	02/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-04B	08/19/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
MW-05A	08/26/09	New well, 3Q09	**370**	--	**1.5**	<0.50	<0.50	<0.50	**3.6**	<0.50	<0.50	**1.6**	0.30 J	**3.1**	**21**
MW-05A	11/23/09		**440**	--	**1.7**	<0.50	<0.50	<0.50	**5.4**	<0.50	<0.50	**1.5**	<0.50	**2.7**	**22**
MW-05A	02/22/10		**170**	--	**0.88**	<0.50	<0.50	<0.50	**1.2**	<0.50	<0.50	0.70 J	<0.50	**1.1**	**8.6**
MW-05A	05/27/10		**390**	--	**0.73**	<0.50	<0.50	<0.50	**3.4**	<0.50	<0.50	**1.5**	<0.50	**2.8**	**23**
MW-05A	08/31/10		**400**	--	**1.7**	<0.50	<0.50	<0.50	**3.0**	<0.50	<0.50	**1.9**	<0.50	**3.4**	**28**
MW-05A	11/18/10		**430**	--	**1.7**	<0.50	<0.50	<0.50	**2.0**	<0.50	<0.50	**1.5**	<0.50	**2.7**	**24**
MW-05A	02/15/11		**330**	--	**1.8**	<0.50	<0.50	<0.50	**2.1**	<0.50	<0.50	**1.3**	<0.50	**2.4**	**21**
MW-05A	05/09/11		**310**	--	**1.3**	<0.50	<0.50	<0.50	**4.4**	<0.50	<0.50	**1.5**	<0.50	**2.8**	**30**
MW-05A	07/20/11		**480**	--	**1.8**	<0.50	<0.50	<0.50	**2.6**	<0.50	<0.50	**2.0**	0.31 J	**4.0**	**37**
MW-05A	11/21/11		**460**	--	**1.7**	<0.50	<0.50	<0.50	**2.2**	<0.50	<0.50	**1.7**	<0.50	**3.0**	**33**
MW-05A	02/15/12		**600**	--	**0.94**	<0.50	<0.50	<0.50	**1.8**	<0.50	<0.50	**1.4**	<0.50	**2.4**	**27**
MW-05A	05/22/12		**360**	--	**1.2**	<0.50	<0.50	<0.50	**3.9**	<0.50	<0.50	**1.5**	<0.50	**3.0**	**30**
MW-05A	08/06/12		**500**	--	**1.4**	<0.50	<0.50	<0.50	**3.2**	<0.50	<0.50	**1.8**	<0.50	**3.1**	**34**
MW-05A	11/14/12		**350**	--	**1.6**	<0.50	<0.50	<0.50	**2.0**	<0.50	<0.50	**1.6**	<0.50	**3.0**	**29**
MW-05A	02/19/13		**390**	--	**1.3**	<0.50	<0.50	<0.50	**2.0**	<0.50	<0.50	**1.1**	<0.50	**2.4**	**25**
MW-05A	05/21/13		**400**	--	**1.2**	<0.50	<0.50	<0.50	**2.8**	<0.50	<0.50	**1.4**	<0.50	**2.5**	**28**
MW-05A	08/06/13		**440**	--	**1.7**	<0.50	<0.50	<0.50	**2.3**	<0.50	<0.50	**1.5**	<0.50	**2.8**	**31**
MW-05A	11/12/13		**290**	--	**1.7**	<0.50	<0.50	<0.50	**2.3**	<0.50	<0.50	**1.6**	0.28 J	**3.1**	**31**
MW-05A	02/19/14		**260**	--	**1.6**	<0.50	<0.50	<0.50	**2.1**	<0.50	<0.50	**1.3**	<0.50	**2.5**	**26**
MW-05A	05/21/14		**490**	--	**1.6**	<0.50	<0.50	<0.50	**1.6**	<0.50	<0.50	**1.2**	<0.50	**2.4**	**25**
MW-05A	08/12/14		**500**	--	**1.5**	<0.50	<0.50	<0.50	**2.2**	<0.50	<0.50	**1.3**	<0.50	**2.2**	**25**
MW-05A	11/18/14		**610**	--	0.38 J	<0.50	<0.50	<0.50	0.96 J	<0.50	<0.50	**1.1**	0.27 J	**0.88**	0.27 J
MW-05A	02/19/15		**370**	--	**1.3**	<0.50	<0.50	<0.50	**1.5**	<0.50	<0.50	**1.0**	<0.50	**1.9**	**22**
MW-05A	05/18/15		**520**	--	**1.2**	<0.50	<0.50	<0.50	**1.4**	<0.50	<0.50	0.99 J	<0.50	**1.7**	**21**
MW-05A	08/18/15		**500**	--	**1.2**	<0.50	<0.50	<0.50	**1.3**	<0.50	<0.50	0.92 J	<0.50	**1.8**	**21**
MW-05A	11/02/15		**450**	--	**1.1**	<0.50	<0.50	<0.50	**1.1**	<0.50	<0.50	0.93 J	<0.50	**1.6**	**19**
MW-05A	03/03/16		**290**	--	**0.98**	<0.50	<0.50	<0.50	**1.3**	<0.50	<0.50	0.82 J	<0.50	**1.4**	**18**
MW-05A	05/25/16		**340**	--	**1.2**	<0.50	<0.50	<0.50	**1.7**	<0.50	<0.50	0.96 J	<0.50	**1.6**	**20**
MW-05A	08/23/16		**340**	--	**1.2**	<0.50	<0.50	<0.50	**1.2**	<0.50	<0.50	0.80 J	<0.50	**1.5**	**20**
MW-05A	11/21/16		**350**	--	**1.0**	<0.50	<0.50	<0.50	**1.1**	<0.50	<0.50	0.72 J	<0.50	**1.2**	**15**
MW-05A	02/22/17		**88**	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	0.72 J	<0.50	<0.50	**0.96**
MW-05A	05/22/17		**220**	--	<0.50	<0.50	<0.50	<0.50	0.48 J	<0.50	<0.50	<1.0	<0.50	**0.64**	**9.4**
MW-05A	08/16/17		**200**	--	**0.53**	<0.50	<0.50	<0.50	0.86 J	<0.50	<0.50	<1.0	<0.50	**0.88**	**9.0**
MW-05A	02/21/18		**160**	--	0.32 J	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	0.25 J	**3.6**
MW-05A	08/21/18		**100**	--	0.40 J	<0.50	<0.50	<0.50	0.41 J	<0.50	<0.50	<1.0	<0.50	<0.50	**2.7**
MW-05A	02/12/19		**68**	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-05A	08/20/19		47 J	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	0.40 J
MW-05A	02/18/20		32 J	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
MW-05A	08/18/20		40 J	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
G-4	02/28/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
G-4	03/10/02		--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
G-4	02/17/06		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	05/18/06		28 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	08/21/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	11/20/06		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	03/01/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	05/18/07		<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	08/24/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	11/15/07		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	02/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	05/19/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	08/18/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	11/10/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	02/18/09		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
G-4	05/27/09	RL Change	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/25/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	11/23/09		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	02/22/10		30 J	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	05/27/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/31/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	11/18/10		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	02/17/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	05/09/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	07/20/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	11/21/11		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	02/16/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	05/22/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/06/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	11/13/12		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	02/20/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/06/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	05/21/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/06/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	11/12/13		<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	02/19/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/12/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	05/21/14		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	11/18/14		<50	--	<0.50	**4.2**	**4.0**	**2.9**	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	02/19/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	05/18/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

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GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
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EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
G-4	08/18/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	11/02/15		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	03/03/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	05/25/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/23/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	11/21/16		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	02/22/17		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	05/23/17	well vandalised, pump stolen	**65**	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/16/17	No-purge sample collected with bailer, monument and casing found damaged	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	02/21/18	well pump repaired/replaced	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/21/18		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	02/12/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/20/19		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	02/18/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
G-4	08/18/20		<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
UG-CHAN-20060216	02/16/06		58 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	**23**	<2.0	<2.0	<2.0	<2.0	<2.0
FDCC-W-20080520	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	**19**	<2.0	<2.0	<2.0	<2.0	<2.0
DG-CHAN-20060216	02/16/06		58 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	**15**	<2.0	<2.0	<2.0	<2.0	<2.0
FDCC-E-20080520	05/20/08		<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	**8.7**	<2.0	<2.0	<2.0	<2.0	<2.0

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
FB-Sump	02/16/06	Field Blank	<100	--	<2.0	<2.0	0.49 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	02/17/06	Field Blank	<100	--	<2.0	<2.0	0.39 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	05/17/06	Field Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	05/17/06	Field Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	08/21/06	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	08/22/06	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	11/20/06	Field Blank	<50	--	<2.0	<2.0	1.2 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	11/21/06	Field Blank	<50	--	<2.0	<2.0	1.4 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	03/01/07	Field Blank	<50	--	<2.0	<2.0	**2.3**	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-Sump	03/02/07	Field Blank	<50	--	<2.0	<2.0	**2.8**	0.67 J	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20070517	05/17/07	Field Blank	<100	--	<2.0	<2.0	0.6 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20070518	05/18/07	Field Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-082307	08/23/07	Field Blank	<50	--	<2.0	<2.0	1.9 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20070824	08/24/07	Field Blank	**65 PV**	--	<2.0	<2.0	1.7 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20071115	11/15/07	Field Blank	<50	--	<2.0	<2.0	**2.2**	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20071116	11/16/07	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	0.53 J	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080219	02/19/08	Field Blank	<50	--	<2.0	<2.0	0.74 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080220	02/20/08	Field Blank	<50	--	<2.0	<2.0	0.69 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080519	05/19/08	Field Blank	<50	--	<2.0	<2.0	1.0 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080520	05/20/08	Field Blank	41 J	--	<2.0	<2.0	1.1 J	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080818	08/18/08	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20080819	08/19/08	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20081110	11/10/08	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20081111	11/11/08	Field Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20090218	02/18/09	Field Blank	<50	--	<2.0	<2.0	**2.2**	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20090219	02/19/09	Field Blank	<50	--	<2.0	<2.0	**2.0**	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
FB-SUMP-20090527	05/27/09	Field Blank	<50	--	<0.50	<0.50	**0.95**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20090528	05/28/09	Field Blank	<50	--	<0.50	<0.50	0.49 J	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20090825	08/25/09	Field Blank	<50	--	<0.50	<0.50	**1.9**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20090826	08/26/09	Field Blank	<50	--	<0.50	<0.50	**2.8**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20091123	11/23/09	Field Blank	<50	--	<0.50	<0.50	**2.0**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20091124	11/24/09	Field Blank	<50	--	<0.50	<0.50	**1.8**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20100222	02/22/10	Field Blank	<50	--	<0.50	<0.50	**2.3**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20100223	02/23/10	Field Blank	<50	--	<0.50	<0.50	**1.7**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20100527	05/27/10	Field Blank	<50	--	<0.50	<0.50	**1.6**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20100528	05/28/10	Field Blank	<50	--	<0.50	<0.50	**1.5**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20100831	08/31/10	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20100901	09/01/10	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20100901	09/01/10	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20101118	11/18/10	Field Blank	<50	--	<0.50	<0.50	**0.82**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20101119	11/19/10	Field Blank	<50	--	<0.50	<0.50	**0.78**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
FB-SUMP-20110215	02/15/11	Field Blank	<50	--	<0.50	<0.50	**1.9**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20110217	02/17/11	Field Blank	<50	--	<0.50	<0.50	**1.9**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20110509	05/09/11	Field Blank	<50	--	<0.50	<0.50	**1.6**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20110510	05/10/11	Field Blank	<50	--	<0.50	<0.50	**1.8**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20110720	07/20/11	Field Blank	<50	--	<0.50	<0.50	0.41 J	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20110721	07/21/11	Field Blank	<50	--	<0.50	<0.50	0.38 J	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20111121	11/21/11	Field Blank	37 J	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20111122	11/22/11	Field Blank	30 J	--	<0.50	<0.50	**0.71**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20120215	02/15/12	Field Blank	<50	--	<0.50	<0.50	**3.5**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20120216	02/16/12	Field Blank	<50	--	<0.50	<0.50	**3.3**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20120522	05/22/12	Field Blank	<50	--	<0.50	<0.50	**4.5**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20120523	05/23/12	Field Blank	<50	--	<0.50	<0.50	**4.6**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20120806	08/06/12	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20120807	08/07/12	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20121113	11/13/12	Field Blank	<50	--	<0.50	<0.50	0.48 J	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20121114	11/14/12	Field Blank	<50	--	<0.50	<0.50	0.48 J	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20130219	02/19/13	Field Blank	<50	--	<0.50	<0.50	**3.5**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20130220	02/20/13	Field Blank	<50	--	<0.50	<0.50	**3.1**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20130521	05/21/13	Field Blank	<50	--	<0.50	<0.50	**1.0**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20130522	05/22/13	Field Blank	<50	--	<0.50	<0.50	**1.2**	<0.50	<0.50	<0.50	0.41 J	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20130806	08/06/13	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20131112	11/12/13	Field Blank	<50	--	<0.50	<0.50	**0.59**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20131113	11/13/13	Field Blank	<50	--	<0.50	<0.50	**0.57**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20140219	02/19/14	Field Blank	<50	--	<0.50	<0.50	**1.5**	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20140220	02/20/14	Field Blank	<50	--	<0.50	<0.50	**2.6**	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20140521	05/21/14	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20140522	05/22/14	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20140812	08/12/14	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20140813	08/13/14	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20141118	11/18/14	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20141119	11/19/14	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20150219	02/19/15	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20150220	02/20/15	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20150518	05/18/15	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20150519	05/19/15	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20150818	08/18/15	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20150819	08/19/15	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20151102	11/02/15	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20151103	11/03/15	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
FB-SUMP	03/03/16	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP	03/04/16	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20160525	05/25/16	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20160526	05/26/16	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20160823	08/23/16	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20160824	08/24/16	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20161121	11/21/16	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20161122	11/22/16	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20170222	02/22/17	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-2017	02/23/17	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20170522	05/22/17	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-2017	05/23/17	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20170816	08/16/17	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20170817	08/17/17	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20180221	02/21/18	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20180222	02/22/18	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20180821	08/21/18	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20190212	02/12/19	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20190820	08/20/19	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20190821	08/21/19	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20200218	02/18/20	Field Blank	<50	--	<0.50	<0.50	**0.56**	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20200219	02/19/20	Field Blank	<50	--	<0.50	<0.50	0.38 J	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20200818	08/18/20	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
FB-SUMP-20200819	08/19/20	Field Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
TB1-Sump	02/16/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB2-Sump	02/16/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB3-Sump	02/16/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB1-Sump	02/17/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB2-Sump	02/17/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	05/17/06	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	05/17/06	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	05/18/06	Trip BlankA	33 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	05/18/06	Trip BlankB	25 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	05/18/06	Trip BlankC	26 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	08/21/06	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	08/21/06	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	08/22/06	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	08/22/06	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	11/20/06	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	11/20/06	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	11/20/06	Trip BlankC	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	11/21/06	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/01/07	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/01/07	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/01/07	Trip BlankC	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/02/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-Sump	03/02/07	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB3-Sump-20060216	02/16/06	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20070517	05/17/07	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20070518	05/18/07	Trip Blank	<100	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-082307	08/23/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20070824	08/24/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20071115	11/15/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20071116	11/16/07	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
TB-SUMP-20080219-A	02/19/08	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080219-B	02/19/08	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080219-C	02/19/08	Trip BlankC	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080220-A	02/20/08	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080220-B	02/20/08	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080519-A	05/19/08	Trip BlankA	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080519-B	05/19/08	Trip BlankB	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080519-C	05/19/08	Trip BlankC	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080520-D	05/20/08	Trip BlankD	34 J	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080520-E	05/20/08	Trip BlankE	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080520-F	05/20/08	Trip BlankF	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080818	08/18/08	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20080819	08/19/08	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20081110	11/10/08	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20081111	11/11/08	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20090218	02/18/09	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20090219	02/19/09	Trip Blank	<50	--	<2.0	<2.0	<2.0	<2.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TB-SUMP-20090527	05/27/09	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20090528	05/28/09	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20090825	08/25/09	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20090826	08/26/09	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20091123	11/23/09	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20091124	11/24/09	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100222	02/22/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100223	02/23/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100527	05/27/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100528	05/28/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100831	08/31/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100901	09/01/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20100901	09/01/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20101118	11/18/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20101119	11/19/10	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20110215	02/15/11	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20110217	02/17/11	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20110509	05/09/11	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20110510	05/10/11	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20110720	07/20/11	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20110721	07/21/11	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20111121	11/21/11	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20111122	11/22/11	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
TB-SUMP-20120215	02/15/12	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20120216	02/16/12	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20120522	05/22/12	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20120523	05/23/12	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20120806	08/06/12	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20120807	08/07/12	Trip Blank	<50	--	<0.50	<0.50	**3.9**	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20121113	11/13/12	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20121114	11/14/12	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20130219	02/19/13	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20130220	02/20/13	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20130521	05/21/13	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20130522	05/22/13	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20130806	08/06/13	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20130807	08/07/13	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20131112	11/12/13	Trip Blank	29 J	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20131113	11/13/13	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20140219	02/19/14	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20140220	02/20/14	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20140521	05/21/14	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20140522	05/22/14	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20140812	08/12/14	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20140813	08/13/14	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20141118	11/18/14	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20141119	11/19/14	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20150219	02/19/15	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20150220	02/20/15	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20150518	05/18/15	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20150519	05/19/15	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20150818	08/18/15	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20150819	08/19/15	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20151102	11/02/15	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20151103	11/03/15	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP	03/03/16	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP	03/04/16	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-2016-0525	05/25/16	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20160526	05/26/16	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20160823	08/23/16	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20160824	08/23/16	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20161121	11/21/16	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20161122	11/22/16	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B											
			GRO	Volatile Organic Compounds											
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na
TB-SUMP-20170222	02/22/17	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-2017	02/23/17	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20170522	05/22/17	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-2017	05/23/17	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20170816	08/16/17	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20180221	02/21/18	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20180222	02/22/18	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20180821	08/21/18	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20180822	08/22/18	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20190212	02/12/19	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20190820	08/20/19	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20190821	08/21/19	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20200218	02/18/20	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20200219	02/19/20	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20200818	08/18/20	Trip Blank	26 J	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
TB-SUMP-20200819	08/19/20	Trip Blank	<50	--	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50

Notes:
GRO = Gasolone Range Organics by modified EPA Method 8015B
* = Analyte was quantitated below the established linear calibration range. Amount reported is an estimate.
ND = Not Detected. This data was obtained from a summary table of a report not prepared by SECOR/Stantec.
<# = Analyte was not detected above the Reporting Limit (#)
µg/L = micrograms per liter
na = Not applicable
-- = Not applicable / Not analyzed
J = Analyte was detected between the MDL and the RL
MB or B = Analyte detected in the method blank
LH,AY = Due to sample matrix effects, the surrogate recovery was outside of acceptance limits.
PV = Hydrocarbon result partly due to individual peak(s) in quantity range.
Results highlighted with **Bold** font indicate results > RL
(1) - National Primary Drinking Water Regulations - EPA Region 9
(2) - California Department of Public Health

Table 3
Summary of Volatile Organic Compounds Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8015B	8260 B										
			GRO	Volatile Organic Compounds										
Sample ID	Date Sampled	Notes	C4 - C12 (ug/L)	Acetone (ug/L)	Benzene (ug/L)	Bromodi-chloro-methane (ug/L)	Chloroform (ug/L)	Dibromo-chloro-methane (ug/L)	Naphthalene (ug/L)	PCE (ug/L)	Toluene (ug/L)	m,p-Xylenes (ug/L)	o-Xylene (ug/L)	1,2,4-Tri-methyl-benzene (ug/L)	1,3,5- Tri-methyl-benzene (ug/L)
EPA Region 9 MCLs (1)			na	na	5	na	na	na	na	5	1,000	10,000		na	na
California DPH MCLs (2)			na	na	1	na	na	na	na	5	150	1,750		na	na

MCLs = Maximum Contaminant Levels

bold # Results highlighted with a gray box indicate results > MCL

RL Change = in 2nd Qtr 2009 the RL's and MDL's were lowered to more closely match the CA State limits on those analytes.

On October 30, 2014, DTSC approved the removal of MW-01A and MW-01B from the groundwater sampling plan.

For safety and security reasons, the surface water sampling locations in the Dominguez Flood Control Channel (DFCC) have been re-located.

During Q2, 2017 GW event, due to vandalism (hinges on well lid cut off and pump stolen), MW-04B and G-4 were sampled using a bailer and analyzed only for GRO and VOC's.

During Q3, 2017 GW event, due to vandalism (monument was found damaged), a no-purge sample was collected from G-4. A trip blank was not collected on 8/17/17 due to VOA breakage.

References:

DTSC, 2000 and 2001. *2000 and 2001Groundwater Sampling Report for Gardena Sumps.*

DTSC, 2002. *2002 Groundwater Sampling Report for Gardena Sumps.*

URS, 1994. *Groundwater Remedial Investigation Technical Memorandum* , Gardena Sumps, 1440 West Artesia Boulevard, Gardena, CA., November 14.

SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.

EPA, 2009. *Drinking Water Standards and Health Advisories Table* , November

Table 4
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium VI, pH, and Sulfide Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

		EPA Method:	8270C			376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (ug/L)	Chrysene (ug/L)	Pyrene (ug/L)	Total (ug/L)	Reactive (ug/L)	(ug/L)		
EPA Region 9 MCLs (1)			6	na	0.2 (3)	na	na	100 (4)	na	na
California DPH MCLs (2)			6	na	0.2 (3)	na	na	10	na	na
MW-01A	05/11/94		8.6*	--	--	--	--	--	--	7.50
MW-01A	06/15/00		D	--	--	--	--	--	--	7.00
MW-01A	06/12/01	Add.Data	--	--	--	--	--	--	--	NS
MW-01A	06/22/01		ND	--	--	--	--	--	--	--
MW-01A	02/28/02		ND	--	--	--	--	--	--	7.26
MW-01A	03/10/02		ND	--	--	--	--	--	--	--
MW-01A	02/16/06		<48	<9.5	<9.5	23 J	ND *	1.6 J	7.13	6.77
MW-01A	05/17/06		<47	<9.4	<9.4	<100	ND *	<25	7.27	6.76
MW-01A	08/21/06		<47	<9.4	<9.4	51 J	ND *	<25	7.05	6.74
MW-01A	11/20/06		<47	<9.4	<9.4	20 J	ND *	<25	7.30	6.56
MW-01A	03/02/07		<47	<9.5	<9.5	<100	--	7.3 MB,J	--	6.72
MW-01A	05/18/07		8.2 J	<9.4	<9.4	44 J	--	<25	--	5.40
MW-01A	08/23/07		<47	<9.4	<9.4	<100	--	<25	7.17	6.93
MW-01A	11/15/07		<47	<9.4	<9.4	<100	--	<25	7.46	6.53
MW-01A	02/19/08		<47	<9.4	<9.4	<100	--	<25	7.35	6.90
MW-01A	05/19/08		<47	<9.4	<9.4	20 J	--	<25	7.53	6.68
MW-01A	08/18/08		<47	<9.5	<9.5	<100	--	<25	7.37	7.03
MW-01A	11/10/08		<47	<9.4	<9.4	<100	--	<25	7.55	6.74
MW-01A	02/18/09		<47	<9.4	<9.4	54 J	--	<25	7.60	6.84
MW-01A	05/27/09	RL Change	<3.8	<0.47	<0.47	<100	--	<2.0	7.34	6.83
MW-01A	08/25/09		1.8 J	<0.47	<0.47	<100	--	<2.0	7.24	6.70
MW-01A	11/23/09		**4.8**	<0.47	<0.47	<100	--	<2.0	7.56	6.20
MW-01A	02/22/10		<3.8	<0.47	<0.47	<100	--	<2.0	7.09	6.31
MW-01A	05/27/10		3.2 J	<0.48	<0.48	65 J	--	<2.0	7.37	6.62
MW-01A	08/31/10	& 09/29/2010	**8.3**	<0.47	<0.19	32 J	--	<2.0	7.45	6.34
MW-01A	11/18/10		2.5 J	<0.47	<0.47	<100	--	<2.0	7.55	6.53
MW-01A	02/15/11		2.5 J	<0.47	<0.47	23 J	--	<2.0	7.61	6.93
MW-01A	05/09/11		3.6 J	<0.47	<0.47	31 J	--	<2.0	8.20	7.10
MW-01A	07/20/11		**5.5**	<0.48	<0.48	<100	--	<2.0	7.60	6.97
MW-01A	11/21/11		3.1 J	<0.47	<0.47	<100	--	<2.0	7.60	6.67
MW-01A	02/15/12		<4.8	<0.48	<0.48	26 J	--	<2.0	7.86	7.50
MW-01A	05/22/12		1.9 J	<0.47	<0.47	<100	--	<2.0	7.83	6.84
MW-01A	08/06/12		3.2 J	<0.47	<0.47	<100	--	<2.0	7.17	7.04
MW-01A	11/14/12		2.0 J	<0.47	<0.47	<100	--	<2.0	7.28	6.88
MW-01A	02/19/13		2.1 J	<0.48	<0.48	<100	--	<2.0	7.05	6.99
MW-01A	05/21/13		3.2 J	<0.47	<0.48	<100	--	<2.0	7.09	7.27
MW-01A	08/06/13		6.0 B *	<0.48	<0.48	<100	--	<2.0	7.21	7.55
MW-01A	11/12/13	Well inaccessible; not sampled	--	--	--	--	--	--	--	--
MW-01A	02/20/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--
MW-01A	02/20/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--
MW-01A	05/21/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--
MW-01A	08/12/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--
MW-01A	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--

Table 4
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium VI, pH, and Sulfide Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

		EPA Method:	8270C			376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (ug/L)	Chrysene (ug/L)	Pyrene (ug/L)	Total (ug/L)	Reactive (ug/L)	(ug/L)		
EPA Region 9 MCLs (1)			6	na	0.2 (3)	na	na	100 (4)	na	na
California DPH MCLs (2)			6	na	0.2 (3)	na	na	10	na	na
MW-01B	01/21/94		--	--	--	--	--	--	--	--
MW-01B	05/11/94		--	--	--	--	--	--	--	10.80
MW-01B	06/15/00		D	--	--	--	--	--	--	7.00
MW-01B	06/12/01	Add.Data	--	--	--	--	--	--	--	NS
MW-01B	06/22/01		ND	--	--	--	--	--	--	--
MW-01B	02/28/02		ND	--	--	--	--	--	--	9.01
MW-01B	03/10/02		ND	--	--	--	--	--	--	--
MW-01B	02/16/06		<48	<9.5	<9.5	23 J	ND *	1.1 J	7.49	7.09
MW-01B	05/17/06		<47	<9.4	<9.4	<100	ND *	<25	7.63	7.12
MW-01B	08/21/06		<47	<9.4	<9.4	39 J	ND *	<25	7.32	7.05
MW-01B	11/20/06		<47	<9.4	<9.4	23 J	ND *	<25	7.52	6.88
MW-01B	03/02/07		<47	<9.5	<9.5	<100	--	8.5 MB,J	--	7.19
MW-01B	05/18/07		5.0 J	<9.4	<9.4	67 J	--	<25	--	7.21
MW-01B	08/23/07		<47	<9.4	<9.4	51 J	--	4.3 J	7.52	7.50
MW-01B	11/15/07		<48	<9.6	<9.6	<100	--	8.7 J	7.70	7.10
MW-01B	02/19/08		<47	<9.4	<9.4	<100	--	<25	7.58	7.11
MW-01B	05/19/08		<47	<9.4	<9.4	78 J	--	<25	7.73	7.07
MW-01B	08/18/08		<47	<9.4	<9.4	<100	--	<25	7.59	7.43
MW-01B	11/10/08		<47	<9.4	<9.4	<100	--	<25	7.63	6.99
MW-01B	02/18/09		<47	<9.4	<9.4	<100	--	7.4 J	7.75	7.13
MW-01B	05/27/09	RL Change	<3.8	<0.47	<0.47	<100	--	<2.0	7.56	7.36
MW-01B	08/25/09		**4.2**	<0.47	<0.47	<100	--	<2.0	7.50	6.79
MW-01B	11/23/09		<3.8	<0.47	<0.47	<100	--	<2.0	7.66	5.85
MW-01B	02/22/10		**5.5**	<0.47	<0.47	<100	--	<2.0	7.43	6.79
MW-01B	05/27/10		**3.9**	<0.48	<0.48	<100	--	<2.0	7.51	6.56
MW-01B	08/31/10	& 09/29/2010	**4.6**	<0.48	<0.19	<100	--	<2.0	7.58	6.85
MW-01B	11/18/10		<3.8	<0.47	<0.47	<100	--	<2.0	7.73	6.76
MW-01B	02/15/11		**5.3**	<0.47	<0.47	<100	--	<2.0	7.73	7.41
MW-01B	05/09/11		**7.1**	<0.47	<0.47	23 J	--	<2.0	8.00	6.95
MW-01B	07/20/11		**3.3 J**	<0.47	<0.47	<100	--	<2.0	7.80	6.90
MW-01B	11/21/11		**28**	<0.47	<0.47	<100	--	<2.0	7.70	7.12
MW-01B	02/15/12		<4.7	<0.47	<0.47	43 J	--	<2.0	7.92	6.99
MW-01B	05/22/12		**5.5**	<0.47	<0.47	<100	--	<2.0	7.94	7.36
MW-01B	08/06/12		<4.7	<0.47	<0.47	<100	--	<2.0	7.48	7.76
MW-01B	11/14/12		2.9 J	<0.47	<0.47	<100	--	<2.0	7.39	8.46
MW-01B	02/19/13		1.8 J	<0.47	<0.47	<100	--	<2.0	7.31	7.47
MW-01B	05/21/13		**5.5**	<0.47	<0.47	<100	--	<2.0	7.39	7.35
MW-01B	08/06/13		**3.3 J,B ***	<0.95	<0.95	<100	--	<2.0	7.49	7.56
MW-01B	11/12/13	Well inaccessible; not sampled	--	--	--	--	--	--	--	--
MW-01B	02/20/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--
MW-01B	05/21/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--
MW-01B	08/12/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--
MW-01B	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--

Table 4
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium VI, pH, and Sulfide Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

		EPA Method:	8270C			376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (ug/L)	Chrysene (ug/L)	Pyrene (ug/L)	Total (ug/L)	Reactive (ug/L)	(ug/L)		
EPA Region 9 MCLs (1)			6	na	0.2 (3)	na	na	100 (4)	na	na
California DPH MCLs (2)			6	na	0.2 (3)	na	na	10	na	na
MW-02A	01/21/94		ND	--	--	--	--	--	--	--
MW-02A	05/10/94		13	--	--	--	--	--	--	--
MW-02A	05/11/94		12	--	--	--	--	--	--	6.90
MW-02A	06/15/00		D	--	--	--	--	--	--	7.00
MW-02A	06/12/01	Add.Data	--	--	--	--	--	--	--	7.25
MW-02A	06/25/01		ND	--	--	--	--	--	--	--
MW-02A	02/28/02		ND	--	--	--	--	--	--	--
MW-02A	03/10/02		ND	--	--	--	--	--	--	--
MW-02A	02/16/06		<48	<9.5	<9.5	23 J	ND *	0.97 J	7.02	6.63
MW-02A	05/18/06		<47	<9.4	<9.4	14 J	ND *	1.9 J	6.86	6.61
2MW-02A	05/18/06	Duplicate	<47	<9.4	<9.4	20 J	--	1.7 J	6.98	6.61
MW-02A	08/22/06		<47	<9.4	<9.4	35 J	ND *	<25	6.97	6.73
2MW-02A	08/22/06	Duplicate	<47	<9.4	<9.4	37 J	ND *	<25	6.98	6.73
MW-02A	11/21/06		<47	<9.4	<9.4	24 J	ND *	<25	7.22	6.52
MW-02A	03/01/07		<47	<9.5	<9.5	<100	--	<25	--	6.72
MW-02A	05/17/07		<47	<9.4	0.073 J	<100	--	<25	7.29	5.62
MW-02A	08/24/07		<47	<9.4	<9.4	44 J	--	<25	7.21	6.67
MW-02A	11/16/07		<48	<9.5	<9.5	<100	--	<25	7.32	6.39
MW-02A	02/20/08		<47	<9.4	<9.4	<100	--	<25	7.15	6.91
MW-02A	05/20/08		<47	<9.4	<9.4	63 J	--	<25	7.45	6.82
MW-02A	08/19/08		<47	<9.4	<9.4	46 J	--	<25	7.35	6.55
MW-02A	11/11/08		<47	<9.4	<9.4	<100	--	<25	7.33	6.93
MW-02A	02/19/09		<47	<9.4	<9.4	77 J	--	<25	7.39	6.91
MW-02A	05/28/09	RL Change	2.0 J	<0.48	<0.48	<100	--	<2.0	7.36	6.67
MW-02A	08/26/09		**8.2**	0.11 J	0.19 J	<100	--	<2.0	7.28	6.17
MW-02A	11/24/09		<3.8	<0.47	<0.47	<100	--	<2.0	7.43	7.08
MW-02A	02/23/10		<3.8	<0.48	<0.48	<100	--	<2.0	7.43	6.47
MW-02A	05/28/10		**10**	<0.48	<0.48	<100	--	<2.0	7.90	7.04
MW-02A	09/01/10	& 09/29/2010	3.3 J	<0.47	<0.19	<100	--	<2.0	7.35	6.41
MW-02A	11/19/10		1.9 J	<0.47	<0.47	31 J	--	<2.0	7.26	6.75
MW-02A	02/17/11		<3.8	<0.47	<0.47	<100	--	<2.0	7.25	6.97
MW-02A	05/10/11		<3.8	<0.47	<0.47	<100	--	<2.0	8.10	6.99
MW-02A	07/21/11		**4.1**	<0.48	<0.48	<100	--	<2.0	7.70	6.87
MW-02A	11/22/11		**9.5**	<0.47	<0.47	36 J	--	<2.0	7.60	6.70
MW-02A	02/16/12		3.0 J	<0.48	<0.48	35 J	--	<2.0	7.50	7.25
MW-02A	05/23/12		2.8 J	<0.47	<0.47	0.026 J	--	0.55 J	7.53	6.80
MW-02A	08/07/12		3.0 J	<0.47	<0.47	<100	--	<2.0	7.37	6.90
MW-02A	11/14/12		**9.1**	<0.48	<0.48	<100	--	<2.0	7.40	6.95
MW-02A	02/20/13		**16**	<0.48	<0.48	<100	--	<2.0	7.08	7.08
MW-02A	05/22/13		**9.6**	<0.47	<0.47	<100	--	35 J	7.06	7.02
MW-02A	08/07/13		3.0 J,B	<0.48	<0.48	<100	--	<2.0	7.34	8.93
MW-02A	11/13/13		**9.0**	<0.54	<0.54	<50	--	<2.0	7.00	6.74
MW-02A	02/20/14		2.8 J	<0.47	<0.47	<50	--	0.29 J	7.04	7.01
MW-02A	05/22/14		3.2 J	<0.48	<0.48	<50	--	<2.0	7.36	6.89
MW-02A	08/13/14		**13**	<0.47	<0.47	<50	--	<2.0	7.33	7.29
MW-02A	11/19/14		**12**	<0.48	<0.48	<50	--	<2.0	7.72	6.98
MW-02A	02/20/15		**12**	<0.48	<0.48	<50	--	<2.0	7.32	6.92
MW-02A	05/19/15		2.7 J	<0.49	<0.49	<50	--	<2.0	7.16	6.92
MW-02A	08/18/15		**18 B**	<0.48	<0.48	<50	--	<2.0	7.27	6.80
MW-02A	11/03/15		3.7 J	<0.47	<0.47	<50	--	<2.0	7.66	6.73
MW-02A	03/04/16		4.7 J	<0.48	<0.48	<50	--	<2.0	7.49	6.94
MW-02A	05/26/16		**4.8**	<0.48	<0.48	<50	--	<2.0	7.74	7.74
MW-02A	08/24/16		**24**	<0.49	<0.49	<50	--	<2.0	7.90	6.74
MW-02A	11/22/16		<4.6	<0.46	<0.46	<50	--	<2.0	7.50	7.25
MW-02A	02/23/17		<4.9	<0.49	<0.49	<50	--	<2.0	7.60	7.10
MW-02A	05/22/17	Well vandalised, locks cut	<5.0	<0.50	<0.50	<50	--	<2.0	7.70	6.78
MW-02A	08/17/17		3.8 J	<0.52	<0.52	<50	--	<2.0	7.60	6.62
MW-02A	02/22/18		<4.9	<0.49	<0.49	<50	--	<2.0	7.70	6.77
MW-02A	08/22/18		**11 B**	<0.49	<0.49	<50	--	<2.0	7.30	6.74
MW-02A	02/13/19		<5.0	<0.50	<0.50	<50	--	<2.0	7.90	6.77
MW-02A	08/21/19		4.2 J	<0.49	<0.49	<50	--	<2.0	7.80	6.89
MW-02A	02/19/20		**5.8**	<0.48	<0.48	<50	--	<2.0	7.70	6.82
MW-02A	08/19/20		<4.8	<0.19	<0.19	<50	--	<2.0	7.40	6.96

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Gardena, California

		EPA Method:	8270C			376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (ug/L)	Chrysene (ug/L)	Pyrene (ug/L)	Total (ug/L)	Reactive (ug/L)	(ug/L)		
EPA Region 9 MCLs (1)			6	na	0.2 (3)	na	na	100 (4)	na	na
California DPH MCLs (2)			6	na	0.2 (3)	na	na	10	na	na
MW-02B	05/11/94		21	--	--	--	--	--	--	8.30
MW-02B	06/15/00		ND	--	--	--	--	--	--	7.00
MW-02B	06/12/01	Add.Data	--	--	--	--	--	--	--	7.39
MW-02B	06/25/01		ND	--	--	--	--	--	--	--
MW-02B	02/28/02		ND	--	--	,	--	--	--	10.30
MW-02B	03/10/02		ND	--	--	--	--	--	--	--
MW-02B	02/16/06		<48	<9.5	<9.5	27 J	ND *	1.7 J	7.12	6.88
2MW-02B	02/16/06	Duplicate	<48	<9.5	<9.5	30 J	ND *	8.6 J	7.14	6.88
MW-02B	05/17/06		<47	<9.4	<9.4	<100	ND *	<25	7.26	6.88
MW-02B	08/22/06		<47	<9.4	<9.4	37 J	ND *	7.3 J	7.09	6.87
MW-02B	11/21/06		<47	<9.4	<9.4	58 J	500 J	<25	7.31	6.78
MW-02B	03/01/07		<47	<9.5	<9.5	37 J	--	25	--	6.98
MW-02B	05/17/07		<47	<9.4	<9.4	9.7 J	--	<25	7.36	7.19
MW-02B	08/24/07		<47	<9.4	<9.4	34 J	--	<25	7.33	8.47
MW-02B	11/16/07		<47	<9.4	<9.4	24 J	--	<25	7.34	6.70
MW-02B	02/20/08		<47	<9.4	<9.4	<100	--	<25	7.26	7.05
MW-02B	05/20/08		<47	<9.4	<9.4	69 J	--	<25	7.59	7.02
MW-02B	08/19/08		<47	<9.4	<9.4	51 J	--	<25	7.46	7.06
MW-02B	11/11/08		<47	<9.4	<9.4	<100	--	<25	7.46	6.92
MW-02B	02/19/09		<47	<9.4	<9.4	63 J	--	5.7 J	7.64	7.08
MW-02B	05/28/09	RL Change	2.9 J	<0.47	<0.47	42 J	--	<2.0	7.39	6.90
MW-02B	08/26/09		2.8 J	<0.47	<0.47	76 J	--	<2.0	7.41	6.96
MW-02B	11/24/09		**6.4**	<0.47	<0.47	25 J	--	<2.0	7.51	7.18
MW-02B	02/23/10		<3.8	<0.47	<0.47	<100	--	<2.0	7.45	6.65
MW-02B	05/28/10		<3.8	<0.47	<0.47	<100	--	<2.0	7.97	6.83
MW-02B	09/01/10	& 09/29/2010	<3.8	<0.47	<0.19	29 J	--	<2.0	7.50	6.98
MW-02B	11/19/10		<3.8	<0.47	<0.47	42 J	--	<2.0	7.36	7.11
MW-02B	02/17/11		**5.0**	<0.47	<0.47	<100	--	<2.0	7.38	6.96
MW-02B	05/10/11		**18**	<0.47	<0.47	<100	--	<2.0	8.00	6.74
MW-02B	07/21/11		**7.1**	<0.47	<0.47	38 J	--	<2.0	7.80	6.80
MW-02B	11/22/11		3.3 J	<0.47	<0.47	<100	--	<2.0	7.60	7.14
MW-02B	02/16/12		**83**	<2.4	<2.4	43 J	--	<2.0	7.69	7.35
MW-02B	05/23/12		**5.1**	<0.48	<0.48	<100	--	<2.0	7.71	7.93
MW-02B	08/07/12		**6.3**	<0.47	<0.47	<100	--	<2.0	7.50	7.77
MW-02B	11/14/12		3.3 J	<0.47	<0.47	<100	--	<2.0	7.39	7.64
MW-02B	02/20/13		2.8 J	<0.47	<0.47	<100	--	<2.0	7.20	7.34
MW-02B	05/22/13		**7.4**	<0.47	<0.47	<100	--	<2.0	7.21	7.44
MW-02B	08/07/13		**5.6 B**	<0.48	<0.48	<100	--	<2.0	7.40	7.72
MW-02B	11/13/13		4.5 J	<0.47	<0.47	<50	--	<2.0	7.12	7.22
MW-02B	02/20/14		3.3 J	<0.47	<0.47	<50	--	<2.0	7.10	6.86
MW-02B	05/22/14		**9.9**	<0.48	<0.48	<50	--	<2.0	7.42	7.53
MW-02B	08/13/14		3.9 J	<0.47	<0.47	<50	--	<2.0	7.49	7.58
MW-02B	11/19/14		<12	<1.2	<1.2	<50	--	<2.0	7.78	7.28
MW-02B	02/20/15		3.8 J	<0.48	<0.48	<50	--	<2.0	7.44	6.98
MW-02B	05/19/15		3.0 J	<0.48	<0.48	<50	--	<2.0	7.29	7.23
MW-02B	08/18/15		**72 B**	<2.4	<2.4	<50	--	<2.0	7.42	6.89
MW-02B	11/03/15		<4.7	<0.47	<0.47	<50	--	<2.0	7.76	7.09
MW-02B	03/04/16		<4.8	<0.48	<0.48	<50	--	<2.0	7.70	7.02
MW-02B	05/26/16		**6.0**	<0.47	<0.47	<50	--	<2.0	7.79	7.61
MW-02B	08/24/16		<4.9	<0.49	<0.49	<50	--	<2.0	8.00	7.66
MW-02B	11/22/16		2.2 J	<0.49	<0.49	<50	--	<2.0	7.50	7.09
MW-02B	02/23/17		<4.9	<0.49	<0.49	<50	--	<2.0	7.70	7.34
MW-02B	05/22/17	Well vandalised, locks cut	**6.2**	<0.50	<0.50	<50	--	<2.0	7.80	6.87
MW-02B	08/17/17		**7.5**	<0.52	<0.52	<50	--	<2.0	7.80	6.84
MW-02B	02/22/18		**10**	<0.49	<0.49	<50	--	<2.0	7.80	7.02
MW-02B	08/22/18		**34 B**	<0.50	<0.50	<50	--	<2.0	7.60	6.86
MW-02B	02/13/19		<4.9	<0.49	<0.49	<50	--	<2.0	8.00	7.08
MW-02B	08/21/19		**20**	<0.49	<0.49	<50	--	<2.0	7.80	7.19
MW-02B	02/19/20		**4.8**	<0.48	<0.48	<50	--	<2.0	7.90	7.11
MW-02B	08/19/20		4.3 J	<0.19	<0.19	<50	--	<2.0	7.60	7.44

Table 4
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium VI, pH, and Sulfide Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

		EPA Method:	8270C			376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (ug/L)	Chrysene (ug/L)	Pyrene (ug/L)	Total (ug/L)	Reactive (ug/L)	(ug/L)		
EPA Region 9 MCLs (1)			6	na	0.2 (3)	na	na	100 (4)	na	na
California DPH MCLs (2)			6	na	0.2 (3)	na	na	10	na	na
MW-03A	05/10/94		ND	--	--	--	--	--	--	7.40
MW-03A	06/15/00		ND	--	--	--	--	--	--	7.00
MW-03A	06/12/01	Add.Data	--	--	--	--	--	--	--	7.19
MW-03A	06/22/01		ND	--	--	--	--	--	--	--
MW-03A	02/28/02		ND	--	--	--	--	--	--	8.51
MW-03A	03/10/02		ND	--	--	--	--	--	--	--
MW-03A	02/17/06		<48	<9.5	<9.5	13 J	ND *	3.4 J	7.20	6.81
MW-03A	05/18/06		<47	<9.4	<9.4	14 J	ND *	<25	6.97	6.67
MW-03A	08/22/06		<47	<9.4	<9.4	35 J	ND *	<25	7.01	6.78
MW-03A	11/20/06		<47	<9.4	<9.4	66.J	ND *	<25	7.18	6.53
2MW-03A	11/20/06	Duplicate	<47	<9.4	<9.4	38 J	ND *	<25	7.14	6.78
MW-03A	03/01/07		<47	<9.5	<9.5	<100	--	4.2 J	6.56	6.53
2MW-03A	03/01/07	Duplicate	<47	<9.5	<9.5	<100	--	4.0 J	--	6.56
MW-03A	05/17/07		<47	<9.4	<9.4	<100	--	<25	7.16	5.29
MW-03A	08/24/07		<47	<9.4	<9.4	40 J	--	<25	7.11	6.10
MW-03A	11/15/07		<47	<9.4	<9.4	<100	--	7.6 J	7.29	6.32
MW-03A	02/19/08		<47	<9.4	<9.4	<100	--	<25	7.22	6.81
MW-03A	05/19/08		<47	<9.4	<9.4	83 J	--	<25	7.34	6.57
MW-03A	08/18/08		<47	<9.5	<9.5	<100	--	<25	7.18	6.67
MW-03A	11/10/08		<47	<9.4	<9.4	<100	--	<25	7.27	6.82
MW-03A	02/18/09		<47	<9.4	<9.4	47 J	--	<25	7.45	6.61
MW-03A	05/27/09	RL Change	<3.8	<0.48	<0.48	<100	--	0.85 J	7.13	6.56
MW-03A	08/25/09		1.8 J	<0.47	<0.47	54 J	--	0.84 J	7.01	6.64
MW-03A	11/23/09		**4.7**	<0.47	<0.47	<100	--	0.71 J	7.28	6.11
MW-03A	02/22/10		<3.8	<0.47	<0.47	<100	--	0.95 J	6.99	6.54
MW-03A	05/27/10		<3.8	<0.47	<0.47	<100	--	1.1 J	7.10	6.43
MW-03A	08/31/10	& 09/29/2010	2.2 J	<0.47	<0.19	21 J	--	1.1 J	7.15	6.38
MW-03A	11/18/10		<3.8	<0.47	<0.47	<100	--	0.63 J	7.33	6.36
MW-03A	02/17/11		<3.8	<0.47	<0.47	<100	--	0.96 J	7.08	6.87
MW-03A	05/09/11		**22**	<0.48	<0.48	20 J	--	0.73 J	7.80	6.61
MW-03A	07/20/11		<3.8	<0.47	<0.47	21 J	--	0.37 J	7.40	6.53
MW-03A	11/21/11		**40**	<0.47	<0.47	34 J	--	0.41 J	7.40	6.71
MW-03A	02/16/12		3.1 J	<0.47	<0.47	30 J	--	0.57 J	7.35	7.01
MW-03A	05/22/12		4.1 J	<0.47	<0.47	<100	--	0.70 J	7.70	7.36
MW-03A	08/06/12		**7.8**	<0.48	<0.48	<100	--	0.64 J	6.95	7.21
MW-03A	11/13/12		1.9 J	<0.47	<0.47	<100	--	1.1 J	7.13	6.70
MW-03A	02/20/13	Not Sampled	NS	NS	NS	NS	--	NS	NS	NS
MW-03A	05/21/13		<4.7	<0.47	<0.47	<100	--	0.45 J	6.98	7.13
MW-03A	08/06/13		3.4 J,B *	<0.48	<0.48	<100	--	0.33 J	7.11	6.93
MW-03A	11/12/13		<5.0	<0.50	<0.50	<50	--	0.62 J	7.05	6.54
MW-03A	02/19/14		**5.8**	<0.47	<0.47	<50	--	0.57 J	7.10	6.49
MW-03A	05/21/14		<4.8 *	<0.48	<0.48	<50	--	0.49 J	7.24	6.70
MW-03A	08/12/14		**13**	<0.95	<0.95	<50	--	<2.0	6.99	7.00
MW-03A	11/18/14	Not Sampled, well vandalized, pump stolen	--	--	--	--	--	--	--	--
MW-03A	02/19/15		<4.8	<0.48	<0.48	<50	--	<2.0	7.09	6.76
MW-03A	05/18/15		<5.1	<0.51	<0.51	<50	--	0.78 J	7.03	6.72
MW-03A	08/18/15		**16 B**	<0.48	<0.48	<50	--	0.49 J	7.08	6.70
MW-03A	11/02/15		<4.7	<0.47	<0.47	<50	--	0.45 J	7.08	6.70
MW-03A	03/03/16		<4.9	<0.49	<0.49	<50	--	0.36 J	7.22	6.63
MW-03A	05/25/16		<4.9	<0.49	<0.49	23 J	--	0.77 J	--	8.24
MW-03A	08/23/16		<4.9	<0.49	<0.49	<50	--	<2.0	7.00	6.51
MW-03A	11/21/16		<4.9	<0.49	<0.49	<50	--	0.28 J	7.30	6.79
MW-03A	02/22/17		<4.9	<0.49	<0.49	<50	--	<2.0	8.00	6.67
MW-03A	05/23/17		<5.0	<0.50	<0.50	<50	--	1.2 J	7.60	6.61
MW-03A	08/16/17		<5.1	<0.51	<0.51	<50	--	0.73 J	7.50	6.48
MW-03A	02/21/18		<4.9	<0.49	<0.49	<50	--	0.39 J	7.40	6.67
MW-03A	08/21/18		2.2 J, B	<0.50	<0.50	<50	--	<2.0	7.30	6.65
MW-03A	02/12/19		<4.9	<0.49	<0.49	<50	--	1.2 J	7.40	6.70
MW-03A	08/20/19		<5.1	<0.51	<0.51	<50	--	0.37 J	7.70	6.78
MW-03A	02/18/20		<4.9	<0.49	<0.49	<50	--	0.54 J	7.60	6.73
MW-03A	08/18/20		<4.8	<0.19	<0.19	<50	--	0.50 J	7.50	7.02

Table 4
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium VI, pH, and Sulfide Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

			EPA Method:	8270C		376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (ug/L)	Chrysene (ug/L)	Pyrene (ug/L)	Total (ug/L)	Reactive (ug/L)	(ug/L)		
EPA Region 9 MCLs (1)			6	na	0.2 (3)	na	na	100 (4)	na	na
California DPH MCLs (2)			6	na	0.2 (3)	na	na	10	na	na
MW-03B	05/10/94		8.9*	--	--	--	--	--	--	7.40
MW-03B	07/05/00		ND	--	--	--	--	--	--	7.00
MW-03B	06/12/01	Add.Data	--	--	--	--	--	--	--	7.45
MW-03B	06/25/01		ND	--	--	--	--	--	--	--
MW-03B	02/28/02		ND	--	--	--	--	--	--	7.98
MW-03B	03/10/02		ND	--	--	--	--	--	--	--
MW-03B	02/17/06		<48	<9.6	<9.6	<100	ND *	1.9 J	8.02	8.61
MW-03B	05/18/06		<47	<9.4	<9.4	<100	ND *	<25	7.86	8.56
MW-03B	08/22/06		<47	<9.4	<9.4	32 J	ND *	<25	8.01	8.85
MW-03B	11/20/06		<47	<9.4	<9.4	23 J	ND *	<25	7.98	8.82
MW-03B	03/01/07		<47	<9.5	<9.5	<100	--	<25	--	8.08
MW-03B	05/17/07		<47	<9.4	<9.4	<100	--	<25	8.02	8.98
MW-03B	08/24/07		<47	<9.4	<9.4	45 J	--	<25	8.09	9.09
MW-03B	11/15/07		<49	<9.7	<9.7	<100	--	9.1 J	8.06	8.50
MW-03B	02/19/08		<47	<9.4	<9.4	<100	--	6.6 J	7.48	7.25
MW-03B	05/19/08		<47	<9.4	<9.4	<100	--	<25	7.66	7.10
MW-03B	08/18/08		<47	<9.5	<9.5	<100	--	<25	7.53	7.39
MW-03B	11/10/08		<47	<9.4	<9.4	<100	--	<25	8.03	8.74
MW-03B	02/18/09		<47	<9.4	<9.4	57 J	--	<25	7.88	8.19
MW-03B	05/27/09	RL Change	<3.8	<0.47	<0.47	<100	--	<2.0	7.96	8.77
MW-03B	08/25/09		**4.5**	<0.47	<0.47	<100	--	<2.0	7.56	7.98
MW-03B	11/23/09		<3.8	<0.47	<0.47	<100	--	<2.0	7.87	7.12
MW-03B	02/22/10		<3.8	<0.47	<0.47	<100	--	<2.0	7.49	7.85
MW-03B	05/27/10		<3.8	<0.48	<0.48	<100	--	<2.0	7.66	8.31
MW-03B	08/31/10	& 09/29/2010	<3.8	<0.48	<0.19	<100	--	<2.0	7.74	8.81
MW-03B	11/18/10		**4.1**	<0.47	<0.47	<100	--	<2.0	7.80	7.40
MW-03B	02/17/11		1.6 J	<0.47	<0.47	<100	--	<2.0	7.65	8.48
MW-03B	05/09/11		**5.4**	<0.48	<0.48	<100	--	<2.0	8.10	7.90
MW-03B	07/20/11		**22**	<0.47	<0.47	20 J	--	<2.0	8.00	7.63
MW-03B	11/21/11		3.0 J	<0.47	<0.47	<100	--	<2.0	7.90	8.39
MW-03B	02/16/12		**6.8**	<0.47	<0.47	28 J	--	<2.0	7.70	7.10
MW-03B	05/22/12		**4.7**	<0.47	<0.47	<100	--	<2.0	8.04	7.07
MW-03B	08/06/12		**5.0**	<0.47	<0.47	<100	--	<2.0	7.40	7.16
MW-03B	11/13/12		**5.4**	<0.48	<0.48	<100	--	0.51 J	7.30	7.27
MW-03B	02/20/13		4.0 J	<0.48	<0.48	21 J	--	<2.0	7.27	7.37
MW-03B	05/21/13		**9.7**	<0.47	<0.47	<100	--	<2.0	7.39	7.44
MW-03B	08/06/13		**5.1 B ***	<0.47	<0.47	<100	--	<2.0	8.17	7.75
MW-03B	11/12/13		2.8 J	<0.48	<0.48	<50	--	<2.0	8.10	9.94
MW-03B	02/19/14		3.6 J	<0.47	<0.47	<50	--	<2.0	8.03	9.56
MW-03B	05/21/14		4.6 J *	<0.48	<0.48	<50	--	<2.0	7.88	6.45
MW-03B	08/12/14		**11**	<0.95	<0.95	<50	--	<2.0	7.67	8.35
MW-03B	11/18/14		<5.1	<0.51	<0.51	<50	--	<2.0	8.09	9.90
MW-03B	02/19/15		3.3 J	<0.48	<0.48	<50	--	<2.0	8.15	9.26
MW-03B	05/18/15		<4.8	<0.48	<0.48	<50	--	<2.0	7.42	7.61
MW-03B	08/18/15		**7.1 B**	<0.47	<0.47	<50	--	<2.0	7.52	7.14
MW-03B	11/02/15		**5.8**	<0.51	<0.51	<50	--	<2.0	7.51	7.54
MW-03B	03/03/16		**19**	<0.47	<0.47	<50	--	<2.0	7.68	7.71
MW-03B	05/25/16		**16**	<0.47	<0.47	<50	--	<2.0	--	8.12
MW-03B	08/23/16		**8.7**	<0.49	<0.49	<50	--	<2.0	8.00	10.41
MW-03B	11/21/16		4.2 J	<0.49	<0.49	<50	--	<2.0	8.00	8.90
MW-03B	02/22/17		**5.1**	<0.48	<0.48	<50	--	0.39 J	7.50	8.78
MW-03B	05/23/17		**7.2**	<0.50	<0.50	<50	--	<2.0	7.80	7.17
MW-03B	08/16/17		**9.2 B**	<0.50	<0.50	<50	--	<2.0	7.70	6.97
MW-03B	02/21/18		**11**	<0.49	<0.49	<50	--	<2.0	7.70	7.40
MW-03B	08/21/18		**27 B**	<0.50	<0.50	<50	--	<2.0	7.60	8.01
MW-03B	02/12/19		**9.6**	<0.49	<0.49	<50	--	0.57 J	7.70	7.15
MW-03B	08/20/19		<5.1	<0.51	<0.51	<50	--	<2.0	8.00	7.60
MW-03B	02/19/20		3.0 J	<0.48	<0.48	<50	--	<2.0	8.10	7.54
MW-03B	08/18/20		<4.8	<0.19	<0.19	<50	--	<2.0	7.90	7.57

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Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium VI, pH, and Sulfide Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

			EPA Method:	8270C		376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (ug/L)	Chrysene (ug/L)	Pyrene (ug/L)	Total (ug/L)	Reactive (ug/L)	(ug/L)		
EPA Region 9 MCLs (1)			6	na	0.2 (3)	na	na	100 (4)	na	na
California DPH MCLs (2)			6	na	0.2 (3)	na	na	10	na	na
MW-04A	03/02/07	New Well	<47	<9.5	<9.5	<100	--	**77 MB,LN,AY**	--	6.77
MW-04A	05/17/07		<47	<9.4	<9.4	15 J	--	<25	7.12	5.50
MW-04A	08/23/07		<47	<9.4	<9.4	<100	--	4.9 J	7.23	6.59
MW-04A	11/16/07		<47	<9.4	<9.4	<100	--	<25	7.09	6.40
MW-04A	02/20/08		<47	<9.4	<9.4	<100	--	<25	7.01	6.79
MW-04A	05/20/08		<47	<9.4	<9.4	57 J	--	5.4 J	7.29	6.80
MW-04A	08/19/08		<47	<9.4	<9.4	<100	--	<25	7.16	6.84
MW-04A	11/11/08		<47	<9.4	<9.4	<100	--	<25	7.18	6.82
MW-04A	02/19/09		<47	<9.4	<9.4	88 J	--	<25	7.35	6.83
MW-04A	05/28/09	RL Change	<3.8	<0.47	<0.47	<100	--	<2.0	7.14	6.93
MW-04A	08/26/09		**4.4**	<0.47	<0.47	52 J	--	<2.0	7.15	6.25
MW-04A	11/24/09		2.0 J	<0.47	<0.47	36 J	--	<2.0	7.27	7.02
MW-04A	02/23/10		<3.8	<0.47	<0.47	<100	--	<2.0	7.20	6.74
MW-04A	05/28/10		1.6 J	<0.48	<0.48	<100	--	<2.0	7.79	6.89
MW-04A	09/01/10	& 09/29/2010	**8.0**	<0.47	<0.19	<100	--	<2.0	7.25	6.43
MW-04A	11/19/10		1.7 J	<0.50	<0.50	31 J	--	<2.0	7.10	6.52
MW-04A	02/17/11		2.9 J	<0.47	<0.47	<100	--	0.58 J	7.13	6.65
MW-04A	05/10/11		1.6 J	<0.47	<0.47	<100	--	<2.0	7.80	6.72
MW-04A	07/21/11		1.8 J	<0.48	<0.48	<100	--	<2.0	7.60	6.66
MW-04A	11/22/11		**3.9**	<0.47	<0.47	<100	--	<2.0	7.40	6.92
MW-04A	02/16/12		2.9 J	<0.48	<0.48	40 J	--	<2.0	7.41	6.60
MW-04A	05/23/12		<4.7	<0.47	<0.47	22 J	--	0.42 J	7.49	6.64
MW-04A	08/07/12		2.2 J	<0.47	<0.47	<100	--	<2.0	7.22	6.87
MW-04A	11/14/12		**10**	<0.47	<0.47	<100	--	<2.0	7.13	6.78
MW-04A	02/20/13		1.6 J	<0.47	<0.47	<100	--	<2.0	6.95	6.97
MW-04A	05/22/13		2.2 J	<0.48	<0.48	<100	--	0.34 J	6.95	6.93
MW-04A	08/07/13		**37 B**	<0.95	<0.95	<100	--	<2.0	7.05	9.28
MW-04A	11/12/13		2.2 J	<0.48	<0.48	<50	--	0.48 J	7.15	6.97
MW-04A	02/20/14		2.5 J	<0.47	<0.47	<50	--	1.4 J	6.84	6.60
MW-04A	05/22/14		**4.9**	<0.48	<0.48	<50	--	<2.0	7.17	7.29
MW-04A	08/13/14		**30**	<2.4	<2.4	<50	--	<2.0	7.25	7.29
MW-04A	11/19/14		4.6 J	<0.49	<0.49	<50	--	<2.0	7.56	6.71
MW-04A	02/20/15		2.1 J	<0.48	<0.48	<50	--	<2.0	7.21	6.77
MW-04A	05/19/15		<4.8	<0.48	<0.48	<50	--	0.25 J	7.11	6.75
MW-04A	08/19/15		**7.3 B**	<0.48	<0.48	<50	--	<2.0	7.16	6.57
MW-04A	11/03/15		<4.7	<0.47	<0.47	<50	--	<2.0	7.59	6.83
MW-04A	03/04/16		<4.7	<0.47	<0.47	<50	--	<2.0	7.43	6.81
MW-04A	05/26/16		1.9 J	<0.47	<0.47	<50	--	<2.0	7.34	7.84
MW-04A	08/24/16		2.5 J	<0.50	<0.50	<50	--	<2.0	7.70	7.13
MW-04A	11/22/16		<4.9	<0.49	<0.49	<50	--	<2.0	7.30	7.26
MW-04A	02/23/17		<5.2	<0.52	<0.52	<50	--	<2.0	7.80	6.98
MW-04A	05/23/17		**10**	<0.51	<0.51	<50	--	<2.0	7.60	6.63
MW-04A	08/17/17		<5.1	<0.51	<0.51	<50	--	0.36 J	7.50	6.55
MW-04A	02/22/18		<4.9	<0.49	<0.49	<50	--	<2.0	7.50	6.67
MW-04A	08/22/18		2.4 J, B	<0.50	<0.50	<50	--	<2.0	7.30	6.69
MW-04A	02/13/19		2.9 J	<0.49	<0.49	<50	--	<2.0	7.70	6.70
MW-04A	08/21/19		<4.9	<0.49	<0.49	<50	--	<2.0	7.80	6.83
MW-04A	02/19/20		<4.8	<0.48	<0.48	<50	--	<2.0	7.70	6.82
MW-04A	08/19/20		<4.8	<0.19	<0.19	<50	--	0.27 J	7.30	7.05

Table 4
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium VI, pH, and Sulfide Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

		EPA Method:	8270C			376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (ug/L)	Chrysene (ug/L)	Pyrene (ug/L)	Total (ug/L)	Reactive (ug/L)	(ug/L)		
EPA Region 9 MCLs (1)			6	na	0.2 (3)	na	na	100 (4)	na	na
California DPH MCLs (2)			6	na	0.2 (3)	na	na	10	na	na
MW-04B	03/02/07	New Well	<47	<9.5	<9.5	69 J	--	24 MB,J	--	7.02
MW-04B	05/17/07		<47	<9.4	<9.4	10 J	--	<25	7.34	7.12
MW-04B	08/23/07		<47	<9.4	<9.4	<100	--	6.8 J	7.05	9.22
MW-04B	11/16/07		<47	<9.4	<9.4	28 J	--	<25	7.27	6.42
MW-04B	02/20/08		<47	<9.4	<9.4	<100	--	<25	7.21	7.01
MW-04B	05/20/08		<47	<9.4	<9.4	60 J	--	<25	7.45	6.96
MW-04B	08/19/08		<47	<9.4	<9.4	43 J	--	<25	7.34	6.89
MW-04B	11/11/08		<47	<9.4	<9.4	<100	--	<25	7.34	6.89
MW-04B	02/19/09		<47	<9.4	<9.4	59 J	--	6.0 J	7.54	6.94
MW-04B	05/28/09	RL Change	<3.8	<0.47	<0.47	<100	--	<2.0	7.32	6.84
MW-04B	08/26/09		2.8 J	<0.47	<0.47	49 J	--	<2.0	7.40	6.77
MW-04B	11/24/09		**9.7**	<0.48	<0.48	<100	--	<2.0	7.46	7.05
MW-04B	02/23/10		<3.8	<0.47	<0.47	<100	--	<2.0	7.43	6.64
MW-04B	05/28/10		3.1 J	<0.47	<0.47	<100	--	<2.0	7.91	6.78
MW-04B	09/01/10	& 09/29/2010	1.8 J	<0.47	<0.19	<100	--	<2.0	7.43	6.71
MW-04B	11/19/10		2.4 J	<0.50	<0.50	43 J	--	<2.0	7.30	7.01
MW-04B	02/17/11		**5.1**	<0.47	<0.47	21 J	--	<2.0	7.29	7.20
MW-04B	05/10/11		2.4 J	<0.47	<0.47	<100	--	<2.0	8.00	6.77
MW-04B	07/21/11		3.6 J	<0.47	<0.47	24 J	--	<2.0	7.80	6.73
MW-04B	11/22/11		**8.5**	<0.47	<0.47	<100	--	<2.0	7.50	6.73
MW-04B	02/16/12		**28**	<0.47	<0.47	34 J	--	<2.0	7.56	7.72
MW-04B	05/23/12		**20**	<0.47	<0.47	25 J	--	<2.0	7.68	7.82
MW-04B	08/07/12		**38**	<1.2	<1.2	<100	--	<2.0	7.46	7.66
MW-04B	11/14/12		1.6 J	<0.47	<0.47	<100	--	<2.0	7.30	7.52
MW-04B	02/20/13		4.2 J	<0.48	<0.48	<100	--	<2.0	7.13	7.23
MW-04B	05/22/13		0.17 J	<0.48	<0.48	28 J	--	<2.0	7.15	7.36
MW-04B	08/07/13		**5.5 B**	<0.47	<0.47	**190**	--	<2.0	7.38	7.68
MW-04B	11/12/13		**75**	<0.48	<0.48	**170**	--	<2.0	7.32	6.86
MW-04B	02/20/14		**68**	<1.9	<1.9	<50	--	69 J	7.03	7.01
MW-04B	05/22/14		3.5 J	<0.48	<0.48	49 J	--	<2.0	7.35	6.98
MW-04B	08/13/14		<5.2	<0.52	<0.52	**72**	--	<2.0	7.43	7.26
MW-04B	11/19/14		<4.8	<0.48	<0.48	**51**	--	<2.0	7.80	7.21
MW-04B	02/20/15		4.4 J	<0.50	<0.50	<50	--	<2.0	7.34	6.91
MW-04B	05/19/15		<4.8	<0.48	<0.48	**120**	--	<2.0	7.27	7.14
MW-04B	08/19/15		**16 B**	<0.47	<0.47	**140**	--	<2.0	7.35	6.87
MW-04B	11/03/15		**5.9**	<0.47	<0.47	**140**	--	<2.0	7.74	7.26
MW-04B	03/04/16		<4.8	<0.48	<0.48	<50	--	<2.0	7.62	6.95
MW-04B	05/26/16		<4.8	<0.47	<0.47	**89**	--	<2.0	7.56	7.24
MW-04B	08/24/16		<4.9	<0.49	<0.49	**750**	--	<2.0	7.60	6.79
MW-04B	11/22/16		**7.3**	<0.50	<0.50	**620**	--	<2.0	7.60	6.96
MW-04B	02/23/17		<4.9	<0.49	<0.49	**120**	--	<2.0	7.40	7.30
MW-04B	05/23/17	Not sampled due to vandalism	--	--	--	--	--	--	--	--
MW-04B	08/17/17		2.1 J	<0.52	<0.52	<50	--	<2.0	7.90	6.94
MW-04B	02/22/18		<4.9	<0.49	<0.49	<50	--	<2.0	7.80	7.07
MW-04B	08/22/18		2.9 J, B	<0.50	<0.50	<50	--	<2.0	7.50	6.91
MW-04B	02/13/19		<5.0	<0.50	<0.50	**550**	--	<2.0	8.10	7.10
MW-04B	08/21/19		<4.9	<0.49	<0.49	**1100**	--	<2.0	8.10	7.13
MW-04B	02/19/20		<4.8	<0.48	<0.48	<50	--	<2.0	7.90	7.03
MW-04B	08/19/20		<4.7	<0.48	<0.48	<50	--	<2.0	7.50	7.20

Table 4
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium VI, pH, and Sulfide Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

		EPA Method:	8270C			376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (ug/L)	Chrysene (ug/L)	Pyrene (ug/L)	Total (ug/L)	Reactive (ug/L)	(ug/L)		
EPA Region 9 MCLs (1)			6	na	0.2 (3)	na	na	100 (4)	na	na
California DPH MCLs (2)			6	na	0.2 (3)	na	na	10	na	na
MW-05A	08/26/09	New Well 3Q09	4.8 J	<1.2	<1.2	63 J	--	<2.0	5.15	4.78
MW-05A	11/23/09		3.7 J	<0.48	<0.48	<100	--	<20	4.70	4.54
MW-05A	02/22/10		<3.8	<0.48	0.11 J	<100	--	<2.0	5.78	5.41
MW-05A	05/27/10		<7.6	<0.95	<0.95	<100	--	<2.0	4.67	4.53
MW-05A	08/31/10	& 09/29/2010	<19	<2.4	<0.94	<100	--	<2.0	4.55	4.63
MW-05A	11/18/10		<7.6	<0.95	<0.95	<100	--	<4.0	4.96	4.67
MW-05A	02/15/11		<3.8	<0.47	0.13 J	<100	--	<2.0	5.10	4.87
MW-05A	05/09/11		<15	<1.9	<1.9	22 J	--	<10	5.00	4.77
MW-05A	07/20/11		<9.4	<1.2	<1.2	25 J	--	<2.0	4.60	4.55
MW-05A	11/21/11		1.6 J	<0.47	0.13 J	<100	--	<2.0	5.10	4.98
MW-05A	02/15/12		<4.9	<0.49	<0.49	31 J	--	<2.0	5.79	5.85
MW-05A	05/22/12		<9.5	<0.95	<0.95	<100	--	<10	5.81	5.13
MW-05A	08/06/12		<9.5	<0.95	<0.95	22 J	--	<2.0	4.99	5.12
MW-05A	11/14/12		<4.8	<0.48	<0.48	<100	--	<2.0	5.39	7.97
MW-05A	02/19/13		<5.0	<0.50	0.21 J	<100	--	<2.0	5.34	5.39
MW-05A	05/21/13		<9.6	<0.96	<0.96	<100	--	<2.0	4.91	5.37
MW-05A	08/06/13		2.3 J,B *	<0.48	0.12 J	<100	--	<2.0	4.67	4.89
MW-05A	11/12/13		<24	<2.4	<2.4	<50	--	<2.0	4.79	4.75
MW-05A	02/19/14		<4.7	<0.47	<0.47	<50	--	<2.0	7.93	4.58
MW-05A	05/21/14		<12 *	<1.2	<1.2	<50	--	<2.0	4.84	4.50
MW-05A	08/12/14		<19	<1.9	<1.9	<50	--	<40	4.57	4.75
MW-05A	11/18/14		<24	<2.4	<2.4	<50	--	<10	4.81	4.64
MW-05A	02/19/15		5.8 J	<1.3	<1.3	<50	--	<2.0	5.48	5.17
MW-05A	05/18/15		<21	<2.1	<2.1	<100	--	<2.0	4.90	4.83
MW-05A	08/18/15		<12	<1.2	<1.2	<50	--	<2.0	4.61	4.41
MW-05A	11/02/15		<4.7	<0.47	<0.47	<50	--	<2.0	5.09	4.74
MW-05A	03/03/16		<9.4	<0.94	<0.94	<50	--	<2.0	5.38	5.16
MW-05A	05/25/16		<9.4	<0.94	<0.94	<50	--	<2.0	--	6.04
MW-05A	08/23/16		<4.8	<0.48	<0.48	<50	--	<2.0	4.40	4.08
MW-05A	11/21/16		<24	<2.4	<2.4	<50	--	<2.0	4.50	4.49
MW-05A	02/22/17		<5.0	<0.50	<0.50	<50	--	<2.0	7.20	6.66
MW-05A	05/22/17		<5.0	<0.50	<0.50	<50	--	<2.0	5.10	4.68
MW-05A	08/16/17		<12	<1.2	<1.2	<50	--	<2.0	5.60	4.18
MW-05A	02/21/18		<4.9	<0.49	<0.49	<50	--	<2.0	6.10	5.64
MW-05A	08/21/18		<4.9	<0.49	<0.49	<50	--	<2.0	5.70	5.48
MW-05A	02/12/19		<4.9	<0.49	0.17 J	<50	--	<2.0	6.70	5.94
MW-05A	08/20/19		<5.1	<0.51	0.21 J	<50	--	<2.0	6.60	5.90
MW-05A	02/18/20		3.8 J	<0.49	<0.49	<50	--	<2.0	6.80	6.07
MW-05A	08/18/20		<4.7	<0.19	0.20	<50	--	<2.0	6.70	6.27

Table 4
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium VI, pH, and Sulfide Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

			EPA Method:	8270C		376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (ug/L)	Chrysene (ug/L)	Pyrene (ug/L)	Total (ug/L)	Reactive (ug/L)	(ug/L)		
EPA Region 9 MCLs (1)			6	na	0.2 (3)	na	na	100 (4)	na	na
California DPH MCLs (2)			6	na	0.2 (3)	na	na	10	na	na
G-4	05/10/94		140	--	--	--	--	--	--	9.50
G-4	06/15/00		ND	--	--	--	--	--	--	7.00
G-4	06/12/01	Add.Data	--	--	--	--	--	--	--	7.41
G-4	06/22/01		ND	--	--	--	--	--	--	--
G-4	02/28/02		ND	--	--	--	--	--	--	8.43
G-4	03/10/02		ND	--	--	--	--	--	--	--
G-4	02/17/06		<48	<9.5	<9.5	31 J	ND *	<25	7.38	7.05
G-4	05/18/06		<47	<9.4	<9.4	45 J	ND *	<25	7.09	6.84
G-4	08/21/06		<47	<9.4	<9.4	75 J	ND *	13 J	7.17	6.91
G-4	11/20/06		<47	<9.4	<9.4	49 J	ND *	<25	7.97	6.80
G-4	03/01/07		<47	<9.5	<9.5	<100	--	4.0 J	--	6.86
G-4	05/18/07		<47	<9.4	<9.4	44 J	--	15 J	--	6.98
G-4	08/24/07		<47	<9.4	<9.4	64 J	--	6.7 J	7.39	7.71
G-4	11/15/07		<47	<9.4	<9.4	<100	--	11 J	7.51	6.60
G-4	02/20/08		<47	<9.4	<9.4	62 J	--	<25	7.24	7.02
G-4	05/19/08		<47	<9.4	<9.4	25 J	--	<25	7.52	6.90
G-4	08/18/08		<47	<9.5	<9.5	<100	--	<25	7.34	7.05
G-4	11/10/08		<47	<9.5	<9.5	<100	--	<25	7.47	7.09
G-4	02/18/09		<47	<9.4	<9.4	<100	--	11 J	7.70	6.93
G-4	05/27/09	RL Change	2.2 J	<0.47	<0.47	<100	--	<2.0	7.40	6.94
G-4	08/25/09		**3.8**	<0.47	<0.47	<100	--	<2.0	7.24	6.62
G-4	11/23/09		2.5 J	<0.47	<0.47	<100	--	<2.0	7.62	7.09
G-4	02/22/10		<3.8	<0.48	<0.48	<100	--	<2.0	7.13	6.99
G-4	05/27/10		<3.8	<0.48	<0.48	20 J	--	<2.0	7.36	6.69
G-4	08/31/10	& 09/29/2010	<3.8	<0.47	<0.19	<100	--	<2.0	7.47	6.66
G-4	11/18/10		3.0 J	<0.47	<0.47	<100	--	<2.0	7.53	6.95
G-4	02/17/11		<3.8	<0.47	<0.47	<100	--	<2.0	7.34	6.94
G-4	05/09/11		2.2 J	<0.47	<0.47	<100	--	<2.0	7.90	7.14
G-4	07/20/11		**11**	<0.48	<0.48	20 J	--	<2.0	7.50	6.82
G-4	11/21/11		**3.9**	<0.47	<0.47	<100	--	<2.0	7.50	6.80
G-4	02/16/12		2.8 J	<0.47	<0.47	29 J	--	<2.0	7.55	7.99
G-4	05/22/12		3.8 J	<0.47	<0.47	<100	--	<2.0	7.95	6.86
G-4	08/06/12		**9.8**	<0.48	<0.48	24 J	--	<2.0	7.29	7.58
G-4	11/13/12		**6.1**	<0.48	<0.48	36 J	--	0.67 J	7.22	7.27
G-4	02/20/13		<4.8	<0.48	<0.48	<100	--	<2.0	7.14	7.25
G-4	05/21/13		2.0 J	<0.47	<0.47	<100	--	<2.0	7.25	7.36
G-4	08/06/13		<4.8 *	<0.48	<0.48	<100	--	<2.0	7.45	7.28
G-4	11/12/13		**6.8**	<0.47	<0.47	<50	--	<2.0	7.30	7.15
G-4	02/19/14		2.4 J	<0.47	<0.47	<50	--	<2.0	7.33	6.98
G-4	05/21/14		**4.8 ***	<0.48	<0.48	<50	--	<2.0	7.47	7.02
G-4	08/12/14		**14**	<0.95	<0.95	<50	--	<2.0	7.17	7.41
G-4	11/18/14		<4.7	<0.47	<0.47	<50	--	<2.0	7.39	7.10
G-4	02/19/15		4.6 J	<0.48	<0.48	<50	--	<2.0	7.33	6.92
G-4	05/18/15		<4.8	<0.48	<0.48	<50	--	<2.0	7.26	7.11
G-4	08/18/15		**45 B**	<2.0	<2.0	<50	--	<2.0	7.28	6.76
G-4	11/02/15		2.0 J	<0.48	<0.48	<50	--	0.41 J	7.29	7.18
G-4	03/03/16		<4.7	<0.47	<0.47	<50	--	<2.0	7.42	7.22
G-4	05/25/16		<4.7	<0.47	<0.47	<50	--	<2.0	--	7.96
G-4	08/23/16		<4.8	<0.48	<0.48	<50	--	<2.0	7.20	6.58
G-4	11/21/16		<4.9	<0.49	<0.49	<50	--	<2.0	7.40	6.99
G-4	02/22/17		**15**	<0.51	<0.51	<50	--	<2.0	7.40	6.19
G-4	05/23/17	Not sampled due to vandalism	--	--	--	--	--	--	--	--
G-4	08/16/17	No-purge sample collected with bailer, monument and casing found damaged	<5.1	<0.51	<0.51	<50	--	0.89 J	8.20	--
G-4	02/21/18	well pump repaired/replaced	<4.9	<0.49	<0.49	<50	--	<2.0	7.50	6.84
G-4	08/21/18		2.2 J, B	<0.49	<0.49	<50	--	<2.0	7.40	6.87
G-4	02/12/19		<4.9	<0.49	<0.49	<50	--	<2.0	7.60	6.89
G-4	08/20/19		<5.1	<0.51	<0.51	<50	--	<2.0	7.80	6.96
G-4	02/18/20		<4.9	<0.49	<0.49	<50	--	<2.0	7.80	6.94
G-4	08/18/20		<4.7	<0.19	<0.19	<50	--	<2.0	7.70	7.20
UG-CHAN-FDCC-W-20080520	02/16/06		<47	<9.5	<9.5	27 J	<100,000	2.3 J	9.07	--
	05/20/08		<47	<9.4	<9.4	69 J	--	<25	9.11	--
DG-CHAN-FDCC-E-20080520	02/16/06		<47	<9.4	<9.4	42 J	<100,000	2.6 J	8.94	--
	05/20/08		<47	<9.4	<9.4	83 J	--	<25	9.29	--
FB-SUMP	02/16/06	Field Blank	<48	<9.5	<9.5	22	ND *	0.97 J	8.67	8.67
FB-SUMP	02/17/06	Field Blank	<48	<9.5	<9.5	<100	ND *	<25	6.80	6.80
FB-SUMP	05/17/06	Field Blank	<47	<9.4	<9.4	--	--	--	--	--
FB-SUMP	05/18/06	Field Blank	<47	<9.4	<9.4	--	--	--	--	--
FB-SUMP	08/21/06	Field Blank	<47	<9.4	<9.4	--	--	--	--	--

Table 4
Summary of Selected Semi-Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbon, Chromium VI, pH, and Sulfide Measured in Groundwater and Surfacewater
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			8270C			376.2/SM-4500SD	SW846 9030B	7196 A / 7199	9040 B	field meas.
			Semi-Volatiles	PAHs		Sulfides		Chromium VI	pH	pH
Sample ID	Date Sampled	Notes	Bis (2-ethylhexyl) Phthalate (ug/L)	Chrysene (ug/L)	Pyrene (ug/L)	Total (ug/L)	Reactive (ug/L)	(ug/L)		
EPA Region 9 MCLs (1)			6	na	0.2 (3)	na	na	100 (4)	na	na
California DPH MCLs (2)			6	na	0.2 (3)	na	na	10	na	na

Notes:
& 09-29-10 = wells were re-sampled on 9/29/2010 for SVOC analytes.
* = Analyte was quantitated below the established linear calibration range. Amount reported is an estimate.
** = pH was measured in the field using a Horriba U-22XB water quality meter
J = Analyte was detected between the MDL and the RL
LN,AY = The MS &/or the MSD were below acceptance limits due to sample matrix interference.
ND = Not Detected. This data was obtained from a summary table of a report not prepared by SECOR.The actual laboratory reports are
ND* = no MDL for reactive sulfide identified by the laboratory
<# = Analyte was not detected above the Reporting Limit (#)
NS = Not sampled
D = detected below quantitation limit
MB or B = Analyte present in Method Blank
µg/L = micrograms per liter
-- = Not applicable / Not analyzed
Add.Data = additional data located (Sep 2006) and included in this table, reference DTSC, 2000 and 2001 report.
pH measurements on June 15, 2000 were obtained using pH paper
pH measurements reported prior to 2006 were obtained from a summary table of a report not prepared by SECOR. The pH measurements are presumed to have been obtained in the field.
Results highlighted with **Bold** font indicate results > RL
(1) - National Primary Drinking Water Regulations - EPA Region 9
(2) - California Department of Public Health
(3) - Identified as Benzo(a)pyrene for MCL
(4) - Identified as Total Chromium for MCL
MCLs = Maximum Contaminant Levels
bold # Results highlighted with a gray box indicate results > MCL
Prior to 2006, some table data was incorrectly represented in mg/L and has been updated to correctly reflect µg/L.
For safety and security reasons, the surface water sampling locations in the Dominguez Flood Control Channel (DFCC) have been re-located.
During the second quarter 2007 the instrument used to measure pH in wells completed in the upper saturated zone had calibration issues that resulted in slightly lower pH values.
During the third quarter 2007 a calibration issue developed in the instrument used to measure pH values in wells within the lower saturated zone resulting in slightly elevated pH values.
RL Change = in 2nd Qtr 2009 the RL's and MDL's were lowered to more closely match the CA State limits on those analytes.
Total Sulfides test method changed to SM 4500-SD in 5-2009
pH test method changed to SM 4500-H,B in 2010
1 - MCL for PAHs undifferentiated based on Benzo(a)pyrene.
2 - Secondary MCL (SMCL)
na = Not applicable
California Maximum Contaminant Level (MCL) for hexavalent chromium which was changed to 10 micrograms per liter (ug/L) and became effective on July 1, 2014. Updated MCL on table to reflect new MCL limits on 3Q2014.
On October 30, 2014, DTSC approved the removal of MW-01A and MW-01B from the groundwater sampling plan.
During Q2, 2017 GW event, due to vandalism (hinges on well lid cut off and pump stolen), MW-04B and G-4 were sampled using a bailer and analyzed only for GRO and VOC's.
During Q3, 2017 GW event, due to vandalism (monument was found damaged), a no-purge sample was collected from G-4.

References:

DTSC, 2000 and 2001. *2000 and 2001Groundwater Sampling Report for Gardena Sumps.*
DTSC, 2002. *2002 Groundwater Sampling Report for Gardena Sumps.*
URS, 1994. *Groundwater Remedial Investigation Technical Memorandum* , Gardena Sumps, 1440 West Artesia Boulevard, Gardena, CA., November 14.
SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.
EPA, 2009. *Drinking Water Standards and Health Advisories Table* , November

Table 5
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-01A	05/11/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.20
MW-01A	06/15/00		--	--	**161**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	06/22/01		--	--	**61**	--	--	--	--	--	--	--	--	--	--	--	--	--	0.40**
MW-01A	02/28/02		<10	<10	**53**	<1.0	<1.0	<10	--	<2.0	<10	--	<10	<10	<10	<10	<10	<10	--
MW-01A	02/16/06		0.38 J	0.97 J	**77**	<0.50	0.18 J	<2.0	0.34 J	1.8 J	<1.0	**3.2**	<2.0	1.5 J	<1.0	<1.0	**6.4**	2.4 J	<0.20
MW-01A	05/17/06		<2.0	<1.0	**69**	<0.50	<1.0	<2.0	<2.0	<2.0	<1.0	**3.4**	<2.0	<2.0	<1.0	<1.0	**6.1**	<20	<0.20
MW-01A	08/21/06		0.36 J	1.1 J	**88**	<0.50	0.18 J	<2.0	0.35 J	1.1 J	0.13 J	**4.7**	1.9 J	1.9 J	<1.0	0.31 J	**5.6**	3.4 J	<0.20
MW-01A	11/20/06		0.14 J	<1.0	**80**	<0.50	0.22 J	<2.0	0.44 J	1.7 J	<1.0	**3.6**	1.5 J	1.2 J	<1.0	<1.0	**6.8**	3.4 J	<0.20
MW-01A	03/02/07		0.066 J	0.74 J	**74**	<0.50	0.15 J	<2.0	0.44 J	1.5 J	<1.0	**3.3**	<2.0	0.78 J	<1.0	<1.0	**5.8**	4.1 J	<0.20
MW-01A	05/18/07		<2.0	**1.1**	**71 CQ**	<0.50	0.18 J	<2.0	0.38 J	1.1 J	<1.0	**2.5**	1.1 J	1.2 J	<1.0	<1.0	**6.7**	3.2 J, MB	<0.20
MW-01A	08/23/07		<10	<5.0	**85**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.5 J	<10	1.9 J	<5.0	<5.0	4.1 J	<100	<0.20
MW-01A	11/15/07		<2.0	**1.4**	**72**	<0.50	0.13 J	<2.0	0.39 J	0.81 J	<1.0	**2.7**	<2.0	0.48 J	<1.0	<1..0	**5.2**	<20	<0.20
MW-01A	02/19/08		<2.0	**1.8**	**83**	<0.50	0.11 J	<2.0	0.47 MB,J	1.3 J	<1.0	**3.4**	<2.0	0.48 J	<1.0	<1..0	**5.4**	3.0 J	<0.20
MW-01A	05/19/08		<2.0	**1.5**	**74**	<0.50	0.18 J	<2.0	0.27 J	1.2 J	<1.0	**3.1**	<2.0	1.7 J,MB	<1.0	<1..0	**5.4**	3.9 J	<0.20
MW-01A	08/18/08		<2.0	**1.0**	**73**	<0.50	0.17 J	<2.0	0.39 J	1.4 J	<1.0	**3.0**	1.5 J	1.6 J	<1.0	<1.0	**5.4**	4.4 J	<0.20
MW-01A	11/10/08		<2.0	**1.6**	**65**	<0.50	0.17 J	<2.0	0.42 J	1.1 J	<1.0	**2.2**	<2.0	1.5 J	<1.0	<1.0	**7.6**	<20	<0.20
MW-01A	02/18/09		0.27 J	**1.1**	**83**	<0.50	0.21 J	<2.0	0.51 J	1.6 J	<1.0	**3.4**	<2.0	1.3 J	<1.0	0.23 J	**5.8**	4.6 J	<0.20
MW-01A	05/27/09		<2.0	**1.1**	**83**	<0.50	0.21 J	**2.9**	0.65 J	1.9 J	<1.0	**3.0**	<2.0	1.3 J	<1.0	<1.0	**5.9**	3.7 J	<0.20
MW-01A	08/25/09		<2.0	<1.0	**80**	<0.50	0.19 J	<2.0	0.53 J	**3.0**	<1.0	**2.9**	<2.0	1.9 J	<1.0	<1.0	**5.9**	4.3 J	<0.20
MW-01A	11/23/09		<2.0	**1.1**	**76**	<0.50	0.20 J	<2.0	0.45 J	1.3 J	<1.0	**2.1**	0.97 J	**2.6**	<1.0	<1.0	**7.1**	<20	<0.20
MW-01A	02/22/10		<2.0	**2.3**	**100**	<0.50	0.17 J	<2.0	0.80 J	1.7 J	<1.0	**5.0**	1.5 J	**2.0**	<1.0	<1.0	**2.6**	<20	<0.20
MW-01A	05/27/10		<2.0	<1.0	**77**	<0.50	0.18 J	<2.0	0.46 J	1.2 J	<1.0	1.9 J	1.7 J	**2.7**	<1.0	<1.0	**7.4**	<20	<0.20
MW-01A	08/31/10		0.30 J	**1.1**	**74**	<0.50	0.21 J	<2.0	0.46 J	0.85 J	<1.0	**2.0**	**2.0**	**2.6 B**	<1.0	<1.0	**7.7**	<20	0.16 J
MW-01A	11/18/10		<2.0	<1.0	**79**	<0.50	0.23 J	<2.0	0.49 J	**2.0**	<1.0	**2.0**	<2.0	1.4 J	<1.0	<1.0	**8.3**	<20	<0.20
MW-01A	02/15/11		<4.0	<2.0	**77**	<1.0	<2.0	<4.0	0.58 J	1.3 J	<2.0	1.9 J	<4.0	1.2 J	<2.0	<2.0	**6.6**	<40	<0.20
MW-01A	05/09/11		<2.0	**1.0**	**87**	<0.50	0.20 J	<2.0	0.32 J	1.1 J	<1.0	**2.2**	<2.0	0.96 J	<1.0	<1.0	**6.9**	<20	<0.20
MW-01A	07/21/11		0.39 J	**1.6**	**88**	<0.50	0.21 J	<2.0	0.31 J	0.75 J	<1.0	**3.8**	1.1 J	1.0 J	<1.0	<1.0	**5.2**	4.3 J	<0.20
MW-01A	11/21/11		0.34 J	**1.5**	**89**	<0.50	0.19 J	<2.0	0.54 J	0.74 J	<1.0	**4.3**	1.1 J	1.1 J	0.14 J	0.26 J	**4.4**	<20	<0.20
MW-01A	02/15/12		<2.0	**1.2**	**96**	<0.50	0.19 J	<2.0	0.49 J	1.6 J	<1.0	**2.0**	1.3 J	1.3 J	0.24 J,B	<1.0	**6.9**	<20	<0.20
MW-01A	05/22/12		<2.0	**1.7**	**90**	<0.50	0.20 J	<2.0	0.42 J	1.2 J	<1.0	**2.1**	0.93 J	**2.2**	<1.0	<1.0	**5.8**	<20	0.15 J,B
MW-01A	08/06/12		<2.0	**1.6**	**99**	<0.50	0.15 J	<2.0	0.47 J	0.99 J	<1.0	**4.0 B**	1.2 J	1.2 J	0.62 J	<1.0	**3.4**	<20	<0.20
MW-01A	11/14/12		<2.0	**1.5**	**76**	<0.50	0.23 J	<2.0	0.20 J	1.2 J	<1.0	**2.8**	0.87 J	1.0 J	<1.0	<1.0	**6.4**	8.6 J	<0.20
MW-01A	02/19/13		<2.0	**1.2**	**89**	<0.50	0.17 J	<2.0	0.29 J	1.2 J	<1.0	**2.6**	1.1 J	0.97 J	<1.0	<1.0	**4.5**	<20	<0.20
MW-01A	05/21/13		<2.0	**1.7**	**100**	<0.50	0.21 J	<2.0	0.39 J	1.0 J	<1.0	**3.5**	1.3 J	0.87 J	0.11 J	<1.0	**3.7**	<20	<0.20
MW-01A	08/06/13		<2.0	**1.2**	**88**	0.12 J	0.26 J	<2.0	0.39 J	0.55 J	<1.0	**2.6 B**	0.95 J	1.4 J	<1.0	<1.0	**5.8**	<20	<0.20
MW-01A	11/12/13	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	02/20/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	05/21/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	08/12/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 5
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-01B	01/21/94		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	05/11/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.20
MW-01B	06/15/00		--	--	**480**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	06/22/01		--	--	**263**	--	--	--	--	--	--	--	--	--	--	--	--	--	0.40**
MW-01B	02/28/02		<10	<10	**110**	<1.0	**1.0**	<10	--	--	<10	--	<10	<10	<10	<10	<10		--
MW-01B	02/16/06		0.18 J	0.58 J	**500**	<0.5	0.16 J	<2.0	0.41 J	1.3 J	<1.0	**2.3**	<2.0	**3.0**	<1.0	<1.0	<2.0	1.4 J	<0.20
MW-01B	05/17/06		<2.0	<1.0	**440**	<0.50	<1.0	<2.0	<2.0	<2.0	<1.0	**2.5**	<2.0	**2.6**	<1.0	<1.0	<2.0	<20	<0.20
MW-01B	08/21/06		0.23 J	<1.0	**440**	<0.50	0.11 J	<2.0	0.45 J	0.60 J	0.15 J	2.2 J	2.6 J	**4.1**	<1.0	<1.0	<2.0	3.7 J	<0.20
MW-01B	11/20/06		0.56 J	0.75 J	**400**	0.078 J	0.11 J	<2.0	0.26 J	1.8 J	<1.0	**2.6**	<2.0	**2.1**	<1.0	<1.0	1.2 J	6.5 J	<0.20
MW-01B	03/02/07		0.82 J	0.71 J	**250**	<0.50	0.15 J	<2.0	0.25 J	**2.3**	<1.0	**3.1**	<2.0	1.7 J	<1.0	<1.0	1.6 J	3.8 J	<0.20
MW-01B	05/18/07		0.64 J	<1.0	**350 CQ**	<0.50	0.18 J	0.77 J	0.34 J	1.6 J	0.11 J	**2.9**	1.7 J	**2.2**	<1.0	<1.0	1.4 J	6.7 J,MB	<0.20
MW-01B	08/23/07		<10	<5.0	**270**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.3 J	<10	3.8 J	<5.0	<5.0	<10	18 J	<0.20
MW-01B	11/15/07		0.51 J	**1.4**	**280**	<0.50	0.14 J	<2.0	0.30 J	1.5 J	<1.0	**3.1**	<2.0	1.5 J	<1.0	<1.0	1.2 J	<20	<0.20
MW-01B	02/19/08		<2.0	**1.3**	**350**	<0.50	0.16 J	<2.0	0.29 MB,J	1.0 J	<1.0	**2.8**	<2.0	1.6 J	<1.0	<1.0	1.3 J	<20	<0.20
MW-01B	05/19/08		<2.0	**1.4**	**280**	<0.50	0.14 J	<2.0	0.40 J	0.77 J	<1.0	**2.5**	<2.0	**3.6 CQ**	<1.0	<1..0	1.4 J	11 J	<0.20
MW-01B	08/18/08		0.21 J	**1.2**	**300**	<0.50	<1.0	<2.0	0.44 J	1.1 J	<1.0	**2.5**	1.6 J	**4.2**	<1.0	<1.0	1.1 J	2.5 J	<0.20
MW-01B	11/10/08		0.74 J	**1.7**	**290**	<0.50	<1.0	**5.7**	0.52 J	1.2 J	<1.0	**3.0**	**4.6**	**4.7**	<1.0	<1.0	1.6 J	<20	<0.20
MW-01B	02/18/09		0.26 J	**1.6**	**270**	<0.50	<1.0	<2.0	0.44 J	**14**	0.44 J	**2.8**	<2.0	**3.5**	<1.0	<1.0	1.3 J	10 J	<0.20
MW-01B	05/27/09		0.46 J	**1.4**	**340**	<0.50	<1.0	<2.0	0.54 J	1.6 J	<1.0	**2.7**	<2.0	**3.5**	<1.0	<1.0	1.2 J	<20	<0.20
MW-01B	08/25/09		0.39 J	0.73 J	**280**	<0.50	<1.0	<2.0	0.37 J	**2.4**	<1.0	**3.0**	<2.0	**3.7**	<1.0	<1.0	1.2 J	5.3 J	<0.20
MW-01B	11/23/09		0.32 J	<1.0	**280**	<0.50	<1.0	1.7 J	0.50 J	**3.5**	<1.0	**2.9**	1.7 J	**6.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-01B	02/22/10		<2.0	<1.0	**290**	<0.50	0.16 J	<2.0	0.44 J	1.1 J	<1.0	**2.6**	1.5 J	**5.5**	<1.0	<1.0	1.5 J	<20	<0.20
MW-01B	05/27/10		<2.0	**1.0**	**280**	<0.50	<1.0	<2.0	0.52 J	0.82 J	<1.0	**2.3**	**3.5**	**5.5**	<1.0	<1.0	1.4 J	<20	<0.20
MW-01B	08/31/10		1.1 J	**1.4**	**270**	<0.50	<1.0	<2.0	0.42 J	1.4 J	<1.0	**3.1**	**3.1**	**4.5 B**	<1.0	<1.0	1.6 J	<20	<0.20
MW-01B	11/18/10		0.34 J	**1.4**	**250**	<0.50	<1.0	<2.0	0.52 J	1.2 J	<1.0	**3.0**	<2.0	**3.6**	<1.0	<1.0	**2.0**	<20	<0.20
MW-01B	02/15/11		<4.0	<2.0	**200**	<1.0	0.25 J	<4.0	0.56 J	3.8 J	<2.0	3.5 J	<4.0	3.7 J	<2.0	<2.0	2.2 J	<40	<0.20
MW-01B	05/09/11		<2.0	**1.7**	**280**	<0.50	<1.0	<2.0	0.37 J	1.1 J	<1.0	**2.6**	<2.0	**2.2**	<1.0	<1.0	1.4 J	<20	<0.20
MW-01B	07/21/11		0.35 J	**1.8**	**270**	<0.50	<1.0	<2.0	0.32 J	<2.0	<1.0	**2.6**	1.2 J	**3.0**	<1.0	<1.0	**2.0**	<20	<0.20
MW-01B	11/21/11		0.57 J	**2.0**	**220**	<0.50	<1.0	<2.0	0.27 J	<2.0	<1.0	**4.1**	1.1 J	**3.3**	0.19 J	0.28 J	1.8 J	<20	<0.20
MW-01B	02/15/12		<2.0	**1.9**	**270**	<0.50	<1.0	<2.0	0.35 J	1.3 J	<1.0	**2.5**	1.7 J	**3.7**	<1.0	<1.0	**2.2**	<20	<0.20
MW-01B	05/22/12		<2.0	**2.4**	**270**	<0.50	<1.0	<2.0	0.26 J	1.0 J	<1.0	**2.4**	1.3 J	**4.4**	<1.0	<1.0	1.6 J	<20	0.11 J,B
MW-01B	08/06/12		<2.0	**1.6**	**280**	<0.50	<1.0	<2.0	0.22 J	0.54 J	<1.0	**2.8 B**	0.91 J	**3.4**	0.16 J	<1.0	1.2 J	<20	<0.20
MW-01B	11/14/12		<2.0	**2.1**	**220**	<0.50	<1.0	<2.0	0.25 J	**2.4**	<1.0	**2.4**	0.62 J	**3.2**	<1.0	<1.0	1.9 J	5.1 J	<0.20
MW-01B	02/19/13		<2.0	**1.5**	**230**	<0.50	<1.0	<2.0	0.43 J	1.7 J	<1.0	**2.4**	**150**	**2.6**	<1.0	<1.0	1.6 J	<20	<0.20
MW-01B	05/21/13		0.31 J	**1.8**	**240**	<0.50	0.10 J	<2.0	0.31 J	1.2 J	0.26 J	**2.7**	1.2 J	**2.9**	0.12 J	<1.0	1.7 J	<20	<0.20
MW-01B	08/06/13		1.2 J	**1.7**	**210**	0.15 J	0.27 J	<2.0	0.25 J	1.2 J	0.22 J	**5.3 B**	0.80 J	**1.9 J**	0.28 J	<1.0	1.9 J	5.8 J	<0.20
MW-01B	11/12/13	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	02/19/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	05/21/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	08/12/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 5
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-02A	01/21/94		--	--	--	--	--	--		--	--	--	--	--	--	--	--	--	--
MW-02A	05/11/94		--	--	<1.0	--	--	--		--	--	--	--	--	--	--	--	--	<0.20
MW-02A	06/15/00		--	--	**130**	--	--	--		--	--	--	--	--	--	--	--	--	--
MW-02A	06/25/01		--	--	**30**	--	--	--		--	--	--	--	--	--	--	--	--	ND**
MW-02A	02/28/02		<10	<10	**34**	<1.0	<1.0	<10	<2.0	<2.0	<10	--	<10	<10	<10	<10	<10	<10	--
MW-02A	02/16/06		0.081 J	<1.0	**48**	<0.50	0.20 J	<2.0	**1.6**	**2.2**	<1.0	**6.5**	<2.0	1.6 J	<1.0	<1.0	**4.4**	**2.3**	<0.20
MW-02A	05/18/06		<2.0	0.68 J	**58**	<0.50	0.32 J	<2.0	0.92 J	1.9 J	<1.0	5.5 J	1.4 J	0.61 J	<1.0	<1.0	**5.5**	**1400 CQ**	<0.20
2MW-02A	05/18/06	Duplicate	<2.0	0.68 J	**59**	<0.50	0.28 J	<2.0	0.96 J	1.9 J	<1.0	5.7 J	1.7 J	0.47 J	<1.0	<1.0	**5.5**	**9.8**	<0.20
MW-02A	08/22/06		<2.0	<1.0	**47**	<0.50	0.27 J	<2.0	1.3 J	1.2 J	0.08 J	**5.4**	1.5 J	<2.0	<1.0	<1.0	**4.9**	5.4 J	<0.20
2MW-02A	08/22/06	Duplicate	<2.0	<1.0	**47**	<0.50	0.27 J	<2.0	1.3 J	1.1 J	<1.0	**5.3**	1.5 J	<2.0	<1.0	<1.0	**4.1**	2.1 J	<0.20
MW-02A	11/21/06		0.32 J	<1.0	**49**	<0.50	0.32 J	<2.0	**1.6**	**2.0**	<1.0	**6.8**	0.98 J	0.72 J	<1.0	<1.0	**5.0**	11 J	<0.20
MW-02A	03/01/07		0.067 J	<1.0	**46**	<0.50	0.20 J	<2.0	**1.4**	1.7 J	<1.0	**6.2**	<2.0	0.45 J	<1.0	<1.0	**4.6**	4.7 J	<0.20
MW-02A	05/17/07		<2.0	<1.0	**42 CQ**	<0.50	0.2 J	<2.0	0.86 J	1.5 J	<1.0	**5.8**	1.4 J	0.52 J	<1.0	<1.0	**3.8**	<20	<0.20
MW-02A	08/24/07		<10	<5.0	**40**	<2.5	<5.0	<10	1.5 J	8.2 J	<1.0	6.0 J	<10	<2.0	<5.0	<5.0	4.8 J	<100	**65**
MW-02A	11/16/07		<2.0	**1.2**	**46**	<0.50	0.21 J	<2.0	**1.6**	1.3 J	<1.0	**6.4**	<2.0	<2.0	<1.0	<1.0	**3.8**	<20	<0.20
MW-02A	02/20/08		<2.0	<1.0	**47**	<0.50	0.19 J	<2.0	**1.4 MB**	1.6 J	<1.0	**6.5**	<2.0	0.32 J	<1.0	<1.0	**4.7**	<20	<0.20
MW-02A	05/20/08		<2.0	<1.0	**37**	<0.50	0.14 J	<2.0	0.83 J	1.2 J	<1.0	**5.7**	<2.0	1.2 J,MB	<1.0	<1.0	**3.5**	<20	<0.20
MW-02A	08/19/08		0.35 J	<1.0	**37**	<0.50	0.21 J	<2.0	**1.2**	1.8 J	<1.0	**7.1**	1.3 J	0.72 J	<1.0	<1.0	**4.3**	<20	<0.20
MW-02A	11/11/08		0.41 J	<1.0	**47**	<0.50	0.21 J	<2.0	**1.5**	1.5 J	<1.0	**7.5**	<2.0	0.48 J	<1.0	<1.0	**4.4**	<20	<0.20
MW-02A	02/19/09		<2.0	0.85 J	**50**	<0.50	0.22 J	<2.0	**1.5**	1.7 J	<1.0	**6.2**	<2.0	<2.0	<1.0	<1.0	**4.2**	<20	<0.20
MW-02A	05/28/09		<2.0	<1.0	**32**	<0.50	0.19 J	<2.0	0.66 J	1.9 J	<1.0	**5.4 B-1**	<2.0	0.42 J	<1.0	<1.0	**3.8**	<20	<0.20
MW-02A	08/26/09		<2.0	<1.0	**42**	<0.50	0.27 J	<2.0	**1.4**	**2.6**	0.65 J	**7.4**	<2.0	0.53 J	<1.0	0.22 J	**5.1**	3.8 J	<0.20
MW-02A	11/24/09		<2.0	<1.0	**48**	<0.50	0.23 J	<2.0	**1.6**	1.5 J	<1.0	**7.4**	0.87 J	0.91 J	<1.0	<1.0	**4.1**	<20	<0.20
MW-02A	02/23/10		<2.0	<1.0	**48**	<0.50	0.23 J	<2.0	**1.2**	1.6 J	<1.0	**7.2**	1.5 J	0.85 J	<1.0	0.35 J	**4.2**	<20	<0.20
MW-02A	05/28/10		<2.0	<1.0	**41**	<0.50	0.13 J	<2.0	0.75 J	1.4 J	<1.0	**5.8**	<2.0	0.64 J	<1.0	0.32 J	**3.6**	**25**	<0.20
MW-02A	09/01/10		0.33 J	<1.0	**43**	<0.50	0.28 J	<2.0	**2.3 B**	1.5 J	<1.0	**8.8**	1.5 J	0.75 J	<1.0	0.25 J	**4.4**	<20	<0.20
MW-02A	11/19/10		<2.0	<1.0	**54**	<0.50	0.25 J	<2.0	**1.4**	1.5 J	<1.0	**8.1**	<2.0	<2.0	<1.0	0.38 J	**4.4**	<20	<0.20
MW-02A	02/17/11		<2.0	<1.0	**62**	<0.50	0.64 J	<2.0	**1.4**	1.3 J	<1.0	**6.7**	1.1 J	0.65 J	<1.0	<1.0	**4.8**	<20	<0.20
MW-02A	05/10/11		<2.0	<1.0	**56**	<0.50	0.17 J	<2.0	0.82 J	1.4 J	<1.0	**5.7**	<2.0	<2.0	<1.0	<1.0	**3.9**	**20**	<0.20
MW-02A	07/21/11		<2.0	<1.0	**43**	<0.50	0.21 J	<2.0	0.83 J	0.92 J	<1.0	**9.0**	0.94 J	<2.0	<1.0	<1.0	**4.4**	<20	<0.20
MW-02A	11/22/11		<2.0	<1.0	**61**	<0.50	0.24 J	<2.0	**1.3**	1.1 J	<1.0	**7.0 B-1**	1.2 J	<2.0	<1.0	<1.0	**4.7**	12 J	<0.20
MW-02A	02/16/12		0.30 J	<1.0	**68**	<0.50	0.30 J	<2.0	**1.6**	1.4 J	<1.0	**8.5**	1.0 J	<2.0	0.58 J,B	0.62 J	**5.1**	6.4 J	<0.20
MW-02A	05/23/12		<2.0	<1.0	**48**	<0.50	0.13 J	<2.0	0.61 J	1.3 J	<1.0	**5.2**	0.76 J	0.50 J	<1.0	<1.0	**3.6**	<20	<0.20
MW-02A	08/07/12		<2.0	<1.0	**46**	<0.50	0.23 J	<2.0	0.89 J	1.2 J	<1.0	**8.7 B**	1.1 J	0.52 J	<1.0	<1.0	**4.1**	<20	<0.20
MW-02A	11/14/12		<2.0	<1.0	**52**	<0.50	0.26 J	<2.0	**1.2**	0.98 J	<1.0	**6.6**	0.64 J	0.62 J	<1.0	<1.0	**4.4**	<20	<0.20
MW-02A	02/20/13		<2.0	<1.0	**60**	<0.50	0.29 J	<2.0	**1.5**	1.2 J	<1.0	**6.9**	0.82 J	0.95 J	<1.0	<1.0	**4.4**	<20	<0.20
MW-02A	05/21/13		<2.0	<1.0	**47**	<0.50	0.15 J	<2.0	0.74 J	**2.4**	<1.0	**4.9**	1.2 J	<2.0	<1.0	<1.0	**3.5**	<20	<0.20
MW-02A	08/07/13		<2.0	<1.0	**54**	<0.50	0.20 J	<2.0	**1.2**	0.76 J	<1.0	**8.1**	0.76 J	0.55 J	<1.0	<1.0	**4.4**	<20	<0.20
MW-02A	11/13/13		<2.0	<1.0	**57**	<0.50	0.41 J	<2.0	**1.7**	1.6 J	<1.0	**6.5**	0.65 J	<2.0	<1.0	<1.0	**4.6**	<20	<0.20
MW-02A	02/20/14		<2.0	<1.0	**55**	<0.50	0.25 J	<2.0	**1.4**	1.1 J	<1.0	**6.5**	0.94 J	<2.0	<1.0	<1.0	**4.3**	6.4 J	<0.20
MW-02A	05/22/14		<2.0	<1.0	**57**	<0.50	0.25 J	<2.0	**1.4**	1.3 J	<1.0	**6.8**	1.6 J	<2.0	<1.0	<1.0	**4.2**	6.3 J	<0.20
MW-02A	08/13/14		<2.0	<1.0	**58**	<0.50	0.28 J	<2.0	**1.4**	1.0 J	<1.0	**7.8**	0.98 J	<2.0	<1.0	<1.0	**4.7**	<20	<0.20
MW-02A	11/19/14		<2.0	<1.0	**61**	<0.50	0.26 J	<2.0	**1.5**	1.5 J	<1.0	**6.8**	0.96 J	<2.0	<1.0	<1.0	**4.2**	<20	<0.20
MW-02A	02/20/15		<2.0	<1.0	**65**	<0.50	0.25 J	<2.0	**1.5**	0.98 J	<1.0	**7.8**	0.61 J	0.54 J	<1.0	<1.0	**5.0**	18 J	<0.20
MW-02A	05/19/15		<2.0	<1.0	**60**	<0.50	0.27 J	<2.0	**1.4**	0.79 J	<1.0	**7.1**	<2.0	<2.0	<1.0	<1.0	**4.6**	<20	<0.20
MW-02A	08/19/15		<2.0	<1.0	**65**	<0.50	0.25 J	<2.0	**1.7**	0.76 J B	<1.0	**6.8**	<2.0	0.56 J	<1.0	<1.0	**4.6**	<20	<0.20
MW-02A	11/03/15		<2.0	<1.0	**63**	<0.50	<1.0	<2.0	**1.6**	0.93 J,B	<1.0	**6.9**	0.60 J	<2.0	<1.0	<1.0	**4.7**	<20	<0.20
MW-02A	03/04/16		<2.0	<1.0	**72**	<0.50	0.32 J	<2.0	**1.8**	**2.0**	<1.0	**7.2**	1.5 J	0.77 J	<1.0	<1.0	**4.3**	<20	<0.20
MW-02A	05/26/16		<2.0	<1.0	**70**	<0.50	0.27 J	<2.0	**1.9**	1.0 J	<1.0	**7.5**	<2.0	<2.0	<1.0	<1.0	**5.0**	2.8 J	<0.20
MW-02A	08/23/16		<2.0	0.52 J	**83**	<0.50	0.34 J	<2.0	**2.7**	1.5 J	<1.0	**7.7**	0.93 J	<2.0	<1.0	<1.0	**5.3**	<20	<0.20
MW-02A	11/22/16		<2.0	<1.0	**75**	<0.50	0.28 J	<2.0	**2.0**	0.94 J	<1.0	**7.1**	0.53 J	0.60 J	<1.0	<1.0	**4.7**	3.7 J	<0.20
MW-02A	02/23/17		<2.0	<1.0	**62**	<0.50	0.27 J	<2.0	**1.1**	0.99 J	<1.0	**5.4**	0.55 J	<2.0	<1.0	<1.0	**5.3**	2.8 J	<0.20
MW-02A	05/22/17	Well vandalised, locks cut	<2.0	0.59 J	**49**	<0.50	<1.0	<2.0	0.81 J	1.1 J	<1.0	**4.6**	<2.0	0.55 J	<1.0	<1.0	**4.6**	<20	<0.20
MW-02A	08/17/17		<10	<5.0	**65**	<2.5	<5.0	<10	<5.0	<10	<5.0	7.1 J	<10	<10	<5.0	<5.0	5.0 J	<100	<0.20
MW-02A	02/22/18		0.87 J	0.90 J	**39**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**5.1**	<2.0	<2.0	<1.0	<1.0	<2.0	8.0 J, B	<0.20
MW-02A	08/22/18		<2.0	<1.0	**91**	<0.50	0.35 J	<2.0	**2.3**	0.85 J	<1.0	**7.8**	1.1 J	0.80 J	<1.0	<1.0	**6.0**	3.2 J	<0.20
MW-02A	02/13/19		<2.0	<1.0	**94**	<0.50	0.43 J	<2.0	**2.2**	1.3 J	<1.0	**6.7**	0.82 J	1.2 J	<1.0	<1.0	**5.9**	<20	<0.20
MW-02A	08/21/19		<2.0	<1.0	**95**	<0.50	0.38 J	0.50 J,B	**2.2**	1.5 J, B	<1.0	**7.3**	0.91 J	0.53 J	<1.0	<1.0	**6.0**	4.8 J	<0.20
MW-02A	02/19/20		<2.0	<1.0	**110**	<0.50	0.51 J	<2.0	**2.5**	1.8 J	<1.0	**7.8**	0.69 J	<2.0	<1.0	<1.0	**6.6**	13 J	<0.20
MW-02A	08/19/20		<2.0	0.55 J	**96**	<0.50	0.52 J	<2.0	**2.2**	1.3 J	<1.0	**8.4**	0.68 J	0.77 J	<1.0	<1.0	**6.2**	<20	<0.20

Table 5
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020															7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2

Table 5
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-02B	05/11/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.20
MW-02B	06/19/00		--	--	**110**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-02B	06/25/01		--	--	**40**	--	--	--	--	--	--	--	--	--	--	--	--	--	ND**
MW-02B	02/28/02		**11**	**11**	**30**	**1.0**	**1.0**	<10	--	--	**14**	--	<10	14	<10	**18**	**11**	<10	--
MW-02B	02/16/06		<2.0	0.78 J	**33**	<0.50	<1.0	<2.0	0.35 J	**4.7**	<1.0	**2.7**	<2.0	**3.9**	<1.0	<1.0	<2.0	3.0 J	<0.20
2MW-02B	02/16/06	Duplicate	<2.0	0.61 J	**31**	<0.50	<1.0	1.6 J	0.32 J	**4.6**	<1.0	**2.7**	<2.0	**3.6**	<1.0	<1.0	<2.0	8.0 J	<0.20
MW-02B	05/17/06		<2.0	<1.0	**33**	<0.50	0.32 J	<2.0	<2.0	**2.2**	<1.0	**2.8**	<2.0	**2.9**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/22/06		<2.0	1.2 J	**32**	<0.50	<1.0	<2.0	0.39 J	1.2 J	0.14 J	3.2 J	2.9 J	**5.2**	<1.0	<1.0	<2.0	3.4 J	<0.20
MW-02B	11/21/06		0.22 J	<1.0	**32**	0.078 J	<1.0	<2.0	0.34 J	1.8 J	<1.0	**3.4**	1.6 J	**4.7**	<1.0	<1.0	<2.0	3.1 J	<0.20
MW-02B	03/01/07		<2.0	**1.4**	**28**	<0.50	<1.0	<2.0	0.28 J	1.7 J	<1.0	**2.8**	<2.0	**2.7**	<1.0	<1.0	<2.0	5.8 J	<0.20
MW-02B	05/17/07		<2.0	<1.0	**36 CQ**	<0.50	<1.0	<2.0	0.29 J	1.5 J	<1.0	**3.2**	2.0	**2.2**	<1.0	<1.0	<2.0	3.1 J	<0.20
MW-02B	08/24/07		<10	<5.0	**27**	<2.5	<5.0	<10	<5.0	<10	<5.0	2.8 J	<10	6.3 J	<5.0	<5.0	<10	**150**	<0.20
MW-02B	11/16/07		<2.0	**1.9**	**30**	<0.50	<1.0	<2.0	0.24 J	1.1 J	<1.0	**2.8**	<2.0	1.1 J	<1.0	<1.0	<2.0	5.0 J	<0.20
MW-02B	02/20/08		<2.0	0.97 J	**30**	<0.50	<1.0	<2.0	0.16 MB,J	**2.0**	<1.0	**3.0**	<2.0	<2.0	<1.0	<1.0	<2.0	2.9 J	0.10 J
MW-02B	05/20/08		<2.0	0.98 J	**32**	<0.50	<1.0	<2.0	0.24 J	**2.1**	<1.0	**3.2**	<2.0	**2.5 MB**	<1.0	<1.0	<2.0	3.0 J	<0.20
MW-02B	08/19/08		<2.0	<1.0	**30**	<0.50	<1.0	<2.0	0.30 J	1.6 J	<1.0	**3.2**	1.7 J	**4.5**	<1.0	<1.0	<2.0	3.3 J	<0.20
MW-02B	11/11/08		0.94 J	**1.3**	**51**	<0.50	<1.0	<2.0	0.34 J	1.8 J	**1.5**	**3.8**	0.92 J	**2.9**	<1.0	<1.0	<2.0	**110**	<0.20
MW-02B	02/19/09		<2.0	**1.3**	**33**	<0.50	<1.0	<2.0	0.22 J	1.9 J	<1.0	**3.1**	<2.0	**2.2**	<1.0	<1.0	<2.0	4.3 J	0.10 J
MW-02B	05/28/09		<2.0	<1.0	**32**	<0.50	<1.0	<2.0	0.37 J	**4.6**	<1.0	**3.3 B**	<2.0	**3.0**	<1.0	<1.0	<2.0	3.5 J	<0.20
MW-02B	08/26/09		<2.0	<1.0	**37**	0.21 J	<1.0	<2.0	0.40 J	**2.6**	<1.0	**4.0**	1.6 J	**2.7**	<1.0	<1.0	<2.0	4.8 J	<0.20
MW-02B	11/24/09		<2.0	**1.0**	**35**	<0.50	<1.0	<2.0	0.32 J	1.4 J	<1.0	**3.6**	1.5 J	**6.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	02/23/10		<2.0	0.96 J	**37**	<0.50	<1.0	<2.0	0.39 J	**2.2**	<1.0	**3.4**	**2.6**	**4.5**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	05/28/10		<2.0	<1.0	**35**	<0.50	<1.0	<2.0	0.31 J	1.7 J	<1.0	**3.6**	1.1 J	**5.7**	<1.0	0.53 J	<2.0	<20	<0.20
MW-02B	09/01/10		0.33 J	<1.0	**35**	<0.50	0.12 J	<2.0	0.37 J, B	1.4 J	<1.0	**4.6**	1.5 J	**4.9**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	11/19/10		<2.0	<1.0	**37**	<0.50	<1.0	<2.0	0.31 J	**2.0**	<1.0	**3.9**	<2.0	**2.5**	<1.0	<1.0	<2.0	**90**	<0.20
MW-02B	02/17/11		<2.0	**1.6**	**36**	<0.50	0.37 J	<2.0	0.23 J	1.5 J	<1.0	**3.7**	1.1 J	**3.3**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	05/10/11		<2.0	<1.0	**39**	<0.50	<1.0	1.0 J	0.21 J	1.9 J	<1.0	**3.7**	<2.0	<2.0	<1.0	<1.0	<2.0	**36**	<0.20
MW-02B	07/21/11		<2.0	<1.0	**36**	<0.50	<1.0	<2.0	0.13 J	<2.0	<1.0	**3.7**	0.91 J	1.6 J	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	11/22/11		<2.0	**1.0**	**36**	<0.50	<1.0	<2.0	0.14 J	<2.0	<1.0	**3.6 B**	1.3 J	**2.2**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	02/16/12		<2.0	**1.2**	**41**	<0.50	<1.0	<2.0	0.27 J	1.6 J	<1.0	**5.4**	1.6 J	**2.9**	0.64 J,B	0.48 J	<2.0	<20	<0.20
MW-02B	05/23/12		<2.0	**2.2**	**36**	<0.50	<1.0	<2.0	0.16 J	0.62 J	<1.0	**3.5**	0.88 J	**3.8**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/07/12		<2.0	**1.2**	**35**	<0.50	<1.0	<2.0	0.12 J	0.77 J	<1.0	**3.8 B**	0.88 J	**3.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	11/14/12		<2.0	**1.1**	**36**	<0.50	<1.0	<2.0	0.16 J	0.69 J	<1.0	**3.5**	0.67 J	1.4 J	<1.0	<1.0	<2.0	7.9 J	<0.20
MW-02B	02/20/13		<2.0	<1.0	**35**	0.11 J	0.15 J	<2.0	0.24 J	0.84 J	<1.0	**3.6**	0.75 J	1.5 J	0.13 J	<1.0	<2.0	<20	<0.20
MW-02B	05/22/13		<2.0	<1.0	**36**	<0.50	<1.0	<2.0	0.16 J	0.51 J	<1.0	**3.9**	0.98 J	1.4 J	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/07/13		<2.0	**1.2**	**37**	<0.50	<1.0	<2.0	0.13 J	<2.0	<1.0	**4.2**	0.86 J	**2.3**	<1.0	<1.0	<2.0	5.2 J,B	<0.20
MW-02B	11/13/13		<2.0	0.66 J	**35**	<0.50	<1.0	<2.0	<1.0	1.0 J	<1.0	**3.5**	0.50 J	1.2 J	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	02/20/14		<2.0	0.83 J	**35**	<0.50	<1.0	<2.0	<1.0	0.78 J	<1.0	**3.3**	1.3 J	0.79 J	<1.0	<1.0	<2.0	8.3 J	<0.20
MW-02B	05/22/14		<2.0	0.90 J	**33**	<0.50	<1.0	<2.0	<1.0	**3.4**	<1.0	**3.8**	1.1 J	1.3 J	<1.0	<1.0	<2.0	5.8 J	<0.20
MW-02B	08/13/14		<2.0	0.79 J	**36**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.2**	<2.0	<2.0	<1.0	<1.0	<2.0	7.4 J	<0.20
MW-02B	11/19/14		<2.0	**1.1**	**35**	<0.50	<1.0	<2.0	<1.0	1.1 J	<1.0	**3.7**	1.1 J	1.7 J	<1.0	<1.0	<2.0	4.3 J	<0.20
MW-02B	02/20/15		<2.0	0.83 J	**37**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.3**	<2.0	<2,0	<1.0	<1.0	<2.0	17 J	<0.20
MW-02B	05/19/15		<2.0	0.80 J	**35**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.3**	<2.0	<2,0	<1.0	<1.0	<2.0	<20	**0.23**
MW-02B	08/19/15		<2.0	0.73 J	**37**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.0**	<2.0	<2,0	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	11/03/15		<2.0	0.86 J	**35**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.3**	<2.0	<2,0	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	03/04/16		<2.0	**1.4**	**38**	<0.50	<1.0	<2.0	<1.0	**2.7**	<1.0	**4.5**	**2.7**	**3.0**	<1.0	<1.0	<2.0	4.0 J	0.11 J
MW-02B	05/26/16		<2.0	0.78 J	**33**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.0**	<2.0	<2.0	<1.0	<1.0	<2.0	3.4 J	<0.20
MW-02B	08/24/16		<2.0	0.88 J	**37**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.8**	<2.0	<2.0	<1.0	<1.0	<2.0	4.1 J	<0.20
MW-02B	11/22/16		<2.0	0.81 J	**38**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.4**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	02/23/17		<2.0	0.76 J	**35**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.2**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	05/22/17	Well vandalised, locks cut	<2.0	**1.1**	**38**	<0.50	<1.0	<2.0	<1.0	0.83 J	<1.0	**4.5**	1.2 J	<2.0	<1.0	<1.0	<2.0	9.6 J	**0.54**
MW-02B	08/17/17		<10	<5.0	**40**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.4 J	<10	<10	<5.0	<5.0	<10	<100	<0.20
MW-02B	02/22/18		<2.0	<1.0	**77**	<0.50	0.31 J	<2.0	**1.8**	1.4 J	<1.0	**8.3**	0.71 J	<2.0	<1.0	<1.0	**5.6**	7.2 J, B	<0.20
MW-02B	08/22/18		<2.0	0.85 J	**38**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.2**	<2.0	<2.0	<1.0	<1.0	<2.0	3.3 J	<0.20
MW-02B	02/13/19		<2.0	0.94 J	**36**	<0.50	<1.0	<2.0	<1.0	0.57 J	<1.0	**4.6**	<2.0	0.68 J	<1.0	<1.0	<2.0	7.4 J	<0.20
MW-02B	08/21/19		<2.0	**2.8**	**44**	<0.50	<1.0	0.85 J, B	<1.0	0.5 J, B	<1.0	**5.5**	0.61 J	<2.0	<1.0	<1.0	<2.0	6.5 J	<0.20
MW-02B	02/19/20		<2.0	**1.3**	**44**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**5.7**	<2.0	<2.0	<1.0	<1.0	<2.0	3.4 J	<0.20
MW-02B	08/19/20		0.61 J	0.95 J	**41**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**7.0**	<2.0	<2.0	<1.0	<1.0	<2.0	**26**	<0.20

Table 5
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-03A	05/10/94		--	--	<1.0	--	--	--		--	--	--	--	--	--	--	--	--	<0.2
MW-03A	06/15/00		--	--	**170**	--	--	--		--	--	--	--	--	--	--	--	--	--
MW-03A	06/22/01		--	--	**70**	--	--	--		--	--	--	--	--	--	--	--	--	ND**
MW-03A	02/28/02		**15**	**12**	**70**	**1.0**	**1.0**	<10		**10**	**19**	--	<10	**18**	**<10**	**15**	**15**	<10	--
MW-03A	02/17/06		1.3 J	<1.0	**66**	<0.50	0.042 J	**2.3**	0.14 J	1.3 J	<1.0	1.4 J	<2.0	1.3 J	<1.0	<1.0	**4.6**	1.2 J	<0.20
MW-03A	05/18/06		0.10 J	<1.0	**70**	<0.50	0.034 J	1.7 J	0.21 J	1.3 J	0.066 J	1.1 J	1.2 J	0.42 J	<1.0	<1.0	**5.3**	15 J	<0.20
MW-03A	08/22/06		<2.0	<1.0	**68**	<0.50	0.17 J	2.2 J	0.26 J	0.93 J	0.23 J	0.96 J	1.6 J	0.68 J	<1.0	<1.0	**4.4**	4.9 J	<0.20
MW-03A	11/20/06		0.15 J	<1.0	**74**	<0.50	0.071 J	1.4 J	0.16 J	1.1 J	<1.0	1.1 J	<2.0	0.30 J	<1.0	<1.0	**5.5**	<20	<0.20
2MW-03A	11/20/06	Duplicate	0.13 J	<1.0	**76**	<0.50	0.083 J	1.5 J	0.22 J	1.4 J	<1.0	1.0 J	<2.0	<2.0	<1.0	<1.0	**5.3**	7.5 J	<0.20
MW-03A	03/01/07		0.099 J	0.78 J	**74**	<0.50	<1.0	1.8 J	0.22 J	0.91 J	<1.0	1.1 J	<2.0	<2.0	<1.0	<1.0	**5.1**	4.8 J	<0.20
2MW-03A	03/02/07	Not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-03A	05/17/07		0.2 J	<1.0	**82 CQ**	<0.50	<1.0	1.2 J	0.18 J	0.81 J	<1.0	1.2 J	1.6 J	0.38 J	<1.0	<1.0	**3.9**	<20	<0.20
MW-03A	08/24/07		<10	<5.0	**73**	<2.5	<5.0	<10	<5.0	<10	<5.0	1.2J	<10	1.8 J	<5.0	<5.0	3.7J	**130**	<0.20
MW-03A	11/15/07		<2.0	0.86 J	**79**	<0.50	<1.0	1.2 J	0.15 J	<2.0	<1.0	1.0 J	<2.0	<2.0	<1.0	<1.0	**3.4**	2.6 J	<0.20
MW-03A	02/19/08		<2.0	0.98 J	**88**	<0.50	<1.0	1.1 J	<1.0	1.2 J	<1.0	1.1 J	<2.0	<2.0	<1.0	<1.0	**3.9**	2.5 J	<0.20
MW-03A	05/19/08		<2.0	<1.0	**88**	<0.50	<1.0	1.5 J	0.23 J	0.83 J	<1.0	1.0 J	<2.0	1.4 J,MB	<1.0	<1.0	**4.3**	<20	<0.20
MW-03A	08/18/08		<2.0	<1.0	**78**	<0.50	<1.0	1.0 J	0.28 J	1.5 J	<1.0	0.95 J	1.9 J	0.69 J	<1.0	<1.0	**4.2**	2.5 J	<0.20
MW-03A	11/10/08		<2.0	<1.0	**82**	<0.50	<1.0	**2.6**	0.32 J	1.3 J	<1.0	0.99 J	**3.5**	0.39 J	<1.0	<1.0	**4.6**	<20	<0.20
MW-03A	02/18/09		0.20 J	<1.0	**90**	<0.50	0.20 J	1.6 J	0.32 J	**2.3**	0.40 J	1.1 J	<2.0	<2.0	<1.0	<1.0	**4.0**	5.0 J	<0.20
MW-03A	05/27/09		<2.0	<1.0	**91**	<0.50	<1.0	1.0 J	0.36 J	1.8 J	<1.0	1.1 J	<2.0	0.39 J	<1.0	<1.0	**4.3**	5.0 J	<0.20
MW-03A	08/25/09		0.23 J	<1.0	**90**	<0.50	0.11 J	1.1 J	0.35 J	1.9 J	<1.0	1.7 J	0.97 J	1.4 J	<1.0	<1.0	**3.9**	8.1 J	<0.20
MW-03A	11/23/09		<2.0	<1.0	**99**	<0.50	0.49 J	<2.0	0.42 J	1.8 J	<1.0	1.1 J	**2.0**	1.4 J	<1.0	<1.0	**5.2**	<20	<0.20
MW-03A	02/22/10		<2.0	<1.0	**86**	<0.50	<1.0	1.5 J	0.40 J	1.4 J	<1.0	0.78 J	1.5 J	0.98 J	<1.0	<1.0	**5.7**	<20	<0.20
MW-03A	05/27/10		<2.0	<1.0	**100**	<0.50	<1.0	<2.0	0.42 J	1.2 J	<1.0	0.54 J	**3.9**	0.77 J	<1.0	<1.0	**4.4**	**29**	<0.20
MW-03A	08/31/10		0.35 J	<1.0	**93**	<0.50	0.16 J	1.3 J	0.33 J	1.1 J	<1.0	1.2 J	**3.9**	0.62 J, B	<1.0	<1.0	**4.1**	<20	<0.20
MW-03A	11/18/10		<2.0	<1.0	**100**	<0.50	0.14 J	1.1 J	0.41 J	1.8 J	<1.0	1.3 J	<2.0	<2.0	<1.0	<1.0	**4.8**	**26**	<0.20
MW-03A	02/17/11		0.42 J	<1.0	**100**	<0.50	0.50 J	1.3 J	0.44 J	1.3 J	<1.0	1.6 J	1.7 J	0.58 J	0.20 J	0.26 J	**4.7**	<20	<0.20
MW-03A	05/09/11		<2.0	<1.0	**110**	<0.50	0.15 J	1.5 J	0.28 J	1.5 J	<1.0	0.85 J	<2.0	<2.0	<1.0	<1.0	**4.2**	5.0 J	<0.20
MW-03A	07/20/11		<2.0	<1.0	**110**	<0.50	0.13 J	<2.0	0.21 J	0.68 J	<1.0	0.96 J	1.6 J	<2.0	<1.0	<1.0	**4.4**	15 J	<0.20
MW-03A	11/21/11		<2.0	<1.0	**95**	<0.50	0.15 J	<2.0	0.21 J	0.80 J	<1.0	1.2 J	**2.0**	<2.0	<1.0	<1.0	**3.8**	<20	<0.20
MW-03A	02/16/12		<2.0	<1.0	**110**	<0.50	<1.0	1.0 J	0.35 J	1.8 J	<1.0	1.4 J	**2.3**	<2.0	0.12 J,B	<1.0	**4.9**	<20	<0.20
MW-03A	05/22/12		<2.0	<1.0	**110**	<0.50	<1.0	<2.0	0.22 J	1.2 J	<1.0	0.86 J	1.9 J	<2.0	<1.0	<1.0	**4.1**	<20	0.11 J,B
MW-03A	08/06/12		<2.0	<1.0	**120**	<0.50	<1.0	<2.0	0.16 J	1.1 J	<1.0	1.2 J,B	**2.0**	<2.0	<1.0	<1.0	**3.5**	<20	<0.20
MW-03A	11/13/12		<2.0	<1.0	**120**	0.10 J	0.16 J	<2.0	0.32 J	1.8 J	<1.0	1.6 J	**2.7**	<2.0	0.14 J	<1.0	**4.0**	18 J	<0.20
MW-03A	02/20/13	Not sampled	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-03A	05/21/13		<2.0	<1.0	**110**	<0.50	0.12 J	<2.0	0.28 J	1.3 J	<1.0	1.2 J	1.8 J	<2.0	<1.0	<1.0	**4.2**	<20	<0.20
MW-03A	08/06/13		<2.0	<1.0	**110**	<0.50	<1.0	<2.0	0.23 J	0.93 J	<1.0	1.3 J,B	**2.1**	<2.0	<1.0	<1.0	**3.6**	<20	<0.20
MW-03A	11/12/13		<2.0	0.60 J	**110**	<0.50	<1.0	<2.0	<1.0	1.3 J	<1.0	1.4 J	1.9 J	0.59 J	<1.0	<1.0	**4.0**	7.0 J	<0.20
MW-03A	02/19/14		<2.0	<1.0	**100**	<0.50	<1.0	0.54 J	<1.0	1.4 J	<1.0	0.87 J	**2.3**	<2.0	<1.0	<1.0	**4.1**	6.6 J	<0.20
MW-03A	05/21/14		<2.0	<1.0	**110**	<0.50	<1.0	0.56 J	<1.0	0.56 J	<1.0	1.2 J, B	**2.1**	<2.0	<1.0	<1.0	**4.0**	<20	<0.20
MW-03A	08/12/14		<2.0	<1.0	**110**	<0.50	0.35 J	0.54 J	<1.0	1.6 J	<1.0	1.3 J	**3.6**	<2.0	<1.0	<1.0	**3.8**	<20	<0.20
MW-03A	11/18/14	Not Sampled, well vandalized, pump stolen	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-03A	02/19/15		<2.0	<1.0	**93**	<0.50	0.69 J	<2.0	<1.0	1.1 J	<1.0	**2.7**	**2.6**	<2.0	<1.0	<1.0	**2.1**	12 J	<0.20
MW-03A	05/18/15		<2.0	<1.0	**97**	<0.50	<1.0	0.67 J	<1.0	0.58 J	<1.0	1.3 J	0.66 J	<2.0	<1.0	<1.0	**3.6**	<20	<0.20
MW-03A	08/18/15		<2.0	<1.0	**110**	<0.50	<1.0	0.58 JB	<1.0	7.2 B	<1.0	1.4 J	0.97 J	<2.0	<1.0	<1.0	**3.7**	<20	<0.20
MW-03A	11/02/15		<2.0	0.62 J	**120**	<0.50	<1.0	0.99 J	<1.0	0.84 J,B	<1.0	1.8 J	1.3 J	<2.0	<1.0	<1.0	**4.3**	<20	<0.20
MW-03A	03/03/16		<2.0	0.83 J	**110**	<0.50	<1.0	0.52 J	0.52 J	**2.7**	<1.0	1.3 J	**3.9**	<2.0	<1.0	<1.0	**3.7**	3.1 J	**0.25**
MW-03A	05/25/16		<2.0	<1.0	**97**	<0.50	<1.0	1.3 J	<1.0	<2.0	<1.0	1.4 J	<2.0	<2.0	<1.0	<1.0	**3.8**	2.6 J	<0.20
MW-03A	08/23/16		<2.0	0.67 J	**110**	<0.50	<1.0	0.63 J	<1.0	0.90 J	**2.1**	1.6 J	1.2 J	<2.0	<1.0	<1.0	**4.2**	<20	<0.20
MW-03A	11/21/16		<2.0	0.64 J	**110**	<0.50	<1.0	0.63 J	<1.0	0.69 J	<1.0	1.6 J	1.0 J	<2.0	<1.0	<1.0	**4.1**	2.6 J	<0.20
MW-03A	02/22/17		<2.0	**1.4**	**66**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.2**	**3.9**	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03A	05/23/17		<2.0	0.78 J	**83**	<0.50	<1.0	1.4 J,B	<1.0	1.8 J	<1.0	1.7 J	<2.0	<2.0	<1.0	<1.0	**4.0**	<20	<0.20
MW-03A	08/16/17		<20	<10	**90**	<5.0	<10	<20	<10	<20	<10	<20	<20	<20	<10	<10	<20	<200	<0.20
MW-03A	02/21/18		<2.0	<1.0	**80**	<0.50	<1.0	0.56 J	<1.0	1.5 J	<1.0	1.3 J	1.8 J	<2.0	<1.0	<1.0	**3.5**	5.9 J	<0.20
MW-03A	08/21/18		<2.0	0.53 J	**95**	<0.50	<1.0	0.67 J	<1.0	0.66 J	<1.0	1.6 J	1.1 J	0.74 J	<1.0	<1.0	**3.4**	6.7 J	<0.20
MW-03A	02/12/19		<2.0	0.61 J	**72**	<0.50	<1.0	1.4 J, B	<1.0	0.90 J	<1.0	1.7 J	1.1 J	<2.0	<1.0	<1.0	**4.2**	<20	<0.20
MW-03A	08/20/19		<2.0	<1.0	**86**	<0.50	<1.0	0.66 J	<1.0	<2.0	<1.0	1.5 J	0.69 J	<2.0	<1.0	<1.0	**3.4**	4.6 J, B	<0.20
MW-03A	02/18/20		<2.0	0.50 J	**96**	<0.50	**1.70**	0.67 J	<1.0	1.3 J	<1.0	1.4 J	1.1 J	<2.0	<1.0	<1.0	**4.4**	8.2 J	<0.20
MW-03A	08/18/20		<2.0	0.65 J	**110**	<0.50	<1.0	0.75 J	<1.0	0.76 J	<1.0	1.6 J	1.0 J	1.9 J	<1.0	<1.0	**4.6**	<20	<0.20

Table 5
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-03B	05/10/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.2
MW-03B	07/05/00		--	--	**130**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-03B	06/25/01		--	--	**40**	--	--	--	--	--	--	--	--	--	--	--	--	--	ND**
MW-03B	02/28/02		**10**	<10	**137**	**1.0**	**1.5**	<10	--	--	**15**	--	**14**	**11**	<10	<10	<10	<10	--
MW-03B	02/17/06		1.1 J	**3.0**	**65**	<0.50	<1.0	0.63 J	0.42 J	**3.1**	<1.0	**2.7**	<2.0	**2.8**	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-03B	05/18/06		0.40 J	<1.0	**65**	<0.50	0.32 J	<2.0	0.60 J	2.0 J	0.38 J	2.9 J	<2.0	1.7 J	0.33 J	<1.0	<2.0	**11**	<0.20
MW-03B	08/22/06		<2.0	<1.0	**68**	<0.50	<1.0	<2.0	0.37 J	0.70 J	0.11 J	3.5 J	4.7	2.8 J	<1.0	<1.0	<2.0	3.8 J	<0.20
MW-03B	11/20/06		0.34 J	**1.2**	**80**	<0.50	<1.0	<2.0	0.38 J	1.4 J	<1.0	**4.6**	**3.3**	**2.9**	<1.0	0.20 J	<2.0	4.1 J	<0.20
MW-03B	03/02/07	Not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-03B	05/17/07		0.2 J	**2.0**	**71 CQ**	<0.50	<1.0	<2.0	0.30 J	0.95 J	<1.0	**4.2**	**3.4**	**2.3**	<1.0	0.16 J	<2.0	3.4 J	<0.20
MW-03B	08/24/07		<10	<5.0	**54**	<2.5	<5.0	<10	<5.0	<10	<5.0	3.7 J	<10	5.5 J	<5.0	<5.0	<2.0	**230**	<0.20
MW-03B	11/15/07		<2.0	**3.0**	**57**	<0.50	<1.0	<2.0	0.30 J	<2.0	<1.0	**3.1**	<2.0	0.37 J	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-03B	02/19/08		<2.0	**4.0**	**54**	<0.50	<1.0	<2.0	0.35 J	1.8 J	<1.0	**2.9**	<2.0	<2.0	<1.0	<1.0	<2.0	7.9 J	<0.20
MW-03B	05/19/08		<2.0	**3.2**	**52**	<0.50	<1.0	<2.0	0.31 J	1.1 J	<1.0	**3.2**	<2.0	**2.0 MB**	<1.0	<1..0	<2.0	2.7 J	<0.20
MW-03B	08/18/08		<2.0	**3.5**	**52**	<0.50	<1.0	<2.0	0.42 J	1.3 J	<1.0	**2.7**	**2.3**	**3.1**	<1.0	<1.0	<2.0	10 J	<0.20
MW-03B	11/10/08		<2.0	**3.4**	**61**	<0.50	<1.0	1.2 J	0.39 J	1.6 J	<1.0	**3.7**	**4.3**	**3.2**	<1.0	<1.0	<2.0	8.2 J	<0.20
MW-03B	02/18/09		<2.0	**3.1**	**64**	<0.50	<1.0	<2.0	0.30 J	1.3 J	<1.0	**3.6**	<2.0	1.2 J	<1.0	<1.0	<2.0	3.2 J	<0.20
MW-03B	05/27/09		<2.0	**2.9**	**59**	<0.50	<1.0	<2.0	0.47 J	**2.6**	<1.0	**3.6**	<2.0	**2.1**	<1.0	<1.0	<2.0	3.1 J	<0.20
MW-03B	08/25/09		0.26 J	**2.3**	**54**	<0.50	<1.0	<2.0	0.37 J	1.6 J	<1.0	**3.8**	<2.0	**3.8**	<1.0	<1.0	<2.0	7.4 J	<0.20
MW-03B	11/23/09		<2.0	**3.6**	**61**	<0.50	<1.0	<2.0	0.40 J	1.2 J	<1.0	**3.6**	**2.3**	**3.8**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/22/10		<2.0	**2.3**	**54**	<0.50	<1.0	<2.0	0.39 J	1.1 J	<1.0	**3.0**	**2.6**	**4.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	05/27/10		<2.0	**2.6**	**56**	<0.50	<1.0	<2.0	0.38 J	0.87 J	<1.0	**3.1**	**4.3**	**4.4**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/31/10		<2.0	**2.2**	**48**	<0.50	<1.0	<2.0	0.33 J	0.56 J	<1.0	**3.3**	**3.2**	**3.8 B**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	11/18/10		<2.0	**2.9**	**55**	<0.50	0.10 J	<2.0	0.39 J	1.7 J	<1.0	**3.6**	<2.0	**2.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/17/11		0.85 J	**3.3**	**60**	<0.50	0.30 J	<2.0	0.40 J	0.95 J	<1.0	**4.6**	**2.3**	**2.4**	0.25 J	0.22 J	<2.0	<20	<0.20
MW-03B	05/09/11		<2.0	**3.5**	**58**	<0.50	<1.0	<2.0	0.28 J	1.1 J	<1.0	**3.3**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	07/20/11		<2.0	**3.1**	**54**	<0.50	<1.0	<2.0	0.23 J	<2.0	<1.0	**3.5**	**2.0**	1.4 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	11/21/11		<2.0	**1.5**	**54**	<0.50	<1.0	<2.0	0.21 J	<2.0	<1.0	**3.6**	**2.9**	1.6 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/16/12		<2.0	**2.6**	**57**	<0.50	<1.0	<2.0	0.37 J	1.3 J	<1.0	**3.0**	**2.1**	1.7 J	<1.0	<1.0	<2.0	16 J	<0.20
MW-03B	05/22/12		<2.0	**3.1**	**50**	<0.50	<1.0	<2.0	0.29 J	0.61 J	<1.0	**2.9**	1.5 J	**2.6**	0.12 J	<1.0	<2.0	<20	0.13 J,B
MW-03B	08/06/12		<2.0	**2.9**	**51**	<0.50	<1.0	<2.0	0.24 J	1.2 J	<1.0	**2.9 B**	1.4 J	**2.3**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	11/13/12		<2.0	**3.0**	**51**	<0.50	<1.0	<2.0	0.28 J	0.64 J	<1.0	**2.7**	1.4 J	**2.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/20/13		<2.0	**3.0**	**47**	<0.50	<1.0	<2.0	0.30 J	1.1 J	<1.0	**2.8**	1.3 J	1.3 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	05/21/13		<2.0	**2.9**	**51**	<0.50	<1.0	<2.0	0.28 J	<2.0	<1.0	**3.2**	1.6 J	1.3 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/06/13		0.31 J	**2.2**	**54**	<0.50	<1.0	<2.0	0.17 J	<2.0	<1.0	**4.6 B**	**2.9**	0.94 J	<1.0	<1.0	<2.0	8.8 J	<0.20
MW-03B	11/12/13		<2.0	**2.2**	**48**	<0.50	<1.0	<2.0	<1.0	0.67 J	<1.0	**4.1**	**2.2**	0.79 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/19/14		<2.0	**2.2**	**54**	<0.50	<1.0	<2.0	<1.0	1.0 J	<1.0	**3.4**	**2.8**	<2.0	<1.0	<1.0	<2.0	7.9 J	<0.20
MW-03B	05/21/14		<2.0	**2.2**	**57**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.7 B**	**2.3**	0.96 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/12/14		<2.0	**1.7**	**45**	<0.50	<1.0	<2.0	<1.0	0.84 J	<1.0	**4.6**	**2.7**	1.8 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	11/18/14		<2.0	**2.2**	**60**	<0.50	<1.0	<2.0	<1.0	0.70 J	<1.0	**4.4**	**3.0**	0.75 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/19/15		0.67 J	**1.0**	**72**	<0.50	<1.0	<2.0	<1.0	0.95 J	<1.0	**6.3**	**3.0**	<2.0	<1.0	<1.0	<2.0	3.8 J	<0.20
MW-03B	05/18/15		<2.0	**2.3**	**52**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.6**	1.2 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/18/15		<2.0	**2.4**	**48**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.3**	0.66 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	11/02/15		<2.0	**2.7**	**46**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.7**	0.86 J	<2.0	<1.0	<1.0	<2.0	2.5 J,B	<0.20
MW-03B	03/03/16		0.53 J	**4.5**	**48**	<0.50	<1.0	<2.0	<1.0	**3.1**	<1.0	**3.9**	**3.5**	**1.5**	<1.0	<1.0	<2.0	<20	0.10 J
MW-03B	05/25/16		<2.0	**2.6**	**42**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.2**	0.83 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/23/16		<2.0	**2.5**	**57**	<0.50	<1.0	<2.0	<1.0	1.7 J	<1.0	**4.7**	**2.3**	<2.0	<1.0	<1.0	<2.0	4.1 J,F1	<0.20
MW-03B	11/21/16		<2.0	**1.5**	**57**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.3**	**2.2**	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/22/17		<2.0	<1.0	**71**	<0.50	<1.0	0.63 J	<1.0	0.83 J	<1.0	0.95 J	0.68 J	0.62 J	<1.0	<1.0	**3.7**	3.1 J	<0.20
MW-03B	05/23/17		<2.0	**2.4**	**56**	<0.50	<1.0	0.93 J, B	<1.0	0.82 J	<1.0	**3.8**	1.4 J	0.91 J	<1.0	<1.0	<2.0	3.6 J, B	<0.20
MW-03B	08/16/17		<20	<10	**46**	<5.0	<10	<20	<10	<20	<10	<20	<20	<20	<10	<10	<20	<200	<0.20
MW-03B	02/21/18		<2.0	**1.2**	**31**	<0.50	<1.0	<2.0	<1.0	0.73 J	<1.0	**3.8**	1.5 J	0.94 J	<1.0	<1.0	<2.0	4.5 J	<0.20
MW-03B	08/21/18		<2.0	**1.9**	**38**	<0.50	<1.0	0.59 J	<1.0	<2.0	<1.0	**4.1**	0.84 J	<2.0	<1.0	<1.0	<2.0	3.2 J	<0.20
MW-03B	02/12/19		<2.0	**2.0**	**34**	<0.50	<1.0	0.78 J, B	<1.0	<2.0	<1.0	**3.7**	1.0 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/20/19		<2.0	**2.0**	**33**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.3**	0.78 J	<2.0	<1.0	<1.0	<2.0	7.6 J, B	<0.20
MW-03B	02/19/20		<2.0	**2.4**	**34**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.3**	0.92 J	<2.0	<1.0	<1.0	<2.0	3.4 J	<0.20
MW-03B	08/18/20		<2.0	**4.1**	**42**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.4**	1.1 J	1.5 J	<1.0	<1.0	<2.0	<20	<0.20

Table 5
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-04A	03/02/07	New Well	0.36 J	**1.7**	**21**	<0.50	0.21 J	<2.0	**1.8**	**2.8**	0.16 J	**5.4**	**2.3**	**4.4**	<1.0	<1.0	**13**	**40 LN,AY**	<0.20
MW-04A	05/17/07		0.26 J	**2.3**	**22 CQ**	<0.50	0.24 J	<2.0	**1.1**	**2.5**	<1.0	**5.6**	**3.1**	**4.9**	<1.0	<1.0	**9.9**	**6.3**	<0.20
MW-04A	08/23/07		<10	4.8J	**21**	<2.5	<5.0	<10	1.2 J	<10	<1.0	5.6 J	7.2J	**13**	<5.0	<5.0	9.6J	18 J	<0.20
MW-04A	11/16/07		<2.0	3.30	**20**	<0.50	0.26 J	<2.0	**1.0**	**4.3**	<1.0	**4.7**	<2.0	**2.2**	<1.0	<1.0	**11**	4.8 J	<0.20
MW-04A	02/20/08		<2.0	**2.1**	**22**	<0.50	0.24 J	<2.0	0.84 MB,J	**3.1**	<1.0	**4.9**	<2.0	<2.0	<1.0	<1.0	**13**	4.6 J	<0.20
MW-04A	05/20/08		<2.0	**2.3**	**25**	<0.50	0.33 J	<2.0	**1.1**	**4.0**	<1.0	**5.3**	1.5 J	**3.9 CQ**	<1.0	<1.0	**12**	12 J	<0.20
MW-04A	08/19/08		<2.0	**1.5**	**21**	<0.50	0.33 J	<2.0	0.87 J	**3.2**	<1.0	**4.7**	**4.0**	**8.6**	<1.0	<1.0	**12**	4.9 J	<0.20
MW-04A	11/11/08		<2.0	**1.6**	**23**	<0.50	0.31 J	<2.0	0.99 J	**2.9**	<1.0	**5.0**	**2.3**	**5.4**	<1.0	<1.0	**14**	5.1 J	<0.20
MW-04A	02/19/09		<2.0	**2.8**	**22**	<0.50	0.23 J	<2.0	0.90 J	**3.2**	<1.0	**5.2**	<2.0	**4.7**	<1.0	<1.0	**10**	16 J	0.13 J
MW-04A	05/28/09		<2.0	**1.3**	**22**	<0.50	0.33 J	<2.0	**1.1**	**6.9**	<1.0	**4.9 B-1**	<2.0	**4.9**	<1.0	<1.0	**13**	5.0 J	<0.20
MW-04A	08/26/09		<2.0	0.78 J	**25**	<0.50	0.32 J	<2.0	**1.1**	**3.7**	<1.0	**5.3**	**2.8**	**4.3**	<1.0	<1.0	**13**	5.2 J	<0.20
MW-04A	11/24/09		<2.0	**2.0**	**22**	<0.50	0.27 J	<2.0	0.90 J	**2.5**	<1.0	**4.9**	**3.7**	**8.9**	<1.0	<1.0	**12**	<20	<0.20
MW-04A	02/23/10		<2.0	**1.1**	**24**	<0.50	0.35 J	<2.0	0.97 J	**3.4**	<1.0	**5.1**	**5.1**	**7.8**	<1.0	<1.0	**12**	<20	<0.20
MW-04A	05/28/10		<2.0	**1.5**	**24**	<0.50	0.36 J	<2.0	0.81 J	**2.8**	<1.0	**4.8**	**3.4**	**9.7**	<1.0	<1.0	**13**	<20	<0.20
MW-04A	09/01/10		<2.0	<1.0	**23**	<0.50	0.34 J	<2.0	0.72 J, B	**2.1**	<1.0	**5.4**	**3.3**	**7.0**	<1.0	<1.0	**12**	7.1 J	<0.20
MW-04A	11/19/10		<2.0	**1.1**	**24**	<0.50	0.35 J	<2.0	0.87 J	**3.3**	<1.0	**5.5**	0.99 J	**5.0**	<1.0	<1.0	**14**	<20	<0.20
MW-04A	02/17/11		<2.0	**2.4**	**24**	<0.50	0.61 J	<2.0	0.71 J	**2.1**	<1.0	**5.2**	**2.9**	**6.2**	<1.0	<1.0	**12**	<20	<0.20
MW-04A	05/10/11		<2.0	**1.6**	**24**	<0.50	0.30 J	<2.0	0.58 J	**2.8**	<1.0	**4.8**	<2.0	<2.0	<1.0	<1.0	**11**	<20	<0.20
MW-04A	07/21/11		<2.0	**1.6**	**24**	<0.50	0.27 J	<2.0	0.52 J	1.2 J	<1.0	**4.9**	**2.7**	**4.0**	<1.0	<1.0	**10**	4.6 J	<0.20
MW-04A	11/22/11		<2.0	**1.9**	**22**	<0.50	0.33 J	<2.0	0.62 J	1.5 J	<1.0	**4.8 B**	**3.1**	**4.3**	<1.0	<1.0	**12**	9.1 J	<0.20
MW-04A	02/16/12		<2.0	**1.8**	**24**	<0.50	0.33 J	<2.0	0.69 J	**2.4**	<1.0	**5.0**	**3.4**	**5.2**	<1.0	<1.0	**12**	15 J	0.11 J
MW-04A	05/23/12		<2.0	**3.2**	**22**	<0.50	0.24 J	<2.0	0.48 J	1.3 J	<1.0	**4.8**	**2.5**	**5.4**	<1.0	<1.0	**11**	<20	0.14 J,B
MW-04A	08/07/12		<2.0	**2.0**	**21**	<0.50	0.28 J	<2.0	0.45 J	1.3 J	<1.0	**5.3 B**	**2.8**	**5.3**	<1.0	<1.0	**10**	<20	<0.20
MW-04A	11/14/12		<2.0	**1.2**	**21**	<0.50	0.31 J	<2.0	0.54 J	1.1 J	<1.0	**4.6**	**2.3**	**2.1**	<1.0	<1.0	**11**	<20	<0.20
MW-04A	02/20/13		<2.0	**1.5**	**21**	<0.50	0.30 J	<2.0	0.55 J	1.8 J	<1.0	**4.7**	**2.4**	**2.0**	<1.0	<1.0	**10**	<20	<0.20
MW-04A	05/22/13		<2.0	**1.5**	**22**	<0.50	0.30 J	<2.0	0.59 J	1.4 J	<1.0	**5.0**	**2.7**	**2.4**	<1.0	<1.0	**11**	<20	<0.20
MW-04A	08/07/13		<2.0	**2.2**	**22**	<0.50	0.13 J	<2.0	0.57 J	0.55 J	<1.0	**6.9**	**2.6**	**3.3**	0.15 J	<1.0	**8.6**	<20	<0.20
MW-04A	11/12/13		<2.0	**1.1**	**21**	<0.50	<1.0	<2.0	0.53 J	1.4 J	<1.0	**4.7**	**2.1**	1.7 J	<1.0	<1.0	**11**	<20	0.12 J
MW-04A	02/20/14		<2.0	**1.3**	**21**	<0.50	0.34 J	<2.0	0.61 J	1.8 J	<1.0	**4.4**	**3.4**	1.2 J	<1.0	<1.0	**11**	6.2 J	<0.20
MW-04A	05/22/14		<2.0	**1.5**	**21**	<0.50	0.29 J	<2.0	0.59 J	1.3 J	<1.0	**4.9**	**2.8**	**2.7**	<1.0	<1.0	**10**	7.2 J	0.13 J
MW-04A	08/13/14		<2.0	**1.0**	**22**	<0.50	0.28 J	<2.0	0.53 J	0.71 J	<1.0	**5.4**	**2.8**	<2.0	<1.0	<1.0	**12**	<20	<0.20
MW-04A	11/19/14		<2.0	**1.8**	**23**	<0.50	0.28 J	<2.0	0.58 J	**2.5**	<1.0	**5.1**	**3.0**	**3.7**	<1.0	<1.0	**11**	3.4 J	<0.20
MW-04A	02/20/15		<2.0	**1.0**	**24**	<0.50	0.35 J	<2.0	0.50 J	0.68 J	<1.0	**6.0**	**2.3**	<2.0	<1.0	<1.0	**12**	6.2 J	<0.20
MW-04A	05/19/15		<2.0	0.93 J	**23**	<0.50	0.29 J	<2.0	<1.0	0.74 J	<1.0	**5.2**	**2.0**	0.53 J	<1.0	<1.0	**11**	<20	<0.20
MW-04A	08/19/15		<2.0	0.95 J	**24**	<0.50	0.29 J	<2.0	<1.0	0.61 JB	**1.2**	**4.9**	1.9 J	<2.0	<1.0	<1.0	**11**	<20	<0.20
MW-04A	11/03/15		<2.0	**1.0**	**24**	<0.50	0.26 J	<2.0	<1.0	**3.3 B**	<1.0	**5.2**	**2.0**	<2.0	<1.0	<1.0	**11**	<20	<0.20
MW-04A	03/04/16		0.58 J	**2.2**	**26**	<0.50	0.41 J	<2.0	0.88 J	**4.1**	<1.0	**5.9**	**8.6**	**5.7**	<1.0	<1.0	**10**	2.9 J	0.13 J
MW-04A	05/26/16		<2.0	0.93 J	**23**	<0.50	<1.0	<2.0	0.53 J	0.50 J	<1.0	**4.6**	**2.1**	<2.0	<1.0	<1.0	**11**	<20	<0.20
MW-04A	08/24/16		<10	**5.7**	**140**	<2.5	1.6 J	<10	3.5 J	5.2 J	<5.0	**29**	**13**	<10	<5.0	<5.0	**60**	<20	<0.20
MW-04A	11/22/16		<2.0	0.98 J	**26**	<0.50	0.32 J	<2.0	0.58 J	0.77 J	<1.0	**5.1**	**2.2**	<2.0	<1.0	<1.0	**12**	<20	0.12 J
MW-04A	02/23/17		<2.0	**1.0**	**28**	<0.50	<1.0	<2.0	0.59 J	0.67 J	<1.0	**5.4**	**3.5**	<2.0	<1.0	<1.0	**11**	<20	<0.20
MW-04A	05/23/17		<2.0	**1.6**	**26**	<0.50	0.38 J	2.8 B	0.88 J	**4.2**	<1.0	**5.2**	**3.5**	1.5 J	<1.0	<1.0	**11**	5.5 J, B	<0.20
MW-04A	08/17/17		<10	<5.0	**28**	<2.5	<5.0	<10	<5.0	<10	<5.0	8.0 J	3.1 J	<10	<5.0	<5.0	**13**	21 J	0.15 J
MW-04A	02/22/18		<2.0	**1.0**	**25**	<0.50	0.35 J	1.0 J	0.61 J	1.2 J	<1.0	**5.6**	**2.6**	<2.0	<1.0	<1.0	**12**	5.1 J, B	<0.20
MW-04A	08/22/18		<2.0	0.90 J	**25**	<0.50	0.28 J	<2.0	0.63 J	<2.0	<1.0	**4.7**	**2.8**	0.56 J	<1.0	<1.0	**11**	3.2 J	<0.20
MW-04A	02/12/19		<2.0	**1.2**	**30**	<0.50	<1.0	<2.0	0.75 J	1.1 J	<1.0	**4.8**	**5.1**	0.65 J	<1.0	<1.0	**11**	<20	<0.20
MW-04A	08/21/19		<2.0	0.91 J	**30**	<0.50	0.39 J	0.69 J, B	0.63 J	1.0 J, B	<1.0	**5.5**	**2.7**	<2.0	<1.0	<1.0	**11**	4.4 J	<0.20
MW-04A	02/19/20		<2.0	0.84 J	**26**	<0.50	0.60 J	<2.0	0.76 J	1.3 J	<1.0	**5.8**	**2.5**	0.51 J	<1.0	<1.0	**12**	4.2 J	0.16 J
MW-04A	08/19/20		<2.0	0.79 J	**23**	<0.50	0.36 J	<2.0	0.56 J	0.71 J	<1.0	**5.8**	**2.2**	0.68 J	<1.0	<1.0	**11**	<20	<0.20

Table 5
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-04B	03/02/07	New Well	0.80 J	**6.5**	**120**	<0.50	<1.0	<2.0	0.50 J	**2.1**	0.38 J	**7.1**	<2.0	**1.5**	<1.0	<1.0	0.93 J	12 J	<0.20
MW-04B	05/17/07		<2.0	**8.9**	**86 CQ**	<0.50	<1.0	<2.0	0.35 J	1.4 J	<1.0	**3.6**	1.6 J	**2.8**	<1.0	<1.0	<2.0	2.8 J	<0.20
MW-04B	08/23/07		<10	**13**	**74**	<2.5	<5.0	3.7 J	<5.0	<10	<1.0	3.0 J	5.0 J	7.4 J	<5.0	<5.0	<10	14 J	<0.20
MW-04B	11/16/07		<2.0	**8.4**	**67**	<0.50	<1.0	<2.0	0.36 J	1.3 J	<1.0	**2.9**	<2.0	1.2 J	<1.0	<1.0	<2.0	3.4 J	<0.20
MW-04B	02/20/08		<2.0	**6.8**	**60**	<0.50	<1.0	<2.0	0.28 MB,J	**2.0**	<1.0	**3.0**	<2.0	<2.0	<1.0	<1.0	<2.0	4.0 J	<0.20
MW-04B	05/20/08		<2.0	**5.8**	**54**	<0.50	<1.0	<2.0	0.35 J	**2.9**	<1.0	**3.0**	<2.0	**3.2 MB**	<1.0	<1.0	<2.0	4.2 J	<0.20
MW-04B	08/19/08		<2.0	**5.0**	**45**	<0.50	<1.0	<2.0	0.40 J	1.7 J	<1.0	**2.8**	**2.4**	**4.2**	<1.0	<1.0	<2.0	3.0 J	<0.20
MW-04B	11/11/08		<2.0	**4.5**	**54**	<0.50	<1.0	<2.0	0.45 J	1.9 J	<1.0	**2.8**	1.4 J	**3.3**	<1.0	<1.0	<2.0	3.2 J	<0.20
MW-04B	02/19/09		<2.0	**5.6**	**47**	<0.50	<1.0	<2.0	0.32 J	2.2	<1.0	**2.7**	<2.0	**2.5**	<1.0	<1.0	<2.0	6.6 J	<0.20
MW-04B	05/28/09		<2.0	**4.7**	**46**	<0.50	<1.0	<2.0	0.51 J	**4.5**	<1.0	**3.0 B**	<2.0	**3.1**	<1.0	<1.0	<2.0	4.4 J	<0.20
MW-04B	08/26/09		<2.0	**4.2**	**48**	<0.50	<1.0	<2.0	0.49 J	**3.0**	<1.0	**3.1**	1.2 J	**2.3**	<1.0	<1.0	<2.0	**23**	<0.20
MW-04B	11/24/09		<2.0	**4.6**	**44**	<0.50	<1.0	<2.0	0.41 J	1.6 J	<1.0	**2.4**	**2.1**	**6.2**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	02/23/10		<2.0	**4.5**	**48**	<0.50	<1.0	<2.0	0.50 J	**2.2**	<1.0	**2.7**	**3.6**	**5.2**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	05/28/10		<2.0	**4.4**	**45**	<0.50	<1.0	<2.0	0.40 J	1.6 J	<1.0	**2.7**	1.9 J	**6.3**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	09/01/10		<2.0	**3.5**	**41**	<0.50	<1.0	<2.0	0.36 J, B	1.2 J	<1.0	**3.1**	1.7 J	**4.3**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/19/10		<2.0	**3.4**	**47**	<0.50	0.24 J	<2.0	0.41 J	**2.6**	0.25 J	**3.1**	<2.0	**2.6**	<1.0	<1.0	<2.0	12 J	<0.20
MW-04B	02/17/11		<2.0	**5.1**	**44**	<0.50	0.38 J	<2.0	0.33 J	1.8 J	<1.0	**2.8**	1.6 J	**3.3**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	05/10/11		<2.0	**3.9**	**45**	<0.50	<1.0	<2.0	0.27 J	1.5 J	<1.0	**2.9**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	07/21/11		<2.0	**4.4**	**41**	<0.50	<1.0	<2.0	0.20 J	<2.0	<1.0	**2.8**	1.4 J	**2.4**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/22/11		<2.0	**4.1**	**42**	<0.50	<1.0	<2.0	0.20 J	0.54 J	<1.0	**2.8 B**	1.7 J	**2.4**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	02/16/12		<2.0	**4.1**	**46**	<0.50	<1.0	<2.0	0.31 J	1.4 J	<1.0	**2.8**	1.9 J	**2.5**	0.15 J,B	<1.0	<2.0	<20	<0.20
MW-04B	05/23/12		<2.0	**4.4**	**43**	<0.50	<1.0	<2.0	0.21 J	0.61 J	<1.0	**2.9**	1.3 J	**3.5**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	08/07/12		<2.0	**3.9**	**42**	<0.50	<1.0	<2.0	0.18 J	0.52 J	<1.0	**3.1 B**	1.3 J	**3.3**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/14/12		<2.0	**4.3**	**41**	<0.50	<1.0	<2.0	0.19 J	<2.0	<1.0	**2.5**	0.85 J	1.6 J	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	02/20/13		<2.0	**3.1**	**41**	<0.50	<1.0	<2.0	0.23 J	0.68 J	<1.0	**2.5**	1.1 J	1.5 J	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	05/22/13		<2.0	**3.7**	**41**	<0.50	<1.0	<2.0	0.22 J	0.53 J	<1.0	**2.8**	1.4 J	1.9 J	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	08/07/13		<2.0	**4.0**	**42**	<0.50	<1.0	<2.0	0.17 J	<2.0	<1.0	**4.6**	1.1 J	**2.5**	0.20 J	<1.0	<2.0	<20	<0.20
MW-04B	11/12/13		<2.0	**3.3**	**42**	<0.50	<1.0	<2.0	<1.0	0.86 J	<1.0	**2.2**	0.80 J	1.3 J	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	02/20/14		<2.0	**3.3**	**40**	<0.50	<1.0	<2.0	<1.0	0.84 J	<1.0	**2.3**	1.7 J	0.73 J	<1.0	<1.0	<2.0	5.8 J	<0.20
MW-04B	05/22/14		<2.0	**3.3**	**39**	<0.50	<1.0	<2.0	<1.0	0.55 J	<1.0	**3.1**	1.5 J	1.4 J	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	08/13/14		<2.0	**3.3**	**42**	<0.50	<1.0	<2.0	<1.0	0.75 J	<1.0	**3.0**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/19/14		<2.0	**3.6**	**45**	<0.50	<1.0	<2.0	<1.0	1.1 J	<1.0	**2.6**	1.5 J	**2.1**	<1.0	<1.0	<2.0	6.5 J	<0.20
MW-04B	02/20/15		<2.0	**3.6**	**49**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.0**	<2.0	<2.0	<1.0	<1.0	<2.0	7.8 J	<0.20
MW-04B	05/19/15		<2.0	**3.0**	**42**	<0.50	<1.0	1.3 J	<1.0	<2.0	<1.0	**3.0**	0.79 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	08/19/15		<2.0	**3.1**	**44**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**2.7**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/03/15		<2.0	**2.9**	**40**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**2.8**	<2.0	<2.0	<1.0	<1.0	<2.0	3.2 J	<0.20
MW-04B	03/04/16		0.55 J	**3.8**	**45**	<0.50	<1.0	<2.0	<1.0	**2.7**	<1.0	**3.4**	**3.1**	**3.1**	<1.0	<1.0	<2.0	3.3 J	0.12 J
MW-04B	05/26/16		<2.0	**3.1**	**40**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.0**	0.53 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	08/24/16		<2.0	**3.3**	**49**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.2**	0.68 J	<2.0	<1.0	<1.0	<2.0	<20	0.11 J
MW-04B	11/22/16		<2.0	**3.4**	**47**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.0**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	02/23/17		<2.0	**3.5**	**49**	<0.50	<1.0	**5.0**	<1.0	0.53 J	<1.0	**3.9**	1.2 J	<2.0	<1.0	<1.0	<2.0	7.3 J	<0.20
MW-04B	05/23/17	Not sampled due to vandalism	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------
MW-04B	08/17/17		<10	4.5 J	**54**	<2.5	<5.0	<10	<5.0	2.7 J	<5.0	3.6 J	2.5 J	<10	<5.0	<5.0	<10	<100	<0.20
MW-04B	02/22/18		<2.0	**1.9**	**64**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.2**	1.5 J	<2.0	<1.0	<1.0	<2.0	9.9 J, B	<0.20
MW-04B	08/22/18		<2.0	**3.6**	**52**	<0.50	<1.0	0.95 J	<1.0	<2.0	<1.0	**2.7**	1.3 J	0.78 J	<1.0	<1.0	1.2 J	8.4 J	<0.20
MW-04B	02/13/19		<2.0	**2.0**	**51**	<0.50	<1.0	0.55 J	<1.0	<2.0	<1.0	**2.6**	0.98 J	0.68 J	<1.0	<1.0	<2.0	4.9 J	<0.20
MW-04B	08/21/19		<2.0	**1.9**	**62**	<0.50	<1.0	1.0 J, B	<1.0	<2.0	<1.0	**2.8**	1.3 J	<2.0	<1.0	<1.0	<2.0	6.8 J	<0.20
MW-04B	02/19/20		<2.0	**3.9**	**56**	<0.50	<1.0	0.73 J	<1.0	0.87 J	<1.0	**3.2**	1.7 J	<2.0	<1.0	<1.0	1.0 J	17 J	<0.20
MW-04B	08/19/20		<2.0	**3.2**	**53**	<0.50	<1.0	<2.0	<1.0	<2.0		**3.1**	0.63 J	0.65 J	<1.0	<1.0	<2.0	4.0 J	<0.20

Table 5
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020															7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-05A	08/26/09		<10	<5.0	**28**	**7.9**	**11**	<10	**270**	**62**	<5.0	1.5 J	**400**	**13**	<5.0	<5.0	**18**	**3,500**	<0.20
MW-05A	11/23/09		<10	<5.0	**22**	**9.3**	**8.9**	<10	**240**	**94**	<5.0	<10	**350**	**18**	<5.0	<5.0	**39**	**4,100**	0.19 J
MW-05A	02/22/10		<10	<5.0	**21**	**3.9**	3.9 J	<10	**120**	**33**	<5.0	1.2 J	**140**	**12**	<5.0	<5.0	**13**	**1,300**	<0.20
MW-05A	05/27/10		<2.0	<1.0	**17**	**7.4**	**5.7**	<2.0	**140**	**62**	0.53 J	<2.0	**190**	**13**	<1.0	<1.0	**29**	**3,800**	<0.20
MW-05A	08/31/10		<10	<5.0	**18**	**10**	**6.8**	<10	**210**	**100**	1.1 J	<10	**280**	**17 B-1**	<5.0	<5.0	**53**	**3,200**	<0.20
MW-05A	11/18/10		<20	<10	**19**	**11**	7.0 J	<20	**210**	**120**	<10	<20	**290**	13 J	<10	<10	**50**	**3,300**	<0.20
MW-05A	02/15/11		<10	<5.0	**19**	**11**	**7.1**	<10	**210**	**81**	<5.0	<10	**270**	**12**	<5.0	<5.0	**35**	**3,100**	<0.20
MW-05A	05/09/11		<40	<20	**23**	**12**	6.9 J	<40	**220**	**120**	<20	<40	**300**	13 J	<20	<20	28 J	**4,800**	<0.20
MW-05A	07/20/11		<4.0	**5.4**	**24**	**15**	**9.2**	<4.0	**270**	**130**	0.92 J	0.91 J	**370**	**9.4**	<2.0	<2.0	**82**	**3,900**	<0.20
MW-05A	11/21/11		<4.0	**4.4**	**18**	**8.9**	**6.5**	<4.0	**170**	**92**	0.82 J	1.0 J	**250**	**7.6**	<2.0	<2.0	**61**	**2,900**	<0.20
MW-05A	02/15/12		<4.0	**4.2**	**21**	**7.2**	**6.2**	<4.0	**160**	**90**	1.1 J	1.0 J	**220**	**6.7**	<2.0	<2.0	**46**	**2,300**	0.11 J
MW-05A	05/22/12		<10	**6.0**	**18**	**7.0**	**5.6**	<10	**150**	**72**	<5.0	1.6 J	**200**	7.7 J	2.5 J	<5.0	**30**	**2,500**	0.10 J,B
MW-05A	08/06/12		<10	<5.0	**17**	**10**	**6.2**	<10	**160**	**120**	<5.0	<10	**260**	7.9 J	<5.0	<5.0	**42**	**2,900**	<0.20
MW-05A	11/14/12		<4.0	**3.2**	**18**	**11**	**5.8**	<4.0	**170**	**90**	0.52 J	0.98 J	**230**	**5.5**	<2.0	<2.0	**49**	**2,200**	<0.20
MW-05A	02/19/13		<10	<5.0	**17**	**6.2**	**5.2**	<10	**160**	**81**	<5.0	1.1 J	**220**	5.3 J	<5.0	<5.0	**37**	**2,100**	<0.20
MW-05A	05/21/13		<10	<5.0	**18**	**11**	**6.7**	<10	**210**	**110**	<5.0	<10	**280**	6.3 J	<5.0	<5.0	**49**	**2,900**	<0.20
MW-05A	08/06/13		<10	<5.0	**19**	**13**	**6.9**	<10	**190**	**98**	1.1 J	2.5 J,B	**240**	8.3 J	<5.0	<5.0	**57**	**2,100**	<0.20
MW-05A	11/12/13		<10	<5.0	**16**	**8.8**	**5.4**	<10	**180**	**110**	<5.0	<10	**260**	7.9 J	<5.0	<5.0	**74**	**2,600**	0.15 J
MW-05A	02/19/14		<10	3.3 J	**16**	**9.6**	**5.9**	<10	**170**	**100**	<5.0	<10	**220**	7.2 J	<5.0	<5.0	**73**	**2,200**	0.18 J
MW-05A	05/21/14		<10	2.8 J	**19**	**12**	**6.9**	<10	**180**	**120**	<5.0	<10	**250**	8.5 J	<5.0	<5.0	**82**	**2,900**	**2.7**
MW-05A	08/12/14		<10	3.6 J	**21**	**11**	**7.4**	<10	**230**	**130**	<5.0	<10	**300**	**10**	<5.0	<5.0	**82**	**2,700**	<0.20
MW-05A	11/18/14		<10	2.7 J	**17**	**7.9**	**5.9**	<10	**180**	**110**	<5.0	<10	**240**	**5.2 J**	<5.0	<5.0	**77**	**2,000**	<0.20
MW-05A	02/19/15		<4.0	**5.6**	**19**	**5.0**	**5.5**	1.1 J	**160**	**83**	<2.0	1.2 J	**200**	**10**	<2.0	<2.0	**42**	**1,300**	0.14 J
MW-05A	05/18/15		<10	**5.1**	**16**	**6.4**	**5.4**	<10	**140**	**78**	<5.0	4.4 J	**190**	**12**	<5.0	<5.0	**48**	**1,400**	<0.20
MW-05A	08/18/15		<10	**5.1**	**17**	**9.5**	**5.8**	<10	**170**	**97 B**	<5.0	4.6 J	**230**	**12**	<5.0	<5.0	**68**	**1,700**	**0.22**
MW-05A	11/02/15		<4.0	**6.0**	**18**	**7.6**	**6.1**	<4.0	**160**	**120 B**	<2.0	<4.0	**220**	**12**	<2.0	<2.0	**44**	**1,300 B**	0.15 J
MW-05A	03/03/16		<4.0	**4.7**	**17**	**4.7**	**4.6**	<4.0	**120**	**86**	<2.0	<4.0	**170**	**6.6**	<2.0	<2.0	**40**	**1,500**	**1.8**
MW-05A	05/25/16		<2.0	**5.1**	**18**	**12**	**6.0**	**13**	**160**	**110**	0.95 J	0.67 J	**220**	**14**	<1.0	<1.0	**70**	**1,900**	<0.20
MW-05A	08/23/16		<10	**5.1**	**18**	**12**	**6.4**	<10	**180**	**100**	<5.0	<10	**250**	8.2 J	<5.0	<5.0	**95**	**1,800 B**	<0.20
MW-05A	11/21/16		<10	4.2 J	**16**	**7.1**	**5.2**	<10	**150**	**78**	<5.0	<10	**200**	8.8 J	<5.0	<5.0	**61**	**1,300**	<0.20
MW-05A	02/22/17		<2.0	**4.9**	**16**	**0.50**	0.53 J	<2.0	**50**	**10**	<1.0	**2.1**	**27**	1.6 J	<1.0	<1.0	**14**	**140 F1**	<0.20
MW-05A	05/22/17		<2.0	**3.9**	**17**	**6.9**	**5.3**	0.55 J	**160**	**61**	0.50 J	0.86 J	**200**	**3.1**	<1.0	<1.0	**40**	**1,100**	<0.20
MW-05A	08/16/17		<20	<10	**15**	4.0 J	4.9 J	<20	**120**	**59**	<10	<20	**160**	<20	<10	<10	**21**	**960**	<0.20
MW-05A	02/21/18		<2.0	**5.2**	**15**	**1.9**	**2.3**	<2.0	**82**	**30**	<1.0	1.7 J	**72**	1.6 J	<1.0	<1.0	**14**	**470**	<0.20
MW-05A	08/21/18		<4.0	**6.4**	**18**	**5.1**	**3.4**	<4.0	**100**	**40**	<2.0	1.8 J	**120**	**14**	<2.0	<2.0	**20**	**790**	**0.24**
MW-05A	02/12/19		<2.0	**8.0**	**18**	**1.6**	0.31 J	0.88 J, B	**40**	**12**	<1.0	**2.8**	**18**	1.2 J	<1.0	<1.0	**16**	**100**	<0.20
MW-05A	08/20/19		<2.0	**7.8**	**19**	**1.7**	0.98 J	<2.0	**50**	**9.8**	<1.0	**2.2**	**36**	1.4 J	<1.0	<1.0	**10**	**200 B**	<0.20
MW-05A	02/18/20		<2.0	**7.1**	**19**	**1.5**	0.44 J	<2.0	**40**	**5.4**	<1.0	**2.3**	**21**	1.6 J	<1.0	<1.0	**8.4**	**100**	**0.22**
MW-05A	08/18/20		0.57 J	**8.2**	**20**	**1.7**	0.39 J	<2.0	**35**	**2.1**	<1.0	**3.5**	**13**	1.7 J	<1.0	0.31 J	**5.6**	**120**	<0.20

Table 5
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
G-1	+		--	--	--	<0.50	--	--	--	<2.0	--	--	--	--	<1.0	--	--	<20	--
G-2	+		--	--	--	<0.50	--	--	--	<2.0	--	--	--	--	20	--	--	<20	--
G-3	+		--	--	--	<0.50	--	--	--	<2.0	--	--	--	--	30	--	--	<20	--
G-4	+		--	--	--	<0.50	--	--	--	<2.0	--	--	--	--	<1.0	--	--	<20	--
G-4	05/10/94		--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.20
G-4	06/15/00		--	--	**134**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G-4	06/22/01		--	--	**50**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G-4	02/28/02		**14**	**11**	**44**	**1.0**	**1.5**	**25**	--	**11**	**19**	--	**26**	**17**	**11**	**21**	**19**	<20	<0.20
G-4	02/17/06		0.32 J	0.80 J	**44**	<0.50	<1.0	<2.0	0.92 J	**4.8**	<1.0	**2.4**	0.36 J	**4.6**	<1.0	<1.0	**8.4**	4.2 J	<0.20
G-4	05/18/06		0.17 J	**1.0**	**42**	<0.50	0.046 J	<2.0	0.95 J	**2.8**	0.057 J	**3.0**	**3.9**	**3.8**	<1.0	<1.0	**8.6**	**6.8**	<0.20
G-4	08/21/06		0.16 J	<1.0	**43**	<0.50	0.056 J	1.4 J	1.3 J	2.3 J	0.40 J	2.9 J	**5.0**	**4.2**	<1.0	<1.0	**10.0**	7.0 J	<0.20
G-4	11/20/06		0.15 J	0.80 J	**48**	<0.50	<1.0	<2.0	**1.1**	**2.3**	<1.0	**3.0**	**2.3**	**3.4**	<1.0	<1.0	**9.2**	10 J	<0.20
G-4	03/01/07		0.078 J	**1.1**	**35**	<0.50	<1.0	<2.0	0.99 J	**2.2**	<1.0	**3.0**	1.2 J	**2.6**	<1.0	<1.0	**9.4**	9.1 J	<0.20
G-4	05/18/07		<2.0	**1.0**	**43 CQ**	<0.50	<1.0	<2.0	**1.0**	**3.5**	0.12 J	**3.0**	**2.3**	**2.5**	<1.0	<1.0	**8.6**	4.1 J,MB	<0.20
G-4	08/24/07		<10	<5.0	**35**	<2.5	<5.0	<10	0.98J	<10	<1.0	2.6 J	<2.0	7.6 J	<1.0	<1.0	9.1 J	<100	<0.20
G-4	11/15/07		<2.0	<1.0	**37**	<0.50	<1.0	<2.0	0.93 J	1.6 J	<1.0	**2.6**	<2.0	1.2 J	<1.0	<1.0	**6.9**	<20	<0.20
G-4	02/20/08		<2.0	**2.0**	**44**	<0.50	<1.0	<2.0	0.96 MB,J	**3.0**	<1.0	**2.6**	<2.0	0.32 J	<1.0	<1.0	**8.3**	8.3 J	<0.20
G-4	05/19/08		<2.0	0.82 J	**54**	<0.50	<1.0	<2.0	**1.1**	**3.4**	<1.0	**2.5**	<2.0	**3.6 CQ**	<1.0	<1.0	**7.1**	5.6 J	<0.20
G-4	08/18/08		<2.0	**1.0**	**41**	<0.50	<1.0	<2.0	**1.1**	**2.7**	<1.0	**2.5**	**3.8**	**6.3**	<1.0	<1.0	**7.7**	4.1 J	<0.20
G-4	11/10/08		<2.0	**1.7**	**38**	<0.50	<1.0	<2.0	**1.0**	**2.9**	<1.0	**2.6**	**2.2**	**5.2**	<1.0	<1.0	**7.2**	**31**	<0.20
G-4	02/18/09		<2.0	**1.3**	**48**	<0.50	<1.0	1.5 J	**1.2**	**3.6**	<1.0	**2.7**	<2.0	**3.2**	<1.0	<1.0	**8.5**	15 J	<0.20
G-4	05/27/09		<2.0	**1.1**	**44**	<0.50	<1.0	1.2 J	**1.7**	**6.8**	<1.0	**3.1**	<2.0	**3.5**	<1.0	<1.0	**10.0**	7.4 J	<0.20
G-4	08/25/09		<2.0	0.90 J	**40**	<0.50	<1.0	0.75 J	**1.2**	**4.7**	<1.0	**3.2**	1.8 J	**5.0**	<1.0	<1.0	**8.3**	4.3 J	<0.20
G-4	11/23/09		<2.0	**1.3**	**35**	<0.50	<1.0	<2.0	**1.0**	**3.8**	<1.0	**3.4**	**3.1**	**4.9**	<1.0	<1.0	**8.8**	<20	<0.20
G-4	02/22/10		<2.0	<1.0	**37**	<0.50	<1.0	<2.0	**1.2**	**3.0**	<1.0	**3.3**	**3.6**	**5.4**	<1.0	<1.0	**9.8**	<20	<0.20
G-4	05/27/10		<2.0	<1.0	**39**	<0.50	<1.0	<2.0	**1.2**	**3.2**	<1.0	**3.6**	**6.0**	**6.4**	<1.0	<1.0	**8.8**	<20	<0.20
G-4	08/31/10		<2.0	0.93 J	**40**	<0.50	<1.0	<2.0	**1.0**	1.8 J	<1.0	**3.9**	**5.0**	**5.6 B**	<1.0	<1.0	**8.2**	<20	<0.20
G-4	11/18/10		<2.0	**1.6**	**35**	<0.50	<1.0	<2.0	**1.1**	**3.1**	<1.0	**4.2**	0.79 J	**2.8**	<1.0	<1.0	**8.8**	**47**	<0.20
G-4	02/17/11		<2.0	**1.6**	**36**	<0.50	0.48 J	<2.0	**1.1**	**2.3**	<1.0	**4.0**	**2.9**	**3.5**	<1.0	<1.0	**8.3**	5.0 J	<0.20
G-4	05/09/11		<2.0	**1.0**	**40**	<0.50	0.17 J	<2.0	**1.0**	**3.3**	<1.0	**3.9**	<2.0	<2.0	<1.0	<1.0	**7.9**	6.7 J	<0.20
G-4	07/20/11		<2.0	**1.6**	**47**	<0.50	<1.0	<2.0	0.98 J	1.4 J	<1.0	**3.1**	**3.4**	**2.8**	<1.0	<1.0	**7.1**	9.3 J	<0.20
G-4	11/21/11		<2.0	**1.8**	**48**	<0.50	<1.0	<2.0	0.92 J	1.5 J	<1.0	**3.4**	**3.4**	**3.7**	<1.0	<1.0	**7.1**	9.4 J	<0.20
G-4	02/16/12		<2.0	**1.6**	**39**	<0.50	<1.0	<2.0	**1.1**	**3.0**	<1.0	**4.4**	**4.0**	**3.1**	<1.0	<1.0	**8.8**	<20	<0.20
G-4	05/22/12		<2.0	**3.8**	**39**	<0.50	<1.0	<2.0	0.87 J	1.2 J	<1.0	**4.2**	**2.8**	**4.5**	0.49 J	<1.0	**7.0**	<20	0.10 J,B
G-4	08/06/12		<2.0	**1.3**	**33**	<0.50	<1.0	<2.0	0.81 J	1.4 J	<1.0	**5.7 B**	**2.6**	**3.3**	<1.0	<1.0	**7.2**	6.2 J	<0.20
G-4	11/13/12		<2.0	**1.5**	**40**	<0.50	0.11 J	<2.0	**1.2**	**2.3**	0.23 J	**5.8**	**2.9**	**3.4**	0.24 J	<1.0	**8.2**	<20	<0.20
G-4	02/20/13		<2.0	**1.3**	**32**	<0.50	<1.0	<2.0	0.87 J	1.4 J	<1.0	**6.2**	**2.4**	**2.0**	<1.0	<1.0	**7.4**	4.6 J	<0.20
G-4	05/21/13		<2.0	**1.9**	**29**	<0.50	<1.0	<2.0	0.96 J	1.6 J	<1.0	**8.2**	**2.5**	1.8 J	<1.0	<1.0	**3.8**	<20	<0.20
G-4	08/06/13		<2.0	**1.3**	**33**	<0.50	0.18 J	<2.0	**1.0**	1.3 J	<1.0	**8.7 B**	**2.3**	**2.7**	<1.0	<1.0	**8.3**	7.1 J	<0.20
G-4	11/12/13		<2.0	0.88 J	**29**	<0.50	<1.0	<2.0	0.90 J	**2.1**	<1.0	**8.9**	**2.2**	1.3 J	<1.0	<1.0	**8.8**	8.8 J	<0.20
G-4	02/19/14		<2.0	**1.2**	**30**	<0.50	<1.0	<2.0	0.99 J	1.8 J	<1.0	**8.9**	**2.8**	1.7 J	<1.0	<1.0	**7.7**	8.0 J	<0.20
G-4	05/21/14		<2.0	**1.3**	**30**	<0.50	<1.0	<2.0	**1.1**	1.3 J	<1.0	**13 B**	**2.4**	**2.0**	<1.0	<1.0	**8.6**	6.6 J	0.12 J
G-4	08/12/14		<2.0	**1.2**	**29**	<0.50	<1.0	<2.0	**1.1**	**2.0**	<1.0	**12**	**3.2**	**2.8**	<1.0	<1.0	**8.4**	<20	<0.20
G-4	11/18/14		<2.0	**1.2**	**31**	<0.50	<1.0	<2.0	**1.0**	**2.0**	<1.0	**11**	**2.6**	1.6 J	<1.0	<1.0	**8.3**	5.4 J	<0.20
G-4	02/19/15		<2.0	0.95 J	**34**	<0.50	<1.0	<2.0	0.91 J	1.1 J	<1.0	**16**	1.6 J	<2.0	<1.0	<1.0	**9.8**	7.3 J	<0.20
G-4	05/18/15		<2.0	0.91 J	**30**	<0.50	<1.0	<2.0	0.78 J	0.71 J	<1.0	**13**	1.4 J	0.65 J	<1.0	<1.0	**7.8**	<20	<0.20
G-4	08/18/15		<2.0	0.85 J	**31**	<0.50	<1.0	<2.0	0.90 J	0.91 JB	<1.0	**13**	1.3 J	0.64 J	<1.0	<1.0	**8.3**	2.9 J	<0.20
G-4	11/02/15		<2.0	0.95 J	**35**	<0.50	<1.0	<2.0	0.81 J	1.8 J,B	<1.0	**14**	1.9 J	0.53 J	<1.0	<1.0	**8.5**	6.0 J,B	<0.20
G-4	03/03/16		0.81 J	**3.0**	**33**	0.34 J	0.39 J	<2.0	**1.5**	**5.9**	<1.0	**16**	**4.8**	**3.5**	<1.0	<1.0	**7.9**	4.5 J	<0.20
G-4	05/25/16		<2.0	0.87 J	**29**	<0.50	<1.0	<2.0	0.86 J	0.73 J	<1.0	**15**	1.3 J	0.53 J	<1.0	<1.0	**8.6**	3.6 J	<0.20
G-4	08/23/16		<2.0	0.94 J	**34**	<0.50	<1.0	<2.0	0.98 J	1.4 J	<1.0	**15**	1.7 J	0.51 J	<1.0	<1.0	**8.2**	<20	<0.20
G-4	11/21/16		<2.0	0.79 J	**30**	<0.50	<1.0	<2.0	0.82 J	0.74 J	<1.0	**13**	1.3 J	<2.0	<1.0	<1.0	**8.0**	<20	<0.20
G-4	02/22/17		<2.0	0.83 J	**30**	<0.50	<1.0	<2.0	0.86 J	0.79 J	<1.0	**13**	1.6 J	0.69 J	<1.0	<1.0	**7.7**	2.6 J	<0.20
G-4	05/23/17	Not sampled due to vandalism	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------

Table 5
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020															7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
G-4	08/16/17	No-purge sample collected with bailer, monument and casing found damaged well pump repaired/replaced	**2.3**	**1.5**	**130**	<0.50	**1.1**	1.9 J	0.60 J	**16**	0.59 J	**7.2**	**4.6**	0.94 J	<1.0	<1.0	**5.2**	**52**	<0.20
G-4	02/21/18		<2.0	**1.1**	**31**	<0.50	<1.0	<2.0	**1.3**	1.9 J	<1.0	**13**	**3.0**	**2.3**	<1.0	<1.0	**7.0**	3.5 J	<0.20
G-4	08/21/18		<2.0	0.97 J	**27**	<0.50	<1.0	<2.0	0.98 J	0.78 J	<1.0	**18**	1.6 J	<2.0	<1.0	<1.0	**7.7**	12 J	<0.20
G-4	02/12/19		<2.0	0.92 J	**32**	<0.50	<1.0	**3.3 B**	**1.1**	0.95 J	<1.0	**15**	**3.7**	0.74 J	<1.0	<1.0	**7.5**	<20	<0.20
G-4	08/20/19		<2.0	**1.0**	**29**	<0.50	<1.0	<2.0	0.85 J	<2.0	<1.0	**17**	1.5 J	0.58 J	<1.0	<1.0	**7.3**	10 J, B	<0.20
G-4	02/18/20		<2.0	0.79 J	**28**	<0.50	<1.0	<2.0	0.91 J	0.84 J	<1.0	**15**	1.5 J	<2.0	<1.0	<1.0	**6.4**	5.3 J	<0.20
G-4	08/18/20		<2.0	**1.4**	**34**	<0.50	<1.0	<2.0	0.86 J	0.65 J	<1.0	**15**	**2.1**	**2.0**	<1.0	<1.0	**6.9**	**21**	<0.20

Table 5
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020																7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
UG-CHAN-20060216	02/16/06		0.37 J	**1.1**	**89**	<0.50	0.17 J	1.9 J	0.45 J	**11**	0.86 J	**6.0**	1.3 J	**3.2**	<1.0	<1.0	**4.4**	**21**	<0.20
FDCC-W-20080520	05/20/08		**2.5**	**2.7**	**100**	<0.50	0.24 J	1.1 J	0.60 J	**14**	**3.1**	**10**	**2.4**	0.98 J	<1.0	<1.0	**6.5**	**27**	<0.20
DG-CHAN-20060216	02/16/06		1.2 J	<1.0	**110**	<0.50	0.33 J	**2.9**	0.96 J	**17**	**4.9**	**5.4**	**2.4**	1.6 J	0.070 J	<1.0	**4.9**	**64**	<0.20
FDCC-E-20080520	05/20/08		**2.3**	**3.0**	**93**	<0.50	0.25 J	1.2 J	0.65 J	**16**	**2.4**	**11**	**2.9**	1.1 J	<1.0	<1.0	**6.3**	**33**	<0.20
FB-SUMP	02/16/06	Field Blank	0.050 J	<1.0	0.39 J	<0.50	<1.0	0.80 J	<2.0	0.52 J	<1.0	<2.0	<2.0	0.58 J	<1.0	<1.0	<2.0	<20	<0.20
FB-SUMP	02/17/06	Field Blank	0.15 J	<1.0	<1.0	<0.50	<1.0	0.89 J	<2.0	0.75 J	<1.0	<2.0	<2.0	0.53 J	<1.0	<1.0	<2.0	<20	<0.20
FB-SUMP	05/17/06	Field Blank	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FB-SUMP	05/18/06	Field Blank	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 5
Historical Title 22 Metals (Total) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020															7470 A
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2

Notes:
* = Analyte was quantitated below the established linear calibration range. Amount reported is an estimate.
** = Method in water by manual cold vapor
+ = Sampling occurred between August 10 and 17, 1987
CQ = Analyte concentration greater than 10 times the blank concentration
J = Analyte was detected between the MDL and the RL
LN,AY = The MS &/or the MSD were below acceptance limits due to sample matrix interference.
ND = Not Detected. This data was obtained from a summary table of a report not prepared by SECOR. The actual laboratory reports are not available, thus MDL's can not be determined for this data.
MB or B = Analyte present in Method Blank
B-1 = Analyte present in Method Blank, Analyte concentration in sample is greater than 10x the concentration found in the method blank
<# = Analyte was not detected above the Reporting Limit (#)
ug/L = micrograms per liter
na = Not applicable
-- = Not applicable / Not analyzed
Results highlighted with **Bold** font indicate results > RL
(1) - National Primary Drinking Water Regulations - EPA Region 9
(2) - California Department of Public Health
(3) - Secondary MCL per CCR Title 22, Div. 4, Chapter 15, Article 16
MCLs = Maximum Contaminant Levels
bold # Results highlighted with a gray box indicate results > MCL
Prior to 2006, some table data was incorrectly represented in mg/L and has been updated to correctly reflect µg/L.
On October 30, 2014, DTSC approved the removal of MW-01A and MW-01B from the groundwater sampling plan.
For safety and security reasons, the surface water sampling locations in the Dominguez Flood Control Channel (DFCC) have been re-located.
During Q2, 2017 GW event, due to vandalism (hinges on well lid cut off and pump stolen), MW-04B and G-4 were sampled using a bailer and analyzed only for GRO and VOC's.
During Q3, 2017 GW event, due to vandalism (monument was found damaged), a no-purge sample was collected from G-4.

References:

Ecology and Environment, 1987. *Site Inspection Report Gardena Sumps, Gardena California.*
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Table 6
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-01A	05/17/06		<2.0	**1.3**	**75**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.6**	<2.0	<2.0	<1.0	<1.0	**6.6**	<20	<0.20
MW-01A	08/21/06		0.26 J	<1.0	**79**	<0.50	0.14 J	<2.0	0.31 J	1.1 J	<1.0	**3.5**	**3.0**	1.1 J	<1.0	<1.0	**4.3**	2.5 J	<0.20
MW-01A	11/20/06		0.080 J	<1.0	**77**	<0.50	0.18 J	<2.0	0.34 J	1.4 J	<1.0	**3.4**	<2.0	0.99 J	<1.0	<1.0	**6.5**	2.6 J	<0.20
MW-01A	03/02/07	No sample	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	05/18/07		<2.0	**1.6**	**66**	<0.50	0.15 J	<2.0	0.37 J	1.0 J	<1.0	**2.7**	1.5 J	1.7 J	<1.0	<1.0	**6.0**	<20	<0.20
MW-01A	08/23/07		<10	<5.0	**78**	<2.5	<5.0	<10	<5.0	<10	<5.0	3.9 J	<10	<10	<5.0	<5.0	3.6 J	<100	<0.20
MW-01A	11/15/07		<2.0	**1.0**	**68**	<0.50	0.15 J	<2.0	0.41 J	1.3 J	0.13 J	**2.3**	<2.0	0.77 J	<1.0	<1.0	**5.7**	19 J	<0.20
MW-01A	02/19/08		0.23 J	**1.5**	**85**	<0.50	0.13 J	<2.0	0.57 J	1.4 J	<1.0	**3.6**	<2.0	0.68 J	<1.0	<1.0	**5.1**	2.7 J	<0.20
MW-01A	05/19/08		<2.0	**1.5**	**88**	<0.50	0.14 J	<2.0	0.35 J	1.1 J	<1.0	**3.5**	<2.0	**2.0 MB**	<1.0	<1.0	**5.4**	<20	<0.20
MW-01A	08/18/08		<2.0	**1.0**	**72**	<0.50	0.14 J	<2.0	0.39 J	1.1 J	<1.0	**3.1**	1.6 J	1.3 J	<1.0	<1.0	**5.4**	3.8 J	<0.20
MW-01A	11/10/08		0.29 J	**1.3**	**75**	<0.50	0.15 J	<2.0	0.41 J	1.1 J	<1.0	**2.5**	<2.0	1.8 J	<1.0	<1.0	**6.6**	<20	<0.20
MW-01A	02/18/09		<2.0	**1.4**	**78**	<0.50	0.16 J	<2.0	0.51 J	1.2 J	<1.0	**3.2**	<2.0	1.6 J	<1.0	<1.0	**5.5**	2.5 J	<0.20
MW-01A	05/27/09		0.26 J	**1.3**	**86**	<0.50	0.15 J	<2.0	0.70 J	**2.2**	<1.0	**3.7**	<2.0	1.3 J	<1.0	<1.0	**5.9**	<20	<0.20
MW-01A	08/25/09		0.28 J	0.92 J	**79**	<0.50	0.14 J	<2.0	0.49 J	**2.0**	<1.0	**3.2**	<2.0	0.97 J	<1.0	<1.0	**6.5**	2.7 J	<0.20
MW-01A	11/23/09		0.56 J	<1.0	**70**	<0.50	0.23 J	1.1 J	0.51 J	1.6 J	0.31 J	1.8 J	1.0 J	**2.8**	<1.0	<1.0	**6.9**	<20	<0.20
MW-01A	02/22/10		<2.0	**1.8**	**100**	<0.50	0.18 J	<2.0	0.80 J	1.9 J	<1.0	**4.1**	**2.7**	**2.2**	<1.0	<1.0	**4.4**	<20	<0.20
MW-01A	05/27/10		<2.0	**1.4**	**82**	<0.50	0.17 J	<2.0	0.57 J	**2.1**	<1.0	**2.3**	1.7 J	**3.0**	<1.0	<1.0	**7.3**	<20	<0.20
MW-01A	08/31/10		0.45 J	<1.0	**77**	<0.50	0.17 J	<2.0	0.47 J	1.1 J, B	<1.0	**2.6**	1.7 J	**2.0**	<1.0	<1.0	**6.6**	<20	<0.20
MW-01A	11/18/10		<2.0	**1.5**	**77**	<0.50	0.16 J	<2.0	0.43 J	1.4 J	<1.0	**2.2**	<2.0	1.6 J	<1.0	<1.0	**5.8**	<20	<0.20
MW-01A	02/15/11		<4.0	<2.0	**86**	<1.0	0.34 J	<4.0	1.1 J	<4.0	<2.0	2.2 J	1.3 J	1.2 J	<2.0	<2.0	**5.9**	<40	<0.20
MW-01A	05/09/11		0.33 J	**1.0**	**84**	<0.50	0.17 J	<2.0	0.36 J	1.2 J	<1.0	**2.9**	<2.0	0.76 J	<1.0	<1.0	**5.9**	<20	<0.20
MW-01A	07/20/11		<2.0	**1.5**	**85**	<0.50	0.20 J	<2.0	0.30 J	0.73 J	<1.0	**2.8**	1.3 J	0.86 J	<1.0	<1.0	**5.1**	<20	<0.20
MW-01A	11/21/11		0.48 J	**1.6**	**95**	<0.50	0.19 J	<2.0	0.70 J	1.5 J	<1.0	**3.9**	0.95 J	0.95 J	<1.0	<1.0	**4.6**	8.7 J	<0.20
MW-01A	02/15/12	lab filtered	<2.0	**1.1**	**88**	0.11 J	0.26 J	<2.0	0.52 J	**16**	<1.0	**2.0**	<2.0	1.5 J,B	0.18 J	<1.0	**5.0**	<20	<0.20
MW-01A	05/22/12		<2.0	**1.7**	**91**	<0.50	0.21 J	<2.0	0.56 J	1.6 J	<1.0	**2.3**	1.2 J	**2.9**	0.37 J	<1.0	**5.5**	<20	<0.20
MW-01A	08/06/12		0.30 J	**1.8**	**95**	<0.50	0.14 J	<2.0	0.56 J	1.1 J	<1.0	**4.0 B**	1.7 J	**2.3**	0.62 J	<1.0	**3.5**	<20	<0.20
MW-01A	11/14/12		<2.0	**1.4**	**79**	<0.50	0.22 J	<2.0	0.21 J	1.8 J	<1.0	**3.1**	1.1 J	0.83 J	<1.0	<1.0	**6.3**	7.2 J	<0.20
MW-01A	05/21/13		<2.0	**1.7**	**100**	<0.50	0.23 J	<2.0	0.44 J	1.3 J	<1.0	**3.4**	1.5 J	0.94 J	0.13 J	<1.0	**4.3**	<20	<0.20
MW-01A	08/06/13		<2.0	**1.2**	**88**	<0.50	0.13 J	<2.0	0.27 J	0.69 J	<1.0	**3.4 B**	0.89 J	**2.1**	0.13 J	<1.0	**5.6**	<20	0.19 J
MW-01A	11/12/13	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	02/20/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	05/21/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	08/12/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01A	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 6
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-01B	05/17/06		<2.0	**1.7**	**470**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**2.7**	<2.0	**2.5**	<1.0	<1.0	<2.0	<20	<0.20
MW-01B	08/21/06		0.21 J	<1.0	**450**	<0.50	0.091 J	<2.0	0.43 J	0.73 J	<1.0	1.9 J	**4.4**	**3.6**	<1.0	<1.0	1.0 J	3.3 J	<0.20
MW-01B	11/20/06		0.78 J	<1.0	**340**	<0.50	0.12 J	<2.0	0.24 J	**2.1**	<1.0	**3.1**	<2.0	1.6 J	<1.0	<1.0	1.5 J	<20	<0.20
MW-01B	03/02/07		0.95 J	0.76 J	**260**	<0.50	0.16 J	<2.0	0.24 J	**2.4 MB**	<1.0	**3.3**	<2.0	1.9 J	<1.0	<1.0	1.6 J	6.4 J	<0.20
MW-01B	05/18/07		0.66 J	**1.3**	**330**	<0.50	0.15 J	<2.0	0.37 J	1.3 J	<1.0	**3.2**	**2.2**	**4.5**	<1.0	<1.0	0.90 J	<20	<0.20
MW-01B	08/23/07		<2.0	<1.0	**260**	<2.5	<5.0	<10	<5.0	<10	<5.0	3.9J	<10	1.6J	<5.0	<5.0	<10	<100	<0.20
MW-01B	11/15/07		0.52 J	<1.0	**280**	<0.50	0.15 J	<2.0	0.35 J	1.8 J	<1.0	**3.0**	<2.0	**2.3**	<1.0	<1.0	1.1 J	2.6 J	<0.20
MW-01B	02/19/08		0.22 J	<1.0	**340**	<0.50	0.20 J	<2.0	0.45 J	1.2 J	<1.0	**3.2**	<2.0	**2.2**	<1.0	<1.0	1.0 J	3.0 J	<0.20
MW-01B	05/19/08		<2.0	<1.0	**350**	<0.50	<1.0	<2.0	0.38 J	<2.0	<1.0	**2.6**	<2.0	**3.4 MB**	<1.0	<1.0	0.98 J	<20	<0.20
MW-01B	08/18/08		0.44 J	**1.1**	**320**	<0.50	<1.0	<2.0	0.48 J	0.91 J	<1.0	**2.7**	1.8 J	**4.6**	<1.0	<1.0	1.3 J	<20	<0.20
MW-01B	11/10/08		0.82 J	**1.3**	**320**	<0.50	<1.0	<2.0	0.44 J	0.88 J	<1.0	**3.0**	**3.1**	**5.1**	<1.0	<1.0	1.5 J	<20	<0.20
MW-01B	02/18/09		0.51 J	0.87 J	**280**	<0.50	<1.0	0.79 J	0.48 J	1.1 J	<1.0	**3.2**	<2.0	**4.0**	<1.0	<1.0	1.4 J	<20	<0.20
MW-01B	05/27/09		0.42 J	**1.3**	**330**	<0.50	<1.0	<2.0	0.59 J	1.7 J	<1.0	**3.1**	<2.0	**3.4**	<1.0	<1.0	1.2 J	<20	<0.20
MW-01B	08/25/09		0.39 J	<1.0	**290**	<0.50	<1.0	<2.0	0.43 J	**4.6**	<1.0	**3.3**	<2.0	**2.3**	<1.0	<1.0	1.6 J	<20	<0.20
MW-01B	11/23/09		0.31 J	<1.0	**72**	<0.50	<1.0	<2.0	0.48 J	1.2 J	<1.0	**3.2**	1.8 J	**5.2**	<1.0	<1.0	1.7 J	<20	<0.20
MW-01B	02/22/10		<2.0	<1.0	**310**	<0.50	0.11 J	<2.0	0.49 J	1.4 J	<1.0	**2.5**	1.9 J	**5.7**	<1.0	<1.0	1.6 J	<20	<0.20
MW-01B	05/27/10		0.44 J	**1.3**	**320**	<0.50	<1.0	<2.0	0.60 J	1.7 J	<1.0	**2.9**	**2.3**	**6.2**	<1.0	<1.0	**2.3**	<20	<0.20
MW-01B	08/31/10		0.95 J	**1.1**	**290**	<0.50	<1.0	<2.0	0.41 J	0.73 J, B	<1.0	**3.1**	**3.4**	**5.2**	<1.0	<1.0	1.1 J	<20	<0.20
MW-01B	11/18/10		0.41 J	**1.2**	**290**	<0.50	<1.0	1.1 J	0.45 J	1.7 J	<1.0	**2.9**	<2.0	**4.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-01B	02/15/11		0.83 J	**2.0**	**230**	<1.0	0.37 J	<4.0	0.33 J	<4.0	<2.0	3.8 J	1.6 J	3.9 J	<2.0	<2.0	2.1 J	<40	<0.20
MW-01B	05/09/11		0.33 J	0.94 J	**280**	<0.50	0.10 J	<2.0	0.37 J	0.77 J	<1.0	**3.1**	<2.0	1.7 J	<1.0	<1.0	1.6 J	<20	<0.20
MW-01B	07/20/11		<2.0	**1.7**	**290**	<0.50	<1.0	<2.0	0.30 J	<2.0	<1.0	**2.5**	1.1 J	**2.6**	<1.0	<1.0	1.7 J	<20	<0.20
MW-01B	11/21/11		<2.0	**1.5**	**260**	<0.50	<1.0	<2.0	0.42 J	1.2 J	<1.0	**3.8**	0.61 J	**2.7**	<1.0	<1.0	**2.2**	4.7 J	<0.20
MW-01B	02/15/12		0.33 J	<1.0	**270**	<0.50	0.12 J	<2.0	0.46 J	1.2 J	<1.0	**2.9**	<2.0	**4.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-01B	05/22/12		<2.0	**1.8**	**270**	<0.50	<1.0	<2.0	0.41 J	1.7 J	<1.0	**2.5**	1.2 J	**5.5**	0.44 J	<1.0	1.4 J	<20	<0.20
MW-01B	08/05/12		<2.0	**1.7**	**290**	<0.50	<1.0	<2.0	0.30 J	0.74 J	<1.0	**2.9 B**	1.7 J	**4.5**	0.10 J	<1.0	1.3 J	<20	<0.20
MW-01B	11/14/12		<2.0	**1.8**	**250**	<0.50	<1.0	<2.0	0.27 J	0.97 J	<1.0	**2.6**	0.81 J	**2.6**	<1.0	<1.0	1.5 J	<20	<0.20
MW-01B	02/19/13		0.36 J	**1.9**	**260**	<0.50	<1.0	**2.2**	0.25 J	0.61 J	0.32 J	**2.8**	0.69 J	**3.2**	0.42 J	<1.0	1.5 J	13 J	<0.20
MW-01B	05/21/13		<2.0	**1.5**	**270**	<0.50	<1.0	<2.0	0.32 J	1.0 J	<1.0	**2.9**	1.2 J	**2.4**	0.12 J	<1.0	1.5 J	5.0 J	<0.20
MW-01B	08/06/13		0.97 J	**1.5**	**220**	<0.50	<1.0	<2.0	0.15 J	1.1 J	<1.0	**5.1 B**	0.82 J	**2.3**	0.16 J	<1.0	1.8 J	5.0 J	0.12 J
MW-01B	11/12/13	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	02/20/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	05/21/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	08/12/14	Well inaccessible; not sampled	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-01B	11/18/14	Well removed from sampling plan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 6
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-02A	05/18/06		<2.0	**1.1**	**57**	<0.50	0.31 J	<2.0	**1.0**	**9.4**	<1.0	**5.5**	1.4 J	0.35 J	<1.0	<1.0	**5.9**	3.6 J	<0.20
2MW-02A	05/18/06	Duplicate	<2.0	<1.0	**54**	<0.50	0.32 J	<2.0	**1.1**	**2.0**	<1.0	**5.9**	**2.3**	0.40 J	<1.0	<1.0	**5.6**	3.4 J	<0.20
MW-02A	08/22/06		<2.0	<1.0	**49**	<0.50	0.21 J	<2.0	**1.0**	1.4 J	0.18 J	**5.0**	**2.5**	0.35 J	<1.0	<1.0	**3.2**	3.7 J	<0.20
2MW-02A	08/22/06	Duplicate	<2.0	<1.0	**50**	<0.50	0.22 J	<2.0	**1.0**	1.3 J	<1.0	**5.2**	**2.5**	<2.0	<1.0	<1.0	**2.6**	2.3 J	<0.20
MW-02A	11/21/06		0.083 J	<1.0	**48**	<0.50	0.22 J	<2.0	**1.5**	1.8 J	<1.0	**6.2**	<2.0	0.72 J	<1.0	<1.0	**4.8**	<20	<0.20
MW-02A	03/02/07		0.087 J	**1.0 MB**	**45 CQ**	<0.50	0.22 J	<2.0	**1.4**	**2.7 MB**	<1.0	**6.1**	<2.0	0.38 J	<1.0	<1.0	**4.5**	5.2 MB,J	<0.20
MW-02A	05/17/07		<2.0	<1.0	**41**	<0.50	0.18 J	<2.0	0.82 J	1.3 J	<1.0	**5.8**	0.95 J	0.60 J	<1.0	<1.0	**4.4**	<20	<0.20
MW-02A	08/24/07		<10	<5.0	**47**	<2.5	<5.0	<10	1.6 J	<10	<1.0	7.6 J	<10	<10	<5.0	<5.0	4.4J	<100	<0.20
MW-02A	11/16/07		<2.0	<1.0	**42**	<0.50	0.20 J	**4.8 MB**	**1.6**	1.7 MB,J	<1.0	**6.2**	1.5 J	0.57 J	<1.0	<1.0	**3.8**	<20	<0.20
MW-02A	02/20/08		<2.0	<1.0	**45**	<0.50	0.20 J	<2.0	**1.5**	1.6 J	<1.0	**6.7**	<2.0	0.36 J	<1.0	<1.0	**4.7**	<20	<0.20
MW-02A	05/20/08		<2.0	<1.0	**39**	<0.50	0.15 J	<2.0	0.88 J	1.1 J	<1.0	**6.0**	<2.0	0.93 J,MB	<1.0	<1.0	**4.3**	<20	<0.20
MW-02A	08/19/08		<2.0	<1.0	**39**	<0.50	0.21 J	<2.0	**1.2**	1.5 J	<1.0	**6.6**	1.4 J	0.54 J	<1.0	<1.0	**4.0**	<20	<0.20
MW-02A	11/11/08		0.33 J	<1.0	**46**	<0.50	0.22 J	<2.0	**1.5**	1.7 J	<1.0	**7.4**	<2.0	0.44 J	<1.0	<1.0	**4.6**	6.3 J	<0.20
MW-02A	02/19/09		<2.0	0.96 J	**53**	<0.50	0.23 J	<2.0	**1.4**	1.3 J	<1.0	**7.0**	<2.0	1.1 J	<1.0	<1.0	**4.5**	<20	<0.20
MW-02A	05/28/09		<2.0	<1.0	**36**	<0.50	0.14 J	<2.0	0.80 J	**2.0**	<1.0	**6.5**	<2.0	0.69 J	<1.0	<1.0	**4.6**	<20	<0.20
MW-02A	08/26/09		<2.0	**1.0**	**44**	<0.50	0.28 J	<2.0	**1.5**	1.7 J	<1.0	**7.7**	<2.0	0.69 J	<1.0	<1.0	**5.5**	<20	<0.20
MW-02A	11/24/09		<2.0	<1.0	**47**	<0.50	0.25 J	<2.0	**1.5**	1.5 J	<1.0	**7.0**	1.2 J	1.1 J	<1.0	<1.0	**4.2**	5.4 J	<0.20
MW-02A	02/23/10		<2.0	<1.0	**47**	<0.50	0.20 J	<2.0	**1.1**	1.7 J	<1.0	**7.4**	0.87 J	0.85 J	<1.0	0.32 J	**4.1**	<20	<0.20
MW-02A	05/28/10		<2.0	<1.0	**40**	<0.50	0.12 J	<2.0	0.65 J	1.5 J	<1.0	**5.7**	0.61 J	0.94 J	<1.0	<1.0	**3.2**	<20	<0.20
MW-02A	09/01/10		0.33 J	<1.0	**47**	<0.50	0.27 J	<2.0	**1.3**	1.4 J	<1.0	**8.5**	1.5 J	<2.0	<1.0	0.21 J	**4.4**	<20	<0.20
MW-02A	11/19/10		<2.0	<1.0	**52**	<0.50	0.24 J	<2.0	**1.4**	1.9 J	<1.0	**7.5**	<2.0	0.56 J	<1.0	<1.0	**4.2**	7.6 J	<0.20
MW-02A	02/17/11		<2.0	<1.0	**63**	<0.50	0.69 J	<2.0	**1.4**	1.3 J	<1.0	**6.9**	1.0 J	0.97 J	<1.0	<1.0	**4.8**	<20	<0.20
MW-02A	05/10/11		<2.0	<1.0	**54**	<0.50	0.17 J	<2.0	0.79 J	1.4 J	<1.0	**5.9**	<2.0	0.52 J	<1.0	<1.0	**4.1**	<20	<0.20
MW-02A	07/21/11		<2.0	<1.0	**46**	<0.50	0.23 J	<2.0	0.91 J	0.98 J	<1.0	**8.3**	0.99 J	0.53 J	<1.0	<1.0	**4.2**	<20	<0.20
MW-02A	11/22/11		<2.0	<1.0	**57**	<0.50	0.26 J	<2.0	**1.4**	1.8 B,J	<1.0	**6.9**	0.70 B,J	<2.0	<1.0	<1.0	**5.5**	4.0 J	<0.20
MW-02A	02/16/12		<2.0	<1.0	**69**	<0.50	0.30 J	<2.0	**1.8**	1.6 J	<1.0	**9.1**	<2.0	0.58 J	<1.0	<1.0	**5.3**	<20	<0.20
MW-02A	05/23/12		<2.0	<1.0	**53**	<0.50	0.22 J	<2.0	0.81 J	1.2 J	<1.0	**6.2**	<2.0	0.71 J	0.52 J,B	<1.0	**4.4**	<20	<0.20
MW-02A	08/07/12		<2.0	<1.0	**47**	<0.50	0.21 J	<2.0	0.92 J	1.4 J	<1.0	**8.9 B**	1.4 J	0.85 J	<1.0	<1.0	**4.1**	<20	<0.20
MW-02A	11/14/12		<2.0	<1.0	**54**	<0.50	0.25 J	<2.0	**1.3**	**2.1**	<1.0	**7.0**	**2.0**	0.67 J	<1.0	<1.0	**4.4**	<20	<0.20
MW-02A	02/20/13		<2.0	<1.0	**63**	<0.50	0.27 J	<2.0	**1.4**	1.6 J	<1.0	**7.6**	0.61 J	<2.0	<1.0	<1.0	**4.4**	<20	<0.20
MW-02A	05/22/13		<2.0	<1.0	**48**	<0.50	0.15 J	<2.0	0.76 J	1.2 J	<1.0	**5.3**	1.0 J	<2.0	<1.0	<1.0	**3.7**	<20	<0.20
MW-02A	08/07/13		<2.0	<1.0	**44**	<0.50	0.13 J	<2.0	0.96 J	0.84 J	<1.0	**7.1 B**	0.73 J	<2.0	<1.0	<1.0	**4.0**	<20	<0.20
MW-02A	11/13/13		<2.0	<1.0	**49**	<0.50	<1.0	<2.0	**1.2**	1.9 J	<1.0	**6.8**	0.82 J	<2.0	<1.0	<1.0	**4.1**	<20	<0.20
MW-02A	02/20/14		<2.0	<1.0	**61**	<0.50	0.25 J	<2.0	**1.4**	1.0 J	<1.0	**8.3**	0.83 J	<2.0	<1.0	<1.0	**4.4**	5.9 J	<0.20
MW-02A	05/22/14		<2.0	<1.0	**56**	<0.50	<1.0	<2.0	**1.3**	0.90 J	<1.0	**6.7**	0.90 J	<2.0	<1.0	<1.0	**4.0**	<20	<0.20
MW-02A	08/13/14		<2.0	<1.0	**57**	<0.50	<1.0	<2.0	**1.3**	0.71 J	<1.0	**6.9**	0.98 J	<2.0	<1.0	<1.0	**3.9**	<20	<0.20
MW-02A	11/19/14		<2.0	<1.0	**63**	<0.50	0.26 J	<2.0	**1.6**	1.2 J	<1.0	**7.6**	1.2 J	<2.0	<1.0	<1.0	**4.4**	3.9 J	<0.20
MW-02A	02/20/15		<2.0	0.52 J	**65**	<0.50	0.26 J	<2.0	**1.7**	1.1 J	<1.0	**9.1**	1.3 J	<2.0	<1.0	<1.0	**5.0**	5.2 J	<0.20
MW-02A	05/19/15		<2.0	<1.0	**60**	<0.50	<1.0	<2.0	**1.4**	1.0 J	<1.0	**7.4**	0.57 J	<2.0	<1.0	<1.0	**4.5**	<20	<0.20
MW-02A	08/19/15		<2.0	<1.0	**59**	<0.50	<1.0	<2.0	**1.6**	0.70 J	<1.0	**6.9**	0.50 J	<2.0	<1.0	<1.0	**4.5**	<20	<0.20
MW-02A	11/03/15		<2.0	0.56 J	**66**	<0.50	0.30 J	<2.0	**1.9**	1.6 J	<1.0	**8.1**	<2.0	<2.0	<1.0	<1.0	**4.9**	<20	<0.20
MW-02A	03/04/16		<2.0	<1.0	**67**	<0.50	0.27 J	<2.0	**2.0**	**12**	<1.0	**7.2**	0.69 J	<2.0	<1.0	<1.0	**4.7**	**56**	<1.0
MW-02A	05/26/16		<2.0	<1.0	**69**	<0.50	0.26 J	<2.0	**2.2**	1.7 J	<1.0	**7.3**	1.1 J	<2.0	<1.0	<1.0	**4.5**	3.6 J	<0.20
MW-02A	08/24/16		<2.0	<1.0	**70**	<0.50	0.27 J	<2.0	**1.9**	1.0 J	<1.0	**7.3 B**	0.63 J	<2.0	<1.0	<1.0	**4.9**	<20	<0.20
MW-02A	11/22/16		<2.0	<1.0	**74**	<0.50	0.28 J	<2.0	**2.3**	1.2 J	<1.0	**6.8**	0.84 J	<2.0	<1.0	<1.0	**4.8**	<20	<0.20
MW-02A	02/23/17		<2.0	<1.0	**59**	<0.50	<1.0	<2.0	**1.3**	1.2 J	<1.0	**5.0**	0.59 J	<2.0	<1.0	<1.0	**5.0**	2.6 J	<0.20
MW-02A	05/22/17	Well vandalised, locks cut	<2.0	<1.0	**49**	<0.50	<1.0	<2.0	0.87 J	1.5 J	<1.0	**4.5**	0.73 J	0.84 J	<1.0	<1.0	**4.4**	3.6 J	<0.20
MW-02A	08/17/17		<10	<5.0	**63**	<2.5	<5.0	<10	<5.0	<10	<5.0	6.8 J	<10	<10	<5.0	<5.0	5.3 J	<100	<0.20
MW-02A	02/22/18		<2.0	**1.1**	**39**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**5.3**	0.75 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-02A	08/22/18		<2.0	<1.0	**74**	<0.50	0.28 J	<2.0	**1.6**	1.3 J	<1.0	**7.7**	0.96 J	<2.0	<1.0	<1.0	**5.7**	4.3 J	<0.20
MW-02A	02/13/19		<2.0	<1.0	**100**	<0.50	0.44 J	1.9 J, B	**2.5**	1.4 J	<1.0	**7.8**	1.7 J, B	<2.0	<1.0	<1.0	**6.6**	<20	<0.20
MW-02A	08/21/19		<2.0	<1.0	**100**	<0.50	0.40 J	<2.0	**2.5**	1.4 J	<1.0	**7.3**	0.87 J	<2.0	<1.0	<1.0	**6.5**	4.6 J, B	<0.20
MW-02A	02/19/20		<2.0	<1.0	**100**	<0.50	0.39 J	<2.0	**2.4**	**6.1**	0.74 J	**7.8**	1.3 J	0.93 J	<1.0	<1.0	**6.2**	18 J	<0.20
MW-02A	08/19/20		0.57 J	0.51 J	**92**	<0.50	0.46 J	<2.0	**2.6**	**1.4 J**	<1.0	**8.4**	0.75 J	0.67 J	<1.0	<1.0	**6.2**	<20	<0.20

Table 6
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-02B	05/17/06		<2.0	**2.3**	**34**	<0.50	<1.0	<2.0	<1.0	**2.1**	<1.0	**2.9**	<2.0	**2.8**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/22/06		<2.0	<1.0	**33**	<0.50	<1.0	<2.0	0.34 J	1.5 J	<1.0	**2.6**	**3.4**	**5.0**	<1.0	<1.0	<2.0	2.2 J	<0.20
MW-02B	11/21/06		<2.0	0.90 J	**30**	<0.50	<1.0	<2.0	0.21 J	1.6 J	<1.0	**2.9**	<2.0	**3.2**	<1.0	<1.0	<2.0	2.8 J	<0.20
MW-02B	03/02/07		<2.0	**1.8 MB**	**27 CQ**	<0.50	<1.0	<2.0	0.25 J	**2.3 MB**	<1.0	**3.4**	<2.0	**2.4**	<1.0	<1.0	<2.0	5.1 MB,J	<0.20
MW-02B	05/17/07		<2.0	**1.0**	**32**	<0.50	<1.0	<2.0	0.23 J	1.2 J	<1.0	**3.0**	0.96 J	**4.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/24/07		<2.0	<1.0	**34**	<2.5	<5.0	<10	<5.0	<10	<5.0	3.0 J	<10	3.3 J	<5.0	<5.0	<10	<100	<0.20
MW-02B	11/16/07		<2.0	<1.0	**28**	<0.50	<1.0	<2.0	0.26 J	1.7 MB,J	<1.0	**2.2**	<2.0	**2.0**	<1.0	<1.0	<2.0	3.7 MB,J	<0.20
MW-02B	02/20/08		<2.0	<1.0	**29**	<0.50	<1.0	<2.0	0.29 J	**2.5**	<1.0	**3.2**	<2.0	0.54 J	<1.0	<1.0	<2.0	4.0 J	<0.20
MW-02B	05/20/08		<2.0	**1.0**	**33**	<0.50	<1.0	<2.0	0.22 J	1.6 J	<1.0	**3.0**	<2.0	**2.1 MB**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/19/08		<2.0	<1.0	**30**	<0.50	<1.0	<2.0	0.30 J	1.4 J	<1.0	**3.0**	**2.0**	**5.2**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	11/11/08		0.97 J	<1.0	**34**	<0.50	<1.0	<2.0	0.31 J	1.8 J	<1.0	**3.6**	<2.0	**2.8**	<1.0	<1.0	<2.0	2.8 J	<0.20
MW-02B	02/19/09		<2.0	<1.0	**35**	<0.50	<1.0	<2.0	0.28 J	1.9 J	<1.0	**3.3**	1.0 J	**2.5**	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-02B	05/28/09		<2.0	0.97 J	**33**	<0.50	<1.0	<2.0	0.30 J	**4.8**	<1.0	**4.3**	<2.0	**2.6**	<1.0	<1.0	<2.0	3.2 J	<0.20
MW-02B	08/26/09		<2.0	**1.8**	**37**	<0.50	<1.0	<2.0	0.40 J	**2.1**	<1.0	**3.7**	0.95 J	**4.0**	<1.0	<1.0	<2.0	3.4 J	<0.20
MW-02B	11/24/09		<2.0	**1.1**	**34**	<0.50	<1.0	<2.0	0.36 J	1.5 J	<1.0	**3.2**	1.6 J	**5.6**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	02/23/10		<2.0	<1.0	**32**	<0.50	<1.0	<2.0	0.36 J	**2.0**	<1.0	**3.8**	1.3 J	**5.3**	<1.0	<1.0	<2.0	5.3 J	<0.20
MW-02B	05/28/10		<2.0	<1.0	**34**	<0.50	<1.0	<2.0	0.32 J	1.6 J	<1.0	**3.4**	0.83 J	**6.5**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	09/01/10		<2.0	<1.0	**34**	<0.50	<1.0	<2.0	0.30 J	1.1 J	<1.0	**4.3**	1.5 J	**3.6**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	11/19/10		<2.0	0.97 J	**36**	<0.50	<1.0	1.1 J	0.26 J	**2.3**	<1.0	**3.5**	<2.0	**3.3**	<1.0	<1.0	<2.0	4.5 J	<0.20
MW-02B	02/17/11		<2.0	**1.4**	**35**	<0.50	0.43 J	<2.0	0.21 J	0.85 J	<1.0	**3.6**	1.2 J	**3.2**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	05/10/11		<2.0	<1.0	**39**	<0.50	<1.0	<2.0	0.18 J	1.4 J	<1.0	**3.7**	<2.0	<2.0	<1.0	<1.0	<2.0	**20**	<0.20
MW-02B	07/21/11		<2.0	0.91 J	**36**	<0.50	<1.0	<2.0	0.14 J	<2.0	<1.0	**3.6**	0.96 J	**2.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	11/22/11		<2.0	**1.5**	**34**	<0.50	<1.0	<2.0	0.26 J	1.8 B,J	<1.0	**3.4**	0.76 B,J	**2.4**	<1.0	<1.0	<2.0	9.1 J	<0.20
MW-02B	02/16/12		<2.0	<1.0	**42**	<0.50	<1.0	<2.0	0.35 J	1.1 J	<1.0	**4.5**	<2.0	1.2 J	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	05/23/12		<2.0	**1.5**	**38**	0.23 J	<1.0	<2.0	0.25 J	1.1 J	<1.0	**3.9**	0.58 J	**4.5**	0.57 J,B	<1.0	<2.0	**33**	<0.20
MW-02B	08/07/12		<2.0	**1.4**	**36**	<0.50	<1.0	<2.0	0.17 J	0.58 J	<1.0	**3.8 B**	1.3 J	**3.9**	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	11/14/12		<2.0	**1.1**	**36**	<0.50	<1.0	<2.0	0.15 J	0.64 J	<1.0	**3.6**	0.76 J	1.1 J	<1.0	<1.0	<2.0	4.1 J	<0.20
MW-02B	02/20/13		<2.0	**1.0**	**35**	<0.50	<1.0	<2.0	0.11 J	<2.0	<1.0	**3.7**	0.77 J	1.9 J	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	05/22/13		<2.0	**1.2**	**37**	<0.50	<1.0	<2.0	0.17 J	1.2 J	<1.0	**4.1**	1.0 J	1.7 J	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/07/13		<2.0	**1.1**	**36**	<0.50	<1.0	<2.0	0.10 J	0.57 J	<1.0	**3.7 B**	0.68 J	1.9 J	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	11/13/13		<2.0	0.77 J	**35**	<0.50	<1.0	<2.0	<1.0	1.4 J	<1.0	**3.6**	1.4 J	1.4 J	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	02/20/14		<2.0	0.81 J	**35**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.1**	0.74 J	1.0 J	<1.0	<1.0	<2.0	8.5 J	<0.20
MW-02B	05/22/14		<2.0	0.88 J	**32**	<0.50	<1.0	<2.0	<1.0	0.52 J	<1.0	**3.6**	1.0 J	1.3 J	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/13/14		<2.0	0.78 J	**37**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.1 B**	1.1 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	11/19/14		<2.0	**1.2**	**35**	<0.50	<1.0	<2.0	<1.0	1.1 J	<1.0	**3.7**	1.2 J	1.6 J	<1.0	<1.0	<2.0	3.5 J	<0.20
MW-02B	02/20/15		<2.0	0.81 J	**38**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.5**	<2.0	<2.0	<1.0	<1.0	<2.0	11 J	<0.20
MW-02B	05/19/15		<2.0	0.78 J	**34**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.2**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	08/19/15		<2.0	0.74 J	**35**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.9**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	11/03/15		0.91 J	0.97 J	**35**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.6**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	03/04/16		<2.0	0.77 J	**36**	<0.50	<1.0	<2.0	<1.0	0.56 J	<1.0	**4.4**	<2.0	<2.0	<1.0	<1.0	<2.0	**84**	<1.0
MW-02B	05/26/16		<2.0	**1.2**	**35**	<0.50	<1.0	<2.0	0.54 J	0.73 J	<1.0	**4.5**	1.0 J	1.7 J	<1.0	<1.0	<2.0	3.5 J	<0.20
MW-02B	08/24/16		<2.0	0.85 J	**37**	<0.50	<1.0	<2.0	0.54 J	0.73 J	<1.0	**4.7 B**	<2.0	<2.0	<1.0	<1.0	<2.0	7.4 J	<0.20
MW-02B	11/22/16		<2.0	0.84 J	**37**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.4**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-02B	02/23/17		<2.0	0.79 J	**35**	<0.50	<1.0	<2.0	<1.0	1.2 J	<1.0	**4.1**	<2.0	<2.0	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-02B	05/22/17	Well vandalised, locks cut	<2.0	0.92 J	**35**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.1**	0.74 J	0.55 J	<1.0	<1.0	<2.0	<20	0.12 J
MW-02B	08/17/17		<10	<5.0	**37**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.2 J	<10	<10	<5.0	<5.0	<10	<100	<0.20
MW-02B	02/22/18		<2.0	<1.0	**75**	<0.50	0.32 J	<2.0	**1.7**	1.4 J	<1.0	**7.3**	1.0 J	<2.0	<1.0	<1.0	**5.2**	<20	<0.20
MW-02B	08/22/18		<2.0	0.94 J	**39**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.2**	<2.0	<2.0	<1.0	<1.0	<2.0	2.9 J	<0.20
MW-02B	02/13/19		0.54 J	**1.0**	**38**	<0.50	<1.0	0.76 J, B	**1.3**	<2.0	<1.0	**4.9**	0.78 J, B	<2.0	<1.0	<1.0	<2.0	2.5 J	<0.20
MW-02B	08/21/19		<2.0	**1.1**	**43**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**5.3**	<2.0	<2.0	<1.0	<1.0	<2.0	5.7 J, B	<0.20
MW-02B	02/19/20		<2.0	**1.1**	**46**	<0.50	<1.0	<2.0	<1.0	**2.4**	<1.0	**6.1**	0.56 J	<2.0	<1.0	<1.0	<2.0	4.7 J	<0.20
MW-02B	08/19/20		0.79 J	0.95 J	**43**	<0.50	<1.0	<2.0	0.91 J	<2.0	<1.0	**7.1**	**11**	<2.0	<1.0	<1.0	<2.0	<20	<0.20

Table 6
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-03A	05/18/06		<2.0	**1.1**	**65**	<0.50	<1.0	1.8 J	0.12 J	0.89 J	<1.0	0.86 J	0.64 J	<2.0	<1.0	<1.0	**4.5**	3.1 J	<0.20
MW-03A	08/22/06		<2.0	<1.0	**69**	<0.50	0.053 J	0.87 J	0.16 J	0.99 J	0.15 J	0.84 J	**2.3**	0.44 J	<1.0	<1.0	**3.6**	3.5 J	<0.20
MW-03A	11/20/06		0.16 J	<1.0	**73**	<0.50	0.084 J	1.3 J	<1.0	1.1 J	<1.0	1.2 J	<2.0	0.52 J	<1.0	<1.0	**4.8**	<20	<0.20
2MW-03A	11/20/06	Duplicate	0.13 J	<1.0	**74**	<0.50	0.085 J	1.3 J	<1.0	0.95 J	<1.0	1.1 J	<2.0	0.38 J	<1.0	<1.0	**4.7**	2.5 J	<0.20
MW-03A	03/01/07		0.087 J	<1.0	**75 CQ**	<0.50	0.073 J	1.3 J	<1.0	1.5 MB,J	<1.0	1.2 J	<2.0	<2.0	<1.0	<1.0	**4.4**	5.6 MB,J	<0.20
2MW-03A	03/01/07	Duplicate	0.084 J	<1.0	**72 CQ**	<0.50	<1.0	1.4 J	<1.0	**6.6 MB**	<1.0	1.2 J	<2.0	0.33 J	<1.0	<1.0	**4.4**	7.9 MB,J	<0.20
MW-03A	05/17/07		<2.0	<1.0	**74**	<0.50	<1.0	1.6 J	0.16 J	<2.0	<1.0	1.3 J	<2.0	0.47 J	<1.0	<1.0	**4.1**	<100	<0.20
MW-03A	08/24/07		<2.0	<1.0	**88**	<2.5	<5.0	<10	<5.0	<10	<5.0	1.7 J	5.8 J	<10	<5.0	<5.0	<10	15 J	<0.20
MW-03A	11/15/07		<2.0	<1.0	**78**	<0.50	0.15 J	1.5 J	0.22 J	1.2 J	<1.0	0.71 J	<2.0	0.34 J	<1.0	<1.0	**4.1**	3.0 J	<0.20
MW-03A	02/19/08		<2.0	<1.0	**86**	<0.50	<1.0	1.7 J	0.23 J	1.3 J	<1.0	1.3 J	<2.0	<2.0	<1.0	<1.0	**3.7**	3.0 J	<0.20
MW-03A	05/19/08		<2.0	<1.0	**85**	<0.50	<1.0	1.3 J	0.15 J	<2.0	<1.0	0.92 J	<2.0	1.6 J,MB	<1.0	<1.0	**3.8**	<20	<0.20
MW-03A	08/18/08		<2.0	<1.0	**81**	<0.50	<1.0	0.83 J	0.24 J	1.3 J	<1.0	0.99 J	**2.6**	1.0 J	<1.0	<1.0	**3.9**	<20	<0.20
MW-03A	11/10/08		0.23 J	<1.0	**84**	<0.50	<1.0	1.3 J	0.26 J	**2.1**	<1.0	1.1 J	**3.1**	0.74 J	<1.0	<1.0	**4.8**	3.0 J	<0.20
MW-03A	02/18/09		0.21 J	<1.0	**93**	<0.50	<1.0	1.4 J	0.21 J	1.3 J	<1.0	1.3 J	<2.0	<2.0	<1.0	<1.0	**4.1**	<20	<0.20
MW-03A	05/27/09		<2.0	<1.0	**90**	<0.50	0.27 J	0.98 J	0.36 J	**2.3**	<1.0	**2.0**	<2.0	0.53 J	<1.0	<1.0	**4.7**	<20	<0.20
MW-03A	08/25/09		<2.0	<1.0	**86**	<0.50	<1.0	<2.0	0.29 J	1.6 J	<1.0	1.3 J	<2.0	0.42 J	<1.0	<1.0	**4.7**	<20	<0.20
MW-03A	11/23/09		<2.0	<1.0	**93**	<0.50	0.23 J	1.0 J	0.33 J	**2.3**	<1.0	1.3 J	1.8 J	1.4 J	<1.0	<1.0	**5.0**	<20	<0.20
MW-03A	02/22/10		<2.0	<1.0	**87**	<0.50	<1.0	<2.0	0.29 J	1.7 J	<1.0	0.84 J	1.8 J	0.96 J	<1.0	<1.0	**5.4**	12 J	<0.20
MW-03A	05/27/10		<2.0	<1.0	**97**	<0.50	<1.0	<2.0	0.38 J	**2.0**	<1.0	1.0 J	**2.0**	0.84 J	<1.0	<1.0	**4.7**	<20	<0.20
MW-03A	08/31/10		<2.0	<1.0	**92**	<0.50	0.15 J	0.99 J	0.27 J	1.0 J, B	<1.0	1.2 J	**4.0**	1.1 J	<1.0	<1.0	**4.2**	<20	<0.20
MW-03A	11/18/10		<2.0	<1.0	**98**	<0.50	0.12 J	1.9 J	0.25 J	1.6 J	<1.0	1.1 J	<2.0	<2.0	<1.0	<1.0	**3.2**	<20	<0.20
MW-03A	02/17/11		0.33 J	<1.0	**100**	<0.50	0.47 J	1.0 J	0.26 J	1.1 J	<1.0	1.4 J	1.6 J	0.65 J	0.13 J	0.21 J	**4.0**	<20	<0.20
MW-03A	05/09/11		<2.0	<1.0	**100**	<0.50	<1.0	1.1 J	0.18 J	1.1 J	<1.0	0.94 J	<2.0	<2.0	<1.0	<1.0	**3.9**	<20	<0.20
MW-03A	07/20/11		<2.0	<1.0	**100**	<0.50	0.12 J	<2.0	0.13 J	0.58 J	<1.0	0.88 J	1.5 J	<2.0	<1.0	<1.0	**3.8**	<20	<0.20
MW-03A	11/21/11		<2.0	0.97 J	**99**	<0.50	0.14 J	<2.0	0.35 J	1.7 J	<1.0	0.99 J	1.6 J	<2.0	<1.0	<1.0	**4.0**	5.3 J	<0.20
MW-03A	02/16/12		<2.0	<1.0	**110**	<0.50	<1.0	<2.0	0.38 J	1.1 J	<1.0	1.2 J	<2.0	<2.0	<1.0	<1.0	**4.2**	<20	<0.20
MW-03A	05/22/12		<2.0	<1.0	**110**	<0.50	<1.0	1.1 J	0.36 J	**2.3**	<1.0	0.86 J	**2.1**	<2.0	0.13 J	<1.0	**3.5**	<20	<0.20
MW-03A	08/06/12		<2.0	<1.0	**110**	<0.50	<1.0	<2.0	0.26 J	1.3 J	<1.0	1.1 J,B	**2.9**	0.77 J	<1.0	<1.0	**3.4**	<20	<0.20
MW-03A	11/13/12		<2.0	<1.0	**110**	<0.50	<1.0	<2.0	0.20 J	1.4 J	<1.0	1.5 J	**2.1**	<2.0	0.24 J	<1.0	**3.5**	<20	<0.20
MW-03A	02/20/13	Not Sampled	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-03A	05/21/13		<2.0	<1.0	**110**	<0.50	0.13 J	<2.0	0.22 J	1.3 J	<1.0	1.2 J	1.8 J	<2.0	<1.0	<1.0	**3.8**	<20	<0.20
MW-03A	08/06/13		<2.0	<1.0	**120**	<0.50	<1.0	<2.0	0.17 J	0.87 J	<1.0	1.2 J,B	**2.4**	<2.0	<1.0	<1.0	**3.7**	4.1 J	<0.20
MW-03A	11/12/13		<2.0	0.55 J	**110**	<0.50	<1.0	<2.0	<1.0	1.5 J	<1.0	1.5 J	**2.1**	<2.0	<1.0	<1.0	**3.8**	<20	<0.20
MW-03A	02/19/14		<2.0	0.50 J	**110**	<0.50	<1.0	<2.0	<1.0	1.3 J	<1.0	1.2 J,B	**2.4**	<2.0	<1.0	<1.0	**3.6**	<20	<0.20
MW-03A	05/21/14		<2.0	<1.0	**110**	<0.50	<1.0	0.60 J	<1.0	1.1 J	<1.0	1.1 J	**2.0**	<2.0	<1.0	<1.0	**3.6**	<20	<0.20
MW-03A	08/12/14		<2.0	<1.0	**110**	<0.50	0.28 J	<2.0	<1.0	1.6 J	<1.0	1.3 J	**3.8**	<2.0	<1.0	<1.0	**3.7**	<20	<0.20
MW-03A	11/18/14	Not Sampled, well vandalized, pump stolen	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-03A	02/19/15		<2.0	<1.0	**95**	<0.50	0.82 J	0.69 J	<1.0	1.4 J	<1.0	**2.7**	**2.8**	<2.0	<1.0	<1.0	**2.8**	8.5 J	<0.20
MW-03A	05/18/15		<2.0	<1.0	**99**	<0.50	<1.0	0.56 J	<1.0	0.87 J	<1.0	1.2 J	0.77 J	<2.0	<1.0	<1.0	**3.5**	<20	<0.20
MW-03A	08/18/15		<2.0	<1.0	**110**	<0.50	<1.0	<2.0	<1.0	0.96 J	<1.0	1.5 J	0.82 J	<2.0	<1.0	<1.0	**3.6**	<20	<0.20
MW-03A	11/02/15		<2.0	0.65 J	**120**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	1.8 J	1.1 J	<2.0	<1.0	<1.0	**4.2**	10 J	<0.20
MW-03A	03/03/16		<2.0	0.56 J	**110**	<0.50	<1.0	0.54 J	<1.0	1.6 J	<1.0	1.4 J	1.7 J	<2.0	<1.0	<1.0	**3.8**	**71**	<0.20
MW-03A	05/25/16		<2.0	<1.0	**110**	<0.50	<1.0	1.5 J	0.84 J	**3.0**	<1.0	1.6 J	**3.2**	<2.0	<1.0	<1.0	**3.7**	3.0 J	<0.20
MW-03A	08/23/16		<2.0	0.69 J	**110**	<0.50	<1.0	0.54 J	<1.0	1.1 J	<1.0	2.1 B	1.2 J	<2.0	<1.0	<1.0	**3.9**	<20	<0.20
MW-03A	11/21/16		<2.0	0.58 J	**110**	<0.50	<1.0	<2.0	0.57 J	1.1 J	<1.0	1.5 J	1.1 J	<2.0	<1.0	<1.0	**3.9**	3.5 J, B	<0.20
MW-03A	02/22/17		<2.0	**1.8**	**72**	<0.50	<1.0	<2.0	0.64 J	<2.0	<1.0	**4.5**	**2.4**	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03A	05/23/17		<2.0	<1.0	**83**	<0.50	<1.0	1.2 J	<1.0	**2.1**	<1.0	1.3 J	0.91 J	0.54 J	<1.0	<1.0	**3.9**	8.6 J	<0.20
MW-03A	08/16/17		<20	<10	**87**	<5.0	<10	<20	<10	<20	<10	<20	<20	<20	<10	<10	<20	<200	<0.20
MW-03A	02/21/18		1.1 J	0.52 J	**96**	<0.50	<1.0	<2.0	<1.0	**3.8**	<1.0	**2.3**	1.3 J	<2.0	<1.0	<1.0	**3.7**	13 J, B	<0.20
MW-03A	08/21/18		0.57 J	<1.0	**100**	<0.50	<1.0	<2.0	<1.0	0.70 J	<1.0	1.5 J	0.99 J	<2.0	<1.0	<1.0	**3.3**	3.0 J	<0.20
MW-03A	02/12/19		<2.0	0.57 J	**71**	<0.50	<1.0	1.1 J, B	<1.0	0.53 J	<1.0	1.6 J	1.1 J	<2.0	<1.0	<1.0	**4.0**	4.2 J	<0.20
MW-03A	08/20/19		<2.0	0.63 J	**91**	0.37 J	<1.0	0.87 J	0.62 J	0.82 J	<1.0	**2.0**	0.93 J	<2.0	<1.0	0.20 J	**3.7**	5.2 J, B	<0.20
MW-03A	02/18/20		<2.0	<1.0	**91**	<0.50	**1.6**	0.66 J	<1.0	1.1 J	<1.0	1.3 J	0.97 J	<2.0	<1.0	<1.0	**4.3**	6.3 J	<0.20
MW-03A	08/18/20		<2.0	0.60 J	**110**	<0.50	<1.0	0.74 J	<1.0	1.1 J	<1.0	1.7 J	1.1 J	1.6 J	<1.0	<1.0	**4.5**	<20	<0.20

Table 6
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-03B	05/18/06		<2.0	<1.0	**64**	<0.50	<1.0	<2.0	0.41 J	1.6 J	<1.0	2.8 J	<2.0	<2.0	0.21 J	<1.0	<2.0	10 J	<0.20
MW-03B	08/22/06		<2.0	<1.0	**69**	<0.50	<1.0	<2.0	0.36 J	0.97 J	0.045 J	**2.7**	**4.6**	**2.7**	<1.0	<1.0	<2.0	2.6 J	<0.20
MW-03B	11/20/06		0.33 J	**1.7**	**71**	<0.50	<1.0	<2.0	0.24 J	1.4 J	<1.0	**4.6**	1.1 J	**3.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	03/01/07		<2.0	**3.4 MB**	**58 CQ**	<0.50	<1.0	<2.0	0.30 J	1.0 MB,J	<1.0	**3.5**	<2.0	1.6 J	<1.0	<1.0	<2.0	7.1 MB,J	<0.20
MW-03B	05/17/07		<2.0	**2.5**	**63**	<0.50	<1.0	<2.0	0.26 J	0.80 J	<1.0	**3.8**	**2.3**	**3.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/24/07		<2.0	<1.0	**63**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.2 J	5.8 J	2.2 J	<5.0	<5.0	<10	<100	<0.20
MW-03B	11/15/07		<2.0	**1.8**	**63**	<0.50	<1.0	<2.0	0.39 J	1.5 J	<1.0	**3.5**	<2.0	1.7 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/19/08		<2.0	**3.2**	**51**	<0.50	<1.0	<2.0	0.43 J	1.6 J	<1.0	**3.0**	<2.0	0.49 J	<1.0	<1.0	<2.0	4.4 J	<0.20
MW-03B	05/19/08		<2.0	**3.6**	**50**	<0.50	<1.0	<2.0	0.32 J	1.0 J	<1.0	**2.5**	<2.0	**2.0 MB**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/18/08		<2.0	**3.4**	**47**	<0.50	<1.0	<2.0	0.41 J	1.1 J	<1.0	**2.6**	**2.6**	**4.1**	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-03B	11/10/08		<2.0	**3.5**	**57**	<0.50	<1.0	1.3 J	0.42 J	1.2 J	<1.0	**3.5**	**4.6**	**4.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/18/09		<2.0	**2.9**	**61**	<0.50	<1.0	<2.0	0.34 J	1.5 J	<1.0	**3.8**	<2.0	1.8 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	05/27/09		<2.0	**3.1**	**54**	<0.50	<1.0	<2.0	0.85 J	**4.0**	<1.0	**4.4**	<2.0	**2.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/25/09		0.48 J	**3.2**	**47**	<0.50	<1.0	<2.0	0.40 J	**2.1**	<1.0	**3.8**	<2.0	**1.6 J**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	11/23/09		<2.0	**2.5**	**53**	<0.50	<1.0	<2.0	0.41 J	1.1 J	<1.0	**3.5**	1.6 J	**3.6**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/22/10		<2.0	**2.2**	**55**	<0.50	<1.0	<2.0	0.47 J	1.5 J	<1.0	**3.2**	**2.8**	**5.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	05/27/10		<2.0	**2.8**	**53**	<0.50	<1.0	<2.0	0.52 J	**2.2**	<1.0	**3.2**	**2.5**	**4.7**	<1.0	<1.0	<2.0	6.2 J	<0.20
MW-03B	08/31/10		<2.0	**2.3**	**47**	<0.50	<1.0	<2.0	0.35 J	0.59 J, B	<1.0	**3.2**	**3.3**	**4.3**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	11/18/10		<2.0	**3.2**	**51**	<0.50	<1.0	1.1 J	0.34 J	1.6 J	<1.0	**3.1**	<2.0	1.9 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/17/11		0.45 J	**3.5**	**54**	<0.50	0.51 J	<2.0	0.36 J	1.1 J	<1.0	**3.6**	**2.0**	**2.4**	0.17 J	<1.0	<2.0	<20	<0.20
MW-03B	05/09/11		<2.0	**2.5**	**55**	<0.50	<1.0	<2.0	0.27 J	0.98 J	<1.0	**3.2**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	07/20/11		<2.0	**2.8**	**51**	<0.50	<1.0	<2.0	0.25 J	0.60 J	<1.0	**3.1**	**2.2**	1.2 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	11/21/11		<2.0	**1.9**	**51**	<0.50	<1.0	<2.0	0.38 J	1.3 J	<1.0	**3.0**	1.9 J	1.7 J	<1.0	<1.0	0.98 J	7.5 J	<0.20
MW-03B	02/16/12		<2.0	**2.0**	**59**	<0.50	<1.0	<2.0	0.49 J	0.86 J	<1.0	**3.4**	<2.0	0.91 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	05/22/12		<2.0	**3.4**	**51**	<0.50	<1.0	<2.0	0.47 J	**2.4**	<1.0	**2.5**	**2.9**	**4.2**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/06/12		<2.0	**3.4**	**51**	<0.50	<1.0	<2.0	0.32 J	0.70 J	<1.0	**2.7 B**	**2.1**	**3.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	11/13/12		<2.0	**2.5**	**50**	<0.50	<1.0	<2.0	0.26 J	0.70 J	<1.0	**2.6**	1.3 J	1.6 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/20/13		<2.0	**2.8**	**46**	<0.50	<1.0	<2.0	0.23 J	<2.0	<1.0	**2.6**	1.2 J	0.98 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	05/21/13		<2.0	**2.9**	**47**	<0.50	<1.0	<2.0	0.29 J	0.96 J	<1.0	**2.8**	1.5 J	1.2 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/06/13		<2.0	**2.0**	**44**	<0.50	<1.0	<2.0	0.11 J	<2.0	<1.0	**4.0 B**	**2.5**	1.3 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	11/13/13		<2.0	**2.4**	**46**	<0.50	<1.0	<2.0	<1.0	0.88 J	<1.0	**3.7**	1.9 J	0.88 J	<1.0	<1.0	<2.0	<20	0.14 J,B
MW-03B	02/19/14		<2.0	**2.3**	**55**	<0.50	<1.0	<2.0	<1.0	0.54 J	<1.0	**3.9 B**	**2.6**	0.73 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	05/21/14		<2.0	**2.7**	**54**	<0.50	<1.0	<2.0	<1.0	0.58 J	<1.0	**3.3**	**2.0**	1.0 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/12/14		<2.0	**2.6**	**45**	<0.50	<1.0	<2.0	<1.0	0.93 J	<1.0	**3.6**	**2.4**	1.5 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	11/18/14		<2.0	**2.2**	**55**	<0.50	<1.0	<2.0	<1.0	0.52 J	<1.0	**4.2**	**2.6**	0.62 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	02/19/15		<2.0	**1.9**	**65**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**5.3**	**2.1**	<2.0	<1.0	<1.0	<2.0	3.1 J	<0.20
MW-03B	05/18/15		<2.0	**2.4**	**50**	<0.50	<1.0	0.56 J	<1.0	0.55 J	<1.0	**3.4**	1.1 J	<2.0	<1.0	<1.0	<2.0	15 J	<0.20
MW-03B	08/18/15		<2.0	**2.4**	**47**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.4**	0.63 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	11/02/15		1.3 J	**2.9**	**48**	<0.50	<1.0	0.83 J	<1.0	<2.0	<1.0	**3.7**	0.90 J	<2.0	<1.0	<1.0	<2.0	4.2 J	<0.20
MW-03B	03/03/16		<2.0	**2.2**	**48**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.1**	0.91 J	<2.0	<1.0	<1.0	<2.0	**57**	0.13 J
MW-03B	05/25/16		<2.0	**2.6**	**43**	<0.50	<1.0	<2.0	0.60 J	**2.3**	<1.0	**3.4**	**3.1**	0.99 J	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/23/16		<2.0	**2.8**	**54**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.0**	1.7 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	11/21/16		<2.0	**1.3**	**56**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.4**	**2.4**	<2.0	<1.0	<1.0	<2.0	2.7 J, B	<0.20
MW-03B	02/22/17		0.56 J	<1.0	**79**	<0.50	<1.0	0.65 J	<1.0	1.1 J	<1.0	1.1 J	0.80 J	0.58 J	<1.0	<1.0	**3.9**	2.5 J, B	<0.20
MW-03B	05/23/17		<2.0	**2.8**	**61**	<0.50	<1.0	<2.0	0.51 J	1.0 J	<1.0	**3.7**	**2.3**	0.84 J	<1.0	<1.0	<2.0	5.3 J	<0.20
MW-03B	08/16/17		<20	<10	**45**	<5.0	<10	<20	<10	<20	<10	<20	<20	<20	<10	<10	<20	<200	<0.20
MW-03B	02/21/18		0.87 J	**1.7**	**36**	<0.50	<1.0	<2.0	<1.0	0.57 J	<1.0	**4.7**	0.95 J	<2.0	<1.0	<1.0	<2.0	7.2 J, B	<0.20
MW-03B	08/21/18		<2.0	**2.1**	**39**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.3**	0.76 J	<2.0	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-03B	02/12/19		<2.0	**2.2**	**36**	<0.50	<1.0	0.63 J, B	<1.0	<2.0	<1.0	**3.6**	0.94 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-03B	08/20/19		1.0 J	**2.0**	**33**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.4**	0.87 J	<2.0	<1.0	<1.0	<2.0	8.6 J, B	<0.20
MW-03B	02/19/20		<2.0	**2.4**	**35**	<0.50	<1.0	<2.0	<1.0	**5.9**	<1.0	**4.7**	1.5 J	<2.0	<1.0	<1.0	<2.0	8.6 J	<0.20
MW-03B	08/18/20		<2.0	**3.9**	**48**	<0.50	<1.0	<2.0	0.97 J	<2.0	<1.0	**4.1**	1.1 J	1.4 J	<1.0	<1.0	<2.0	<20	<0.20

Table 6
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-04A	03/02/07	New Well	0.30 J	**1.7**	**21**	<0.50	0.22 J	<2.0	**1.8**	**2.9 MB**	<1.0	**5.7**	**2.1**	**5.4**	<1.0	<1.0	**12**	**32**	<0.20
MW-04A	05/17/07		0.24 J	**2.6**	**22**	<0.50	0.22 J	<2.0	**1.0**	**2.2**	<1.0	**5.6**	**2.4**	**9.9**	<1.0	<1.0	**11**	**5.2**	<0.20
MW-04A	08/23/07		<2.0	<3.5	**21**	<2.5	<5.0	<10	1.2 J	<10	<1.0	5.3 J	7.2 J	6.2 J	<5.0	<5.0	**12**	<100	<0.20
MW-04A	11/16/07		<2.0	**1.6**	**19**	<0.50	0.28 J	1.9 MB,J	**1.1**	**2.9 MB**	<1.0	**4.3**	1.4 J	**2.8**	<1.0	<1.0	**11**	5.3 MB,J	<0.20
MW-04A	02/20/08		<2.0	**1.5**	**21**	<0.50	0.28 J	<2.0	**1.0**	**3.8**	<1.0	**4.9**	<2.0	1.3 J	<1.0	<1.0	**13**	5.4 J	<0.20
MW-04A	05/20/08		<2.0	**1.3**	**24**	<0.50	0.31 J	<2.0	0.84 J	**3.1**	<1.0	**4.7**	<2.0	**2.8 MB**	<1.0	<1.0	**13**	3.3 J	<0.20
MW-04A	08/19/08		<2.0	**1.7**	**21**	<0.50	0.30 J	<2.0	0.89 J	**2.6**	<1.0	**4.6**	**3.6**	**9.8**	<1.0	<1.0	**12**	2.5 J	<0.20
MW-04A	11/11/08		<2.0	<1.0	**23**	<0.50	0.30 J	<2.0	0.98 J	**2.8**	<1.0	**4.9**	**2.3**	**5.3**	<1.0	<1.0	**13**	5.1 J	<0.20
MW-04A	02/19/09		<2.0	**1.5**	**23**	<0.50	0.22 J	<2.0	**1.0**	**2.9**	<1.0	**4.9**	**3.2**	**4.3**	<1.0	<1.0	**12**	11 J	<0.20
MW-04A	05/28/09		<2.0	**1.3**	**22**	<0.50	0.34 J	<2.0	0.87 J	**7.1**	<1.0	**5.6**	<2.0	**5.2**	<1.0	<1.0	**12**	5.9 J	<0.20
MW-04A	08/26/09		<2.0	**1.9**	**23**	<0.50	0.41 J	<2.0	**1.0**	**3.1**	<1.0	**5.1**	**2.4**	**5.5**	<1.0	<1.0	**14**	<20	<0.20
MW-04A	11/24/09		<2.0	**1.6**	**21**	<0.50	0.30 J	<2.0	0.90 J	**2.6**	<1.0	**4.3**	**4.2**	**8.1**	<1.0	<1.0	**12**	<20	<0.20
MW-04A	02/23/10		<2.0	**1.3**	**22**	<0.50	0.33 J	<2.0	0.89 J	**3.4**	<1.0	**5.5**	**4.0**	**7.5**	<1.0	<1.0	**14**	<20	<0.20
MW-04A	05/28/10		<2.0	**1.1**	**24**	<0.50	0.35 J	<2.0	0.90 J	**3.2**	<1.0	**5.2**	**3.1**	**9.3**	<1.0	0.34 J	**12**	<20	<0.20
MW-04A	09/01/10		<2.0	**1.2**	**22**	<0.50	0.39 J	1.1 J	0.84 J	**2.2**	<1.0	**5.1**	**3.6**	**6.4**	<1.0	<1.0	**13**	<20	<0.20
MW-04A	11/19/10		<2.0	**1.5**	**23**	<0.50	0.35 J	**3.2**	0.82 J	**3.9**	<1.0	**5.0**	1.9 J	**4.9**	<1.0	<1.0	**12**	<20	<0.20
MW-04A	02/17/11		<2.0	**2.4**	**25**	<0.50	0.79 J	<2.0	0.72 J	**2.0**	<1.0	**5.3**	**3.1**	**5.9**	<1.0	<1.0	**12**	<20	<0.20
MW-04A	05/10/11		<2.0	**1.1**	**24**	<0.50	0.30 J	<2.0	0.64 J	**2.7**	<1.0	**4.8**	<2.0	<2.0	<1.0	<1.0	**11**	<20	<0.20
MW-04A	07/21/11		<2.0	**1.4**	**23**	<0.50	0.33 J	<2.0	0.55 J	1.3 J	<1.0	**4.8**	**2.7**	**3.9**	<1.0	<1.0	**11**	5.2 J	<0.20
MW-04A	11/22/11		<2.0	**1.9**	**21**	<0.50	0.36 J	<2.0	0.71 J	**2.9 B**	<1.0	**4.6**	1.8 J,B	**4.3**	<1.0	<1.0	**12**	8.0 J	<0.20
MW-04A	02/16/12		<2.0	<1.0	**26**	<0.50	0.33 J	<2.0	0.82 J	**2.4**	<1.0	**5.9**	0.91 J	**2.1**	<1.0	<1.0	**13**	<20	<0.20
MW-04A	05/23/12		<2.0	**4.5**	**23**	0.19 J	0.35 J	<2.0	0.62 J	**2.4**	<1.0	**5.0**	**3.2**	**6.6**	0.13 J,B	<1.0	**12**	6.8 J	<0.20
MW-04A	08/07/12		<2.0	**2.4**	**21**	<0.50	0.31 J	<2.0	0.56 J	1.4 J	<1.0	**5.0 B**	**3.2**	**6.8**	<1.0	<1.0	**10**	<20	<0.20
MW-04A	11/14/12		<2.0	**1.3**	**22**	<0.50	0.34 J	<2.0	0.58 J	1.5 J	<1.0	**4.9**	**2.6**	1.8 J	<1.0	<1.0	**12**	<20	<0.20
MW-04A	02/20/13		<2.0	**1.7**	**20**	<0.50	0.30 J	<2.0	0.49 J	1.2 J	<1.0	**4.9**	**2.2**	**3.2**	<1.0	<1.0	**10**	<20	<0.20
MW-04A	05/22/13		<2.0	**1.4**	**23**	<0.50	0.31 J	<2.0	0.61 J	1.4 J	<1.0	**5.3**	**2.8**	**2.5**	<1.0	<1.0	**12**	<20	<0.20
MW-04A	08/07/13		<2.0	**2.0**	**23**	<0.50	<1.0	<2.0	0.53 J	1.1 J	<1.0	**5.1 B**	**2.5**	**3.1**	<1.0	<1.0	**8.6**	5.3 J	<0.20
MW-04A	11/13/13		<2.0	**1.2**	**21**	<0.50	<1.0	<2.0	0.57 J	1.8 J	<1.0	**4.9**	**2.3**	**2.3**	<1.0	<1.0	**11**	<20	0.10 J,B
MW-04A	02/20/14		<2.0	**1.4**	**23**	<0.50	0.33 J	<2.0	0.59 J	1.2 J	**1.1**	**6.2**	**2.5**	**2.6**	<1.0	<1.0	**12**	7.7 J	<0.20
MW-04A	05/22/14		<2.0	**1.6**	**20**	<0.50	0.26 J	<2.0	0.58 J	1.3 J	<1.0	**4.8**	**2.7**	**2.8**	<1.0	<1.0	**10**	<20	0.10 J
MW-04A	08/13/14		<2.0	**1.4**	**22**	<0.50	0.29 J	<2.0	0.56 J	1.1 J	<1.0	**5.4**	**2.7**	**2.7**	<1.0	<1.0	**10**	<20	<0.20
MW-04A	11/19/14		<2.0	**1.6**	**21**	<0.50	0.38 J	<2.0	0.61 J	1.7 J	<1.0	**5.7**	**2.7**	**3.2**	<1.0	<1.0	**12**	2.6 J	<0.20
MW-04A	02/20/15		<2.0	**1.0**	**23**	<0.50	0.36 J	<2.0	0.53 J	1.1 J	<1.0	**5.7**	**2.1**	<2.0	<1.0	<1.0	**12**	5.3 J	<0.20
MW-04A	05/19/15		<2.0	0.78 J	**20**	<0.50	0.37 J	<2.0	<1.0	0.99 J	<1.0	**4.9**	1.4 J	<2.0	<1.0	<1.0	**12**	<20	<0.20
MW-04A	08/19/15		<2.0	0.94 J	**23**	<0.50	0.29 J	<2.0	0.66 J	0.52 J	<1.0	**5.1**	**2.1**	<2.0	<1.0	<1.0	**11**	<20	<0.20
MW-04A	11/03/15		<2.0	**1.0**	**23**	<0.50	0.28 J	<2.0	0.50 J	0.66 J	<1.0	**5.3**	1.6 J	<2.0	<1.0	<1.0	**11**	<20	<0.20
MW-04A	03/04/16		<2.0	0.86 J	**22**	<0.50	0.38 J	<2.0	0.54 J	1.1 J	<1.0	**5.1**	1.7 J	<2.0	<1.0	<1.0	**12**	**25**	<1.0
MW-04A	05/26/16		<2.0	**1.8**	**26**	<0.50	0.31 J	<2.0	**1.1**	1.9 J	<1.0	**5.5**	**3.3**	**4.2**	<1.0	<1.0	**11**	<20	<0.20
MW-04A	08/24/16		<2.0	0.96 J	**24**	<0.50	0.33 J	<2.0	0.67 J	1.7 J	<1.0	**5.2 B**	**2.3**	<2.0	<1.0	<1.0	**12**	<20	<0.20
MW-04A	11/22/16		<2.0	0.95 J	**26**	<0.50	0.32 J	<2.0	0.76 J	1.3 J	<1.0	**5.4**	**2.4**	<2.0	<1.0	<1.0	**12**	<20	<0.20
MW-04A	02/23/17		<2.0	0.97 J	**25**	<0.50	<1.0	<2.0	0.85 J	0.83 J	<1.0	**4.8**	**3.1**	<2.0	<1.0	<1.0	**9.9**	2.8 J	<0.20
MW-04A	05/23/17		<2.0	**1.4**	**27**	<0.50	0.28 J	<2.0	**1.4**	1.8 J	<1.0	**5.1**	**3.5**	1.6 J	<1.0	<1.0	**12**	2.6 J	<0.20
MW-04A	08/17/17		<10	<5.0	**27**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.8 J	2.8 J	<10	<5.0	<5.0	**12**	<100	<0.20
MW-04A	02/22/18		<2.0	**1.4**	**23**	<0.50	0.30 J	<2.0	0.71 J	1.1 J	<1.0	**5.1**	**2.9**	<2.0	<1.0	<1.0	**11**	<20	<0.20
MW-04A	08/22/18		<2.0	0.83 J	**25**	<0.50	0.26 J	<2.0	**1.1**	1.1 J	<1.0	**5.0**	**2.6**	<2.0	<1.0	<1.0	**11**	4.1 J	<0.20
MW-04A	02/13/19		<2.0	**1.2**	**31**	<0.50	<1.0	0.78 J, B	0.80 J	1.5 J	<1.0	**5.0**	**4.2 B**	<2.0	<1.0	<1.0	**11**	4.9 J	<0.20
MW-04A	08/21/19		<2.0	0.96 J	**31**	<0.50	0.34 J	0.54 J	**1.1**	0.86 J	<1.0	**6.0**	**2.6**	<2.0	<1.0	<1.0	**12**	4.7 J,F2,B	<0.20
MW-04A	02/19/20		<2.0	0.82 J	**27**	<0.50	0.38 J	<2.0	0.66 J	**7.1**	<1.0	**6.4**	**3.1**	0.66 J	<1.0	<1.0	**12**	7.9 J	<0.20
MW-04A	08/19/20		<2.0	0.79 J	**23**	<0.50	0.36 J	<2.0	0.56 J	0.71 J	<1.0	**5.8**	**2.2**	0.68 J	<1.0	<1.0	**11**	<20	0.14 J

Table 6
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-04B	03/02/07	New Well	0.78 J	**6.2**	**120**	<0.50	<1.0	<2.0	0.31 J	1.4 MB,J	<1.0	**7.4**	<2.0	**2.8**	<1.0	<1.0	<2.0	4.1 J	<0.20
MW-04B	05/17/07		<2.0	**9.5**	**83**	<0.50	<1.0	<2.0	0.30 J	1.2 J	<1.0	**3.6**	1.5 J	**4.7**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	08/23/07		<2.0	**7.0**	**85**	<2.5	<5.0	<10	<5.0	<10	<5.0	4.1 J	6.4 J	3.6 J	<5.0	<5.0	<10	<100	<0.20
MW-04B	11/16/07		<2.0	**6.8**	**61**	<0.50	<1.0	<2.0	0.38 J	1.7 MB,J	<1.0	**2.4**	<2.0	**2.8**	<1.0	<2.0	<2.0	2.8 MB,J	<0.20
MW-04B	02/20/08		<2.0	**6.0**	**60**	<0.50	<1.0	<2.0	0.39 J	**3.3**	<1.0	**3.2**	<2.0	0.49 J	<1.0	<2.0	<2.0	4.4 J	<0.20
MW-04B	05/20/08		<2.0	**5.2**	**60**	<0.50	<1.0	<2.0	0.30 J	**2.0**	<1.0	**3.0**	<2.0	**2.2 MB**	<1.0	<1.0	<2.0	15 J	<0.20
MW-04B	08/19/08		<2.0	**5.1**	**46**	<0.50	<1.0	<2.0	0.37 J	1.5 J	<1.0	**2.6**	1.8 J	**4.8**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/11/08		<2.0	**3.9**	**51**	<0.50	<1.0	<2.0	0.38 J	1.8 J	<1.0	**2.7**	0.99 J	**3.0**	<1.0	<1.0	<2.0	2.5 J	<0.20
MW-04B	02/19/09		<2.0	**4.8**	**50**	<0.50	<1.0	<2.0	0.34 J	**2.4**	<1.0	**2.7**	1.1 J	**2.4**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	05/28/09		<2.0	**4.4**	**46**	<0.50	<1.0	<2.0	0.38 J	**4.6**	<1.0	**4.0**	<2.0	**3.2**	<1.0	<1.0	<2.0	2.7 J	<0.20
MW-04B	08/26/09		<2.0	**4.8**	**48**	<0.50	<1.0	<2.0	0.47 J	**4.2**	<1.0	**3.0**	1.2 J	**4.9**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/24/09		<2.0	**4.5**	**43**	<0.50	<1.0	<2.0	0.43 J	1.5 J	<1.0	**2.0**	**2.3**	**5.2**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	02/23/10		<2.0	**4.5**	**48**	<0.50	<1.0	<2.0	0.47 J	**2.1**	<1.0	**2.9**	**2.9**	**4.9**	<1.0	<1.0	<2.0	5.3 J	<0.20
MW-04B	05/28/10		<2.0	**4.4**	**46**	<0.50	<1.0	<2.0	0.40 J	1.6 J	<1.0	**3.0**	1.1 J	**6.2**	<1.0	0.25 J	<2.0	<20	<0.20
MW-04B	09/01/10		<2.0	**3.8**	**44**	<0.50	<1.0	<2.0	0.31 J	1.2 J	<1.0	**2.9**	1.7 J	**3.4**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/19/10		<2.0	**3.0**	**40**	<0.50	<1.0	1.1 J	0.32 J	**2.2**	<1.0	**2.8**	<2.0	**2.6**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	02/17/11		<2.0	**5.1**	**44**	<0.50	0.38 J	<2.0	0.28 J	0.87 J	<1.0	**2.8**	1.7 J	**3.3**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	05/10/11		<2.0	**4.3**	**45**	<0.50	<1.0	<2.0	0.26 J	1.4 J	<1.0	**3.0**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	07/21/11		<2.0	**3.8**	**42**	<0.50	<1.0	<2.0	0.18 J	<2.0	<1.0	**2.7**	1.3 J	**2.1**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/22/11		<2.0	**4.2**	**42**	<0.50	<1.0	<2.0	0.35 J	1.9 B,J	<1.0	**2.7**	0.62 B,J	**2.3**	<1.0	<1.0	1.1 J	**92**	<0.20
MW-04B	02/16/12		<2.0	**3.5**	**47**	<0.50	<1.0	<2.0	0.41 J	0.83 J	<1.0	**3.4**	<2.0	1.3 J	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	05/23/12		<2.0	**4.8**	**46**	0.11 J	<1.0	<2.0	0.30 J	0.70 J	<1.0	**3.2**	**2.5**	**4.6**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	08/07/12		<2.0	**4.5**	**43**	<0.50	<1.0	<2.0	0.25 J	0.70 J	<1.0	**2.9 B**	1.9 J	**4.7**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/14/12		<2.0	**4.1**	**43**	<0.50	<1.0	<2.0	0.19 J	0.93 J	<1.0	**2.8**	0.97 J	1.7 J	<1.0	<1.0	<2.0	6.5 J	<0.20
MW-04B	02/20/13		<2.0	**3.9**	**41**	<0.50	<1.0	<2.0	0.15 J	<2.0	<1.0	**2.8**	0.97 J	**2.1**	<1.0	<1.0	<2.0	4.9 J	<0.20
MW-04B	05/22/13		<2.0	**4.0**	**42**	<0.50	<1.0	<2.0	0.21 J	0.59 J	<1.0	**2.9**	1.4 J	1.8 J	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	08/07/13		<2.0	**3.8**	**43**	<0.50	<1.0	<2.0	0.17 J	<2.0	<1.0	**2.5 B**	1.6 J	**2.2**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/12/13		<2.0	**3.4**	**41**	<0.50	<1.0	<2.0	<1.0	1.0 J	<1.0	**2.3**	0.88 J	1.2 J	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	02/20/14		<2.0	**3.5**	**43**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**4.1**	1.1 J	1.7 J	<1.0	<1.0	<2.0	6.1 J	<0.20
MW-04B	05/22/14		<2.0	**3.3**	**39**	<0.50	<1.0	<2.0	<1.0	0.51 J	<1.0	**3.0**	1.4 J	1.7 J	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	08/13/14		<2.0	**3.1**	**40**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.3**	1.5 J	1.5 J	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/19/14		<2.0	**3.3**	**42**	<0.50	<1.0	<2.0	<1.0	1.1 J	<1.0	**3.1**	1.5 J	**2.0**	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	02/20/15		<2.0	**3.6**	**50**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.9**	0.89 J	<2.0	<1.0	<1.0	<2.0	7.4 J	<0.20
MW-04B	05/19/15		<2.0	**2.8**	**40**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**2.8**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	08/19/15		<2.0	**3.2**	**43**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**2.7**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/03/15		<2.0	**3.3**	**42**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.2**	<2.0	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	03/04/16		<2.0	**3.2**	**46**	<0.50	<1.0	<2.0	<1.0	0.99 J	<1.0	**3.3**	0.50 J	<2.0	<1.0	<1.0	<2.0	**38**	<1.0
MW-04B	05/26/16		<2.0	**3.4**	**42**	<0.50	<1.0	<2.0	0.81 J	1.2 J	<1.0	**3.3**	1.4 J	**2.6**	<1.0	<1.0	<2.0	3.4 J	<0.20
MW-04B	08/24/16		<2.0	**3.3**	**46**	<0.50	<1.0	<2.0	0.60 J	<2.0	<1.0	**3.0 B**	0.55 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	11/22/16		<2.0	**3.3**	**48**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.4**	0.65 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	02/23/17		<2.0	**3.3**	**44**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**3.2**	0.71 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	05/23/17	Not sampled due to vandalism	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-04B	08/17/17		<10	3.2 J	**48**	<2.5	<5.0	<10	<5.0	<10	<5.0	3.3 J	<10	<10	<5.0	<5.0	<10	<100	<0.20
MW-04B	02/22/18		<2.0	**2.0**	**62**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**2.8**	1.5 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20
MW-04B	08/22/18		<2.0	**3.2**	**51**	<0.50	<1.0	<2.0	<1.0	<2.0	<1.0	**2.7**	0.64 J	<2.0	<1.0	<1.0	<2.0	3.2 J	<0.20
MW-04B	02/13/19		<2.0	**2.3**	**61**	<0.50	<1.0	0.93 J, B	**1.5**	0.61 J	<1.0	**3.0**	1.6 J, B	<2.0	<1.0	<1.0	<2.0	2.9 J	<0.20
MW-04B	08/21/19		<2.0	**2.1**	**65**	<0.50	<1.0	0.50 J	**1.0**	<2.0	<1.0	**2.6**	1.3 J	<2.0	<1.0	<1.0	<2.0	2.9 J	<0.20
MW-04B	02/19/20		<2.0	**3.9**	**57**	0.30 J	0.26 J	0.58 J	<1.0	**3.1**	<1.0	**3.7**	**2.0**	0.81 J	<1.0	0.27 J	<2.0	6.9 J	<0.20
MW-04B	08/19/20		<2.0	**3.1**	**53**	<0.50	<1.0	<2.0	0.71 J	<2.0	<1.0	**3.2**	0.56 J	<2.0	<1.0	<1.0	<2.0	<20	<0.20

Table 6
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
MW-05A	08/26/09		<2.0	<5.0	**27**	**6.3**	**11**	<10	**270**	**55**	<5.0	1.7 J	**410**	**16**	<5.0	<5.0	**17**	**3,200**	<0.20
MW-05A	11/23/09		<10	<5.0	**16**	**10**	**8.8**	<10	**240**	**97**	<5.0	<10	**350**	**18**	<5.0	<5.0	**34**	**4,200**	<0.20
MW-05A	02/22/10		<10	<5.0	**22**	**3.8**	4.0 J	<10	**130**	**28**	<5.0	1.2 J	**150**	**13**	<5.0	<5.0	6.7 J	**1,400**	<0.20
MW-05A	05/27/10		<2.0	<1.0	**14**	**6.1**	**5.1**	<2.0	**190**	**74**	<1.0	0.22 J	**240**	**17**	<1.0	<1.0	**32**	**4,400**	<0.20
MW-05A	08/31/10		<10	<5.0	**17**	**11**	**7.0**	<10	**210**	**110 B-1**	1.2 J	1.0 J	**290**	**16**	<5.0	<5.0	**45**	**3,500**	<0.20
MW-05A	11/18/10		<20	<10	**17**	**10**	6.2 J	<20	**210**	**110**	<10	<20	**270**	12 J	<10	<10	**39**	**3,100**	<0.20
MW-05A	02/15/11		<10	<5.0	**21**	**10**	**9.0**	<10	**220**	**85**	<5.0	<10	**300**	9.2 J	<5.0	<5.0	**26**	**4,000**	<0.20
MW-05A	05/09/11		<40	<20	**21**	**14**	7.6 J	<40	**230**	**120**	<20	<40	**320**	15 J	<20	<20	19 J	**4,100**	<0.20
MW-05A	07/20/11		0.69 J	**3.1**	**18**	**12**	**7.9**	<4.0	**210**	**110**	0.68 J	2.3 J	**310**	**8.3**	<2.0	<2.0	**43**	**3,700**	<0.20
MW-05A	11/21/11		<4.0	**3.7**	**16**	**6.7**	**5.7**	<4.0	**160**	**85**	0.41 J	0.76 J	**230**	**5.5**	<2.0	<2.0	**39**	**2,400**	<0.20
MW-05A	02/15/12		<2.0	**1.3**	**3.8**	**1.6**	**1.2**	<2.0	**33**	**20**	0.26 J	0.54 J	**47**	**2.3**	<1.0	<1.0	**7.9**	**550**	0.12 J
MW-05A	05/22/12		<4.0	**3.3**	**18**	**8.2**	**5.8**	<4.0	**160**	**73**	<2.0	0.79 J	**220**	**10**	<2.0	<2.0	**20**	**2,400**	<0.20
MW-05A	08/06/12		<4.0	**3.8**	**17**	**8.1**	**6.0**	<4.0	**170**	**77**	<2.0	1.1 J,B	**220**	**12**	0.27 J	<2.0	**28**	**2,500**	0.13 J
MW-05A	11/14/12		<4.0	**2.5**	**16**	**6.9**	**5.5**	<4.0	**160**	**84**	<2.0	0.77 J	**230**	**5.0**	<2.0	<2.0	**29**	**2,000**	<0.20
MW-05A	02/19/13		<10	<5.0	**17**	**7.0**	**6.2**	<10	**170**	**81**	<5.0	1.2 J	**220**	6.4 J	<5.0	<5.0	**21**	**2,600**	<0.20
MW-05A	05/21/13		<10	<5.0	**20**	**12**	**7.1**	<10	**230**	**130**	<5.0	<10	**310**	7.7 J	<5.0	<5.0	**41**	**2,700**	<0.20
MW-05A	08/06/13		<10	<5.0	**17**	**12**	**6.7**	<10	**190**	**100**	<5.0	<10	**260**	5.2 J	<5.0	<5.0	**45**	**2,300**	0.15 J
MW-05A	11/12/13		<10	<5.0	**16**	**9.2**	**5.4**	<10	**190**	**120**	<5.0	<10	**260**	8.1 J	<5.0	<5.0	**50**	**2,800**	0.18 J
MW-05A	02/19/14		<10	<5.0	**16**	**7.6**	**5.8**	<10	**180**	**110**	<5.0	<10	**240**	7.6 J	<5.0	<5.0	**42**	**2,300**	<0.20
MW-05A	05/21/14		<10	<5.0	**19**	**12**	**7.1**	<10	**190**	**120**	<5.0	3.0 J	**250**	8.6 J	<5.0	<5.0	**46**	**2,900**	**1.5**
MW-05A	08/12/14		<10	3.4 J	**19**	**10**	**7.4**	<10	**220**	**130**	<5.0	<10	**300**	**10**	<5.0	<5.0	**63**	**2,600**	<0.20
MW-05A	11/18/14		<10	<5.0	**17**	**8.1**	**6.1**	<10	**190**	**110**	<5.0	<10	**250**	5.3 J	<5.0	<5.0	**55**	**2,200**	<0.20
MW-05A	02/19/15		<4.0	**4.3**	**18**	**4.4**	**5.3**	1.2 J	**150**	**76**	<2.0	1.1 J	**200**	**9.8**	<2.0	<2.0	**23**	**1,700**	<0.20
MW-05A	05/18/15		<10	**5.0**	**17**	**9.5**	**5.5**	<10	**150**	**90**	<5.0	<10	**210**	**13**	<5.0	<5.0	**33**	**1,700**	<0.20
MW-05A	08/18/15		<4.0	**4.1**	**17**	**12**	**6.2**	<4.0	**190**	**100**	<2.0	<4.0	**240**	**13**	<2.0	<2.0	**57**	**1,800**	<0.20
MW-05A	11/02/15		<10	**5.5**	**16**	**6.8**	**6.4**	<10	**160**	**93**	<5.0	<10	**210**	**19**	<5.0	<5.0	**30**	**1,500**	0.12 J
MW-05A	03/03/16		<10	4.2 J	**17**	**6.7**	**5.1**	<10	**140**	**72**	<5.0	<10	**190**	7.9 J	<5.0	<5.0	**26**	**1,600**	**1.1**
MW-05A	05/25/16		<10	<5.0	**19**	**13**	**7.1**	<10	**190**	**150**	<5.0	<10	**280**	8.7 J	<5.0	<5.0	**55**	**2,500**	<0.20
MW-05A	08/23/16		<10	4.4 J	**16**	**11**	**6.2**	<10	**180**	**100 B**	<5.0	<10	**260**	**10**	<5.0	<5.0	**71**	**2,100**	<0.20
MW-05A	11/21/16		<4.0	**4.0**	**17**	**6.4**	**5.9**	<4.0	**170**	**86**	<2.0	<4.0	**230**	**9.1**	<2.0	<2.0	**47**	**1,300 B**	<0.20
MW-05A	02/22/17		<2.0	**3.5**	**16**	0.40 J	0.60 J	<2.0	**53**	**5.4**	<1.0	**2.5**	**29**	0.98 J	<1.0	<1.0	**3.9**	**150 B**	<0.20
MW-05A	05/22/17		<2.0	**2.9**	**17**	**6.7**	**5.6**	0.62 J	**170**	**59**	<1.0	0.79 J	**180**	**3.6**	<1.0	<1.0	**20**	**1,200**	<0.20
MW-05A	08/16/17		<20	<10	**15**	3.6 J	4.6 J	<20	**130**	**52**	<10	<20	**170**	<20	<10	<10	14 J	**1,000**	<0.20
MW-05A	02/21/18		1.0 J	**5.2**	**17**	**1.7**	**2.3**	<2.0	**79**	**20**	<1.0	**2.1**	**82**	2.9	<1.0	<1.0	**6.9**	**460 B**	<0.20
MW-05A	08/21/18		<4.0	**5.0**	**16**	**3.6**	**2.9**	<4.0	**93**	**28**	<2.0	1.8 J	**110**	**11**	<2.0	<2.0	**11**	**710**	<0.20
MW-05A	02/12/19		<2.0	**6.7**	**17**	**1.3**	0.34 J	0.62 J, B	**40**	**4.6**	<1.0	**2.7**	**18**	<2.0	<1.0	<1.0	**5.1**	**94**	<0.20
MW-05A	08/20/19		<2.0	**6.9**	**18**	**2.1**	**1.2**	<2.0	**52**	**9.4**	<1.0	**2.1**	**42**	1.4 J	<1.0	<1.0	**9.9**	**240 B**	<0.20
MW-05A	02/18/20		<2.0	**7.8**	**23**	**1.8**	0.42 J	<2.0	**42**	**7.1**	<1.0	**4.0**	**23**	**2.2**	<1.0	<1.0	**8.5**	**120**	0.15 J
MW-05A	08/18/20		0.64 J	**7.1**	**19**	**1.7**	0.56 J	<2.0	**39**	**2**	<1.0	**3.2**	**19**	**1.3 J**	<1.0	0.28 J	**4.0**	**89 F1, B**	<0.20

Table 6
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2
FDCC-W-20080520	05/20/08		**2.1**	**2.7**	**92**	<0.50	0.20 J	<2.0	0.49 J	**11**	0.87 J	**10**	**2.3**	0.89 J	<1.0	<1.0	**5.9**	16 J	<0.20
FDCC-E-20080520	05/20/08		**2.4**	**2.8**	**85**	<0.50	0.18 J	<2.0	0.53 J	**11**	0.34 J	**11**	**2.4**	1.0 J	<1.0	<1.0	**6.4**	13 J	<0.20
G-4	05/18/06		0.098 J	**2.3**	**43**	<0.50	<1.0	<2.0	0.89 J	2.9	<1.0	**2.7**	**3.1**	**2.7**	<1.0	<1.0	**8.8**	10 J	<0.20
G-4	08/21/06		0.10 J	<1.0	**44**	<0.50	0.039 J	<2.0	0.87 J	1.5 J	<1.0	**2.3**	**6.1**	**5.3**	<1.0	<1.0	**5.0**	2.1 J	<0.20
G-4	11/20/06		0.34 J	<1.0	**45**	<0.50	<1.0	<2.0	0.94 J	1.9 J	<1.0	**3.2**	1.3 J	**3.6**	<1.0	0.16 J	**8.0**	11 J	<0.20
G-4	03/01/07		0.075 J	**1.0 MB**	**35 CQ**	<0.50	0.051 J	<2.0	0.86 J	**4.3 MB**	<1.0	**2.9**	1.1 J	**2.6**	<1.0	<1.0	**8.2**	6.3 MB,J	<0.20
G-4	05/18/07		<2.0	**1.1**	**45**	<0.50	<1.0	<2.0	**1.0**	1.8 J	<1.0	**2.7**	**4.3**	**5.7**	<1.0	<1.0	**6.7**	<20	<0.20
G-4	08/24/07		<2.0	<1.0	**42**	<2.5	<5.0	<10	1.0 J	<10	<1.0	3.2 J	7.4 J	3.6 J	<5.0	<5.0	7.6 J	<100	<0.20
G-4	11/15/07		<2.0	0.94 J	**37**	<0.50	<1.0	<2.0	**1.2**	**2.6**	<1.0	**2.7**	<2.0	**3.2**	<1.0	<1.0	**8.3**	3.6 J	<0.20
G-4	02/20/08		<2.0	<1.0	**47**	<0.50	<1.0	<2.0	**1.1**	**3.6**	<1.0	**2.6**	<2.0	1.1 J	<1.0	<1.0	**7.8**	4.9 J	<0.20
G-4	05/19/08		<2.0	**1.2**	**67**	<0.50	<1.0	<2.0	**1.2**	**4.2**	<1.0	**2.4**	<2.0	**3.8 MB**	<1.0	<1.0	**7.2**	4.5 J	<0.20
G-4	08/18/08		<2.0	0.79 J	**48**	<0.50	<1.0	<2.0	**1.2**	**2.8**	<1.0	**2.3**	**5.2**	**6.5**	<1.0	<1.0	**6.7**	<20	<0.20
G-4	11/10/08		<2.0	**1.6**	**40**	<0.50	<1.0	<2.0	**1.1**	**2.4**	<1.0	**2.8**	**2.1**	**6.4**	<1.0	<1.0	**8.3**	2.5 J	<0.20
G-4	02/18/09		<2.0	<1.0	**48**	<0.50	<1.0	<2.0	**1.1**	**3.2**	<1.0	**3.0**	<2.0	**3.8**	<1.0	<1.0	**7.6**	3.6 J	<0.20
G-4	05/27/09		<2.0	<1.0	**43**	<0.50	<1.0	<2.0	**1.4**	**7.9**	<1.0	**3.8**	<2.0	**4.0**	<1.0	<1.0	**8.6**	5.2 J	<0.20
G-4	08/25/09		<2.0	<1.0	**39**	<0.50	<1.0	<2.0	**1.1**	**4.5**	<1.0	**3.5**	1.7 J	**2.6**	<1.0	<1.0	**8.2**	4.6 J	<0.20
G-4	11/23/09		<2.0	**1.0**	**37**	<0.50	<1.0	<2.0	**1.1**	**2.6**	<1.0	**3.5**	**2.3**	**4.7**	<1.0	<1.0	**9.6**	<20	<0.20
G-4	02/22/10		<2.0	<1.0	**22**	<0.50	<1.0	<2.0	**1.2**	**3.2**	<1.0	**3.3**	**3.1**	**6.6**	<1.0	<1.0	**9.9**	<20	<0.20
G-4	05/27/10		<2.0	**1.2**	**40**	<0.50	<1.0	<2.0	**1.4**	**5.1**	<1.0	**3.5**	**3.1**	**6.4**	<1.0	<1.0	**9.4**	<20	<0.20
G-4	08/31/10		0.52 J	<1.0	**54**	<0.50	<1.0	<2.0	0.98 J	1.7 J, B	<1.0	**3.7**	**5.7**	**6.4**	<1.0	<1.0	**7.0**	8.3 J	<0.20
G-4	11/18/10		<2.0	**1.1**	**37**	<0.50	<1.0	<2.0	**1.1**	**3.9**	<1.0	**3.7**	<2.0	**3.1**	<1.0	<1.0	**8.9**	6.6 J	<0.20
G-4	02/17/11		<2.0	**1.6**	**37**	<0.50	0.45 J	<2.0	0.95 J	**2.3**	<1.0	**3.6**	**2.9**	**3.8**	<1.0	<1.0	**7.7**	<20	<0.20
G-4	05/09/11		<2.0	<1.0	**44**	<0.50	<1.0	<2.0	0.93 J	**3.1**	<1.0	**3.4**	<2.0	<2.0	<1.0	<1.0	**7.0**	4.0 J	<0.20
G-4	07/20/11		0.44 J	**2.0**	**53**	<0.50	<1.0	<2.0	0.97 J	1.4 J	<1.0	**4.0**	**3.6**	**3.5**	<1.0	<1.0	**6.8**	<20	<0.20
G-4	11/21/11		<2.0	**1.6**	**50**	<0.50	<1.0	<2.0	**1.3**	**2.6**	<1.0	**3.7**	**2.2**	**3.9**	<1.0	<1.0	**8.1**	8.7 J	<0.20
G-4	02/16/12		<2.0	<1.0	**45**	<0.50	<1.0	<2.0	**1.2**	**2.0**	<1.0	**4.9**	<2.0	1.9 J	<1.0	<1.0	**8.0**	4.3 J,B	<0.20
G-4	05/22/12		<2.0	**2.7**	**42**	<0.50	<1.0	<2.0	**1.1**	**2.8**	<1.0	**4.2**	**3.3**	**7.6**	<1.0	<1.0	**6.5**	<20	<0.20
G-4	08/06/12		<2.0	**1.5**	**32**	<0.50	<1.0	<2.0	0.80 J	1.4 J	<1.0	**5.4 B**	**3.3**	**4.5**	<1.0	<1.0	**6.6**	<20	<0.20
G-4	11/13/12		<2.0	**1.2**	**40**	<0.50	<1.0	<2.0	0.94 J	1.9 J	<1.0	**5.0**	**2.8**	**3.4**	0.20 J	<1.0	**7.2**	<20	<0.20
G-4	02/20/13		<2.0	**1.3**	**34**	<0.50	<1.0	<2.0	0.75 J	0.99 J	<1.0	**5.8**	**2.3**	**2.6**	<1.0	<1.0	**6.7**	<20	<0.20
G-4	05/21/13		<2.0	**1.8**	**29**	<0.50	<1.0	<2.0	0.81 J	0.84 J	<1.0	**7.8**	**2.3**	**2.0**	<1.0	<1.0	**3.6**	<20	<0.20
G-4	08/06/13		<2.0	**1.3**	**33**	<0.50	<1.0	<2.0	0.90 J	1.6 J	0.21 J	**8.6 B**	**2.3**	**2.3**	<1.0	<1.0	**8.0**	4.3 J	<0.20
G-4	11/12/13		<2.0	**1.0**	**30**	<0.50	<1.0	<2.0	0.84 J	1.4 J	<1.0	**8.3**	**2.0**	1.8 J	<1.0	<1.0	**7.9**	<20	<0.20
G-4	02/19/14		<2.0	**1.1**	**32**	<0.50	<1.0	<2.0	0.85 J	1.7 J	<1.0	**8.7 B**	**2.5**	1.8 J	<1.0	<1.0	**7.3**	<20	<0.20
G-4	05/21/14		<2.0	**1.2**	**30**	<0.50	<1.0	<2.0	0.98 J	1.5 J	<1.0	**11**	**2.5**	1.8 J	<1.0	<1.0	**7.8**	<20	0.10 J
G-4	08/12/14		<2.0	**1.5**	**29**	<0.50	<1.0	<2.0	**1.0**	**2.1**	<1.0	**11**	**3.2**	**2.9**	<1.0	<1.0	**7.7**	8.5 J	<0.20
G-4	11/18/14		<2.0	**1.1**	**31**	<0.50	<1.0	**5.2**	**1.0**	**2.8**	<1.0	**12**	**6.0**	1.6 J	<1.0	<1.0	**8.0**	5.7 J	<0.20
G-4	02/19/15		<2.0	0.93 J	**30**	<0.50	<1.0	0.70 J	0.84 J	0.93 J	<1.0	**15**	1.3 J	0.52 J	<1.0	<1.0	**9.3**	9.3 J	<0.20
G-4	05/18/15		<2.0	0.91 J	**30**	<0.50	<1.0	<2.0	0.71 J	0.78 J	<1.0	**13**	1.3 J	0.60 J	<1.0	<1.0	**7.7**	3.5 J	<0.20
G-4	08/18/15		<2.0	0.91 J	**31**	<0.50	<1.0	<2.0	0.86 J	0.66 J	<1.0	**13**	1.3 J	<2.0	<1.0	<1.0	**8.3**	<20	<0.20
G-4	11/02/15		<2.0	**1.0**	**35**	<0.50	<1.0	<2.0	0.87 J	0.96 J	<1.0	**12**	1.4 J	<2.0	<1.0	<1.0	**8.3**	<20	<0.20
G-4	03/03/16		<2.0	0.90 J	**31**	<0.50	<1.0	0.73 J	0.86 J	1.6 J	<1.0	**15**	1.8 J	0.55 J	<1.0	<1.0	**8.3**	**35**	<0.20
G-4	05/25/16		<2.0	**1.3**	**31**	<0.50	<1.0	<2.0	**1.4**	**5.6**	<1.0	**16**	**4.7**	**2.9**	<1.0	<1.0	**8.0**	5.2 J	<0.20
G-4	08/23/16		<2.0	0.97 J	**34**	<0.50	<1.0	<2.0	**1.1**	1.1 J	<1.0	**14 B**	1.6 J	0.56 J	<1.0	<1.0	**8.0**	3.6 J	<0.20
G-4	11/21/16		<2.0	0.90 J	**32**	<0.50	<1.0	<2.0	**1.2**	0.97 J	<1.0	**15**	1.7 J	<2.0	<1.0	<1.0	**8.7**	2.9 J, B	<0.20
G-4	02/22/17		<2.0	0.79 J	**29**	<0.50	<1.0	<2.0	**1.2**	0.81 J	<1.0	**14**	1.6 J	0.83 J	<1.0	<1.0	**7.7**	3.1 J, B	<0.20
G-4	05/22/17	Not sampled due to vandalism	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G-4	08/16/17	No-purge sample collected with bailer, monument and casing found damaged	1.9 J	**1.2**	**110**	<0.50	0.93 J	1.4 J	<1.0	**9.3**	<1.0	**6.9**	**3.7**	0.72 J	<1.0	<1.0	**4.4**	**28**	<0.20
G-4	02/21/18	well pump repaired/replaced	<2.0	0.90 J	**35**	<0.50	<1.0	<2.0	**1.0**	1.7 J	<1.0	**14**	1.6 J	0.56 J	<1.0	<1.0	**7.3**	**9.9 J, B**	<0.20
G-4	08/21/18		<2.0	0.82 J	**27**	<0.50	<1.0	<2.0	**1.2**	0.58 J	<1.0	**16**	1.4 J	<2.0	<1.0	<1.0	**7.6**	2.7 J	<0.20
G-4	02/12/19		<2.0	0.93 J	**29**	<0.50	<1.0	0.59 J, B	**1.0**	0.60 J	<1.0	**15**	1.9 J	<2.0	<1.0	<1.0	**7.1**	<20	<0.20
G-4	08/20/19		0.66 J	**1.0**	**32**	<0.50	<1.0	<2.0	**1.1**	<2.0	<1.0	**16**	1.6 J	<2.0	<1.0	<1.0	**7.1**	**76 B**	<0.20
G-4	02/18/20		<2.0	0.91 J	**29**	<0.50	<1.0	<2.0	0.99 J	0.78 J	<1.0	**16**	1.6 J	0.53 J	<1.0	<1.0	**6.8**	5.7 J	<0.20
G-4	08/18/20		<2.0	**1.3**	**39**	<0.50	<1.0	<2.0	**1.2**	0.70 J	<1.0	**14**	**2.1**	1.8 J	<1.0	<1.0	**6.9**	<20	<0.20

Table 6
Historical Title 22 Metals (Dissolved) Measured in Groundwater and Surface Water
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, California

EPA Method:			6020 (dissolved)															7470 A (diss)
Sample ID	Date Sampled	Notes	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Lead (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ug/L)
EPA Region 9 MCLs (1)			6	10	2,000	4	5	100	na	na	na	na	na	50	na	2	na	na	2
California DPH MCLs (2)			6	10	1,000	4	5	50	na	1000 (3)	na	na	100	50	100 (3)	2	na	5,000 (3)	2

Notes:
<# = Analyte was not detected above the Reporting Limit (#)
ND = Not Detected. This data was obtained from a summary table of a report not prepared by SECOR.
The actual laboratory reports are not available, thus MDL's can not be determined for this data.
-- = Not applicable / Not analyzed
na = Not applicable
CQ = analyte concentration greater than 10 times the blank concentration
J = Analyte was detected between the MDL and the RL
MB or B = Analyte present in Method Blank
ug/L = micrograms per liter
Results highlighted with **Bold** font indicate results > RL
(1) - National Primary Drinking Water Regulations - EPA Region 9
(2) - California Department of Public Health
(3) - Secondary MCL per CCR Title 22, Div. 4, Chapter 15, Article 16
MCLs = Maximum Contaminant Levels
bold # Results highlighted with a gray box indicate results > MCL
Prior to the 2008 sampling event, dissolved metals was not tested for in surface water samples.
-- = Not applicable / Not analyzed
On October 30, 2014, DTSC approved the removal of MW-01A and MW-01B from the groundwater sampling plan.
For safety and security reasons, the surface water sampling locations in the Dominguez Flood Control Channel (DFCC) have been re-located.
During Q2, 2017 GW event, due to vandalism (hinges on well lid cut off and pump stolen), MW-04B and G-4 were sampled using a bailer and analyzed only for GRO and VOC's.
During Q3, 2017 GW event, due to vandalism (monument was found damaged), a no-purge sample was collected from G-4.

SECOR International Incorporated, 2005: *Remedial Investigation / Feasibility Study Workplan* , Gardena Sumps, City of Gardena, California.
Prior to 2006, some table data was incorrectly represented in mg/L and has been updated to correctly reflect µg/L.
EPA, 2009. *Drinking Water Standards and Health Advisories Table* , November

Prepared for

Atlantic Richfield Company
6 Centerpointe Drive
La Palma, California 92048

DRAFT REMEDIAL ACTION PLAN

GARDENA SUMPS
GARDENA, CALIFORNIA

Prepared by

Geosyntec consultants

engineers | scientists | innovators

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San Diego, California 92127

Project Number: SC0467A

18 January 2021

DRAFT Remedial Action Plan
Gardena Sumps
Gardena, California

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LIST OF ACRONYMS AND ABBREVIATIONS

%	percent
AMP	Air Monitoring Plan
amsl	above mean sea level
AOC	Area of Concern
APA	Air Pathway Analysis
ARAR	Applicable or Relevant and Appropriate Requirement
ARC	Atlantic Richfield Company
BaP-eq	benzo(a)pyrene toxicity equivalent
bgs	below ground surface
$CaCO_3$	calcium carbonate
CalDWR	California Department of Water Resources
CalEPA	California Environmental Protection Agency
$Ca(OH)_2$	calcium hydroxide
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CGP	Construction General Permit
CHHSL	California Human Health Screening Levels
COC	constituent of concern
COPC	constituent of potential concern
CQA	Construction Quality Assurance
CSM	Conceptual Site Model
CY	cubic yard
DTSC	Department of Toxic Substances Control
EECAR	Engineering Evaluation/Cost Analysis Report
EEI	Ecology and Environmental, Inc.

°F	degrees Fahrenheit
FS	Feasibility Study
ft	feet
GAC	granular activated carbon
GCL	geosynthetic clay liner
Geosyntec	Geosyntec Consultants, Inc.
GRO	gasoline range organics
H&SC	Health and Safety Code
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
LACDPW	Los Angeles County Department of Public Works
LARWQCB	Los Angeles Regional Water Quality Control Board
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
µg/L	micrograms per liter
mph	miles per hour
°N	degrees north
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
OHM	OHM Corporation
O&M	operation & maintenance
OMM	operation, maintenance, and monitoring
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyls
PEL	permissible exposure level
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million

PPP	Public Participation Plan
RAO	Remedial Action Objective
RAP	Remedial Action Plan
RAW	Removal Action Workplan
RBC	risk-based concentration
RI	Remedial Investigation
RMP	Risk Management Plan
ROD	Record of Decision
RPP	reinforced polypropylene
SCAQMD	South Coast Air Quality Management District
SDS	Safety Data Sheets
sf	square feet
SSAL	Site-Specific Action Levels
SVOC	semi-volatile organic compounds
SWRCB	State Water Resources Control Board
TEH	total extractable hydrocarbons
TPC	The Planning Center
USEPA	United States Environmental Protection Agency
VFH	volatile fuel hydrocarbons
VOC	volatile organic compounds
°W	degrees west

EXECUTIVE SUMMARY

Pursuant to California Health and Safety Code Section 25356.1, this document presents the Remedial Action Plan (RAP) for the Gardena Sumps Site (Site) located at the southwest corner of Artesia Boulevard and Normandie Avenue in Gardena, California. The RAP was prepared by Geosyntec Consultants, Inc. (Geosyntec) on behalf of Atlantic Richfield Company (ARC) for submittal to the California Environmental Protection Agency (CalEPA), Department of Toxic Substances Control (DTSC). The Administrative Record for this Site is included in Appendix A of this RAP.

This RAP addresses the Cooper North sump, Cooper South sump, Haack sump, and Haack Rework Area on the Site. The three sumps and the Haack Rework Area are referred to as the areas of concern (AOCs) in this RAP.

The Cooper sumps currently are capped by a geosynthetic material that was installed by OHM Corporation (OHM) in July 1993 as part of the DTSC's environmental program at the Site. An additional geosynthetic liner was placed over the 1993 liner in August 2013. The Haack Sump has been covered by asphalt and a concrete slab. Currently the Haack property is leased to various tenants who operate small businesses, including a U-Haul rental agency, a metal fabricating, sand blasting and painting company, and an auto body repair shop. Three buildings and numerous small trailer-type storage structures are present on the Haack property.

Based on the Draft Human Health Risk Assessment (HHRA) (Geosyntec, 2010), primary risk driving chemicals were identified as constituents of concern (COCs) from the list of constituents of potential concern (COPC). The primary COCs identified in the Cooper and Haack Sumps as well as in the Haack Rework Area are: (i) Soil: arsenic, hexavalent chromium, naphthalene, and the benzo(a)pyrene toxicity equivalent (BaP-eq); (ii) Air: benzene, hydrogen sulfide; and (iii) Groundwater: dibenz(a,h)anthracene.

The most suitable remedial alternative for the AOCs at the Site was evaluated based on the selection criteria described in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidance document (United States Environmental Protection Agency [USEPA], 1988). In a letter dated 14 July 2020, DTSC approved ARC's Feasibility Study (FS) (Geosyntec, 2014). Based on the comparative analysis of the remedial alternatives, Alternative 2A - Capping with selective excavation was identified as the alternative that meets the Remedial Action Objectives (RAOs) and ranks the highest. This alternative consists of excavating the Haack Rework area and a portion of sludge overflow along the eastern limits of the Cooper Sumps and consolidating the materials above the Cooper North and South Sumps. A cap consisting

of a stabilization layer, foundation layer, low-hydraulic conductivity layer, and erosion resistance layer would be constructed above the sumps. A vapor control and monitoring system would be installed beneath the cap and around the sumps, and groundwater monitoring would continue.

This remedial alternative effectively mitigates the risk from ingestion, inhalation, and dermal contact with soils from the AOCs for both future non-residential and residential occupants of buildings on Site, and future landscape and utility workers. This alternative also effectively mitigates the risk from dermal contact with Site groundwater through construction of the cap and institutional controls.

Alternative 2A readily meets the criteria of overall protection of human health and the environment and satisfies Applicable or Relevant and Appropriate Requirements (ARARs). When evaluated against the balancing criteria, Alternative 2A provides short-term effectiveness as well as long-term effectiveness and permanence. It is readily implementable and presents an effective balance of cost against the other criteria. Alternative 2A also would best accommodate future potential redevelopment of the Site.

Additional remedial alternatives considered included:

1. Alternative 1 – No action.
2. Alternative 3 – Capping with selective excavation and stabilization/neutralization, which included mixing the top 3 feet (ft) of sludge in the Cooper North and South Sumps with reagent to stabilize/neutralize the sludge. The Haack Rework area and a portion of sludge overflow along the eastern Cooper Sumps would be mixed with the stabilized/neutralized material. A cap consisting of a foundation layer, low-hydraulic conductivity layer, and erosion resistance layer would be constructed above the Cooper North and South and Haack Sumps. A vapor control and monitoring system would be installed beneath the cap and around the sumps, groundwater monitoring would continue, and institutional controls would be implemented.
3. Alternative 4 – Excavation of sludge with off-Site disposal. The sludge would be mixed with the neutralizing agent and loaded into trucks for disposal off-Site. Major components of this alternative include concrete and asphalt removal, odor and air emissions control, excavation and mixing of sludge, transportation to the disposal facility, confirmation sampling, sump backfill, and ongoing groundwater monitoring.

Redevelopment plans for the Site have been proposed by a developer but have not yet been approved nor has the developer purchased the property at this point. ARC has provided a copy of the RAP to the developer and has engaged them in conversation regarding the nature of their development and how it would fit with the selected remedy. The redevelopment plans are generally consistent with the remedy presented in this RAP. To the extent that the redevelopment plans are approved in such a manner so as to be consistent with the remedy, ARC will coordinate with the developer, as necessary, to carry out redevelopment at the Site to the extent practical and appropriate.

Consistent with the Public Participation requirements for the RAP process, the public participation process will include:

- Development of a mailing list, including at a minimum, all commercial, industrial, and residential occupants within at least a ¼-mile radius;
- Fact sheet preparation and mailing;
- Public notice and public hearing;
- 45-day comment period; and
- A response to comments document sent to all individuals who submitted formal public comments.

Public access for review of the project documents, including previously distributed documents, is available at the following locations:

Gardena Mayme Dear Library
1731 W. Gardena Avenue
Gardena, California 90247
(310) 323-6363
www.colpublib.org/libs/gardena

Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630
Contact Mr. Nick Ta for an appointment at (714) 484-5381

Other information on the Site may be accessed at:

DTSC EnviroStor Website:
http://www.envirostor.dtsc.ca.gov/public/

1. INTRODUCTION

Pursuant to California Health and Safety Code Section 25356.1, this document presents the Remedial Action Plan (RAP) for the Gardena Sumps Site (Site) located at the southwest corner of Artesia Boulevard and Normandie Avenue in Gardena, California. The RAP was prepared by Geosyntec Consultants, Inc. (Geosyntec) on behalf of Atlantic Richfield Company (ARC) for submittal to the California Environmental Protection Agency (CalEPA), Department of Toxic Substances Control (DTSC).

1.1 Purpose

This RAP summarizes the Remedial Investigation (RI) performed by Stantec and documented in the Revised Draft 2006 Remedial Investigation Report (Revised Draft RIR) (Stantec, 2008) and the Addendum to the 22 August 2008 Revised Draft 2006 Remedial Investigation Report (Addendum to the Revised Draft RIR) (Stantec, 2010b), which was approved by the Department of Substances Control (DTSC) in a letter dated 8 March 2011 (DTSC, 2011). This RAP also summarizes the evaluation and selection of the preferred remedial alternative, outlines the design objectives and criteria, and summarizes the design components, implementation plan, monitoring, schedule, and other regulatory requirements for the remedy approved in the Feasibility Study (FS) for the Cooper North sump, Cooper South sump, Haack sump, and the Haack Rework Area, constituting the areas of concern (AOCs).

1.2 Public Participation

Consistent with the Public Participation requirements for the RAP process, the public participation process will include:

- Development of a mailing list, including at a minimum, all commercial, industrial, and residential occupants within at least a ¼-mile radius;
- Fact sheet preparation and mailing;
- Public notice and public hearing;
- 45-day comment period; and
- A response to comments document sent to all individuals who submitted formal public comments.

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Other information on the Site may be accessed at:

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http://www.envirostor.dtsc.ca.gov/public/

1.3 Terms of Reference

On 2 November 2004, the United States (US) District Court for the Central District of California entered a Consent Decree in the case of California Dept. of Toxic Substances Control, et al. v. Atlantic Richfield Company (Consent Decree) (DTSC, 2004). The Consent Decree dictates the remedial responsibilities assumed by ARC and governs the preparation of a RAP. The Consent Decree requires the final draft RAP to be consistent with the National Contingency Plan (NCP) and Health and Safety Code (H&SC) Section 25356.1, et seq.

1.4 RAP Organization

The remainder of the RAP is organized as follows:

- Section 2, Site Background, presents physical characteristics of the Site, owner/operator information, permits, regulatory status, and facility history.
- Section 3, Summary of Remedial Investigations, summarizes the RI activities, results of testing, and provides the conceptual site model (CSM) abstracted from the Revised Draft Remedial Investigation (Stantec, 2008).
- Section 4, Summary of Removal Actions, summarizes removal actions completed at the Site.
- Section 5, Summary of Risk Assessment, Remedial Action Objectives and Site Cleanup Levels, presents the constituents of concern (COCs) and Site risks

abstracted from the Draft Human Health Risk Assessment (HHRA) (Geosyntec, 2010). The remedial action objectives (RAOs) and applicable or relevant and appropriate requirements (ARARs) are also discussed in this section.

- Section 6, Summary and Evaluation of Alternatives, describes the screening of potential remedial action technologies against evaluation criteria and presents a comparative analysis of the alternatives.
- Section 7, Remediation in Areas of Concern, summarizes the design components, implementation plan, monitoring, schedule, and other regulatory requirements for the remedy proposed in Section 6.
- Section 8, References, presents the references used in the preparation of this report.

2. SITE BACKGROUND

2.1 General

This section includes information on Site location and description, Site history, geology, and hydrogeology. The information presented in this section generally has been excerpted from the Revised Draft RIR (Stantec, 2008).

2.2 Site Location and Description

The Site is located at 1440 West Artesia Boulevard, in the southwest corner of the Artesia Boulevard and Normandie Avenue intersection, in the City of Gardena, Los Angeles County, California (Figure 1-1). Generally, the area surrounding the Site is bordered to the south by the Los Angeles County Department of Public Works (LACDPW) Dominguez Flood Channel, to the east by the Southern Pacific Railroad right-of-way and Normandie Avenue, to the west by commercial properties, and to the north by Artesia Boulevard, although a small portion of Artesia Boulevard is included within the Site.

The Site, shown on Figure 1-2, is approximately 6.48 acres of mixed-use development (i.e., residential and commercial) and primarily consists of two properties, the Cooper property and the Haack property. The Cooper property is comprised of two large sumps (referred to as the "Cooper North" and "Cooper South" sumps). The Haack property contains one modified sump (referred to as the "Haack sump") and the "Haack Rework Area," which is a reworked and mixed sludge-soil area south of the Haack sump. The Haack Rework Area encroaches onto the extreme northern portions of the two easternmost residential lots. Commercial property is located west of the Haack sump, and four residential properties are located south of the commercial property and the Haack sump.

This RAP addresses the three sumps and the Haack Rework Area, which are referred to in this RAP as the AOCs.

2.3 Site History, Operation, and Ownership

The Revised Draft RIR documents the Site history and presents historic aerial photographs. Please refer to the Revised Draft RIR (Stantec, 2008) for details.

2.4 Agency Involvement

DTSC oversight began in 1988 when it determined that the presence of hazardous substances in the soil at the Site posed an imminent and substantial endangerment to

public health and the environment. In 1992, the DTSC issued an Imminent and Substantial Endangerment Order and Remedial Action Order requiring respondents to undertake certain cleanup measures at the Site. OHM Corporation installed a geosynthetic cap over the sumps in 1993 as part of the DTSC's environmental program at the Site. On 2 November 2004, the DTSC entered into a Consent Decree with ARC which directed ARC to:

- Complete removal actions;
- Prepare a Public Participation Plan (PPP);
- Perform and prepare an RI;
- Perform interim screening and evaluation of remedial technologies;
- Perform Treatability Studies;
- Prepare a Baseline Risk Assessment;
- Prepare an FS;
- Evaluate the California Environmental Quality Act (CEQA); and
- Prepare a RAP.

2.5 Climatology

The climate in Gardena is controlled by the strength and position of a semi-permanent high-pressure cell over the eastern Pacific Ocean. The high-pressure cell generally creates a pattern of early morning cloudiness, afternoon sunshine, and minor temperature fluctuations throughout the year.

Complete-year historic climate data is available for 30 years between 1961 and 1990 for the nearby Torrance Municipal Airport, located approximately 5 miles southwest of the Site at approximately 33.80 degrees north (°N) and 118.33 degrees west (°W) and 108 feet (ft) above mean sea level (amsl) (WorldClimate.com, 2013). According to the data, the annual average temperature for the area is 62.8 degrees Fahrenheit (°F) with an average monthly high temperature of 79.9°F occurring in August, and an average monthly low temperature of 45.1°F occurring in January. Rainfall occurs mostly from November through April as generally mid-latitude storms move through the area. An average of approximately 13.6 inches of rain falls each year. Summers are often dry, with the exception of occasional rainfall from thundershowers of tropical origin. The average wind is from the west at a speed of 7.8 miles per hour (mph).

2.6 Topography

The Site is located in a generally low-lying coastal plain that is relatively flat. Artesia Boulevard to the north ranges in elevation from approximately 20 ft amsl to 22 ft amsl in the vicinity of the Site and slopes slightly to the west. Normandie Avenue to the east ranges in elevation from approximately 24 ft amsl to 22 ft amsl and slopes slightly to the north. The top of the slopes of concrete-lined Dominguez Channel to the south of the Site are at an approximate elevation of 25 ft amsl and the channel flows to the west. The residential properties to the south of the Site generally range from 25 ft amsl to 35 ft amsl and slope to the west. The commercial property to the west slopes to the northeast with a maximum elevation of approximately 29 ft msl in the southwest corner to a minimum elevation of approximately 21 ft msl in the northeast corner adjacent to Artesia Boulevard.

The surface elevation of the Cooper North, Cooper South, and Haack Sumps is approximately 20 ft amsl. The Haack Rework Area ranges in elevation from approximately 20 ft amsl to 35 ft amsl.

2.7 Geology

The following discussion is based on California Department of Water Resources (CalDWR) Bulletin No. 104, Planned Utilization of the Ground Water Basins of the Coastal Plain of Los Angeles County, Appendix A — Ground Water Geology, dated June 1961, reprinted April 1988 (CalDWR, 1961) and discussions contained in reports from previous investigations (CalEPA, 1994; URS, 1994; and Stantec, 2008).

The Site is located in the Los Angeles Coastal Plain and is underlain by a thick sequence of marine and continental sediments that were deposited in a broad synclinal depression. This depression is generally referred to as the Los Angeles Basin. The Los Angeles Basin is bisected by the northwest trending Newport-Inglewood uplift, which divides the Coastal Plain into two smaller synclinal troughs. The Site is located in the West Coast Basin, which constitutes the southwest portion of the Los Angeles Basin.

The Site is located near the junction of the Torrance Plain and the Dominguez Erosion Gap. The Torrance Plain runs west of and parallel to the hills of the Newport-Inglewood uplift from the Ballona Gap southeast to the Dominguez Gap. The Plain is a broad featureless area only slightly dissected locally by the Dominguez Creek (Dominguez Channel).

According to boring logs in the Ecology and Environmental, Inc. (EEI) (1986), Metcalf and Eddy (1992), CalEPA (1994) and URS (1994) reports, sediments underlying the Site,

to the maximum explored depth of 92 ft below ground surface (bgs), consist primarily of a mixture of clays and silts with interbeds of sand. Copies of the available boring logs from these previous studies are provided in Appendix F and summarized in Table 13 of the Revised Draft RIR (Stantec, 2008). This stratigraphy correlates in general with the observed conditions in borings completed in conjunction with the Revised Draft RIR (Stantec, 2008) and the Addendum to the Revised Draft RIR (Stantec, 2010b), which reached a maximum depth of 100 ft bgs.

2.8 Hydrogeology

The following discussion is based on CalDWR Bulletin No. 104, Planned Utilization of the Ground Water Basins of the Coastal Plain of Los Angeles County, Appendix A - Ground Water Geology, dated June 1961, reprinted April 1988 (CalDWR, 1961) and discussions contained in reports from previous investigations (CalEPA, 1994; URS, 1994; Stantec, 2008).

The Site is located in what is known as the West Coast Groundwater Basin. The West Coast Groundwater Basin has existing beneficial uses for municipal and domestic supply wells, agricultural supply, industrial process supply, industrial service supply, and aquaculture (Los Angeles Regional Water Quality Control Board [LARWQCB], 1994). This basin is hydraulically isolated from other, larger groundwater basins in the Coastal Plain by the regional Newport-Inglewood Fault. The Site is underlain by Holocene and late-Pleistocene Age alluvial and marine deposits, which include the Bellflower Aquiclude at the ground surface, and the Gardena and/or Gage Aquifers of the Lakewood Formation beneath the aquiclude. Major underlying aquifers (beneath the Lakewood Formation) are the Lynwood and the Silverado Aquifers of the San Pedro Formation.

The uppermost defined unit within the basin, and the unit the Site is located within, is the Bellflower Aquiclude. Regionally, the Bellflower Aquiclude contains interfingered zones of permeable and less permeable sediments. The zones with modest to relatively high hydraulic conductivity consist of fine to coarse sand with gravel and silty sand. These coarser grained sediments vary in thickness from 10 to 60 ft and are not laterally continuous. However, in some areas, these permeable zones can contain significant amounts of water. Little beneficial use is made of water in these shallow, discontinuous hydraulic zones because well yields tend to be low and water quality generally poor (CalDWR, 1961).

The Gardena/Gage, Silverado, and Lynwood Aquifers are all capable of storing or conveying groundwater in significant quantities and constitute major sources of groundwater in the West Coast Groundwater Basin. The Lynwood and Silverado

Aquifers are primary sources for domestic water supply, while the Gardena and Gage Aquifers are a secondary domestic water supply source. Neither the Gardena nor Gage Aquifers are currently pumped for domestic use. The intervening finer-grained aquitards have not been named. These aquitards, including those that separate the Gardena and Gage Aquifers from the Lynwood Aquifer and the Lynwood Aquifer from the Silverado Aquifer, are discontinuous in nature and absent in some areas.

Immediately beneath the Site, there are two hydraulic groundwater zones within the Bellflower Aquiclude: Zone A (upper) and Zone B (lower), which are approximately 15 to 25 and 75 to 80 ft bgs, respectively. Site groundwater monitor wells are screened within these two zones. General groundwater chemistry analyses were performed at the Site to evaluate if a hydraulic interconnection exists between Zone A and Zone B due to the existence of a downward vertical gradient between the two zones. The groundwater chemistry analysis indicated the two zones are characterized by different groundwater geochemistry. The concrete lined Dominguez Channel influences the flow direction of the shallow Zone A groundwater southward while the deeper Zone B groundwater has a flow direction to the east – southeast. Groundwater monitoring at the Site over the past seven years indicates that COCs are not migrating vertically or laterally over any significant distance from the locations of the waste material.

2.9 Surface Water

The area surrounding the Site is urbanized, with surface waters that drain via storm drains into the Dominguez Channel. The Dominguez Channel is a concrete-lined flood-control structure immediately south of the Site. The upstream portion of the modern-day Dominguez Channel originates several miles west-northwest of the Site, and it drains surface water to the southeast where it discharges to the Cerritos Channel of the Los Angeles Harbor. Surface water at the Site generally drains towards the north and east following site topography, and is intercepted by a flood control storm drain located at the northeast corner of the Site adjacent to the intersection of Artesia Boulevard and Normandie Avenue.

Historically, the Dominguez Channel flowed along a natural channel bed located approximately several hundred feet west and north of the Site where it flowed eastward into Laguna Dominguez. Presently the shallow groundwater beneath the Site is influenced by the concrete lined Dominguez Channel and flows southward.

3. SUMMARY OF REMEDIAL INVESTIGATIONS

3.1 General

The nature and extent of hydrocarbon and metal impacts at and surrounding the Site have been evaluated through several investigation programs conducted since 1982. Sludge, soil, surface water, groundwater, and soil vapor have been investigated. The following sections provide a summary of findings for each of these media. Figures 3-1 through 3-3 depict the locations of soil matrix, soil vapor, and groundwater samples, respectively, collected during the RI. Details of the investigations and findings can be found in the Revised Draft RIR (Stantec, 2008) and the Addendum to the Revised Draft RIR (Stantec, 2010b).

3.2 Sludge and Soil

As a part of the RI, Stantec investigated the Cooper South Sump, the Cooper North Sump, The Haack Sump, the Haack Rework Area, as well as other on-Site and off-Site areas to delineate the vertical and horizontal extents of continuous (nonreworked) sludge and sludge-induced impacts to soil. The investigation included over 300 subsurface soil and sludge samples analyzed for the following organic and inorganic constituents:

- Volatile fuel hydrocarbons (VFHs);
- Total extractable hydrocarbons (TEHs);
- Volatile organic compounds (VOCs);
- Semi-volatile organic compounds (SVOCs);
- Polynuclear aromatic hydrocarbons (PAHs);
- Title 22 metals;
- Mercury; and
- Hexavalent chromium.

Detected constituents in soil and sludge samples analyzed as part of the RI investigation are provided in the Revised Draft RIR (Stantec, 2008) and updated in the Addendum to the Revised Draft RIR (Stantec, 2010b). The delineation of sludge is shown on Figure 1-2 and described in the sections below. The thickness of sludge in the sumps and the Haack Rework Area, as identified in the Stantec 2008 and Stantec 2010 reports, is variable due to uneven basal surfaces and interlayered reworked sand deposits.

3.2.1 Cooper South Sump

Typical average total thickness of sludge in the Cooper South Sump is approximately 4 to 5 ft with a maximum thickness of 11.5 ft. Lateral impacts of sludge in soil are negligible. Approximately 6,700 cubic yards (CY) of sludge was calculated by Stantec to be in the Cooper South Sump (Stantec, 2010b).

3.2.2 Cooper North Sump

Typical average total thickness of sludge in the Cooper North Sump is approximately 6 ft with a maximum thickness of 15.5 ft. Chrysene was detected in one boring up to 11 ft beneath the sludge. Some TEH and PAH constituents were detected approximately 6 ft laterally from this sump in depths up to 15 ft bgs, indicating some lateral migration in soil to the north; however, other borings indicated lateral impacts of sludge in soil in other directions is negligible. Approximately 7,000 CY of sludge was calculated by Stantec to be in the Cooper North Sump (Stantec, 2010b).

3.2.3 Haack Sump

Typical total thickness of sludge in the Haack Sump is approximately 4 to 5 ft with a maximum thickness of 12 ft. Boring logs indicated the western and central areas of the sump had been reworked, possibly during Site development in the late 1940s. Approximately 2,250 CY of sludge was calculated by Stantec to be in the Haack Sump (Stantec, 2010b).

3.2.4 Haack Rework Area

The Haack Rework Area consists of deposited sludge, soil, and debris in discontinuous and mixed layers of varying thickness beneath a soil cover. Sludge deposits in the Haack Rework Area slope and thicken to the northeast, to a maximum thickness of 6 ft. Approximately 670 CY of sludge material was calculated by Stantec to be in the Haack Rework Area (Stantec, 2010b).

3.3 Surface Water

Surface water samples were collected upstream and downstream of the Site from the Dominguez Channel in 2006 and 2008. Analytical data from these samples indicated elevated concentrations of gasoline range organics (GRO) and VOC analytes in contrast to the non-detections for those analytes in groundwater monitored at the Site. Based on the organic chemical parameters, the Site is not impacting surface water quality in the channel. Overall, the observed concentrations of metals in surface water adjacent to the

Site support the same conclusion that the Site groundwater conditions are not impacting surface water quality (Stantec, 2008).

3.4 Soil Vapor

The soil vapor investigation activities evaluated the subsurface concentrations of VOCs, hydrogen sulfide, and methane at various locations across the Site for use in the baseline HHRA. Constituent concentrations reported above the detection limit for targeted VOCs included benzene, toluene, ethylbenzene, m-,p-,o-xylenes, 1,3,5-trimethylbenzene, and Freon 113.

During the 2009 RI activities, additional samples were collected from 22 semi-permanent direct-push soil vapor probes. Samples collected near the Haack administrative building showed no VOCs greater than California Human Health Screening Levels (CHHSLs). On the residential properties, benzene from the sample collected from the former corral (SV-135) was the only constituent reported higher than the specific constituent CHHSL value. The results elsewhere at the Site during the 2009 RI activities generally confirmed the results of the 2006 RI (Stantec, 2010a).

An Air Pathway Analysis (APA) was performed during the 2006 investigation to evaluate the exposure pathway of outdoor inhalation of vapors. The APA showed disturbed sludge can be generally characterized as having moderate to high area source emissions as compared to the low to moderate source emissions for undisturbed sludge. Odor analyses confirmed the potential for sulfur compounds from disturbed sludge to create nuisance odors to people in the area or downwind of the disturbed sludge. The APA also showed individual compound emissions are greatly affected by the existing surface coverings and concrete slab (Stantec, 2008).

3.5 Groundwater

Groundwater is currently monitored from wells G-4 and MW-05A, screened in the upper (Zone A) hydrogeologic unit, and from four additional wells screened in both the Zone A and lower (Zone B) hydrogeologic zones (MW-02A/B, MW-03A/B, and MW-04A/B). Data collected during first quarter 2019 indicated groundwater elevations ranging from 6.17 to 7.82 ft amsl in Zone A and from 3.11 to 4.35 ft amsl in Zone B. Groundwater in Zone A generally flows to the south from Artesia Boulevard to the Dominguez Channel while groundwater in Zone B generally flows to the east.

Results of the first quarter 2019 semi-annual groundwater monitoring event are generally consistent with the analytical results from past sampling events since February 2006.

MW-05A continues to indicate the presence of GRO above the reporting limit; however, there is no Maximum Contaminant Level (MCL) for GRO. Although Bis(2-ethylhexyl)Phthalate has been detected above the MCL in wells MW-02B, MW-03B, MW-04A, and G-4 in the past, only well MW-03B had a detection above the MCL during the first quarter 2019. While concentrations of metals continue to be detected in all monitor wells, only MW-05A has had exceedances of beryllium, cadmium, and nickel above MCLs (Stantec, 2019).

3.6 Fate and Transport

Based on the results from previous investigations and the extensive field work performed as part of the Revised Draft RIR (Stantec, 2008) and the Addendum to the Revised Draft RIR (Stantec, 2010b), the current CSM suggests:

- The undisturbed sludge at the Site does not pose a threat to surface water and does not pose a threat to shallow (Zone A) or deeper (Zone B) groundwater quality throughout much of the Site. Shallow groundwater is impacted (lower pH, total & dissolved metals) south of the Haack sump; however, these impacts are not detected in samples collected downgradient of the sumps;
- The undisturbed sludge at the Site does not pose a substantive threat to the air quality in the immediate vicinity of the Site. Isolation of the sludge from temperature fluctuations above approximately 100 °F would further minimize this potential impact.
- The undisturbed sludge does not pose a threat to further contamination of soil surrounding the sludge by leaching of constituents of potential concern (COPCs) from the sludge; and
- The transport mechanisms identified during the HHRA are wind, erosion and dust; volatilization to indoor and ambient air; and leaching to groundwater (Geosyntec, 2010).

3.7 Treatability Studies Conducted

As part of the RI, a treatability study was conducted by Stantec to define and evaluate the physical and chemical characteristics of the sludge and evaluate neutralization/stabilization options. Characteristics of the sludge evaluated included acidity, wet density, moisture, viscosity, and softening point. Components of the neutralization/stabilization evaluation included:

- Potential of off-vapor evolution during full-scale mixing operations;

- Analysis of mobilization of organics and metals in treated and untreated sludges including long-term leaching analysis;
- Permeability testing;
- Analysis of soil additives;
- Testing for the potential for thermal treatment;
- Evaluation of moisture/density relationships for sludge and sludge/soil mixtures; and
- Analysis of asphaltic quality.

Testing indicated the sludge can be neutralized by using 25 percent treatment reagent addition by weight where the treatment reagent is comprised of 50 percent hydrated lime (calcium hydroxide, Ca(OH)2) and 50 percent calcium carbonate (CaCO3) fines. Approximately 10 percent water addition was also required to help activate the lime and carbonate reactions. The addition of 50 percent soil by weight during this mixing will also effectively solidify the waste so it is no longer susceptible to viscoelastic deformation. This treatment also effectively fixates lead, as demonstrated through long-term leaching tests, and neutralizes acid gases such as hydrogen sulfide and sulfur dioxide (Stantec, 2008).

4. SUMMARY OF REMOVAL ACTIONS

Since the Site was identified by the DTSC in 1981, three removal actions have been performed. The following section summarizes the removal actions completed at the Site.

4.1 1993 – Interim Cover Construction

In 1993, the DTSC prepared an Engineering Evaluation/Cost Analysis Report (EECAR) for the Site with the objective of preventing human dermal contact with the sludge. The EECAR identified three alternatives to achieve the stated objective: Haul and Dump (Alternative 1), Recycling (Alternative 2), and Construction of Cover (Alternative 3). The EECAR identified Alternative 3 as the proposed removal action (DTSC, 1993a).

Between 14 June and 6 August 1993, the removal action was implemented. The interim cover was constructed to prevent dermal contact with the sludge over an area of approximately 114,000 square feet (sf). Further investigation of the Site was identified as additional work to be completed (DTSC, 1993b).

4.2 1994 – Sludge Seepage Removal

Between 10 January and 24 January 1994, a layer of clean fill dirt was placed above exposed areas of sludge on the Southern Pacific Railroad right-of-way to the east. Additionally, a fence was installed around an approximately 12,000 sf portion of the Southern Pacific Railroad right-of-way bordering the Site (DTSC, 1994).

4.3 1998 – Haack Property Cover Construction

As part of the legal settlement between the DTSC and Mr. Clarence Haack (Haack property owner), DTSC Docket #91/92-012, Mr. Haack was responsible for abating the risk to human health from the sludge on his property. The Removal Action Workplan (RAW) identified three alternative treatment options: haul and dump (Alternative 1), Recycling (Alternative 2), and Construction of Cover (Alternative 3).

Alternative 3 was found to be the best option for the Haack Property. The cover reportedly consists of a 6-mil thick visqueen vapor barrier, with 2 inches of sand above and below to provide protection, and a concrete cap. The concrete cap included steel reinforcement within a minimum 6-inch thick slab.

4.4 2013 – Interim Cover Replacement

An additional geosynthetic liner was placed over the 1993 liner in August 2013. The new 45-mil reinforced polypropylene (RPP) geomembrane material was hot air welded along internal seams and seam taped and hot air welded to the underlying original geomembrane along the perimeter of the existing cover by Barber-Webb Co., Inc (BW). At the conclusion of cover repair, twenty-five pound sand bags constructed out of geomembrane material were placed on top of the cover at 25-ft intervals. Additional details of the new liner construction are provided in the Annual Cover Inspection and Maintenance Report prepared by Stantec dated 31 January 2014 (Stantec, 2014).

5. SUMMARY OF RISK ASSESSMENT, REMEDIAL ACTION OBJECTIVES AND SITE CLEANUP LEVELS

This section describes the development of RAOs and target cleanup levels for the Site. The process of developing the RAOs depends upon the assessment of risk to identified receptors at the Site and in the Site vicinity. A discussion of the HHRA at the Site follows.

5.1 Constituents of Potential Concern

The COPCs for the Site were developed and discussed in the hazard identification section of the HHRA (Geosyntec, 2010). United States Environmental Protection Agency (USEPA) guidance states the list of chemicals should include all chemicals that were:

- Positively detected in at least one sample;
- Detected above levels of the same chemicals found in associated blank samples;
- Tentatively identified, but may be associated with the Site based on historical information;
- Transformation products of detected chemicals; and
- Detected above naturally occurring levels (background).

During the HHRA, those contaminants posing a potential risk to receptors at the Site were identified as COPCs and can be found in Table 5-1 for soil, soil vapor, and groundwater.

5.2 Human Health Risk Assessment

5.2.1 Approach

The draft HHRA included an evaluation of health risks to potentially exposed receptor populations consisting of commercial/industrial workers, construction workers, hypothetical future residents, and trespassers. Potential exposures were evaluated for these populations assuming existing physical Site conditions (without the existence of the protective caps on the Cooper and Haack properties and prior to any future remediation efforts at the Site). In addition, a current residential scenario was included for the immediate adjacent off-Site residential area (Geosyntec, 2010).

Future development of the Site and the immediate adjacent off-Site residential area would be zoned for commercial as designated in the City of Gardena's report titled Artesia Corridor Specific Plan (The Planning Center [TPC], 2006). A more conservative hypothetical future residential scenario was included in the HHRA to evaluate potential

risks under an unrestricted land use scenario. For the construction worker scenario, shallow groundwater was also evaluated assuming that outdoor vapor inhalation and dermal contact could potentially occur when groundwater is exposed in an open excavation (Geosyntec, 2010).

To evaluate the spatial distribution of risk driving chemicals, two types of comparison criteria were developed for each chemical identified in the risk characterization: (1) those based on background; and (2) risk-based concentrations (RBCs) or target risk concentrations which are based on each receptor group and assuming Site-specific soil characteristics and a target risk goal. For worker exposures (commercial/industrial and construction worker) a target risk goal of 1 in 100,000 (1×10-5) was used. For residential and trespasser scenarios a 1 in 1,000,000 (1×10-6) target risk goal was used. For those chemicals in which the RBCs are below background, the background concentration is used as the comparison criteria. This is the case for arsenic for residential and commercial/industrial worker scenarios, and benzo(a)pyrene toxicity equivalent (BaP-eq) for the residential scenarios (Geosyntec, 2010).

5.2.2 Results

The results of the HHRA indicate exposures to on-Site soils may potentially exceed target risk goals for all potential receptor scenarios evaluated: commercial/industrial worker, construction worker, hypothetical future on-Site/current off-Site resident, and trespasser. The primary contributors to the risk estimates were arsenic, hexavalent chromium, naphthalene, and predominantly the carcinogenic PAHs as represented by the BaP-eq concentration. The majority of locations where concentrations of these chemicals were elevated occurred within areas of known sludge material which are currently covered by the existing geomembrane cap, soil, concrete, and/or asphalt (Geosyntec, 2010).

5.3 Constituents of Concern

Following completion of the HHRA, primary risk driving chemicals were identified as COCs from the list of COPCs (see Section 5.1). These chemicals were identified as primary risk drivers because they are the most ubiquitous chemicals throughout the Site and because they are co-located with a majority of the COPCs (i.e., the risk associated with the COCs would encompass the COPCs). Based on the HHRA, the primary COCs at the Site are:

- Soil: arsenic, hexavalent chromium, naphthalene, and the BaP-eq.
- Air: benzene, hydrogen sulfide.

- Groundwater: dibenz(a,h)anthracene.

These COCs are present in the Cooper and Haack Sumps as well as in the Haack Rework Area. Methane has been detected at low concentrations around the Site but was not identified as a COC based on the HHRA. Due to the potential explosive risk associated with methane, it has been included as an RAO.

5.4 Remedial Action Objectives

RAOs are goals specific to various media and apply to those media that have been identified as posing an unacceptable risk based on the HHRA work performed for the Site. The RAOs for on-Site soils, soil vapor, and groundwater are:

- Prevent ingestion/direct contact with sludge and/or soil having 10-5 to 10-6 excess cancer risk from carcinogenic constituents as represented by arsenic, hexavalent chromium, naphthalene, and the BaP-eq concentration;
- Prevent dermal contact with shallow groundwater having 10-5 excess cancer risk from carcinogenic PAHs as represented by dibenz(a,h)anthracene;
- Prevent dermal contact with low pH, PAH containing sludge;
- Prevent inhalation of VOCs, as represented by benzene, posing excess cancer risk levels of 10-5 to 10-6; and
- Prevent explosive risks associated with methane.

5.5 Future Site Use

The Site is currently used for residential and commercial/industrial applications. The DTSC has requested the following three future land use scenarios be evaluated for the Site:

- Current land use will continue; residential properties would remain, and Cooper and Haack areas would remain commercial/industrial;
- Use the Site for residential only; and
- Use the Site for commercial/industrial only.

Although not planned to accommodate residential redevelopment, as a conservative approach to meet the DTSC request, the residential cleanup goals will be used, which are the most stringent.

The City of Gardena has developed the City of Gardena Master Plan (TPC, 2006) which indicates the Site would be developed in the future as commercial property with a mix of commercial buildings and parking. To accommodate this development plan and constraints of the Site, The City of Gardena requested the remedial design be compatible with a parking lot or open space end use incorporating curbs, gutters, light poles, and utilities.

5.6 Target Cleanup Levels

The target cleanup levels for the Site were developed with consideration given to the following factors:

- Hypothetical future use scenario;
- RAOs; and
- Potential Site health risk.

The Site-Specific Action Levels (SSALs) shown in Tables 5-2, 5-3, and 5-4 were developed for each of the COCs identified in Section 5.3. Cleanup criteria either are numeric goals to be achieved through remediation or are non-numeric, performance-based criteria. The cleanup levels shown in Tables 5-2, 5-3, and 5-4 were used to guide the selection and screening of remedial technologies and the development and detailed analysis of remedial alternatives. A discussion of the development of cleanup criteria follows.

5.6.1 Site-Specific Action Levels

Soil cleanup criteria are based on the derivation of RBCs for Site COCs. RBCs were developed for each chemical identified as a COC or "risk driver" in the risk characterization of the HHRA (Geosyntec, 2010) based on each receptor group and assuming Site-specific soil characteristics. RBCs were derived for arsenic, BaP-eq, hexavalent chromium, benzene, and naphthalene in soil (Table 5-2); benzene in soil vapor (Table 5-3); and dibenz(a,h)anthracene in groundwater (Table 5-4). The derivation of these concentrations is provided in Appendix B of the HHRA (Geosyntec, 2010). RBCs are presented for both cancer and noncancer effects; cancer effects generally produce lower RBCs. The selected SSALs, considering background concentrations, are presented in Tables 5-2 through 5-4 for each receptor group.

For arsenic in soil, the DTSC screening level of 12 milligrams per kilogram (mg/kg), which is considered background for southern California sites (Cal-EPA DTSC, 2007), was used as the SSAL for residential receptors.

For BaP-eq in soil, a concentration of 0.9 mg/kg, considered representative of background PAH concentrations in southern California soils, was used as the SSAL for residential receptors (CalEPA DTSC, 2009).

6. SUMMARY AND EVALUATION OF ALTERNATIVES

The FS, approved by DTSC on 14 July 2020, screened alternatives for remediation of the AOCs at the Site. The objectives of the FS were to identify remedial technologies available to address COCs at the AOCs, to assemble remedial alternatives, to evaluate the remedial alternatives against the nine criteria outlined in the CERCLA guidance document, and to recommend a preferred alternative.

The approach used in the FS first defined RAOs and ARARs for the AOCs at the Site, then evaluated remedial technologies for addressing the RAOs and ARARs. The remedial technologies judged inapplicable or ineffective were eliminated from further evaluation. Retained process options underwent screening to assess effectiveness, implementability, and cost. The selected methods were then assembled into four potential remedial alternatives. A detailed evaluation of these alternatives was performed using the nine criteria required by the CERCLA guidance document (USEPA, 1988). Finally, based on a comparative analysis of the remedial alternatives, the FS recommended a preferred alternative for the AOCs. The DTSC approved the FS in a letter dated 14 July 2020.

6.1 Screening of Remedial Technologies

Potentially applicable technologies for soil remediation were screened based on effectiveness, implementability, and cost. The remedial alternatives determined to be most applicable to the AOCs, including a no action alternative, are defined below.

- Alternative 1 – No action.
- Alternative 2A – Capping with selective excavation.
- Alternative 3 – Capping with selective excavation and stabilization/neutralization.
- Alternative 4 – Excavation with off-Site disposal.

6.2 Evaluation Criteria

The CERCLA guidance document explains the nine criteria are used to evaluate each remedial alternative (USEPA, 1988). The first two criteria relate directly to findings that must be made in the Record of Decision (ROD) for the Site. These are categorized as threshold criteria that a selected remedy must meet.

1. Overall Protection of Human Health and the Environment – This criterion requires evaluation of how the alternative achieves and maintains protection of human health and the environment. The overall assessment of protectiveness draws on

the assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. Evaluation of the overall protectiveness of an alternative focuses on whether an alternative achieves adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineered controls or institutional controls. This evaluation also considers whether an alternative poses any unacceptable short-term or cross-media impacts.

2. Compliance with ARARs – This criterion requires an evaluation of how the alternative complies with identified ARARs and applicable advisories or guidance that are "to be considered." ARARs are generally categorized as action-specific, location-specific, or chemical-specific Federal or state-promulgated requirements. A list of potential Federal and state action-specific, location-specific, and chemical-specific ARARs have been identified for the AOCs at the Site and are included in Table 6-1.
3. Long-Term Effectiveness and Permanence – This criterion requires evaluation of the long-term effectiveness of the remedial alternative in maintaining protection of human health and the environment following implementation of the alternative.
4. Reduction of Toxicity, Mobility, and Volume Through Treatment – This criterion evaluates the anticipated performance of the treatment technologies the alternative comprises, and assesses their ability to reduce the toxicity, mobility and volume of contaminated materials through the use of treatment.
5. Short-Term Effectiveness – This criterion requires an assessment of the protection of human health and the environment during construction and implementation of the remedial alternative until RAOs are met. The following factors are addressed as appropriate for each alternative: protection of the community during remedial actions, protection of workers during remedial actions, environmental impacts, and time until remedial response objectives are achieved.
6. Implementability – This criterion requires an assessment of the technical and administrative feasibility of an alternative, including the availability of required services and materials to execute the alternative. How each alternative is impacted by the property ownership (i.e., one, large, single property or seven individual properties) will also be discussed.
7. Cost – This criterion requires evaluation of the anticipated capital costs and operation and maintenance (O&M) costs of an alternative.

8. State Acceptance – This criterion allows for consideration of preferences or apparent concerns by the DTSC.
9. Community Acceptance – This criterion allows for consideration of the community's preferences or concerns regarding remedial alternatives. DTSC formally considers the community's preferences or concerns after the FS Report and RAP are prepared.

6.3 Remedial Alternatives Considered

The four remedial alternatives developed from the retained remedial technologies are described below.

6.3.1 Alternative 1 – No Action

Alternative 1 consists of no remedial actions or institutional controls to address soils above target cleanup levels.

6.3.2 Alternative 2A – Capping with Selective Excavation

Alternative 2A consists of excavating the Haack Rework Area and a portion of sludge overflow along the eastern perimeter of the Cooper Sumps and consolidating the materials above the Cooper North and South Sumps. A cap consisting of a stabilization layer, foundation layer, low-hydraulic conductivity layer, and erosion resistance layer would be constructed above the sumps. A vapor control and monitoring system would be installed beneath the cap and around the sumps, and groundwater monitoring would continue. The northern edge of the Haack Sump cap would slope to terminate at an elevated curb adjacent to the sidewalk along Artesia Boulevard. Institutional controls consisting of a Health and Safety Plan (HASP), Construction Quality Assurance (CQA) Plan, and Risk Management Plan (RMP) would be implemented. Alternative 2A replaced Alternative 2 in the Draft FS dated February 2011. Alternative 2A is consistent with the former Alternative 2 in that capping and selective excavation of the sludge in the Haack Rework Area are evaluated. However, the cap proposed in Alternative 2A is significantly lower in overall height than the cap of former Alternative 2.

6.3.3 Alternative 3 – Capping with Selective Excavation and Stabilization/Neutralization

This alternative includes mixing the top 3 ft of sludge in the Cooper North and South Sumps with reagent to stabilize/neutralize the sludge. The Haack Rework Area and a portion of sludge overflow along the eastern Cooper Sumps would also be mixed with

the stabilized/neutralized material. A cap consisting of a foundation layer, low-hydraulic conductivity layer, and erosion resistance layer would be constructed above the Cooper North and South and Haack Sumps. A vapor control and monitoring system would be installed beneath the cap and around the sumps, and groundwater monitoring would continue. Institutional controls consisting of a HASP, CQA Plan, and RMP would be implemented.

6.3.4 Alternative 4 – Excavation with Off-Site Disposal

This alternative includes excavation of sludge with disposal off-Site. The sludge would be mixed with neutralizing agent and loaded into trucks for disposal off-Site. Major components of this alternative include concrete and asphalt removal, excavation and mixing of sludge, transportation to the disposal facility, confirmation sampling, sump backfill, and groundwater monitoring.

6.4 Alternatives Analysis and Recommended Alternative

The purpose of the evaluation of relative performance of the alternatives is to select a preferred remedial alternative that will be most suitable for the AOCs at the Site, based on the CERCLA guidance document (USEPA, 1988). In the comparative analysis and evaluation, the remedial alternatives are weighed against each of the nine criteria in the CERCLA guidance document, and comparisons between alternatives are made to assist in screening out inferior alternatives and selecting a preferred alternative. The preferred alternative becomes the alternative that meets the threshold criteria (Section 6.2, criteria 1 and 2), and best achieves a balance between the balance criteria (Section 6.2, criteria 3 through 7). The modifying criteria (Section 6.2, number 8 and 9) are used to guide DTSC to project modifications, if needed. Below is a summary of the evaluation.

6.4.1 Comparative Evaluation of the Alternatives

1. Overall Protection of Human Health and the Environment – Alternative 1, No Action, does not provide adequate protection of human health and the environment. No further assessment or comparison with this alternative is provided. Alternative 2A would perform better than Alternative 3. While Alternative 3 stabilizes/neutralizes a portion of the sludge, the mixing of the reagent releases potentially hazardous amounts of hydrogen sulfide and sulfur dioxide gas. Alternative 4 would provide very good protection of human health and the environment with the removal of the impacted materials; however, because of the risks associated with hazardous vapor generation during excavation and transportation of the material, the overall protection is deemed moderate.

2. Compliance with ARARs – Alternative 2A would perform better with respect to ARARs due to the reduction of vapor emissions when compared to Alternatives 3 and 4.

3. Long-Term Effectiveness and Permanence – Alternative 3 is ranked higher than Alternative 2A with respect to long-term effectiveness and permanence. Both alternatives would be effective and permanent over the long-term with maintenance; however, because Alternative 3 neutralizes the sludge, the treatment is likely more permanent. Alternative 4 provides the greatest long-term effectiveness and permanence since the sludge would be removed from the AOCs at the Site and disposed off-Site.

4. Reduction of Toxicity, Mobility, and Volume Through Treatment – Alternative 3 would slightly reduce toxicity and mobility through partial in-situ treatment of the source zone; however, toxicity would increase as sulfur dioxide gases are released during mixing of the sludge for treatment. Alternatives 2A and 3 would reduce mobility of the sludge by limiting infiltration and wind erosion. Alternative 4 would reduce the mobility of the sludge after off-Site disposal since the disposal landfill would be equipped with a liner system to collect leachate; however, transport of the material would temporarily increase the potential mobility.

5. Short-Term Effectiveness – Alternative 2A would perform the best with respect to short-term effectiveness. Unlike Alternatives 3 and 4, Alternative 2A does not significantly disturb the sludge, thereby minimizing the release of sulfur dioxide gas. Both Alternatives 2A and 3 incorporate a cap into the final design which would provide an immediate reduction in risk due to inhalation, dermal exposure, and ingestion. Alternative 4 would provide a reduction in risk after the sludge was transported off-Site; however, risk is temporarily increased in the short-term during sludge disturbance and transport.

6. Implementability – Alternatives 3 and 4 pose significant implementation issues due to the vapor generation during mixing and excavation of the sludge. Vapor control and treatment would be necessary during mixing and excavation of the sludge. Construction of an enclosure to contain the vapors would be difficult to perform due to low bearing capacity of the sludge to support the enclosure structure and the area the enclosure would need to span (enclosure structural support would need to be founded on native soils outside the limits of each sump, creating a need for the enclosure to span the entire width of each sump). Vapors captured by the enclosure would need treatment prior to discharge.

   Alternative 2A is relatively easy to implement. A stabilization layer on the Cooper sumps would be placed first to provide a surface on which to install the foundation

and vapor collection, barrier, and cover layers. Disturbance of the sludge would be limited to the eastern overflow and Haack Rework Area, which are significantly degraded and would release significantly less sulfur dioxide gas than the sludge in the Haack and Cooper Sumps (Appendix A, Stantec, 2008). The materials necessary for construction of Alternative 2A are available and do not require admixtures or special equipment.

7. Cost[1] – Alternative 2A has the lowest capital cost of approximately $6MM (not including Alternative 1). Alternative 3 has capital costs ranging from approximately $11MM to $13MM while Alternative 4 capital costs range from approximately $28MM to $29MM. Alternatives 2A and 3 have identical net present value O&M costs of approximately $5MM. Alternative 4 has the lowest net present value O&M cost of approximately $120K. Alternative 2A has the lowest combined remedial cost.
8. State Acceptance – In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the RAP approval letter is being prepared.
9. Community Acceptance – In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the RAP approval letter is being prepared.

6.4.2 FS-Recommended Alternative

Based on the comparative analysis of the remedial alternatives, the alternative that meets the RAOs and ranks the highest is Alternative 2A, capping with selective excavation with an optional cover that will eliminate the need for a retaining wall adjacent to Artesia Boulevard to accommodate the City of Gardena's request for future potential redevelopment of the AOCs at the Site as a parking lot to support future commercial operations adjacent to the remedy. This remedial alternative effectively mitigates the risk from ingestion, inhalation, and dermal contact with on-Site soils for both future non-residential and residential occupants of buildings on Site, and future landscapers and utility workers. This alternative also effectively mitigates the risk from dermal contact with Site groundwater through the cap and institutional controls including the HASP and RMP.

Alternative 2A readily meets the criteria of overall protection of human health and the environment and satisfies ARARs. When evaluated against the balancing criteria,

[1] All costs are in 2014 values consistent with the approved FS (Geosyntec, 2014).

Alternative 2A provides short-term effectiveness as well as long-term effectiveness and permanence. It is readily implementable and presents an effective balance of cost against the other criteria. Alternative 2A also would best accommodate future potential redevelopment of the Site.

In addition to the cap elements discussed in the following sections, Alternative 2A includes institutional controls. The controls include restrictions on land use as a residence, day care center for children, long-term care hospital, or a traditional public or private school for persons less than 21 years of age, without DTSC consent.

7. REMEDIATION IN THE AREAS OF CONCERN

7.1 Introduction

As presented in Section 6.4, Alternative 2A was selected in the FS as the most suitable remedial alternative for the AOCs at the Site because it meets the primary objective of protecting public health and the environment and minimizes negative impacts to the extent reasonably practical. The DTSC approved the FS in a letter dated 14 July 2020. The following sections summarize the remedy components, sequence of work activities, safety, traffic, community relations procedures, and schedule for the FS-approved remedy.

7.2 Components of the FS-Approved Remedy

The components of Alternative 2A (FS-Approved Remedy), include:

1. Degraded and soil-sludge mixture (Haack Rework Area) excavation;
2. Consolidation of excavated degraded and soil-sludge mixture materials in the AOCs;
3. Site grading for excavated areas;
4. Grading and installation of a cap (cap) over the Cooper North and Cooper South sumps, including the following layers:
    a. Stabilization layer
    b. Foundation layer
    c. Low hydraulic conductivity layer
    d. Erosion resistance layer
5. Installation of a retaining wall system along the north side of the Haack sump;
6. Installation of a vapor control and monitoring system;
7. Groundwater monitoring system; and
8. Vegetation and Site Restoration.

The Alternative 2A cap overview, including layout and feature locations relative to the AOC and Site boundaries and surrounding features is depicted on Figure 7-1. Alternative 2A cap design detail and cross section profile references are shown on Figure 7-2. East-west and north-south cross-sections of the Alternative 2A cap are shown on Figures 7-3

and 7-4, respectively. Figures 7-9 and 7-10 show the soil vapor control system and monitor probes, respectively.

7.3 Sequence of Work

The general sequence for implementing the FS-approved remedy is summarized below. A more detailed sequence of activities and design requirements will be provided during the remedial design process. Descriptions of design configurations and work sequences below are subject to change based on the remedial design process.

1. Mobilization and Setup: Mobilize equipment (excavators, loaders, trucks, water tanks, foam applicators, etc.), materials, and construction personnel. Set up office trailers, staging areas, temporary utilities, and access roads. An initial topographic survey will be performed at the AOCs prior to the start of work.
2. Vapor Monitoring and Control: Air monitoring will be conducted during excavation activities for health and safety as well as for nuisance odors. Workers will be provided personal health and safety monitoring devices such as hydrogen sulfide and sulfur dioxide indicator badges. The devices alert workers when the permissible exposure limit (PEL, 10 parts per million [ppm] and 2 ppm for hydrogen sulfide and sulfur dioxide, respectively) is nearing so workers can exit the work area or change practices. Additionally, fixed monitoring will be performed around the perimeter of the Site to minimize impacts to off-Site receptors. Odor control measures, such as foam suppressants and/or misting sprayers, will be available at the Site should it be necessary to mitigate odors. Additional details are provided in Section 7.4 below.
3. AOC Clearing and Demolition: Demolish and remove structures, pavement, vegetation, and debris remaining within the remedy construction area on the Haack and Cooper properties and demolish relevant residential structures that conflict with remedy implementation. Prior to demolition, buildings will be evaluated for the presence of lead-based paint, asbestos, and/or polychlorinated biphenyls (PCBs). Materials from clearing and demolition will be characterized and disposed of based on characterization sampling results at inert waste landfills, non-hazardous, and/or hazardous disposal facilities. Monitor wells that are not compatible with the remedial design will be abandoned according to applicable regulations.
4. Anchor Trench Excavation and Cap Stabilization Layer: Install a high-strength geotextile above the existing Cooper Sump geomembrane and anchor the perimeter of the geotextile in an anchor trench.

5. Sheet Pile Wall Installation: Sheet piles will be installed to a maximum depth corresponding to the bottom depth of the identified sludge in the Cooper North and Haack Sumps. Sheet piles will be terminated above ground surface so that sheet pile stickup can be integrated into the retaining wall required along the north edge of the Haack sump to facilitate cap construction. The sheet piles will be coated to minimize corrosion of the steel due to the low pH and high hydrogen sulfide environment. The sheet pile cut-off wall will provide a physical barrier between the sludge remaining in the Haack and Cooper North Sumps and Artesia Boulevard and adjacent sidewalk. The sheet pile wall will aid in the mitigation of lateral migration of soil vapor.

6. Installation of Vapor Collection and Control System: The Vapor Collection and Control system will be comprised of below-cap horizontal vapor collection geostrips (Item 8b), perimeter vertical vapor migration control wells, vapor treatment system, soil vapor monitor probes, and groundwater monitor wells.

    a. Vertical Vapor Migration Control Wells: A series of alternating air inlet and vapor extraction wells will be placed no more than every 80 ft along the perimeter of the cap, except where sheet piles are installed as shown on Figure 7-9. The wells would be installed to approximately 2 ft above the groundwater "A" horizon. The air inlet and vapor extracting wells act to create a "curtain" of air surrounding the sumps, minimizing the horizontal migration of vapor without extracting vapor from the sludge.

       The system of vapor migration control wells will be designed to be a passive system that, as a contingency, can be converted readily to an active system. The system will operate actively for a startup period following completion of the remedial action construction at the AOCs. Based on the concentrations of constituents detected during the startup period, the system will remain active or switch to passive operation with the option for active control in the future. The system may be converted to passive operation with written prior approval from the DTSC. The decision to make the system active again would be based upon future gas monitoring at the AOCs.

       During active vapor extraction, a vacuum will be applied to the vapor extraction wells, thus extracting vapors from these wells, which will be conveyed to a treatment system for treatment prior to discharge to the atmosphere. The location of the system is shown on Figures 7-6 and 7-9. The vacuum pressure in the vapor extraction wells imparts a vacuum on the soils surrounding each vapor extraction well. With the air inlet wells

equally spaced between the vapor extraction wells, the air inlet forces a "short-circuiting" of the flow into the vapor extraction wells. The "short circuiting" effect creates a preferential flow path between the air inlet and vapor extraction wells, thereby allowing the system to "sweep" or "flush" vapors migrating from the sludge material laterally without extracting vapors from within the sludge (Figure 7-10).

b. Vapor Treatment System: The vapor treatment system will include conveyance piping from the extraction wells, treatment pad, and treatment system. Conveyance piping will be installed in the approximate locations shown on Figures 7-6 and 7-9. The treatment system will be installed on a temporary skid and include granular activated carbon (GAC) vessels specifically formulated for treatment of hydrogen sulfide and sulfur dioxide. The temporary skid will be installed in the location shown on Figures 7-6 and 7-9.

   The vapor treatment system will be operated actively for a time period, which will be defined in a future Operation, Maintenance, and Monitoring (OMM) Plan. During initial operation, soil vapor data, including constituents extracted and their concentrations, will be collected. The need for active vapor collection will be based on the extracted soil vapor COC concentrations and associated, calculated health risk goals. If start-up data indicates COC concentrations are below risk-based trigger concentrations, and therefore, active vapor collection is not needed, the system may be converted to a passive system which vents to the atmosphere or is turned off with no venting.

   Soil vapor samples will be collected from the treatment system on a regular basis to evaluate the operation of the system and/or migration of soil vapor and to comply with South Coast Air Quality Management District (SCAQMD) permit requirements. Sample results will be compared to risk-based trigger concentrations developed with the OMM Plan for each COC.

c. Soil Vapor Monitor Probes: Multi-level soil vapor monitor probes will be placed outside of the perimeter of the cap. The monitor probes will be installed in accordance with Detail 5 on Figure 7-7 and spaced, on average, 300 ft apart to detect potential subsurface vapor migration, if any.

d. Groundwater Monitor Wells: The existing groundwater monitor well network, or some subset of the network, will be monitored at an appropriate frequency. Groundwater monitor wells may be used to

monitor for soil vapor. Details of the typical groundwater monitor well is shown as Detail 3 on Figure 7-7.

7. Sludge Excavation and Consolidation:

    a. Sludge and soil materials will be excavated from the Haack Rework Area, portions of the high strength woven geotextile anchor trench, and certain areas outside the limits of the cap as shown on Figure 7-2. The Haack Rework Area will be excavated to an elevation of approximately 20 ft amsl, as shown on Figure 7-5. Anchor trench materials and sludge located along the north east perimeter of the Cooper North Sump will be excavated to the extent sludge is found outside the limits of the anchor trench. Excavated materials will be utilized as a portion of the cap system stabilization layer and/or foundation layer.

    b. Confirmation Sampling: Post-excavation confirmation samples will be obtained from the sloped portions (side walls or slopes of excavation not covered by cap) of the Haack Rework Area once target excavation elevations have been achieved. Confirmation sampling will be performed at a frequency of one sample per 50 lineal feet of side wall or slope, with samples collected from the lower two-thirds of the side wall or slope. Confirmation sample results will be compared to risk-based cleanup goals described in Section 5.6. For locations where test results indicate concentrations in excess of cleanup goals, additional material will be excavated from side walls or slopes, 25 ft on either side of the confirmation sample exceeding cleanup goals, then either hauled and disposed of off-Site or used as cap stabilization and/or foundation material. Additional confirmation test will be performed in area of exceedance once additional materials are removed and the original sample number will be appended with an alpha code designation (e.g., sample 4 will be retested and labeled as 4A, 4B, etc., until confirmation results indicate values less than cleanup goals).

    c. Vapor suppression foams, soil, plastic sheeting, and/or spray applied cover materials will be used as necessary during the excavation and construction work to mitigate fugitive vapors and excessive odors. The use of vapor controls will be based on personnel and perimeter air monitoring devices. At the completion of excavation activities each day, a vapor suppressing foam, soil, plastic sheeting, and/or spray applied cover will be used to cover the exposed surface of the excavation and stockpiles of impacted materials from the excavation to minimize release of vapors overnight.

8. Cap System Construction:

    a. Foundation Soil: The foundation soil will be placed above the high-strength geotextile (Cooper Sumps) or asphalt/concrete surface (Haack Sump). The foundation soil will consist of excavated material from the Haack Rework Area and the anchor trench excavations. The foundation soil layer minimum thickness will be 0.5 ft (Haack Sump) and 1 ft (Cooper Sumps). Where necessary around the cap system perimeter, the foundation layer will be graded (thinned) to blend with the existing ground surface. The foundation soil will be placed in lifts until foundation grades are met (i.e., 1 ft below the cap grades shown on Figures 7-1 and 7-2). The slopes will be a minimum of 2 percent (%) to reduce impacts on drainage due to settlement of the foundation material and/or sludge.

    b. Vapor Collection Layer: Rows of vapor collection geostrips will be placed at the surface of the finished foundation layer. The geostrips will generally be 6 to 12 inches wide and up to 1 inch thick, and consist of a geosynthetic filter fabric surrounding a molded polyethylene core (US Fabrics, 2011). The molded polyethylene core provides a pathway for the vapor to travel, while the filter fabric prevents soil intrusion into the core. A polyethylene core and polypropylene geotextile, which are more resistant to acidic environments, will be required in the technical specifications. The vapor collection geocomposite will be placed above the geostrip rows and the foundation layer (Figure 7-6).

    c. Low Hydraulic Conductivity Layer: The low hydraulic conductivity layer will be placed above the foundation soil and vapor collection geostrips and geocomposite and will consist of a geosynthetic clay liner (GCL) overlain by a 60 mil high-density polyethylene (HDPE) geomembrane (Details 1-A and 1-B, Figure 7-7).

    d. Anchor Trenches: The GCL and HDPE geomembrane will be secured by an anchor trench around the perimeter of the cap. The anchor trench will vary in configuration depending on the termination condition. Along the cap perimeter, the anchor trench will consist of a v-shaped trench filled with soil and concrete to form a surface water drainage ditch (Detail 6, Figure 7-8). Along portions of the northern and western perimeter, the GCL and HDPE will be anchored with a rectangular anchor trench (Detail 7, Figure 7-8). Along the northern edge of the Haack sump, where sheet piles are located, the geosynthetic materials will be secured to the sheet piles using battens.

e. Drainage Layer: The drainage layer will overlie the low hydraulic conductivity layer and provide a means to drain surface water that percolates through the erosion resistance layer to minimize head build up on the low hydraulic conductivity layer. The drainage layer will consist of a geocomposite (geonet core bounded by nonwoven geotextile) that will daylight along the perimeter of the cap to promote drainage towards the perimeter of the cap and into surface water management features (concrete ditches).

f. Erosion Resistance Layer: The erosion resistance layer will overlie the drainage geocomposite and will consists of 1 ft of an aggregate base material (Details 1-A and 1-B, Figure 7-7). The aggregate base material will be resistant to foreseeable erosion effects caused by wind-scour, raindrop impact, and runoff prior to Site development.

g. Haack Protection Layer: At the northern-most portion of the Haack Sump, along the retaining wall and sheet pile wall alignment adjacent to Artesia Boulevard, the geosynthetics and sheet pile wall will be protected by landscaping in the form of decorative rock, artificial turf, and/or planter box-type vegetation structures. These features will also limit maintenance. If necessary, cushion geotextiles may be used above the geomembrane where geocomposite is not present to prevent damage from installed landscaping.

h. Curb Installation: Immediately adjacent to the Artesia Boulevard sidewalk, the Haack Sump and a portion of the Cooper North Sump caps will terminate at a concrete curb. The curb will deter unintended light traffic across the slope, act as a water-stop for drainage from the slope and accommodate slight variations in the existing Haack Sump concrete slab surface elevation.

9. Final Administrative Work: Establish final AOC conditions, implement monitoring and maintenance requirements: soil vapor and groundwater monitoring, and operate the vapor collection system. Implement administrative controls/restrictive covenants.

10. Groundwater Monitoring: Groundwater and soil vapor monitoring will be established and documented in the OMM Plan. The vapor mitigation system will be operated actively for a period of time defined in a future OMM Plan. During initial operation, soil vapor data, including constituents extracted and their concentrations, will be collected. The need for active vapor collection will be based on the extracted soil vapor COC concentrations and associated, calculated

health risk goals. If start-up data indicates that COC concentrations are below risk-based trigger concentrations, and therefore, active vapor collection is not needed, the system may be converted to a passive system which vents to the atmosphere.

7.4 Site Safety Procedures

7.4.1 Air Monitoring

7.4.1.1 Air Monitoring During Implementation

An Air Monitoring Plan (AMP) will be prepared prior to implementation of the remedial action. The AMP will be approved by DTSC and will include, at a minimum, the following monitoring and control measures described in the following sections.

7.4.1.2 Air Monitoring Objectives:

- Monitor COPC changes in ambient air resulting from excavation and grading of impacted Site materials.
- Identify if mitigation measures are necessary to meet SCAQMD permit conditions during excavation and grading activities.
- Monitor ambient air at Site perimeter to prevent off-Site migration during excavation and grading and provide additional control measures, as needed.

The AMP will supplement the HASP and will consider data collected during the RI. It is anticipated that potential air emissions from the Haack Rework Area excavation and grading will be low due to the significantly degraded sludge within the rework material.

Air monitoring will be performed at the working areas and up- and down-wind areas near the Site perimeter as discussed in Section 7.3 above. Wind direction and velocity will be documented during field activities with an on-Site weather station. Dust will be monitored with particulate monitors while VOCs will be monitored with photoionization detectors (PIDs). Odors, such as those indicating hydrogen sulfide or sulfur dioxide, will be monitored with personal indicator badges. Nuisance odors will be evaluated by an on-Site, trained individual. Mitigation measures, such as the use of vapor suppression foams, soil, plastic sheeting, and/or spray-applied covers, will be used as necessary.

7.4.1.3 Work Area Monitoring

Workers will wear hydrogen sulfide and sulfur dioxide indicator badges which alert workers when the PEL (10 ppm and 2 ppm for hydrogen sulfide and sulfur dioxide,

respectively) is nearing. This allows the worker to exit the work area or change practices before the PEL is reached. In addition, air monitoring will be conducted at excavation equipment and up- and down-wind of the work area using a PID to monitor for VOCs in accordance with the SCQAMD Rule 1150/1166/1466 permit. Dust monitoring will be performed downwind.

7.4.1.4 Perimeter Monitoring

Perimeter monitoring will be performed for VOCs, dust, and odors resulting from hydrogen sulfide and sulfur dioxide. If action levels are exceeded at the perimeter, response actions will be undertaken such as stopping or changing work activities, applying water for dust suppression and applying foam suppressants and/or using misting sprayers for odor suppression.

7.4.2 Mitigation of Odor

Hydrogen sulfide and sulfur dioxide are known to be emitted from the sludge when it is disturbed. Odor control measures, such as foam suppressants and/or misting sprayers, will be available at the Site should it be necessary to mitigate odors. If sludge material is staged on-Site prior to off-Site disposal, stockpiles and/or roll-off bins will be covered to minimize odor. In addition, at the completion of excavation activities each day, a vapor suppressing foam, soil, plastic sheeting, and/or spray-applied cover will be used to cover the exposed excavation and stockpiles to minimize release of vapors.

7.5 Traffic Control

Truck traffic is anticipated to be greatest during mobilization/demobilization and off-Site transportation and disposal of any Haack Rework Area sludge. A City-approved traffic plan will be developed to establish the trucking route, operating times, maximum number of trucks per day, and other requirements to reduce adverse impacts to the City of Gardena.

7.6 Worker Protection

A Project HASP will be developed which outlines the actions to protect workers during remedy implementation. The HASP will include, but not be limited to, the following:

- Health and safety-related roles and responsibilities of key personnel: Project Manager and Project Safety Officer;

- A stop-work authority requirement for all work locations and workers. The stop-work authority grants any worker the ability to stop work if an unsafe condition is identified that could cause substantial harm or imminent danger to health and safety of workers, the public, or the environment.
- Air monitoring procedures in work areas for VOCs, hydrogen sulfide, sulfur dioxide, and dust.
- Safety Data Sheets (SDSs) for chemicals that could be found in sludge and/or brought to the Site by workers.
- Identification of Site-specific safety hazards including: chemical exposure; heavy equipment; and fire, temperature, acoustic, biological, dust, and physical hazards. The process to identify and mitigate these hazards will be included.
- Safety measures when performing tasks such as excavation, backfill, sheet pile installation, and liner deployment.
- Hazard communication procedures.
- Training requirements for workers.
- Work zone designations and access control.
- Personal protective equipment (PPE) requirements for work tasks and within specific work zones.
- Medical surveillance requirements for workers.
- Decontamination procedures for workers and equipment.
- Contingency plans for spills, fires, or other emergencies.

The HASP will be reviewed and approved by the DTSC prior to implementing the remedy.

7.7 Community Relations

Residents and commercial business owners in the surrounding community will be kept informed of activities through community outreach. Community relation activities may include issuance of fact sheets and/or public meetings, if needed. Community members may ask questions and obtain information via a telephone number established for the project. The DTSC will update the DTSC EnviroStor website with project documents as they become approved.

7.8 Permit Requirements and Implementation

Several permits will be required to implement the Site remedy. Anticipated permits include:

- Grading permit,
- SCAQMD Rule 1150/1166/1466/403 permits,
- Encroachment permits,
- Traffic permit,
- State Water Resources Control Board (SWRCB) Construction General Permit (CGP), and
- SCAQMD permit to operate vapor treatment system.

7.9 Implementation Schedule

The duration for implementation of the remedy is estimated to be approximately six months. This time frame does not include the final remedial design or contracting and permitting. The remedial design, contracting, and permitting are anticipated to be completed approximately one year after approval of the CEQA findings and all documentation related to implementation of this RAP.

7.10 Reporting

During implementation of the remedy, DTSC will be kept appraised of progress with routine progress reports. The frequency of these reports will be determined during the design phase.

Upon completion of the remedy, a report will be prepared documenting the remedial activities. The report will include, at a minimum, a description of the work conducted, as-built drawings of the cap and vapor collection and control system, any analytical data collected during implementation, copies of all permits obtained for implementation of the remedy, waste manifests for any material disposed of off-Site, and certification by a licensed professional that the cap was installed in accordance with all applicable regulations.

7.11 Site Redevelopment

Redevelopment plans for the Site have been proposed by a developer but have not yet been approved nor has the developer purchased the property at this point. ARC has provided a copy of the RAP to the developer and has engaged them in conversation regarding the nature of their development and how it would fit with the selected remedy. The redevelopment plans are generally consistent with the remedy presented in this RAP. To the extent that the redevelopment plans are approved in such a manner so as to be consistent with the remedy, ARC will coordinate with the developer, as necessary, to carry out redevelopment at the Site to the extent practical and appropriate.

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TABLES

TABLE 5-1
CONSTITUENTS OF POTENTIAL CONCERN
Gardena Sumps, Gardena, California

Geosyntec consultants

Soil		
1,1,1,2-Tetrachloroethane	Chlorobenzene	Methylene chloride
1,2,3-Trichlorobenzene	Chloroethane	Molybdenum
1,2,4-Trimethylbenzene	Chromium	Naphthalene
1,3,5-Trimethylbenzene	Chromium VI	n-Butylbenzene
1,3-Dichlorobenzene	Chrysene	Nickel
Acenaphthene	Cobalt	n-Propylbenzene
Acenaphthylene	Copper	Oil range organics (C29-C40)
Aluminum	Dibenz(a,h)anthracene	o-Xylene
Anthracene	Dibromochloromethane	Phenanthrene
Antimony	Diethyl phthalate	p-Isopropyltoluene
Arsenic	Diesel range organics (C13 - C28)	Pyrene
Barium	Extractable fuel hydrocarbons (C10 - C40)	sec-Butylbenzene
Benzene	Extractable fuel hydrocarbons (C13 - C40)	sec-Butylbenzene
Benzo(a)anthracene	Extractable fuel hydrocarbons (C8 - C40)	Selenium
Benzo(a)pyrene	Ethylbenzene	Silver
Benzo(b)fluoranthene	Fluoranthene	Styrene
Benzo(g,h,i)perylene	Fluorene	tert-Butylbenzene
Benzo(k)fluoranthene	Gasoline range organics (C4 - C12)	Thallium
Benzoic acid	Indeno(1,2,3-cd)pyrene	Toluene
Beryllium	Iron	trans-1,3-Dichloropropene
Bis(2-ethylhexyl)phthalate	Isopropylbenzene	Vanadium
Bromobenzene	Lead	Volatile fuel hydrocarbons (C4-C12)
Butyl benzyl phthalate	m,p-Xylenes	Zinc
Cadmium	Mercury	
Soil Gas		
1,1-Difluoroethane (LCC)	Chloroethane	
1,2,4-Trimethylbenzene	Chloroform	
1,2-Dichloro-1,1,2,2-tetrafluoroethane	Chloromethane	
1,2-Dichloroethane	Cyclohexane	
1,3,5-Trimethylbenzene	Dichlorodifluoromethane	
1,3-Butadiene	Ethylbenzene	
1,4-Dioxane	Freon 113	
2,2,4-Trimethylpentane (Isoctane)	Heptane	
2-Butanone	Hexane	
4-Ethyltoluene	m,p-Xylene	
4-Methyl-2-pentanone	Methylene chloride	
Acetone	Naphthalene	
Benzene	o-Xylene	
Bromodichloromethane	Propylene	
Bromoform	Styrene	
Carbon disulfide	Tetrachloroethene	
Carbon tetrachloride	Toluene	
Chlorobenzene	Trichloroethene	
Chloroethane	Trichlorofluoromethane	

TABLE 5-1
CONSTITUENTS OF POTENTIAL CONCERN
Gardena Sumps, Gardena, California

Geosyntec consultants

Groundwater		
1,2,4-Trimethylbenzene	Chloride	Mercury
1,2-Dichlorobenzene	Chloroethane	Methylene chloride
1,2-Diphenylhydrazine/Azobenzene	Chloromethane	Molybdenum
1,3,5-Trimethylbenzene	Chromium	Naphthalene
1,4-Dichlorobenzene	Chromium VI	Nickel
2,4-Dimethylphenol	Chrysene	Nitrate-N
2-Methylnaphthalene	Cobalt	Oil range organics (C29-C40)
2-Methylphenol	Copper	o-Xylene
Acenaphthylene	Dibenz(a,h)anthracene	Phenanthrene
Antimony	Diethyl phthalate	Phenol
Arsenic	Di-n-butyl phthalate	Potassium
Barium	Di-n-octyl phthalate	Pyrene
Benzene	Diesel range organics (C13 - C28)	Selenium
Benzo(a)anthracene	Extractable fuel hydrocarbons (C13 - C40)	Silver
Benzo(b)fluoranthene	Ethylbenzene	Sodium
Benzo(g,h,i)perylene	Fluorene	Sulfate
Benzo(k)fluoranthene	Gasoline range organics (C4 - C12)	Sulfide
Benzoic acid	Indeno(1,2,3-cd)pyrene	Thallium
Benzyl alcohol	Iron	Toluene
Beryllium	Isophorone	Vanadium
Bis(2-ethylhexyl)phthalate	Lead	Xylenes, total
Butyl benzyl phthalate	m,p-Xylenes	Zinc
Cadmium	Magnesium	
Calcium	Manganese	

TABLE 5-2
SUMMARY OF SITE-SPECIFIC ACTION LEVELS FOR SOIL
Gardena Sumps, Gardena, California

Geosyntec consultants

Chemicals of Concern	Site-Specific Action Levels for Soil (mg/kg)											
	Commercial/Industrial			Construction			Residential			Trespasser		
	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL
Inorganics												
Arsenic	2.7E+02	1.7E+01	1.7E+01	6.2E+01	1.2E+02	6.2E+01	2.2E+01	3.9E-01	1.2E+01[(1)]	3.8E+03	8.5E+01	8.5E+01
Chromium VI	3.0E+03	5.4E+01	5.4E+01	6.1E+02	7.3E+01	7.3E+01	2.3E+02	1.2E+00	1.2E+00	4.9E+04	3.2E+02	3.2E+02
Polyaromatic Hydrocarbons												
Benzo(a)pyrene	2.0E+04	1.6E+00	1.6E+00	5.5E+03	1.1E+01	1.1E+01	1.7E+03	3.7E-02	9.0E-01[(2)]	2.2E+05	6.2E+00	6.2E+00
Volatile Organic Compounds												
Benzene	6.7E+02	2.4E+01	2.4E+01	1.6E+02	1.4E+02	1.4E+02	1.2E+02	4.8E-01	4.8E-01	1.4E+04	1.8E+02	1.8E+02
Naphthalene	8.5E+02	2.5E+02	2.5E+02	1.9E+02	1.4E+03	1.9E+02	1.8E+02	4.9E+00	4.9E+00	1.8E+04	1.9E+03	1.9E+03

Notes:

BaP-eq: benzo(a)pyrene toxicity equivalent

mg/kg: milligram per kilogram

RBCc: risk-based concentration based on cancer effects

RBCnc: risk-based concentration based on noncancer effects

SSAL: site-specific action level

Selected SSALs are the lowest between RBCc and RBCnc, or the background concentration for chemicals in which the RBCs were below background (e.g., arsenic and BaP-eq for the residential scenario).

(1) For arsenic, the DTSC screening level of 12 mg/kg (Cal-EPA DTSC, 2007), considered representative of background in southern California soils, was selected as the SSAL.

(2) For benzo(a)pyrene, a concentration of 0.9 mg/kg, considered representative of background PAH concentrations in southern California soils, was selected as the SSAL.

TABLE 5-3

SUMMARY OF SITE-SPECIFIC ACTION LEVELS FOR SOIL VAPOR

Gardena Sumps, Gardena, California

Geosyntec consultants

Chemical of Concern	Site-Specific Action Levels for Soil Gas (µg/L)					
	Commercial/Industrial			Residential		
	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL
Benzene						
5 ft bgs	3.2E+02	1.0E+01	1.0E+01	3.8E+01	1.0E-01	1.0E-01
10 ft bgs	5.5E+02	1.8E+01	1.8E+01	6.5E+01	1.8E-01	1.8E-01
12 ft bgs	6.4E+02	2.1E+01	2.1E+01	7.6E+01	2.1E-01	2.1E-01
15 ft bgs	7.8E+02	2.5E+01	2.5E+01	9.3E+01	2.5E-01	2.5E-01

Notes:

Soil gas to indoor air pathway

ft bgs: feet below ground surface

RBCc: risk-based concentration based on cancer effects

RBCnc: risk-based concentration based on noncancer effects

SSAL: site-specific action level

µg/L: micrograms per liter

Selected RBCs are the lowest between RBCc and RBCnc

Soil gas RBCs were derived using default soil properties for soil type loam in the model

Values revised per response to comments package dated 4/4/12

TABLE 5-4

SUMMARY OF SITE-SPECIFIC ACTION LEVELS FOR GROUNDWATER

Gardena Sumps, Gardena, California

Geosyntec consultants

Chemical of Concern	Site-Specific Action Levels for Groundwater (µg/L)		
	Construction		
	Site-Specific RBCnc	Site-Specific RBCc	Selected SSAL
Polyaromatic Hydrocarbons			
Dibenz[a,h]anthracene	--	2.0E+00	2.0E+00

Notes:

" -- " not applicable

RBCc: risk-based concentration based on cancer effects

RBCnc: risk-based concentration based on noncancer effects

SSAL: site-specific action level

µg/L: micrograms per liter

Selected SSAL is the lowest between RBCc and RBCnc

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
Gardena Sumps, Gardena, California

Geosyntec consultants

Requirement	Prerequisites	Citation	ARAR Determination (A, RA, or TBC)	Comments
CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS				
Clean Air Act (42 USC 7401-7671) Regulated by the SCAQMD				
Primary and secondary national standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead)	Air contamination affecting public health and welfare	40 CFR 50.4-50.12	A	SCQAMD standards from State Implementation Plan and California Air Resources Board are more restrictive
Resources Conservation and Recovery Act (42 USC 6901-6991[i]) Regulated by the CalEPA, DTSC				
Defines RCRA hazardous waste; a solid waste is toxic, based on the TCLP, if the waste exceeds the TCLP maximum concentrations	Waste	22 CCR 66261.21-66261.24, 66261.100	A	Applicable for material disposed of off-Site
Definition of "non-RCRA hazardous waste"	Waste	22 CCR 66261.22, 66261.24, 66261.101, 66261.3	A	Applicable for determining whether a waste is non-RCRA hazardous waste
Safe Drinking Water Act (42 USC 300(f-j) - 26) Regulated by the SWRCB				
MCLs for organic and inorganic chemicals of concern in drinking water.	Public water system	40 CFR 141.61 (a,b), 141.62(b), & 141.11	RA	Leachate from the sumps may impact groundwater that has a designated beneficial use as municipal water. The Lynwood, Silverado, Gardena, and Gage aquifers have designated domestic water supply use.
Non-zero MCLGs for organic and inorganic chemicals of concern in drinking water	Public water system	40 CFR 141.50 & 141.51	RA	Leachate from the sumps may impact groundwater that has a designated beneficial use as municipal water. The Lynwood, Silverado, Gardena, and Gage aquifers have designated domestic water supply use.
California Safe Drinking Water and Toxic Enforcement Act (California Health and Safety Code 25249.5 - 25249.13) Regulated by the SWRCB				
Primary MCLs for inorganic chemicals of concern in drinking water	Drinking water source	22 CCR 64431 and 64449	RA	Leachate from the sumps may impact groundwater that has a designated beneficial use as municipal water. The Lynwood, Silverado, Gardena, and Gage aquifers have designated domestic water supply use.
Public health goals for inorganic chemicals in drinking water	Drinking water source	Health and Safety Code 116365	TBC	Guidelines established by the Office of Environmental Health Hazard assessment based on health considerations; HHRA was performed with Site-specific conditions and acceptable risk was identified
LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS				
No location-specific ARARs were identified for the Gardena Sumps Site; the Site is not located in a sensitive or protected area	----	----	----	----
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS				
Porter-Cologne Water Quality Control Act (California Water Code, Division 7) Regulated by the SWRCB				
Any activity that could affect water quality must not result in water quality parameters exceeding appropriate beneficial use water quality objectives	Contaminants affecting waters of the state	Los Angeles Basin Water Quality Control Plan	A	Groundwater protection standards are set at levels consistent with identified beneficial use for the area
State antidegradation policy applicable to both surface and groundwater requiring that discharges to waters of the state be regulated to achieve the "highest water quality consistent with maximum benefit to the people of the State"	Contaminants affecting waters of the state	Los Angeles Basin Water Quality Control Plan	A	Groundwater protection standards are set at levels consistent with identified beneficial use for the area
Requires that quality of the waters of the state that is better than needed to protect all beneficial uses be maintained unless certain findings are made. Discharges to high-quality waters must be treated using best practicable treatment or control necessary to prevent pollution or nuisance and to maintain the highest quality water. Requires cleanup to background water quality or to lowest concentrations technically and economically feasible to achieve. Beneficial uses must, at least, be protected.	Contaminants affecting waters of the state	SWRCB Res. 68-16	A	Groundwater protection standards are set at levels consistent with identified beneficial use for the area

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
Gardena Sumps, Gardena, California

Geosyntec consultants

Requirement	Prerequisites	Citation	ARAR Determination (A, RA, or TBC)	Comments
California Hazardous Waste Control Laws Regulated by the Cal EPA, DTSC				
Person who generates waste shall determine if that waste is hazardous waste	Waste	22 CCR 66262.10 & 66262.11	A	Materials in sumps are hazardous in certain areas; hydrogen sulfide emissions in excess of 500 ppm_v are also hazardous
Owners and operators of a RCRA surface impoundment, waste pile, land treatment unit, or landfill shall conduct a monitoring and response program for each regulated unit	Unit which has waste which may pose a threat to human health or the environment	22 CCR 66264.91	A	A monitoring and response program will be prepared as part of the final remedial design
Requirements for monitoring groundwater, surface water, and the vadose zone	Hazardous waste unit	22 CCR 66264.97	A	Requirements will be determined as part of the final remedial design
Design and construction requirements for the foundation, earth-barrier, and vegetation-support layers of the final cover	Discharge of hazardous waste to land after 7/18/97 for treatment, storage, or disposal	22 CCR 66264.228	A	General design elements included in this RAP; final design and construction requirements will be determined as part of the final remedial design
Requires that hazardous wastes be covered by a low-permeability cover of specific properties. The cover will prevent the downward entry of water to the closed unit for at least 100 years. Provides for post-closure care and maintenance of the cover and related components. Toxic or flammable gas or vapor must be controlled for as long as it is emitted from the Site.	Discharge of hazardous waste to land after 7/18/97 for treatment, storage, or disposal	22 CCR 66264.310	A	General design elements included in this RAP; final design and construction requirements will be determined as part of the final remedial design
Solid Waste Disposal Regulatory Reform Act Regulated by the SWRCB and CalRecycle				
Waste dischargers are responsible for accurate characterization of waste; defines designated nonhazardous solid waste and inert waste	Discharge of nonhazardous waste to land after 7/18/97 for treatment, storage, or disposal	27 CCR 20220 (b,c,d) and 20230 (b)	A	----
Requires detection monitoring; once a significant release has occurred, evaluation or corrective action monitoring is required	Discharge of water to land after 7.18.1997	27 CCR 20385 (a) (1) and (2)	A	Water quality monitoring required for closed units, unless they are clean-closed
Defines water quality protection standards that apply during closure and post-closure maintenance periods	Discharge of water to land after 7.18.1997	27 CCR 20390, 20395, and 20400	A	Water quality protection standards in WDRs must be met as demonstrated in detection monitoring program
Establishes requirements for gas monitoring and controls as related to closure and post-closure of units	Discharge of water to land after 7.18.1997	27 CCR 20921 to 20937	A	Gas monitoring required for closed units
Defines point of compliance as hydraulically downgradient from the unit and requires soil, surface water, and groundwater monitoring with RAOs for 3 years after cleanup	Discharge of water to land after 7.18.1997	27 CCR 20405, 20410, and 20415	A	WDRs will specify monitoring locations
Closure and postclosure maintenance submittal requirement showing that the unit will meet performance standards and will comply with waste containment and precipitation and drainage control	Discharge of water to land after 7.18.1997	27 CCR 20950	A	Relevant to Site closure
Requirements for final cover slopes, foundation layer, low-hydraulic conductivity layer, and erosion-resistance layer and mandates cover maintenance plan and annual cost estimates	Discharge of water to land after 7.18.1997	27 CCR 21090	A	Relevant to Site closure
Requires access control, site protection, and signage during closure and postclosure	Discharge of water to land after 7.18.1997	27 CCR 21135	A	Relevant to Site closure
Sets design criteria for final covers of units	Discharge of water to land after 7.18.1997	27 CCR 21140	A	Relevant to Site closure
Requires monitoring and analysis of differential settlement during the postclosure period	Discharge of water to land after 7.18.1997	27 CCR 21142	A	Relevant to Site closure
Requires minimum of 1.5 factor of safety for static and seismic stability of final unit face	Discharge of water to land after 7.18.1997	27 CCR 21145 and 21750	A	Relevant to Site closure
Requires postclosure maintenance of final cover and control systems for no less than 30 years	Discharge of water to land after 7.18.1997	26 CCR 21180	A	Relevant to Site closure
Requires that postclosure land uses shall protect public health and safety, prevent damage to the unit, and prevent public contact with waste	Discharge of water to land after 7.18.1997	26 CCR 221190 (a)	A	Relevant to Site closure

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
Gardena Sumps, Gardena, California

Geosyntec consultants

Requirement	Prerequisites	Citation	ARAR Determination (A, RA, or TBC)	Comments
Clean Air Act (42 USC 7401-7671) Regulated by the SCAQMD				
Limits visible emissions from a single source	Air emissions	SCAQMD Rule 401	A	Applicable for construction activities
Prohibits discharge of materials that cause injury, detriment, nuisance, or annoyance to the public; endanger the comfort, repose, health, or safety of the public; or cause or have tendency to cause injury or damage to business or property	Air emissions	SCAQMD Rule 402	A	Applicable for construction activities
Shall not cause or allow emissions of fugitive dust such that the presence of dust remains visible in the atmosphere beyond the property line of the emission source and shall not allow PM10 levels to exceed 50 mg/m^3	Generation of fugitive dust	SCAQMD Rule 403	A	Applicable for construction activities
Prohibits discharge into the atmosphere of particulate matter in excess of specified	Generation of particulates	SCAQMD Rule 404	A	Applicable for construction activities
Limits equipment from discharging particulate emissions in excess of 0.99 to 30 lbs/hr, based on a given process weight	Generation of particulates	SCAQMD Rule 405	A	Applicable for construction activities
Limits carbon monoxide and sulfur dioxide from any equipment other than that used for mobile equipment propulsion or stationary equipment engines	Air contaminant sources except mobile equipment or stationary engines	SCAQMD Rule 407	A	Applicable for construction activities
Prohibits building or using equipment which reduces or conceals an emission otherwise constituting a violation	Air emissions	SCAQMD Rule 408	A	Applicable for construction activities
Limits particulate emissions from the exhaust of a combustion source (other than an internal combustion engine) to 0.23 g/m^3 at 12% carbon dioxide averaged over 15 minutes	Combustion sources except internal combustion engines	SCAQMD Rule 409	A	Applicable for construction activities
Limits emissions of sulfur compounds from gaseous fuels to no more than 40 ppm, 0.05 percent by weight (liquid fuels), and 0.56 pounds of sulfur per million BTUs (solid fossil fuels)	Combustion sources using liquid or solid fossil fuels	SCAQMD Rules 431.1, 431.2, 431.3	A	Applicable for construction activities
Limits concentrations of oxides of nitrogen from any non-mobile sources fuel-burning equipment, averaged over 15-minutes, to a range of 125 to 300 ppm (gaseous fuels) and 225 to 400 ppm depending on equipment size	Non-mobile equipment using gaseous, liquid, or solid fuels	SCAQMD Rule 474	A	Applicable for construction activities
Specifies emissions testing, monitoring procedures, or handling or hazardous pollutants such as beryllium, benzene, mercury, vinyl chloride, and asbestos	Hazardous air pollution	SCAQMD Reg. X NESHAPS	A	Applicable for construction activities
Sets emissions standards for nitrous oxides, volatile organic compounds, and carbon monoxide from gaseous and liquid fuels portable engines	Portable engines used on construction site	SCAQMD Rule 1110-2	A	Applicable for construction activities
Requires person excavating a landfill to identify mitigation measures to ensure that a public nuisance does not occur	Excavation of inactive landfill	SCAQMD Rule 1150	A	Applicable for construction activities
Limits volatile organic compound emissions from contaminated soil to less than 50 ppm; for higher emissions an approved mitigation plan, describing removal methods and mitigations measures must be obtained	Volatile organic compounds in soil being excavated	SCAQMD Rule 1166	A	Applicable for construction activities
All new sources of air pollution that may result in a net emission increase of any non-attainment air contaminant or any halogenated hydrocarbon are to employ Best Available Control Technology; limits emissions of non-methane organic compounds to less than 1 lb/day	Non-attainment contaminant or halogenated hydrocarbon	SCAQMD Rule 1303	A	Applicable for construction activities
Requires equipment to be constructed with Best Available Control Technology; non-attainment emission increases must be offset and substantiated with modeling that the equipment will not significantly increase concentrations of nonattainment emissions.	New/modified equipment which may cause issuance of a non-attainment contaminant	SCAQMD Reg XII New Source Review	A	Applicable for construction activities
Defines health risk assessment methodology; exempts nonmethane organic compounds from controls if the health risk is less than 1 in 1 million	nonmethane organic compounds	SCAQMD Rule 1401	A	----

TABLE 6-1
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
Gardena Sumps, Gardena, California

Geosyntec consultants

Requirement	Prerequisites	Citation	ARAR Determination (A, RA, or TBC)	Comments
Clean Water Act (33 USC 1251-1387) and Porter-Cologne Water Quality Control Act (California Water Code, Division 7) Regulated by the SWCRB and Los Angeles RWQCB				
Waste Management Units undergoing final closure, with 1 acre of disturbance or more, must comply with substantive requirements for eliminating most non-stormwater discharges, developing and implementing a stormwater pollution prevention plan, and monitoring stormwater discharges	Construction activity on site larger than 1 acre	SWRCB Order 99-08-DWQ; SWRCB Res. 2001-046	A	Site exceeds 1 acre
Requires incorporation of permanent Best Management Practices to control stormwater runoff pollution after completion of the project; requires monitoring, sampling, and analysis of stormwater discharges under specified circumstances	Long-term operation and maintenance of site	SWRCB Order R8-2002-0012	A	Stormwater pollution controls required for long-term maintenance
Miscellaneous State Provisions for Institutional Controls				
Provides conditions under which land-use restrictions apply to successive owners of land	Transfer site to new owner	Ca. Civil Code 1471	A	Institutional controls apply to future Site use
Prohibits certain uses of land containing hazardous waste without a specific variance	Hazardous waste property	California Health and Safety Code 25232 (b)(1)(A-E)	A	Institutional controls that will contain appropriate restrictive covenants to be finalized during the final remedial design
OSWER Directive – Air Stripper Control Guidance (9355.8-28)				
Guidance regarding the use of emission controls at CERCLA sites; will be used to develop air emissions controls if necessary	----	----	----	----
Air Toxic "Hot Spot" Act (California Health and Safety Code § 44300 et seq.) as implemented by the SCAQMD and overseen by the Air Resources Board under CCR, Title 17, Section 93300 et seq.				
This statute and its regulations require operators of regulated facilities to prepare and submit inventory emission plans and reports and, in some cases, the preparation of health risk assessments. Only applicable if facility uses or releases a "listed" substance and releases more than 25 tons/year of total organic gases, particulate matter, nitrogen oxides or sulfur oxides.	----	----	TBC	The risk assessment required under the "Hot Spot" Act is more stringent than that performed under the FS because the FS risk assessment calculated risks due to exposure to soil and groundwater at the Site, not risks attributable to treatment processes from the remedial alternatives.

NOTES:

A - Applicable requirement (cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal or State environmental or facility citing laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site)

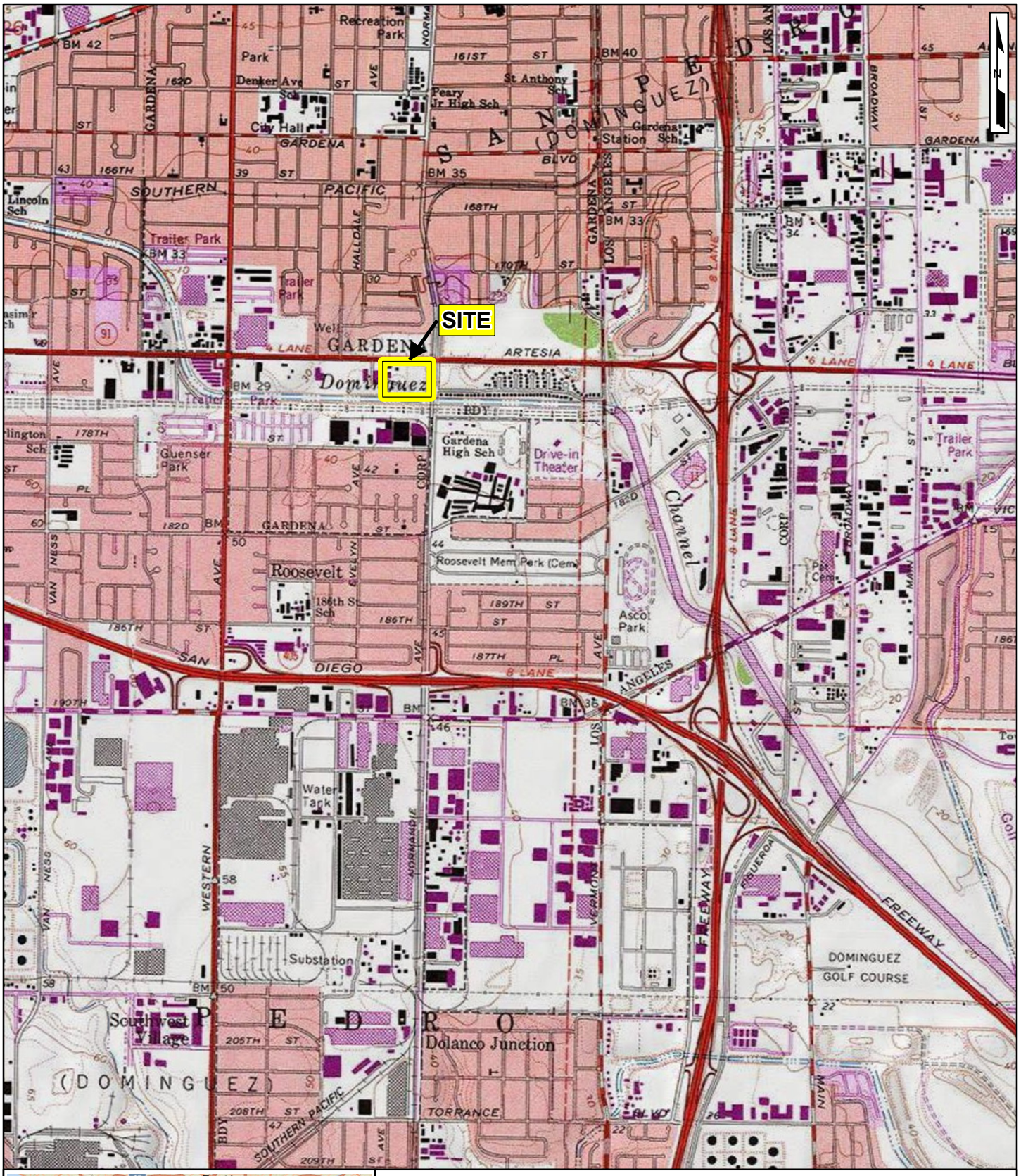
RA - Relevant and appropriate requirement (cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site)

TBC - To be considered (Federal and State nonpromulgated standards, policies, or guidance documents and local requirements)

NA - Not applicable

ARAR - Applicable or Relevant and Appropriate Requirement
BTU - British Thermal Unit
CalEPA - California Environmental Protection Agency
CCR - California Code of Regulations
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
CFR - Code of Federal Regulations
DTSC - California Department of Toxic Substances Control
DWQ - Division of Water Quality
EPA - Environmental Protection Agency
FS - Feasibility Study
g/m^3 - grams per cubic meter
HHRA - Human Health Risk Assessment
lb/day - pound per day
lbs/hr - pounds per hour
mg/m^3 - milligrams per cubic meter
MCL - Maximum contaminant level
MCLG - Maximum contaminant level goal
OSWER - Office of Solid Waste and Emergency Response
PM10 - Particulate Matter with diameters generally 10 micrometers and smaller
ppm - parts per million
ppm_v - parts per million by volume
RAO - Remedial Action Objective
RAP - Remedial Action Plan
RCRA - Resources Conservation and Recovery Act
RWQCB - Regional Water Quality Control Board
SCAQMD - South Coast Air Quality Management District
SWRCB - California State Water Resources Control Board
TCLP - Toxic characteristic leaching procedure
USC - United States Code
WDR - Waste Discharge Requirement

FIGURES



SITE LOCATION
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CA

Geosyntec consultants

DATE: NOVEMBER 2020

PROJECT NO: SC0467A

FIGURE 1-1

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LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PPIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- WOODEN FENCE
- FENCE
- RAIL ROAD
- BUILDING
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- APPROXIMATE DISTRIBUTION OF SLUDGE
- APPROXIMATE LOCATION OF HAACK REWORK AREA

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.

0 80' 160'

SCALE IN FEET

SITE LAYOUT
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2020

PROJECT NO. SC0467A

FIGURE 1–2

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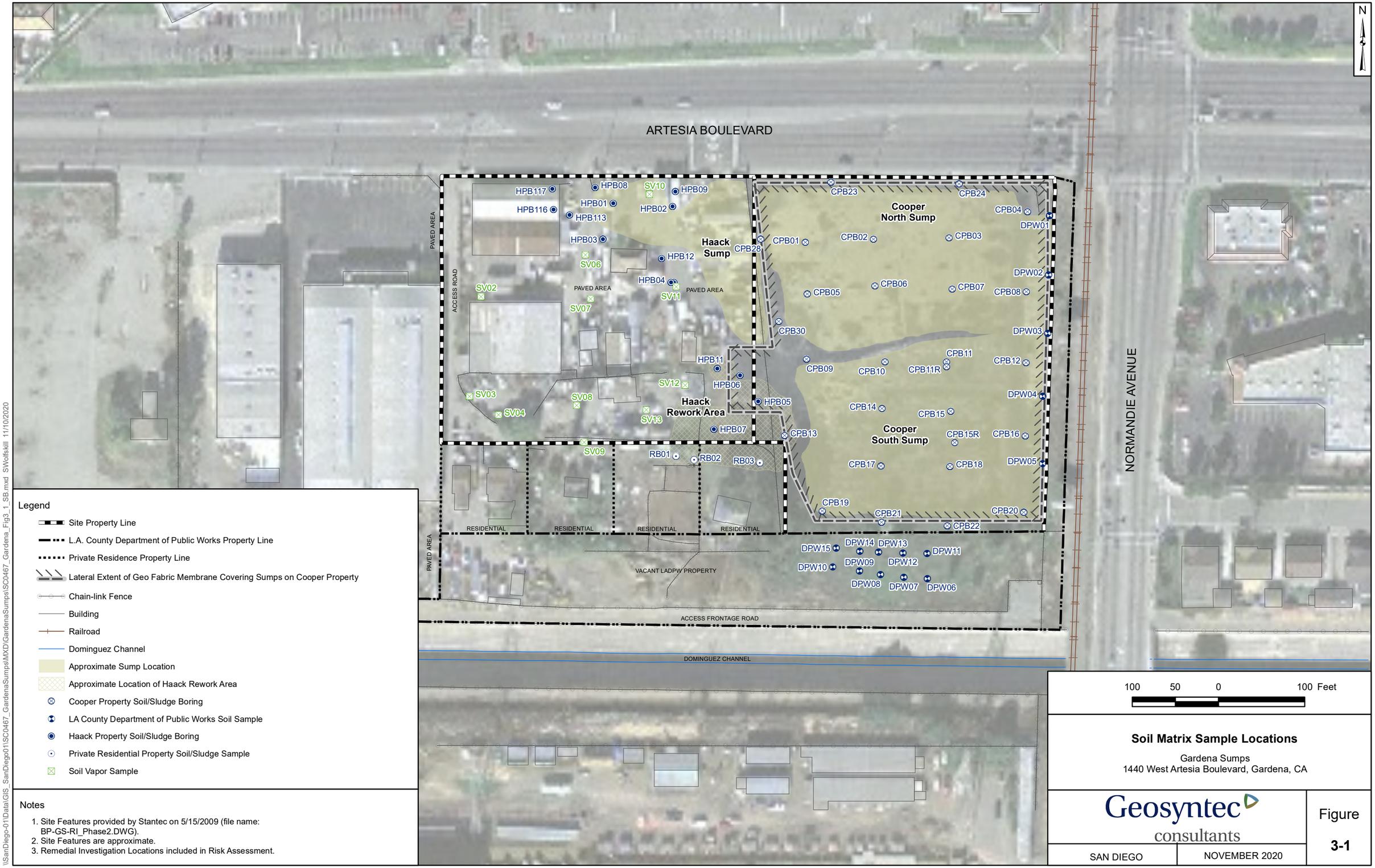


Legend

- Site Property Line
- L.A. County Department of Public Works Property Line
- Private Residence Property Line
- Lateral Extent of Geo Fabric Membrane Covering Sumps on Cooper Property
- Chain-link Fence
- Building
- Railroad
- Dominguez Channel
- Approximate Sump Location
- Approximate Location of Haack Rework Area
- Cooper Property Soil/Sludge Boring
- LA County Department of Public Works Soil Sample
- Haack Property Soil/Sludge Boring
- Private Residential Property Soil/Sludge Sample
- Soil Vapor Sample

Notes

1. Site Features provided by Stantec on 5/15/2009 (file name: BP-GS-RI_Phase2.DWG).
2. Site Features are approximate.
3. Remedial Investigation Locations included in Risk Assessment.

100 50 0 100 Feet

Soil Matrix Sample Locations

Gardena Sumps
1440 West Artesia Boulevard, Gardena, CA

Geosyntec consultants

SAN DIEGO | NOVEMBER 2020

Figure 3-1

\\SanDiego-01\Data\GIS_SanDiego01\SC0467_GardenaSumps\MXD\GardenaSumps\SC0467_Gardena_Fig3_1_SB.mxd SWolfskill 11/10/2020

Legend

- Site Property Line
- L.A. County Department of Public Works Property Line
- Private Residence Property Line
- Lateral Extent of Geo Fabric Membrane Covering Sumps on Cooper Property
- Chain-link Fence
- Building
- Railroad
- Dominguez Channel
- Approximate Sump Location
- Approximate Location of Haack Rework Area
- Soil Vapor Samples

Notes

1. Site Features provided by Stantec on 5/15/2009 (file name: BP-GS-RI_Phase2.DWG).
2. Site Features are approximate.
3. Remedial Investigation Locations included in Risk Assessment.

100 50 0 100 Feet

Soil Vapor Sample Locations

Gardena Sumps
1440 West Artesia Boulevard, Gardena, CA

Geosyntec consultants

SAN DIEGO | NOVEMBER 2020

Figure **3-2**

\\SanDiego-01\Data\GIS_SanDiego01\SC0467_GardenaSumps\MXD\GardenaSumps\SC0467_Gardena_Fig3_2_SV.mxd SWolfskill 11/10/2020

Legend

- Site Property Line
- L.A. County Department of Public Works Property Line
- Private Residence Property Line
- Lateral Extent of Geo Fabric Membrane Covering Sumps on Cooper Property
- Chain-link Fence
- Building
- Railroad
- Dominguez Channel
- Approximate Sump Location
- Approximate Location of Haack Rework Area
- Groundwater Hydropunch Sample Location (A + B Water-Bearing Zones)
- Cluster Wells (A + B)
- Temporary Groundwater Monitoring Wells

Notes

1. Site Features provided by Stantec on 5/15/2009 (file name: BP-GS-RI_Phase2.DWG).
2. Site Features are approximate.
3. Remedial Investigation Locations included in Risk Assessment.

100 50 0 100 Feet

Groundwater Sample Locations

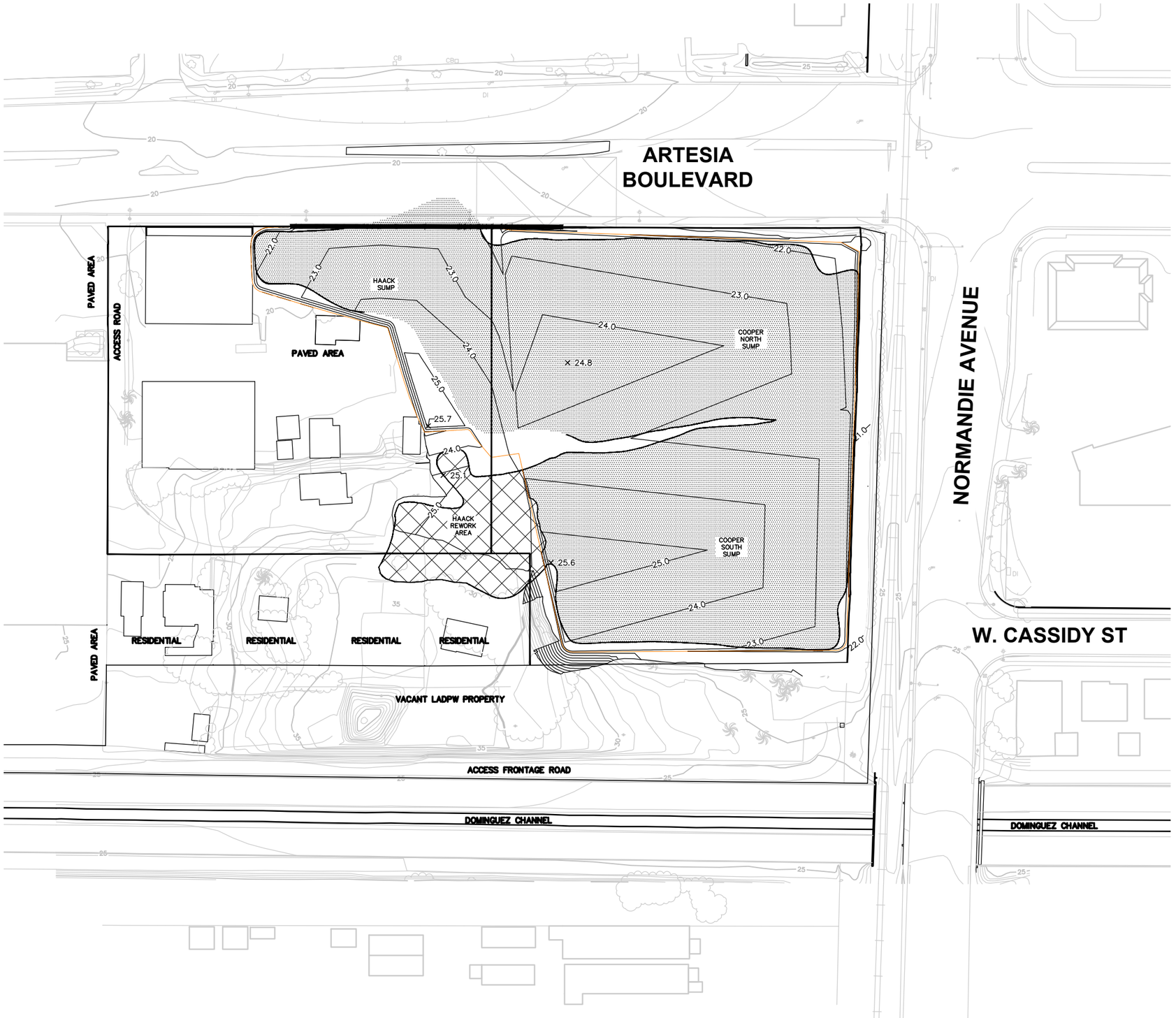
Gardena Sumps
1440 West Artesia Boulevard, Gardena, CA

Geosyntec consultants

SAN DIEGO | NOVEMBER 2020

Figure 3-3

\\SanDiego-01\Data\GIS_SanDiego01\SC0467_GardenaSumps\MXD\GardenaSumps\SC0467_Gardena_Fig3_3_GW.mxd SWolfskill 11/16/2020



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- LIMIT OF FINAL COVER GEOMEMBRANE
- PROPOSED RETAINING WALL (2 / 7-7)
- CHAIN-LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (TO BE REMOVED PRIOR TO CONSTRUCTION)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- PALM TREE
- APPROXIMATE DISTRIBUTION OF SLUDGE
- HAACK REWORK MATERIAL TO BE REMOVED

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.

0 100' 200'

SCALE IN FEET

ALTERNATIVE 2A CAP – OVERVIEW
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

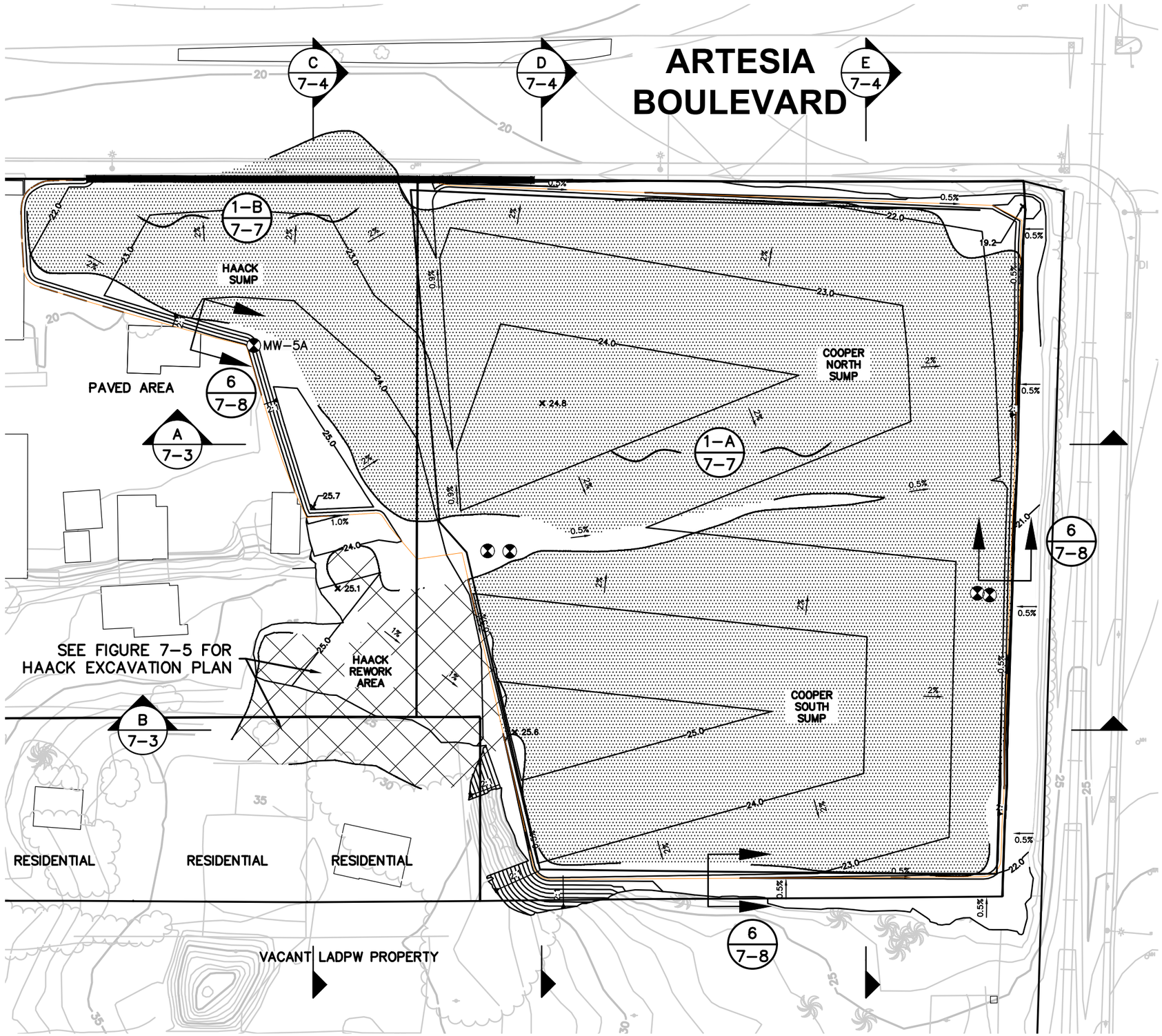
Geosyntec consultants

DATE: NOVEMBER 2020

PROJECT NO. SC0467A

FIGURE 7-1

P:\PRJ\SDCadd\CADD\SC0467A – Gardena Sumps\SC0467A-01-02\Planset_Current Set\Pile Set\SC0467A-6-1 to 6-4.dwg



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- LIMIT OF FINAL COVER GEOMEMBRANE (NOTE 4)
- PROPOSED RETAINING WALL (2 / 7-7)
- CHAIN-LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (NOTE 4)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- LIMIT OF HIGH STRENGTH GEOTEXTILE (NOTE 5)
- APPROXIMATE DISTRIBUTION OF SLUDGE
- HAACK REWORK MATERIAL TO BE REMOVED
- EXISTING GROUNDWATER MONITORING WELL TO BE ABANDONED

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.
4. BUILDINGS WILL BE REMOVED PRIOR TO CONSTRUCTION, AS NECESSARY AND DEPENDING ON FINAL DESIGN. REMAINING BUILDINGS WILL BE MAINTAINED.
5. LIMIT OF GEOSYNTHETICS IS APPROXIMATE. ACTUAL LIMIT TO BE DETERMINED DURING FINAL DESIGN ON CONSTRUCTION DRAWINGS.

0 60' 120'

SCALE IN FEET

ALTERNATIVE 2A CAP
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

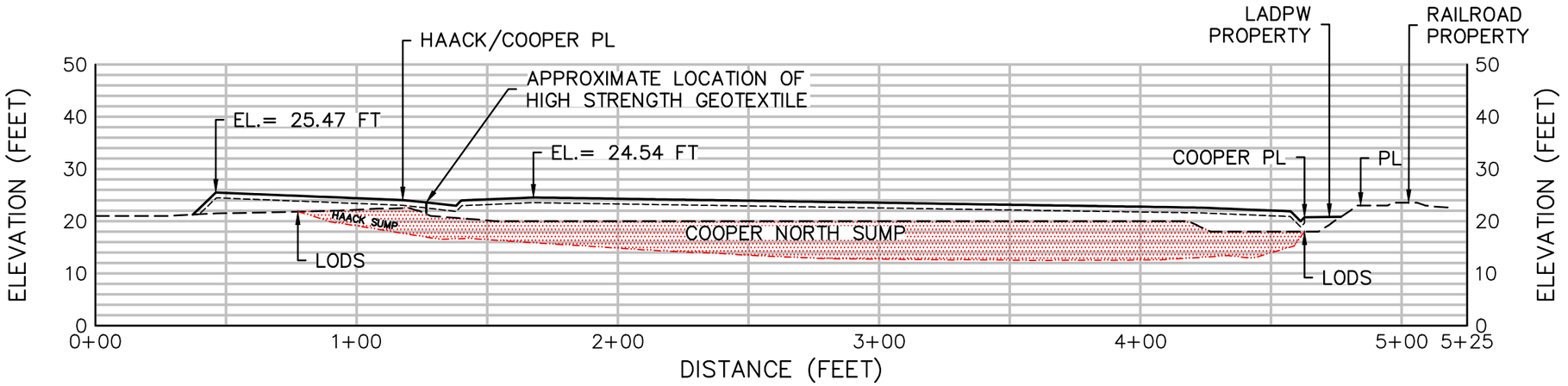
Geosyntec consultants

DATE: NOVEMBER 2020

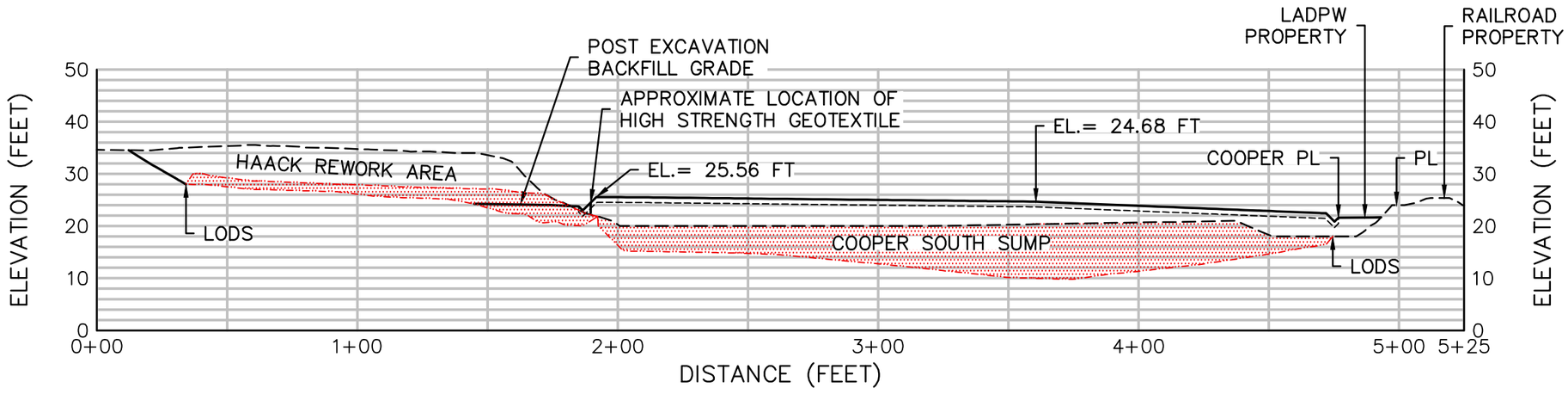
PROJECT NO. SC0467A

FIGURE 7-2

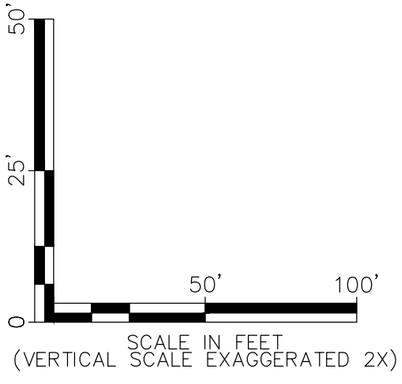
P:\PRJ\SDCadd\CADD\SC0467A - Gardena Sumps\SC0467A-01-02\Plansets_Current Set\Pile Set\SC0467A-6-1 to 6-4.dwg



SECTION A



SECTION B



LEGEND

- EXISTING GRADE
- GEOMEMBRANE
- FINAL GRADE
- APPROXIMATE LIMITS OF DETECTED SLUDGE

NOTES:

1. LODS = LIMIT OF DETECTED SLUDGE
2. LADPW = LOS ANGELES DEPARTMENT OF PUBLIC WORKS
3. PL = PROPERTY LINE

ALTERNATIVE 2A EAST–WEST SECTIONS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

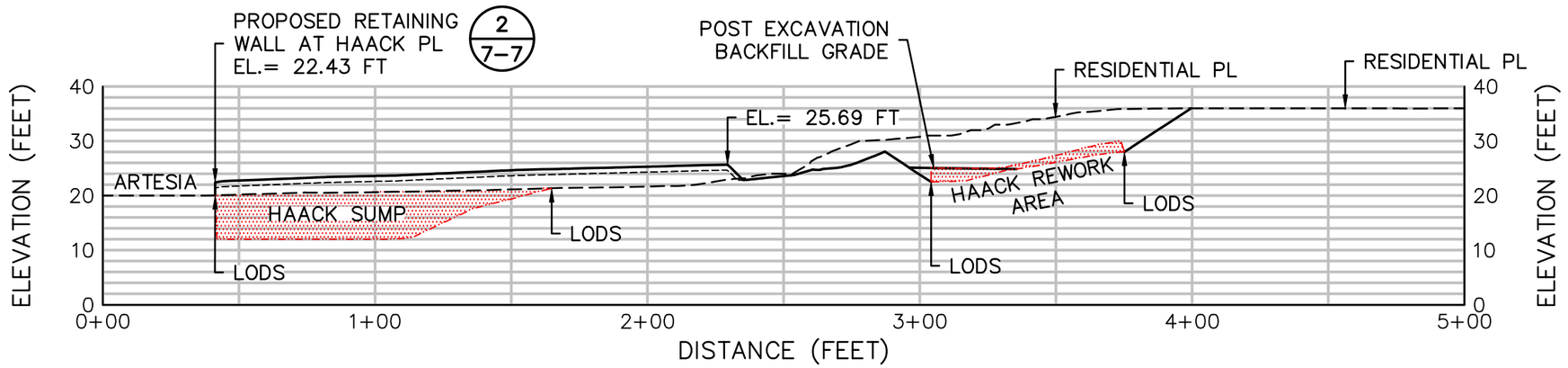
Geosyntec consultants

DATE: NOVEMBER 2020

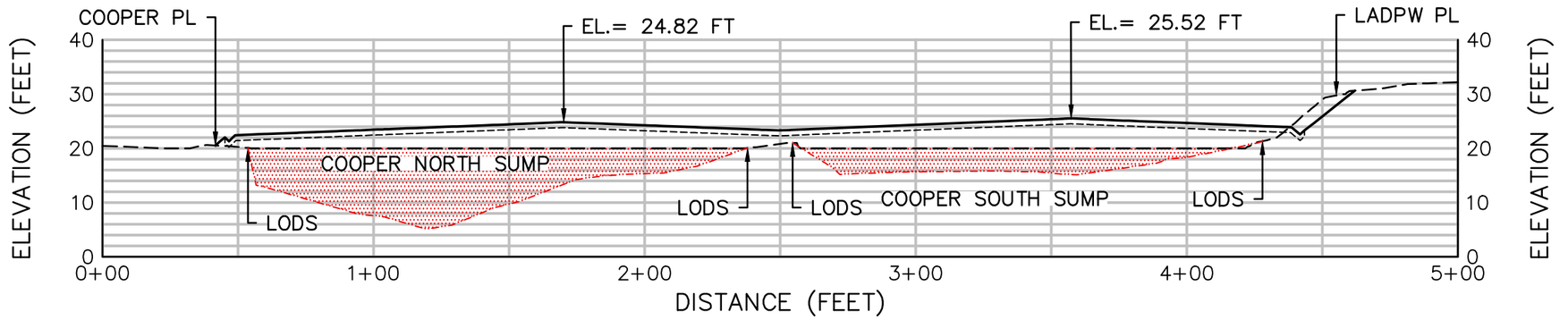
PROJECT NO. SC0467A

FIGURE 7–3

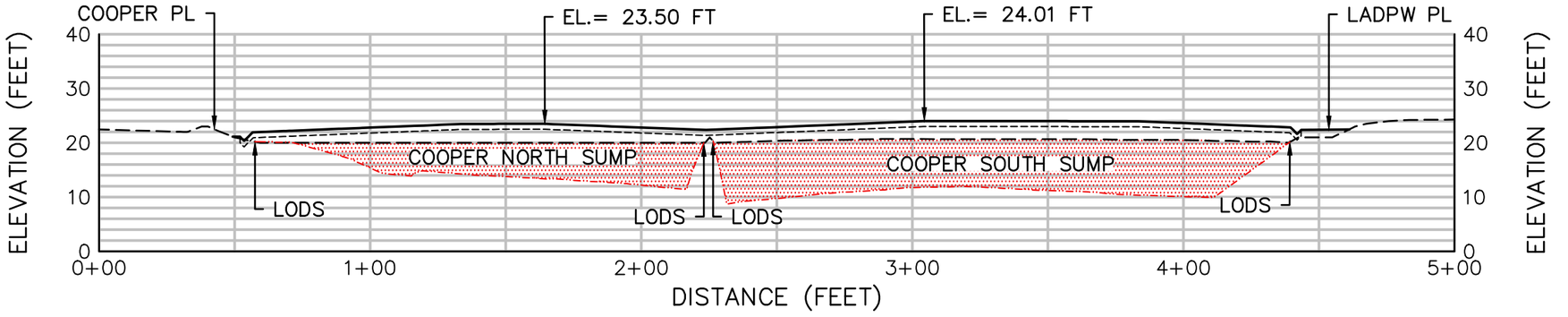
p:\PRJ\SDCadd\CADD\sc0467a – gardena sumps\sc0467a-01-02\Planssets_current set\Pile Set\SC0467A-6-1 to 6-4.dwg



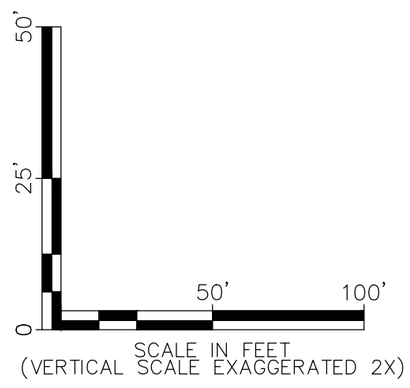
SECTION C



SECTION D



SECTION E



LEGEND

- EXISTING GRADE
- GEOMEMBRANE
- FINAL GRADE
- APPROXIMATE LIMITS OF DETECTED SLUDGE

NOTES:

1. LODS = LIMIT OF DETECTED SLUDGE
2. LADPW = LOS ANGELES DEPARTMENT OF PUBLIC WORKS
3. PL = PROPERTY LINE

ALTERNATIVE 2A NORTH-SOUTH SECTIONS
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

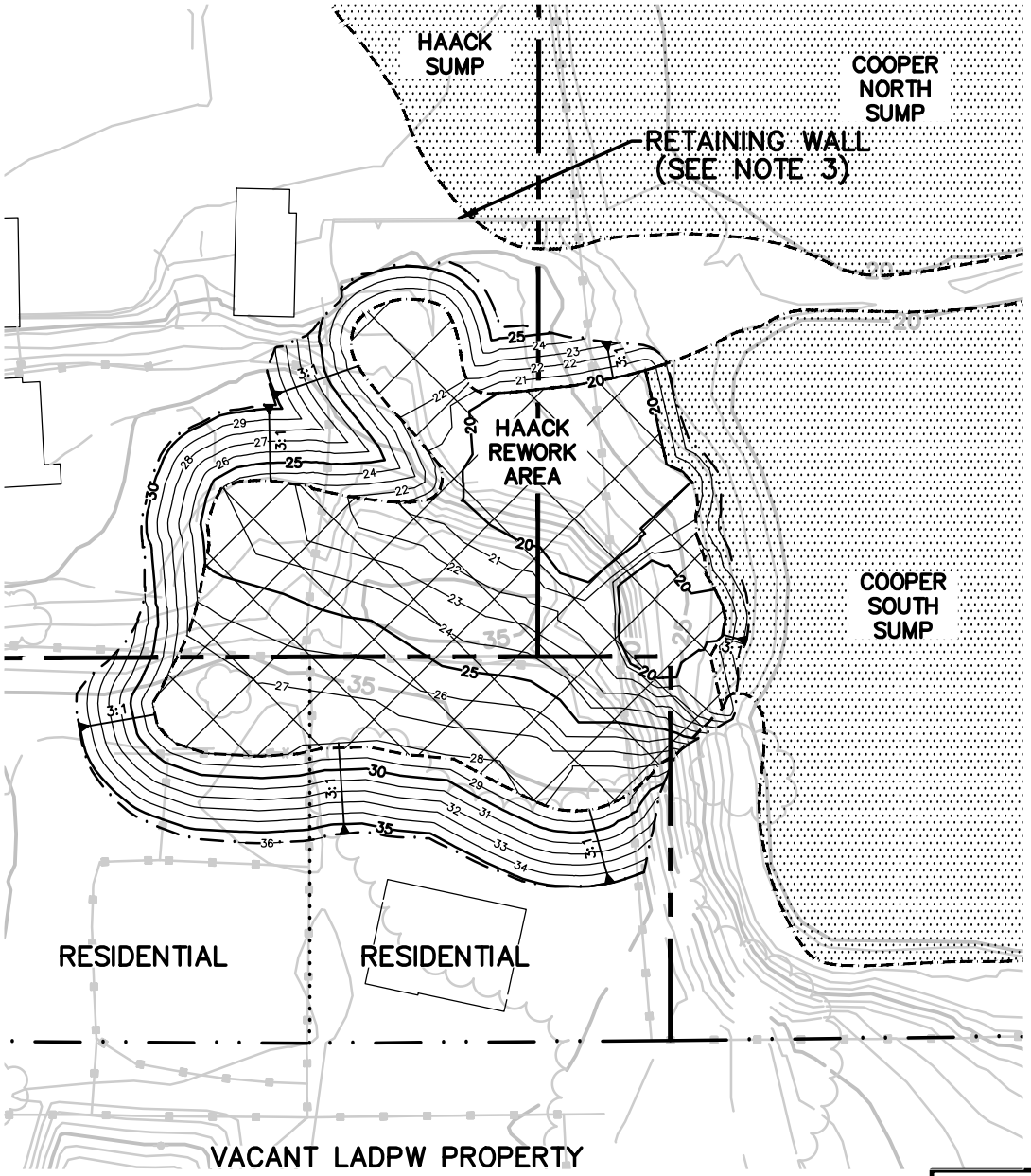
Geosyntec consultants

DATE: NOVEMBER 2020

PROJECT NO. SC0467A

FIGURE 7-4

P:\PRJ\SDCadd\CADD\SC0467A - Gardena Sumps\SC0467A-01-02\Planset_Current Set\Pile Set\SC0467A-6-1 to 6-4.dwg



LEGEND

- SITE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET)
- EXISTING MINOR CONTOURS (1 FOOT)
- PROPOSED FINAL MAJOR CONTOUR (5 FEET)
- PROPOSED FINAL MINOR CONTOUR (1 FOOT)
- LIMIT OF EXCAVATION
- CHAIN LINK FENCE
- BUILDING (NOTE 4)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- APPROXIMATE DISTRIBUTION OF SLUDGE
- HAACK REWORK MATERIAL TO BE REMOVED

0 50' 100'

SCALE IN FEET

NOTES:
1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING RETAINING WALL TO BE DEMOLISHED PRIOR TO CONSTRUCTION.
4. BUILDINGS WILL BE REMOVED PRIOR TO CONSTRUCTION, AS NECESSARY AND DEPENDING ON FINAL DESIGN. REMAINING BUILDINGS WILL BE MAINTAINED.

HAACK REWORK EXCAVATION PLAN
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

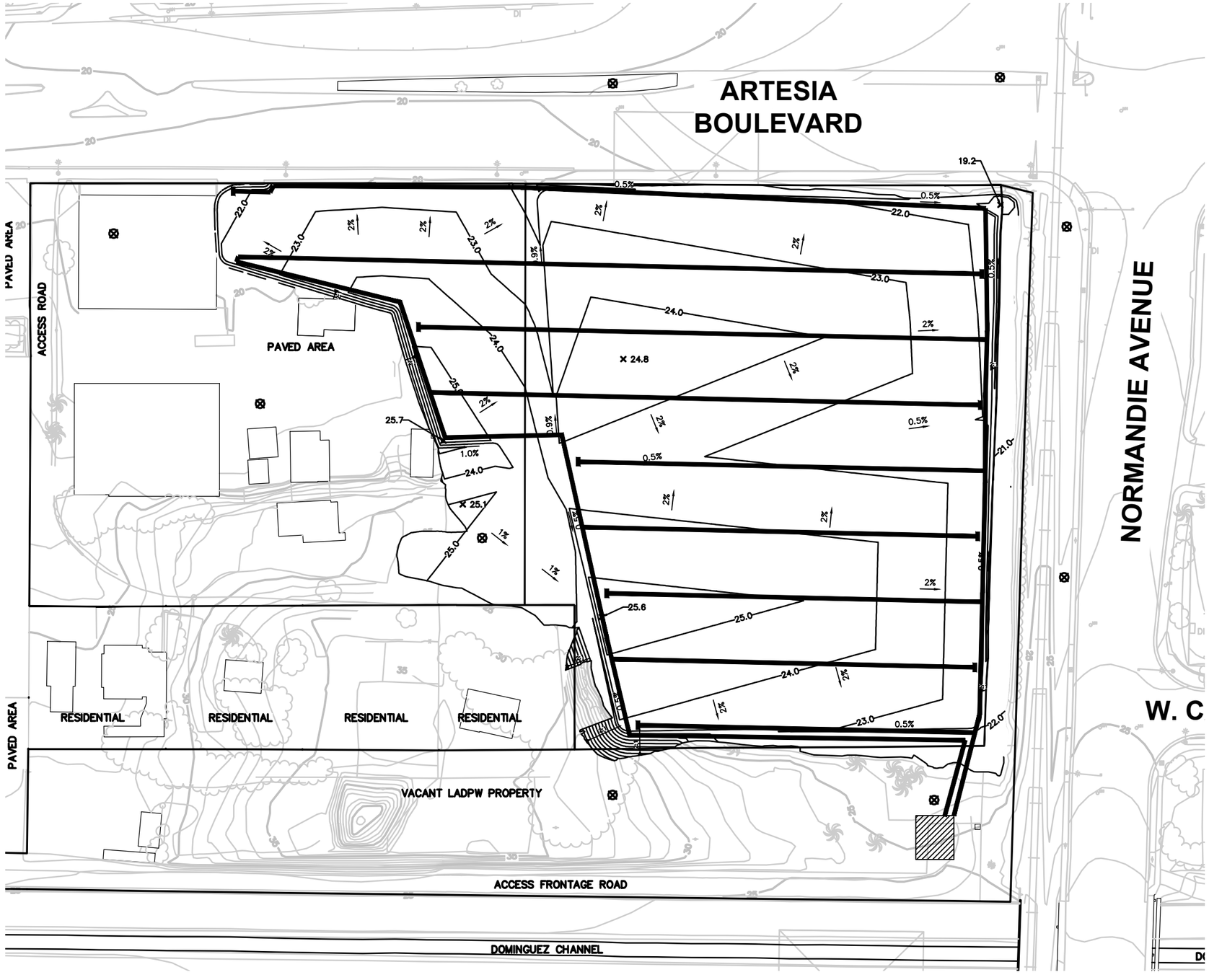
Geosyntec consultants

DATE: NOVEMBER 2020

PROJECT NO. SC0467A

FIGURE 7-5

p:\PRJ\SDCadd\CADD\sc0467a - gardena sumps\sc0467a-01-02\Plansets_current set\Pile Set\SC0467A-6-5.dwg



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- CHAIN–LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (NOTE 4)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- HORIZONTAL GAS COLLECTION GEOSTRIP
- HORIZONTAL AIR INLET GEOSTRIP
- HORIZONTAL GAS COLLECTION / AIR INLET SOLID WALL PIPE LOCATION
- PROPOSED TREATMENT SYSTEM LOCATION
- GAS MONITORING PROBE (5 / 7–7)

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.
4. BUILDINGS WILL BE REMOVED PRIOR TO CONSTRUCTION, AS NECESSARY AND DEPENDING ON FINAL DESIGN. REMAINING BUILDINGS WILL BE MAINTAINED.

0 80' 160'

SCALE IN FEET

ALTERNATIVE 2A HORIZONTAL VAPOR CONTROL SYSTEM
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

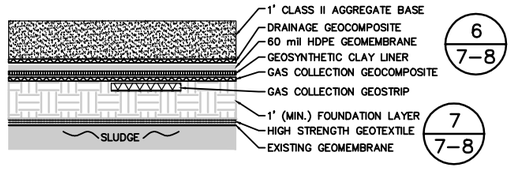
Geosyntec consultants

DATE: NOVEMBER 2020

PROJECT NO. SC0467A

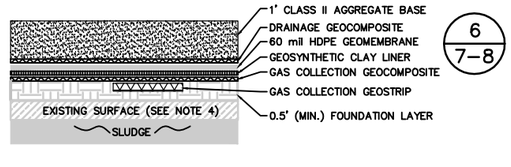
FIGURE 7–6

p:\PRJ\SDCadd\CADD\sc0467a – gardena sumps\sc0467a-01-02\Plansets_current set\Pile Set\SC0467A-6-7.dwg



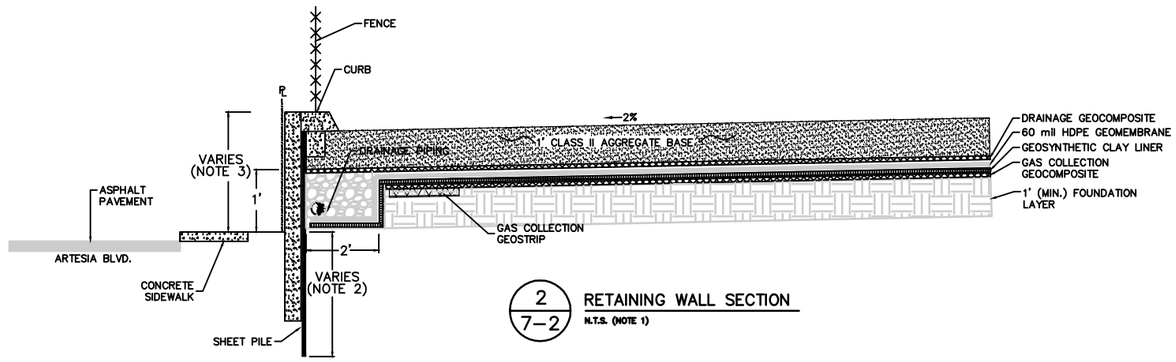
1-A / 7-2 ALTERNATIVE 2A COOPER SUMP CAP DETAIL

SCALE = 1" = 4' (NOTE 1)



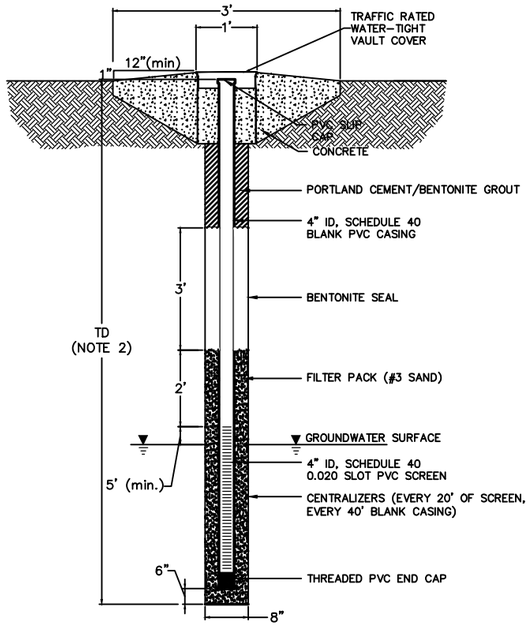
1-B / 7-2 ALTERNATIVE 2A HAACK SUMP CAP DETAIL

SCALE = 1" = 4' (NOTE 1)



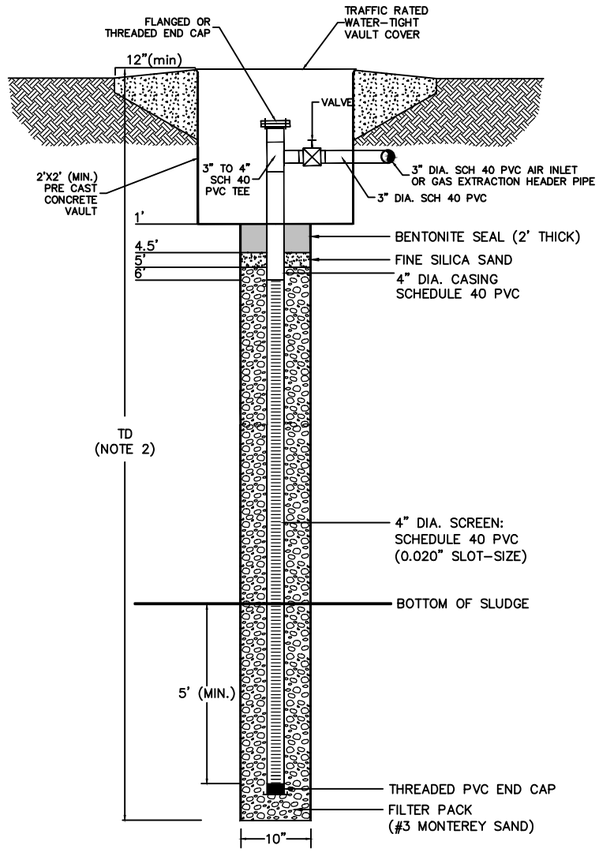
2 / 7-2 RETAINING WALL SECTION

N.T.S. (NOTE 1)



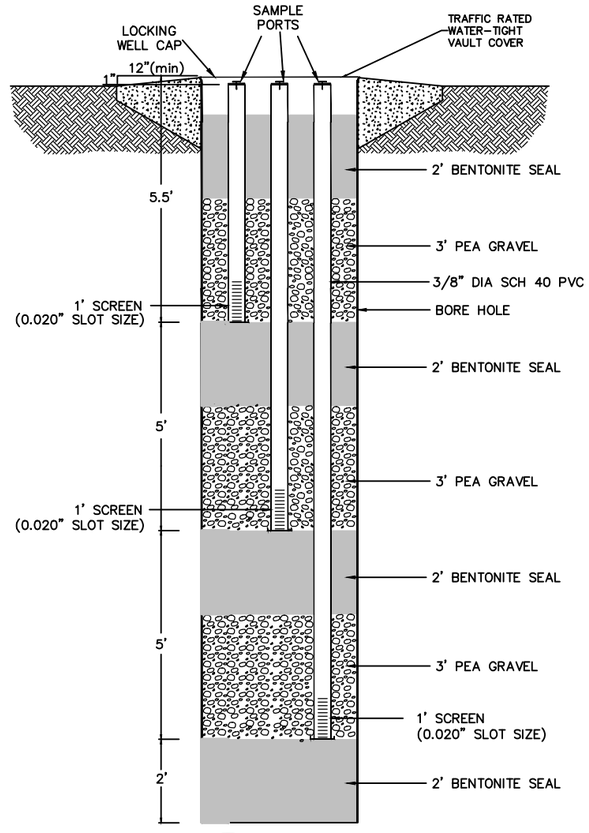
3 DETAIL NEW MONITORING WELL

N.T.S.



4 / 7-9 ALTERNATIVE 2 AND 3 CONCEPTUAL VERTICAL GAS CONTROL WELL

N.T.S.



5 / 7-6 DETAIL SOIL VAPOR MONITORING PROBES

N.T.S.

NOTES:

1. GEOSYNTHETIC THICKNESS EXAGGERATED FOR CLARITY.
2. FINAL CONSTRUCTION DEPTHS BASED ON FIELD CONDITIONS. ALL DEPTHS IN FEET BELOW GROUND SURFACE.
3. FINAL RETAINING WALL HEIGHT DEPENDENT ON FINAL CAP ELEVATIONS. MAXIMUM RETAINING WALL HEIGHT IS 23 FT MSL.
4. EXISTING SURFACE IS DEGRADED ASPHALT OR CONCRETE. SURFACE WILL BE PROTECTED IN PLACE.

ALTERNATIVE 2A DETAILS I
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

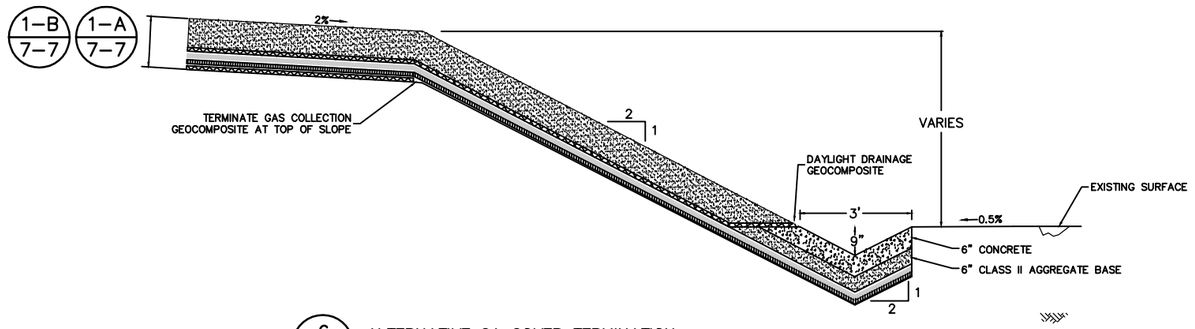
Geosyntec consultants

DATE: NOVEMBER 2020

PROJECT NO. SC0467A

FIGURE 7-7

p:\PRJ\SDCadd\CADD\sc0467a - gardena sumps\sc0467a-01-02\Planset_current set\Pile Set\SC0467A-6-14.dwg

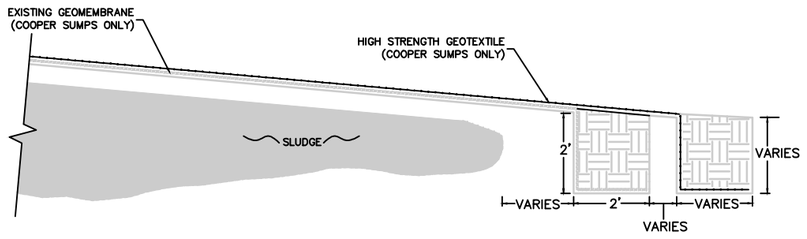


6 / 7-2 ALTERNATIVE 2A COVER TERMINATION

SCALE = 1" = 4' (NOTE 1)

7 / 7-7 ALTERNATIVE 2A HIGH STRENGTH GEOTEXTILE ANCHOR TRENCH DETAIL

SCALE = 1" = 4' (NOTE 1)



7 / 7-7 ALTERNATIVE 2A HIGH STRENGTH GEOTEXTILE ANCHOR TRENCH DETAIL

SCALE = 1" = 4' (NOTE 1)

NOTES:

1. GEOSYNTHETIC THICKNESS EXAGGERATED FOR CLARITY.

ALTERNATIVE 2A DETAILS II
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

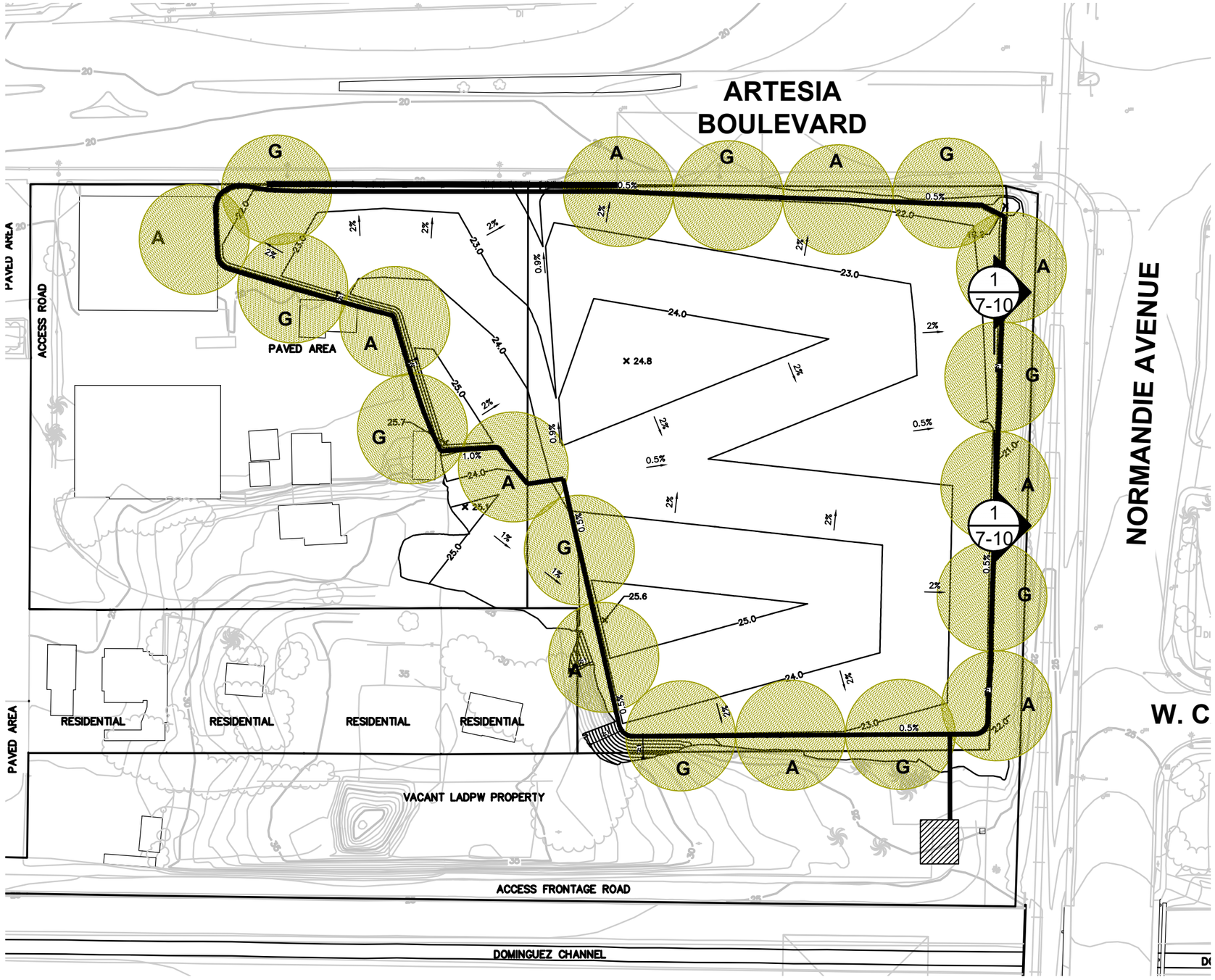
Geosyntec consultants

DATE: NOVEMBER 2020

PROJECT NO. SC0467A

FIGURE 7-8

p:\PRJ\SDCadd\CADD\sc0467a - gardena sumps\sc0467a-01-02\Plansets_current set\Pile Set\SC0467A-6-14.dwg



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- EXISTING MAJOR CONTOURS (5 FEET, SEE NOTE 3)
- EXISTING MINOR CONTOURS (1 FOOT, SEE NOTE 3)
- PROPOSED FINAL MAJOR CONTOUR (1 FOOT)
- LIMIT OF FINAL COVER GRADING
- PROPOSED RETAINING WALL (2 / 7-7)
- CHAIN-LINK FENCE
- WOODEN FENCE
- RAIL ROAD
- BUILDING (NOTE 4)
- PAVED ROAD
- UNPAVED ROAD
- TREES/BRUSH
- VERTICAL GAS CONTROL WELL RADIUS OF INFLUENCE (WELL AT CENTER OF CIRCLE) (4 / 7-7)
  - **A** = AIR INLET WELL
  - **G** = GAS EXTRACTION WELL
- VERTICAL GAS COLLECTION PIPE LOCATION
- PROPOSED TREATMENT SYSTEM LOCATION

NOTES:

1. SITE FEATURES PROVIDED BY STANTEC ON 5/15/09.
2. SITE FEATURES ARE APPROXIMATE.
3. EXISTING GRADE ASSUMES HAACK REWORK EXCAVATION IS COMPLETE.
4. BUILDINGS WILL BE REMOVED PRIOR TO CONSTRUCTION, AS NECESSARY AND DEPENDING ON FINAL DESIGN. REMAINING BUILDINGS WILL BE MAINTAINED.

0 80' 160'

SCALE IN FEET

ALTERNATIVE 2A VAPOR CONTROL LAYOUT PLAN
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

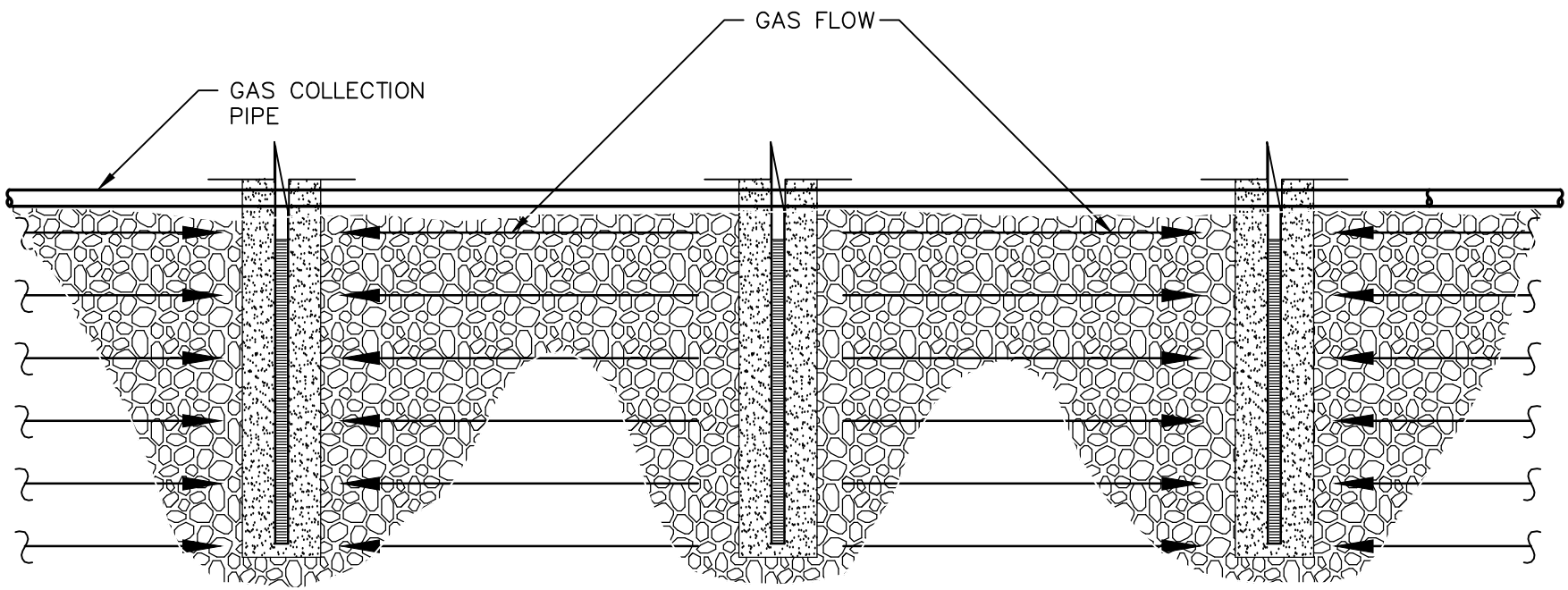
Geosyntec consultants

DATE: NOVEMBER 2020

PROJECT NO. SC0467A

FIGURE 7-9

p:\PRJ\SDCadd\CADD\sc0467a - gardena sumps\sc0467a-01-02\Planset_current set\Pile Set\SC0467A-6-6.dwg



NOT TO SCALE

1/7–9 CROSS SECTION/VAPOR CONTROL SYSTEM PROFILE
SCALE = 1" = 4' (NOTE 1)

ALTERNATIVE 2A VAPOR CONTROL SYSTEM
GARDENA SUMPS
1440 WEST ARTESIA BOULEVARD
GARDENA, CALIFORNIA

Geosyntec consultants

DATE: NOVEMBER 2020

PROJECT NO. SC0467A

FIGURE 7–10

p:\PRJ\SDCadd\CADD\sc0467a - gardena sumps\sc0467a-01-02\Plansets_current set\Pile Set\SC0467A-6-8.dwg

APPENDIX A

Administrative Record (Reserved for Final Remedial Action Plan)

APPENDIX B

Statement of Reasons (Reserved for Final Remedial Action Plan)

STATEMENT OF REASONS

FOR [SITE NAME]

REMEDIAL ACTION PLAN

Pursuant to California Health and Safety Code (HSC), section 25356.1(d), the California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC) has prepared this Statement of Reasons as part of the attached Remedial Action Plan (RAP) for the [site name] at [site address: street, city, county and State].

The RAP presents a summary of the Remedial Investigation (RI) to address [list types of chemicals contaminants, compounds found] that have been detected in [list media, e.g. soil, groundwater, surface water] at and near the [site name]. The RAP summarizes the results of a Baseline Risk Assessment performed to determine the potential risks to public health and the environment associated with the [list types of chemical contaminants, compounds found]. The RAP also provides a discussion of the feasible remedial alternatives that were evaluated in the Feasibility Study (FS). The RAP recommends a remedial alternative that will meet the objectives of protecting public health and the environment. The RAP proposes remediation of [list media to be cleaned up] by [describe proposed remedial measures].

The DTSC believes that the attached RAP complies with the law as specified in California Health and Safety Code, section 25356.1. Section 25356.1(e) requires that RAPs "shall include a statement of reasons setting forth the basis for the removal and remedial actions selected." The statement of reasons "shall also include an evaluation of the consistency of the removal and remedial actions proposed by the plan with the federal regulations and factors specified in subdivision (d)..." Subdivision (d) specifies six factors against which the remedial alternatives in the RAP must be evaluated. The proposed remedial action is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (the National Contingency Plan, "NCP"), the federal Superfund regulations. The attached RAP has addressed all these factors in detail. A brief summary of each factor follows. The statement of reasons also includes the preliminary Nonbinding Allocation of Responsibility (NBAR) as required by HSC section 25356.1(e).

1. Health and Safety Risks - Section 25356.1(d)(1)

   The chemicals of concern identified for this site are [list chemicals of concern by media].

The risk assessment evaluated potential exposures for [list scenarios considered, e.g., residential, worker, etc.]. [Discuss those pathways which represent a possible health risk].

2. Beneficial Uses of the Site Resources - Section 25356.1(d)(2)

   [Discuss beneficial uses of surface water, groundwater, land].

3. Effect of the Remedial Actions on Groundwater Resources

   Available technologies were evaluated to meet remedial action objectives for soil and groundwater. A variety of scientific engineering approaches and technologies were considered. [For sites with soil and groundwater problems, it may be appropriate to say: "The primary remedial action objectives are to reduce chemical concentrations in groundwater, limit the migration of chemicals from the soil into groundwater, and restrict further downgradient movement of contaminated groundwater."] [Describe beneficial uses of groundwater]. The proposed remedial alternative will result in [describe impact on groundwater].

4. Site-Specific Characteristics - Section 25356.1(d)(4)

   Chemicals in soil and groundwater beneath the site have been extensively characterized. [Describe the following: 1) Potential for offsite migration; 2) Commingling, if present, with other contamination; and 3) Site-specific soil/hydrogeological conditions which may affect contaminant movement].

5. Cost-Effectiveness of Alternative Remedial Action Measures - Section 25356.1(d)(5)

   The proposed remedial action alternative [describe alternative] was the most cost-effective alternative to meet the cleanup objectives.

6. Potential Environmental Impacts of Remedial Actions – Section 25356.1(d)(6)

   All potential impacts will be mitigated under the proposed remedial alternative. The proposed remedial alternative will not create any significant environmental impacts. Because of this, a Negative Declaration was proposed pursuant to the California Environmental Quality Act (CEQA) for the recommended remedial alternative. An Environmental Study Checklist was completed for the [site name] which discussed potential environmental impacts of the recommended remedial alternative, as well as actions that will be taken to reduce or eliminate these potential environmental impacts during implementation. The CEQA Environmental Study Checklist and proposed Negative Declaration are being distributed (under separate cover) for a 30-day public comment period. [For the

Final RAP, revise the last sentence to indicate that CEQA documents were distributed]

7. Preliminary Nonbinding Allocation of Financial Responsibility - Section 25356.1(e)

   The RAP must include a "nonbinding preliminary allocation of responsibility (NBAR) among all identifiable potentially responsible parties at a particular site, including those parties which may have been released, or may otherwise be immune, from liability..." (HSC section 25356.1(e)). The current NBAR for the [site name], as issued by the DTSC, is presented on the next page. [The NBAR should be printed on DTSC letterhead]

APPENDIX C

Responsiveness Summary (Reserved for Final Remedial Action Plan)

APPENDIX D

Final CEQA Documents (Reserved for Final Remedial Action Plan)

Geosyntec consultants

7 May 2021

Nicholas Ta
Project Manager
Acting Unit Chief
Site Mitigation and Restoration Program
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630

Re: Response to DTSC's Review Comments to Draft Remedial Action Work Plan for the Gardena Sumps, 1450 W. Artesia Blvd., Gardena, California 90248 (Site Code: 19490135)

Dear Mr. Ta,

On behalf of Atlantic Richfield Company (ARC), Geosyntec Consultants, Inc. (Geosyntec) has prepared these responses to the Department of Toxic Substances Control (DTSC) comments dated 31 March 2021 on the draft Remedial Action Plan (draft RAP) dated 18 January 2021. DTSC's comments on the draft RAP include comments from DTSC's Engineering and Special Projects Office (ESPO). A teleconference call to discuss the comments was held between ARC, DTSC, and Geosyntec representatives on 20 April 2021.

Responses are provided for each DTSC comment and DTSC comments are numbered and provided in italics. A revised RAP will be submitted to DTSC upon receipt of DTSC concurrence with the responses.

We appreciate the opportunity to work with you and the DTSC on this matter and we look forward to your response. If you have any questions, please do not hesitate to contact Lisa Hall at (909) 259-9130 or lhall@geosyntec.com.

Sincerely,

Jonathan H. Gillen, P.E. (CO, MA, WY)
Senior Engineer

Lisa A. Hall, P.E. (CA)
Senior Engineer

cc: Wade Melton –Operation Project Manager, ARC
Eric Vanderbilt – Sr. Hazardous Substances Engineer, DTSC

Geosyntec consultants

DTSC REVIEW COMMENTS – DRAFT REMEDIAL ACTION PLAN FOR THE GARDENA SUMPS SITE

DTSC Comment (italics):

1. *The following background is composed of adapted excerpts from the Executive Summary and Introduction of the Draft RAP.*

   "Gardena Sumps Site (Site) is located at the southwest corner of Artesia Boulevard and Normandie Avenue in Gardena, California. This RAP addresses the Cooper North sump, Cooper South sump, Haack sump, and Haack Rework Area on the Site. The Cooper sumps currently are capped by a geosynthetic material that was installed in July 1993. An additional geosynthetic liner was placed over the 1993 liner in August 2013. The Haack Sump has been covered by asphalt and a concrete slab."

   A description of the surface of the Haack Rework Area was not readily apparent in the Draft RAP to the ESPO reviewer.

Response:

The Executive Summary will be updated to include the following description of the Haack Rework Area:

> "The Haack property contains the Haack sump and the Haack Rework Area. The Haack Rework Area is a reworked and mixed sludge-soil area south of the Haack sump. Most of the Haack Rework Area currently is vegetated with various trees, shrubs and grass. The eastern portion of the Haack Rework Area is incorporated under the existing Cooper South sump geosynthetics cap. The southern portion of the Haack Rework Area extends onto the extreme northern portions of the two easternmost residential lots."

Section 2 of the RAP will be updated to be consistent with the Executive Summary and include the following statement:

> "Most of the Haack Rework Area currently is vegetated with various trees, shrubs, and grass. The eastern portion of the Haack Rework Area is incorporated under the existing Cooper South sump geosynthetics cap."

DTSC Comment (*italics*):

2. *Section 3 presents a "Summary of Remedial Investigations", and Section 3.3, "Surface Water", describes that the observed GRO presence in samples of surface water from the adjacent Dominguez Channel cannot be due to the Gardena Sumps Site because GROs are not detected in groundwater at the Gardena Sumps Site.*

   These statements are following in Section 3.5 by statements describing the presence of GRO's in the groundwater at the Gardena Sumps Site.

Thus, the conclusion in Section 3.3 is not well supported. ESPO recommends the noted conclusion in the Draft RAP be revised or the supporting evidence be more clearly expressed.

Response:

Section 3.3 will be updated to provide further clarification regarding surface water. The text will be modified to state the following (underlined text constitutes new, updated text):

"Surface water samples were collected upstream and downstream of the Site from the Dominguez Channel in 2006 and 2008. Analytical data from these samples indicated ~~elevated~~ concentrations of gasoline range organics (GRO) to be an estimated concentration of 58 J µg/L, which is just above the reporting limit of 50 µg/L, in both upgradient and downgradient 2006 samples. Samples collected in 2008 were below the reporting limit in both upgradient and downgradient samples. Although GROs have been detected in the past in one monitor well, MW-05A, located on the north portion of the Haack Property and adjacent to the Haack Sump area, GRO concentrations have been trending downward since 2018, with the last three sampling events below the reporting limit. GRO concentration data, obtained in 2009 and collected from groundwater hydropunch locations GWP100 and GWP101 between MW-05A and the Dominguez Channel, indicate that GROs do not impact the water quality of the Dominguez Channel south of the Site (Stantec, 2010). ~~and VOC analytes in contrast to the non-detections for those analytes in groundwater monitored at the Site.~~ VOCs, including PCE and TCE, have been measured in surface water within the Dominguez Channel both upgradient and downgradient of the Site. These VOCs are not present in groundwater beneath the Site.

Based on the organic chemical parameters, the Site is not impacting surface water quality in the channel. Overall, the observed concentrations of metals in surface water adjacent to the Site support the same conclusion that the Site groundwater conditions are not impacting surface water quality (Stantec, 2008)."

Section 3.5 will be updated to reflect recent groundwater monitoring data and to clarify and agree with the footnote in Section 3.3. The text will be modified to state the following (underlined text constitutes new, updated text):

"Results of the third quarter 2020 semi-annual groundwater monitoring event are generally consistent with the analytical results from past sampling events since February 2006. GRO concentrations in MW-05A, located on the north portion of the Haack Property and adjacent to the Haack Sump area, have generally continued to decrease since 2018 with the last three sampling events below the reporting limit. Groundwater and surface water data obtained between MW-05A and the Dominguez Channel (i.e., groundwater hydropunch investigation locations, and existing monitor

wells) indicate that GROs are not observed in groundwater adjacent to or near the portion of the Dominguez Channel that is adjacent to the Site. The groundwater quality data indicates that GROs observed in MW-05A are not migrating to the Dominguez Channel. Throughout 2019 and 2020, neither SVOCs nor metals have been detected above their respective MCLs. ~~Although Bis(2-ethylhexyl) Phthalate has been detected above the MCL in wells MW-02B, MW-03B, MW-04A, and G-4 in the past, only well MW-03B had a detection above the MCL during the first quarter 2019. While concentrations of metals continue to be detected in all monitor wells, only MW-05A has had exceedances of beryllium, cadmium, and nickel above MCLs (Stantec, 2019).~~"

DTSC Comment (italics):

3. *Section 6.4.2, "FS – Recommended Alternative", describes the protective nature of the selected alternative in the following excerpt:*

"Based on the comparative analysis of the remedial alternatives, the alternative that … ranks the highest is Alternative 2A, capping with selective excavation … This remedial alternative effectively mitigates the risk from ingestion, inhalation, and dermal contact with on-Site soils for both future … occupants … and future landscapers and utility workers."

However, ESPO was unable to find the specified separation between the hazardous waste and future users of the property, i.e. the thickness of the cover. Continuing the concern about separation in the paragraph above, ESPO provides the excerpt below from Page 32 of Section 7.3, "Sequence of Work":

"7. Sludge Excavation and Consolidation:

a. *Sludge and soil materials will be excavated from the Haack Rework Area … Excavated materials will be utilized as a portion of the cap system…"*

ESPO recommends the Draft RAP be revised to specify the separation between hazardous waste and future potential users that will be maintained in the future design.

Response:

Figure 7-7, Detail 1-A and Detail 1-B (pg. 77 of the draft RAP PDF) show the cover (i.e., cap) systems. These details include the proposed cap components and minimum foundation soil thicknesses. The details include the minimum specified thicknesses for soil components. The minimum cap thickness will be 2 feet in the Cooper Sumps, and 1.5 feet (not including the existing surfacing materials) in the Haack Sump Area.

Section 7.3, item number 8.a of the RAP describes the foundation soil material and geometry. The text will be updated with the following to indicate that (i) the foundation layer thickness may vary across the site; and (ii) details for cap system components are shown on Figure 7-7 (underlined text constitutes new, updated text):

"a. Foundation Soil: The foundation soil will be placed above the high-strength geotextile (Cooper Sumps), relocated sludge materials (used as stabilization layer material and/or foundation layer material as appropriate), or asphalt/concrete surface (Haack Sump). The foundation soil will consist of excavated material from the Haack Rework Area and the anchor trench excavations. The foundation soil layer minimum thickness will be 0.5 ft (Haack Sump) and 1 ft (Cooper Sumps). The foundation layer soil thickness may increase above the minimum thickness as necessary to achieve the design goals for grading, waste separation, and surface water conveyance. Where necessary around the cap system perimeter, the foundation layer will be graded (thinned) to blend with the existing ground surface. The foundation soil will be placed in lifts until foundation grades are met (i.e., 1 ft below the cap grades shown on Figures 7-1 and 7-2). The slopes will be a minimum of 2 percent (%) to reduce impacts on drainage due to settlement of the foundation material and/or sludge. The foundation layer and other cap components are shown on Figure 7-7, Details 1-A and 1-B."

DTSC Comment (italics):

4. *ESPO notes the passage describing the proposed sheet piling on Page 32 of Section 7.3, "Sequence of Work", which is excerpted below:*

"5. Sheet Pile Wall Installation: Sheet piles will be installed to … the bottom depth of the identified sludge in the … Sumps. … The sheet piles will be coated to minimize corrosion of the steel due to the low pH and high hydrogen sulfide environment. The sheet pile cut-off wall will provide a physical barrier between the sludge remaining in the … Sumps and … adjacent sidewalk. The sheet pile wall will aid in the mitigation of lateral migration of soil vapor."

The above excerpt makes clear the significant long term role of the sheet piling component of Alternative 2A in protecting public health. ESPO highlights Arco's understanding that the proposed sheet piling requires maintenance in the following excerpt from Section 6.4.1 of the Draft RAP:

"3. Long-Term Effectiveness and Permanence – Alternative 3 is ranked higher than Alternative 2A with respect to long-term effectiveness and permanence. Both alternatives would be effective and permanent over the long-term with maintenance"

To obtain the required long term effectiveness ESPO recommends the proposed coated sheet piling include a cathodic protection scheme, with maintenance prescribed in the anticipated documents, land use covenant or other (Item 9 on Page 34).

Response:

Section 7.3, item number 5 of the RAP will be updated with the following text:

"a. Sheet Pile Wall Maintenance: Sheet piles will be designed and installed with appropriate corrosion mitigation measures. Details of corrosion mitigation measures will be presented in the design. Additional maintenance of the exposed portion of the sheet pile wall after construction may be required due to vandalism, accidents, or other damage. Maintenance requirements will be included as part of a monitoring and maintenance plan or as part of a land use covenant."

DTSC Comment (*italics*):

5. *ESPO notes contradictory Site end use descriptions in the following passages from Section 5.5, "Future Site Use":*

"The … City of Gardena Master Plan … indicates the Site would be developed in the future as commercial property with a mix of commercial buildings and parking.

"DTSC has requested the following three future land use scenarios be evaluated for the Site: … Cooper and Haack areas would remain commercial/industrial"

"The City of Gardena requested the remedial design be compatible with a parking lot or open space end use"

The above contradictory passages indicate that the loadings that the underlying soils would need to support is not established. ESPO finds no discussion of estimated long term stiffness of the proposed soil cover and the underlying existing Cooper and Haack soils and other materials.

ESPO does find the following soil cover construction detail on Page 33 and Sheet 7-7 of the Draft RAP:

8. Cap System Construction:

a. Foundation Soil: The foundation soil will be placed above the high-strength geotextile (Cooper Sumps) or asphalt/concrete surface (Haack Sump). The foundation soil layer minimum thickness will be 0.5 ft (Haack Sump) and 1 ft (Cooper Sumps).

ESPO recognizes that future ownership and development plans are not finalized (Section 7.11). However, ESPO submits the caution that if Arco constructs a soil cover only capable of supporting a parking lot, then the future owners would face a significant challenge modifying the soil cover to support commercial buildings.

Given Arco's stated intention to support future development on the Site, as evidenced by the following passage from Page xi describing the soil cover alternative, Alt. 2A:

"Alternative 2A also would best accommodate future potential redevelopment of the Site."

ESPO recommends that Arco propose a remedial design to accommodate the highest structural loading consistent with, "future potential redevelopment of the Site". Such a design would provide long term protection for construction workers and neighbors, as sought in the FS.

Response:

Section 5.5 of the RAP will be reworded to state the following:

> "Future Site use considerations have been identified by DTSC, the City of Gardena, and the Site owner. Specific future Site uses, as described in this document will be accommodated in the design phase of the work. The basis of design and specific design parameters will be considered during the design phase of work. As discussed with DTSC, the basis of design and design parameters cannot incorporate or consider all potential future uses or redevelopment scenarios; therefore, any additional redevelopment work, beyond the current specific and intended uses, should be considered in future permitting processes at the time of the future redevelopment."

As discussed with DTSC in our 20 April 2021 teleconference call, the current basis of design cannot consider or incorporate all potential future uses; therefore, future redevelopment of the site will be restricted by a land use covenant and will be subject to the permitting processes applicable at the time of future redevelopment, including DTSC review of proposed development that differs from final remedy design.

DTSC Comment (*italics*):

6. *Related to the prior ESPO Comment, ESPO recommends that the Draft RAP be revised to provide an evaluation of the long term effectiveness of the soil vapor collection system. In particular, such soil vapor collection systems typically include an estimation of future settlement and provisions to mitigate potential local "dips" in the vertical alignment which collect liquids and occlude the gas flow. ESPO requests the revised Draft RAP provide such a discussion.*

Response:

Section 6.3.2 of the RAP will be updated to include the following statements (underlined text constitutes new, updated text):

"A vapor control and monitoring system would be <u>designed and</u> installed beneath the cap and around the sumps, and groundwater monitoring would continue. <u>The vapor control system would include a flexible gas collection system designed to accommodate the long-term operation of the system.</u>"

Section 7.3, item number 6 of the RAP will be updated to include the following statement:

"The system will be designed to accommodate differential settlement, maintain gas flow, and mitigate condensate buildup."

DTSC Comment (*italics*):

7. *ESPO expects rainfall will quickly cause rills and progressive erosion on the proposed 2:1 side slope of aggregate base specified on Detail 6 of Sheet 7-8. The function of the cover would be compromised.*

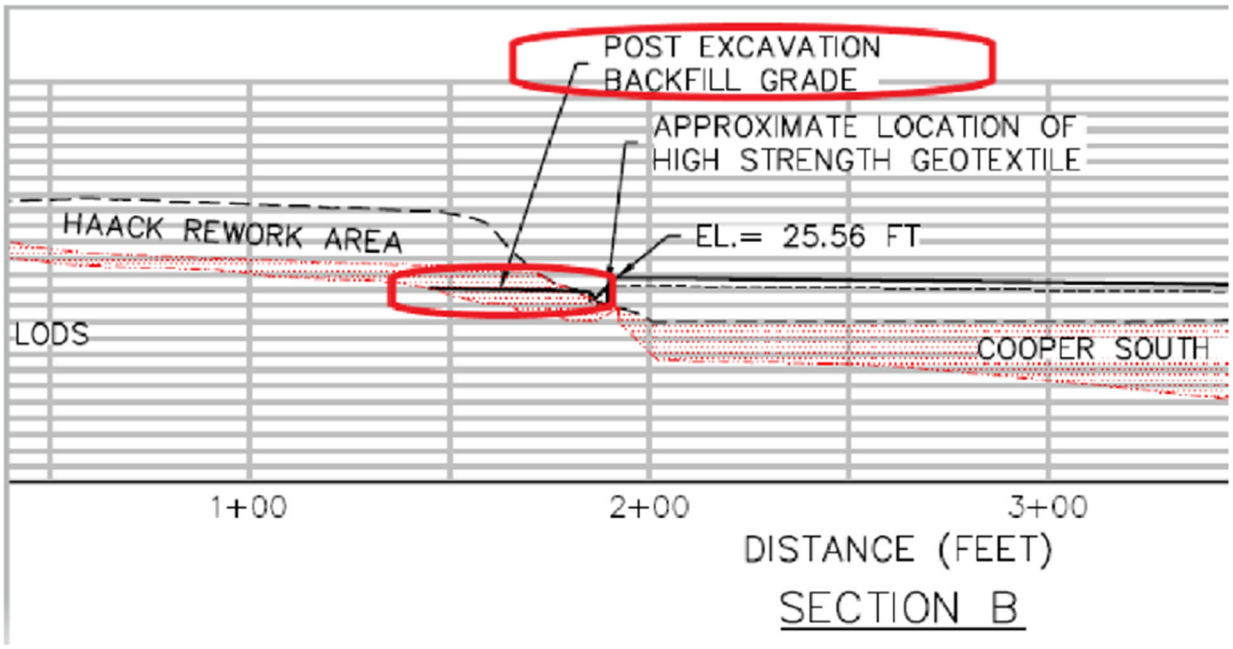
   ESPO recommends the slope be revised to 3:1.

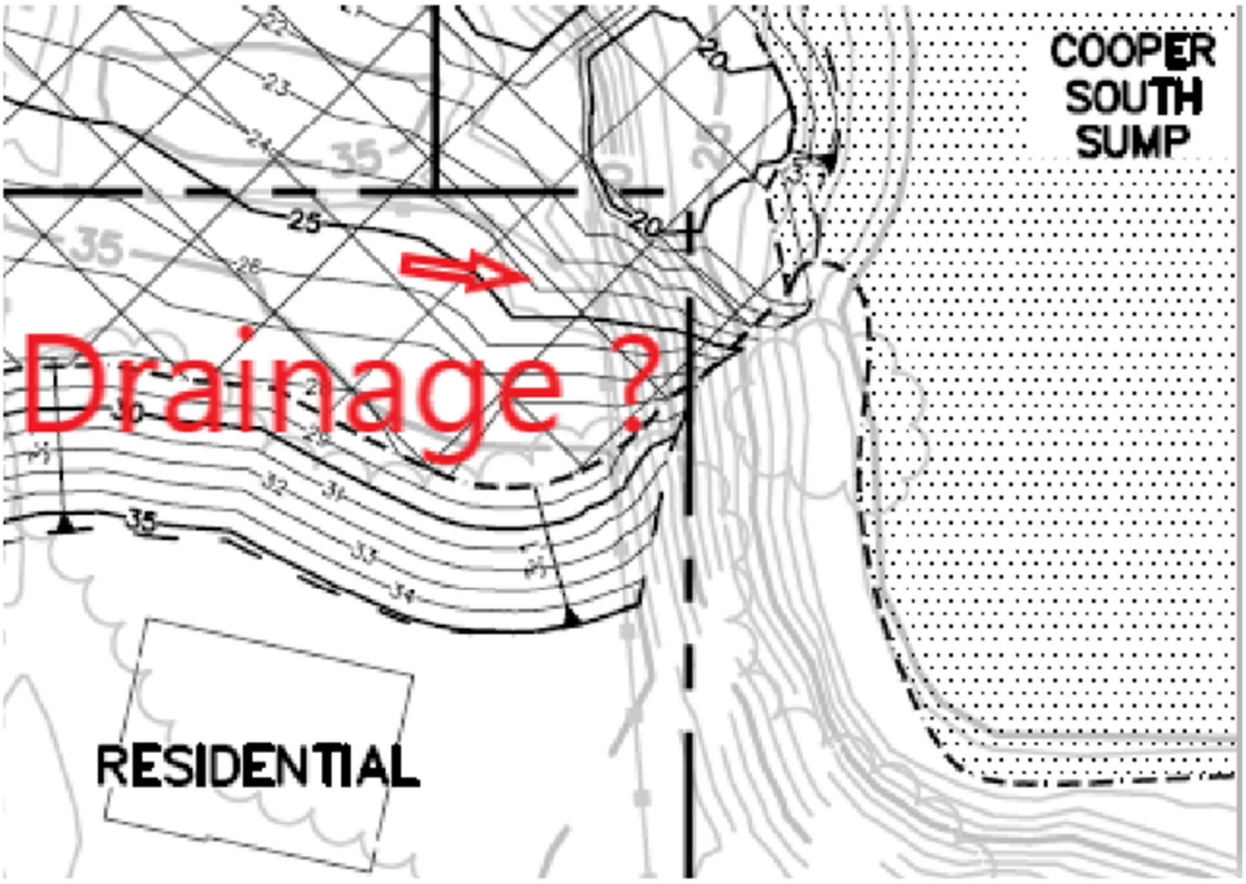
Response:

ESPO's comment is acknowledged. Erosion control and surface water drainage will be included as part of the basis of design for the final design grades. Appropriate erosion control measures will be included in the remedy design to mitigate erosion potential. Slopes will be evaluated for stability as part of the remedy design. Detail 6 on Sheet 7-8 will be revised to state that the slope will be "2:1 (maximum)" indicating no slopes will be steeper than 2:1.

DTSC Comment (*italics*):

8. *The location of Section B on Sheet 7.3 is not shown on the plan view of Sheet 7-5, hence it is difficult to understand the resulting surface and drainage outfall, as shown with red highlight in the two excerpted figures below:*

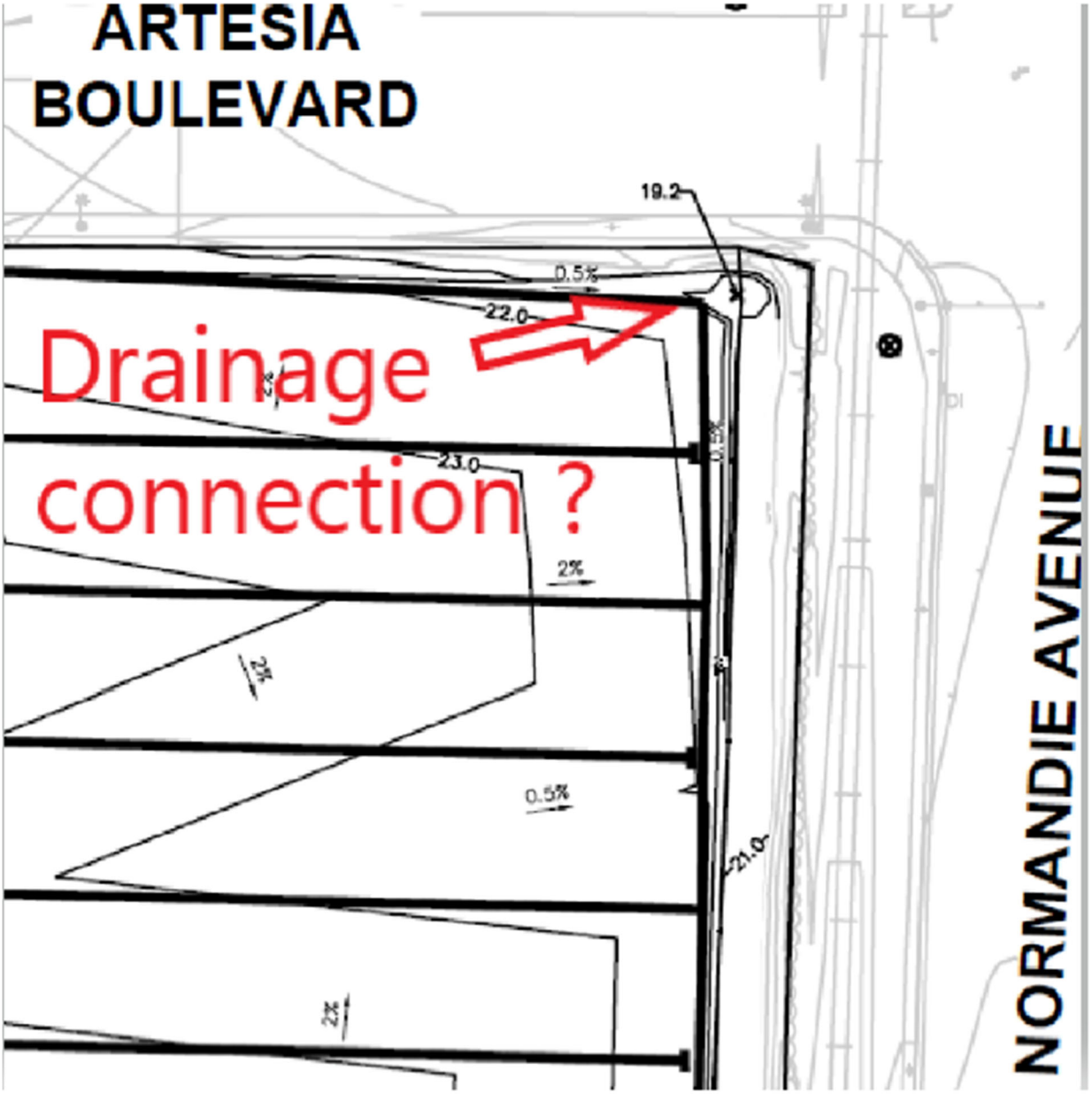

POST EXCAVATION
BACKFILL GRADE
APPROXIMATE LOCATION OF
HIGH STRENGTH GEOTEXTILE
HAACK REWORK AREA
EL.= 25.56 FT
LODS
COOPER SOUTH
1+00
2+00
3+00
DISTANCE (FEET)
SECTION B



ESPO notes that ponded water, if that is the result of the proposed grades, would undermine the intended containment of the remedial design.

ESPO notes an additional drainage concern on the excerpt from Sheet 7-6 shown below where the tie-in to downstream storm water improvements is not shown.

ESPO recommends the drainage details be clearly shown on the plans. ESPO also recommends the LODS (Limit of Disposed Sludge) be displayed on Sheet 7.5.



Response:

The images included by ESPO in the comments represent interim (e.g., temporary construction) conditions for the areas shown. Section 7.3, item number 7 will be updated to include the following detail regarding contact water management during sludge excavation and consolidation:

> " b. Contact water, including stormwater run-on, stormwater run-off, antecedent rainfall, and groundwater which comes into contact with the sludges or materials containing potential COCs, will be managed during construction through

> interim contact water management controls. These may include pumps, erosion and sediment controls, diversion berms, etc. Water within work areas will be managed to prevent ponding and to remove excess water prior to construction of remedy features. Details regarding requirements for contact water management will be included in the remedy design documents (e.g., specifications)."

The Limit of Disturbed Sludge (LODS) referenced by the ESPO represents the pre-remedy condition. ESPO recommends displaying the LODS on Sheet 7.5, which represents post-remedy construction conditions; therefore, the LODS shown on Sheet 7.5 would not be an accurate depiction. The LODS will be included on design drawings and figures showing pre-remedy construction conditions (i.e., existing conditions drawing). Because the LODS will be modified during construction, the LODS will not be included on drawings or figures that represent interim or post-construction conditions.

Stantec Consulting Services Inc.
3777 Worsham Avenue Suite 200, Long Beach CA 90808-1774

January 15, 2021
File: 185850766.400

Attention: Mr. Nicholas Ta
California Department of Toxic Substances Control
Southern California Cleanup Operations Branch – Cypress Office
5796 Corporate Avenue
Cypress, California 90630-4732

Dear Mr. Ta,

Reference: Annual Cover Inspection and Maintenance Report
January to December 2020
Gardena Sumps Site, DTSC Project No. 400067
1440 West Artesia Boulevard, Gardena CA, 90247
Southwest Corner of West Artesia Boulevard and Normandie Avenue

On behalf of Atlantic Richfield Company (ARC), Stantec Consulting Services Inc. (Stantec) has prepared this summary report addressing the geomembrane cover inspections and maintenance activities performed at the Gardena Sumps Site (the Site) in 2020. The Site is located at the southwest corner of the intersection of Artesia Boulevard and Normandie Avenue in the City of Gardena, Los Angeles County, California (Figures 1 and 2). The cover inspection and maintenance activities were conducted pursuant to §VII-A2 of the Consent Decree for US District Court Case Number CV04-7882–AHM (JTLx). ARC signed this Consent Decree on June 16, 2004 with the California Department of Toxic Substances Control (DTSC). The consent decree was entered into the court records of the United States District Court for the Central District of California on November 4, 2004. A detailed Interim Cover Maintenance Plan (ICMP) was submitted to the DTSC on December 16, 2004 by SECOR International Incorporated (SECOR, now Stantec) to provide a framework for ensuring cover integrity until final remediation could be achieved. On June 25, 2012, the ICMP was updated and included a new format for the cover repairs log and Site inspection report. The June 25, 2012 updated ICMP addresses the requirements for periodic inspections, documentation, maintenance, repairs, and reporting.

The purpose of this document is to present the results of cover inspection and maintenance activities performed by Stantec during the 2020 calendar year. A comprehensive cover inspection and maintenance report covering the period from December 2004 through April 2007 was submitted to DTSC on April 18, 2007. A second report covering the partial year of April 19 through December 31, 2007 was submitted on January 4, 2008. Since that time, Stantec has submitted a yearly cover inspection and maintenance summary report to the DTSC for activities conducted during the calendar year, from January through December, in January of the following year. Per the June 25, 2012 updated ICMP, long-term quarterly monitoring of cover integrity will continue and be documented during 2021. This report addresses cover inspection and maintenance activities that occurred from January through December 2020.

Reference: **Annual Cover Inspection and Maintenance Report**
January to December 2020Gardena Sumps Site, DTSC Project No. 400067
1440 West Artesia Boulevard, Gardena CA, 90247
Southwest Corner of West Artesia Boulevard and Normandie Avenue

SITE GROUNDWATER SAMPLING, INSPECTIONS, AND MAINTENANCE VISITS

As requested by the DTSC, Stantec conducts monthly inspections of the perimeter fence and gates, and signage. During the reporting period, there have been a total of twenty-two site visits. Site visits were for the purpose of conducting monthly perimeter fence, gate, and sign inspections; semi-annual groundwater monitoring and sampling, quarterly cover inspections; and for general site maintenance. The dates and purposes of Site Visits during 2020 are summarized below.

1.	1/27/2020	Monthly Site Visit. Graffiti observed on 5 of 8 Proposition 65 signs installed along perimeter fence.
2.	2/18/2020	First Quarter 2020 Semi-Annual groundwater sampling event, First Quarter 2020 Cover Inspection and Monthly Site Visit. Well MW-05A vault gasket was noted as worn and needing repair. No damage to cover was noted. A tree was identified as having fallen onto and causing damage to the chain-link perimeter fence in the southwest portion of the Site. A breach was identified and temporarily fixed in perimeter fence along Normandie Avenue near Gate 2. Approximately 10-foot-long section of privacy windscreen had been cut out and removed along Artesia Boulevard. Weed growth is present.
3.	2/26/2020	Site Maintenance. Replaced vault gasket at well MW-05A. Conducted general cleanup along perimeter fence. Installed new warning signs and replaced missing privacy windscreen on perimeter fence along Artesia Boulevard.
4.	3/3/2020	Monthly Site Visit. Weeds are present. Graffiti observed on 6 of 8 Proposition 65 signs installed along perimeter fence. Waste drums were removed from Site during the site visit.
5.	4/3/2020	Monthly Site Visit. Weeds are present. Graffiti present on Proposition 65 signs.
6.	5/1/2020	Monthly Site Visit and Second Quarter 2020 Cover Inspection. No damage to cover noted. Weed growth present. Breaches identified along the Los Angeles Department of Public Works (LADPW) perimeter fence on Normandie Avenue. Replaced graffiti covered Proposition 65 signs on perimeter fence along Artesia Boulevard and Normandie Avenue.
7.	5/26/2020	Site Maintenance. Assessed perimeter fence and windscreen for proper repairs.
8.	6/10/2020	Site Maintenance. Repaired breaches along perimeter fence along Normandie Avenue. Covered graffiti identified on perimeter fence windscreen facing Artesia Boulevard.
9.	6/11/2020	Monthly Site Visit. Weeds present on LADPW property. Breaches identified on LADPW property in perimeter fence along Normandie Avenue.
10.	7/7/2020	Monthly Site Visit. Breach identified in the perimeter fence on Artesia Boulevard. The windscreen and chain-link fence were cut where the breach was identified.

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1440 West Artesia Boulevard, Gardena CA, 90247
Southwest Corner of West Artesia Boulevard and Normandie Avenue

		Gate panel located in the southeast portion of the LADPW perimeter fence was noted as unsecured.
11.	7/8/2020	Site Maintenance. Fence breach along Artesia Boulevard and windscreen was repaired.
12	7/28/2020	Site Maintenance. Repaired breaches in LADPW property a second time in perimeter fence along Normandie Avenue. Reset gate panel on new hinges attached to the perimeter fence. Covered graffiti identified on windscreen facing Artesia Boulevard.
13.	8/18/2020	Third Quarter 2020 Semi-Annual groundwater sampling event and Monthly Site Visit. Weed growth observed next to wells MW-03A/3B and well G-4 on LADPW property.
14.	8/19/2020	Third Quarter 2020 Cover Inspection. No damage to cover was noted. Weed growth present.
15.	8/25/2020	Site Maintenance. Repaired chain-link fence and removed tree stump and fallen tree branches located in the southwest portion of Site.
16.	9/10/2020	Monthly Site Visit. Breaches identified on LADPW Property in perimeter fence along southern boundary of Site.
17.	9/15/2020	Site Maintenance. Repaired fence breaches in LADPW property along the southern portion of perimeter fence.
18.	10/8/2020	Monthly Site Visit. No issues identified.
19.	10/28/2020	Fourth Quarter 2020 Cover Inspection. Damage to southeast portion of the LADPW perimeter fence was noted. Warning signs were observed to be missing at entry gate in the southern portion of perimeter fence. Weed growth present in interior Site perimeter and in areas on the LADPW property around wells MW-3A/B and G-4. Sandbags on top of the western portion of cover were noted to have deteriorated. A 12-inch cut was observed in the cover in the southeast portion of the Site.
20.	11/4/2020	Site Maintenance. Installed new warning signs on south entry gate of Site. Repaired the 12-inch cut identified in the cover. Repaired breaches identified in the southern portion of the perimeter fence.
21.	11/9/2020	Monthly Site Visit. Weeds are present on the LADPW property.
22.	12/9/2020	Monthly Site Visit. Burnt vegetation and soil was observed near the southeast corner of the cover due to fire. Graffiti was identified on a Caution sign attached to the southeast gate to the Site. One lock was noted as missing from the southeast gate. A chain and lock used to secure a fence panel (attached to the southeast

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1440 West Artesia Boulevard, Gardena CA, 90247
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corner of the perimeter fence) were removed and left on the ground apparently by fire department personnel.

Inspection of the cover is performed during the semi-annual groundwater sampling events in the First and Third Quarters of each year and during the Second and Fourth quarters of each year as separate site visits. On October 12, 2018, Stantec received a letter from the DTSC approving semi-annual events. Starting in the beginning of 2018 the groundwater sampling events were scheduled to occur in the first and third quarters each year. Cover inspection and cover maintenance events conducted during 2020 were performed in general accordance with Stantec's June 25, 2012 updated ICMP. During the regular Quarterly site visits, punctures, rips and/or tears, degradation of previous repairs/patches or traffic related wear in the cover, if present, are identified and an assessment is made to determine the need for repair

COVER INSPECTION AND MAINTENANCE

The geomembrane cover in the entire eastern portion (Cooper Property) of the Site was re-covered in the fall of 2013. A small patch of approximately 1 square foot was installed in December 2020. The perimeter of the Site is inspected for fence, sign and gate damage or vandalism monthly. The entire Site is regularly inspected quarterly, sometimes coinciding with the quarterly groundwater monitoring event, for any signs of damage, failed seams, or tar seeps. Quarterly Cover Inspection Reports for 2020 are provided in Attachments A through D. Geomembrane photograph repair logs for repairs conducted by Stantec during the year (when repairs have been performed) are provided as Attachment E.

The following summarizes observations, findings and activities conducted during each quarter of this reporting year.

First Quarter 2020:

On February 18, 2020, the First 2020 Semi-Annual groundwater sampling event and First Quarter Cover Inspection was conducted. No damage to the cover was observed.

Second Quarter 2020:

On May 1, 2020, the Second Quarter 2020 Cover Inspection was conducted. No damage to the cover was observed.

Third Quarter 2020:

On August 19, 2020, the Second 2020 Semi-Annual groundwater sampling event and Third Quarter Cover Inspection was conducted. No damage to the cover was observed.

Fourth Quarter 2020:

On October 28, 2020, the Fourth Quarter 2020 Cover Inspection was conducted. Sandbags on top of the western portion of cover were noted to have some deterioration; they will continue to be monitored for further deterioration. A 12-inch cut was also observed in the cover located in the southeast portion of the Site. On November 4, 2020, Stantec repaired the 12-inch cut in the cover.

Reference: **Annual Cover Inspection and Maintenance Report**
January to December 2020Gardena Sumps Site, DTSC Project No. 400067
1440 West Artesia Boulevard, Gardena CA, 90247
Southwest Corner of West Artesia Boulevard and Normandie Avenue

Cover inspection reports for the First Quarter through Fourth Quarter 2020 are provided in Attachments A through D, and photographs of cover repairs are provided in Attachment E.

STANDARD LIMITATIONS

This report was prepared in accordance with the scope of work outlined in Stantec's contract and with generally accepted professional engineering and environmental consulting practices existing at the time this report was prepared and applicable to the location of the Site. It was prepared for the exclusive use of ARC and local regulatory agencies, for the express purpose stated above. Any re-use of this report for a different purpose or by others not identified above shall be at the user's sole risk without liability to Stantec. To the extent that this report is based on information provided to Stantec by third parties, Stantec may have made efforts to verify this third-party information, but Stantec cannot guarantee the completeness or accuracy of this information. The opinions expressed, and data collected are based on the conditions of the Site existing at the time of the field investigation. No other warranties expressed or implied are made by Stantec.

If you have any questions or comments regarding the contents of this letter, please call either Mr. Kelly C. Brown with Stantec at 562-354-2638 or Mr. Wade Melton with ARC at 360-594-7978.

Best regards,

Stantec Consulting Services Inc.

Garrett Pankratz
Staff Geologist

Kelly C. Brown, PG
Principal Geologist

Holly Quasem, PE
Senior Engineer

Attachments:

Figure 1 — Site Location Map
Figure 2 — Site Map
Attachment A - First Quarter 2020 Cover Inspection Report
Attachment B - Second Quarter 2020 Cover Inspection Report
Attachment C - Third Quarter 2020 Cover Inspection Report

Reference: **Annual Cover Inspection and Maintenance Report**
January to December 2020Gardena Sumps Site, DTSC Project No. 400067
1440 West Artesia Boulevard, Gardena CA, 90247
Southwest Corner of West Artesia Boulevard and Normandie Avenue

Attachment D - Fourth Quarter 2020 Cover Inspection Report
Attachment E - Before and After Cover Repairs Photo Log

Reference: **Annual Cover Inspection and Maintenance Report**
January to December 2020Gardena Sumps Site, DTSC Project No. 400067
1440 West Artesia Boulevard, Gardena CA, 90247
Southwest Corner of West Artesia Boulevard and Normandie Avenue

REFERENCES

US District Court, Central District of California, 2004, Case No. CV04-7882-AHM (JTLx), The California DTSC v. Atlantic Richfield Company: Consent Decree

DTSC Letter, Re: Annual Cover Repair and Maintenance Report - January to December 2011, April 19, 2012

SECOR, Gardena Sumps, Interim Cover Maintenance Plan. December 16, 2004

Stantec, Interim Cover Maintenance Plan. June 25, 2012.

Stantec, Work Plan for Temporary Cover at the Haack Rework Area. October 21, 2004.

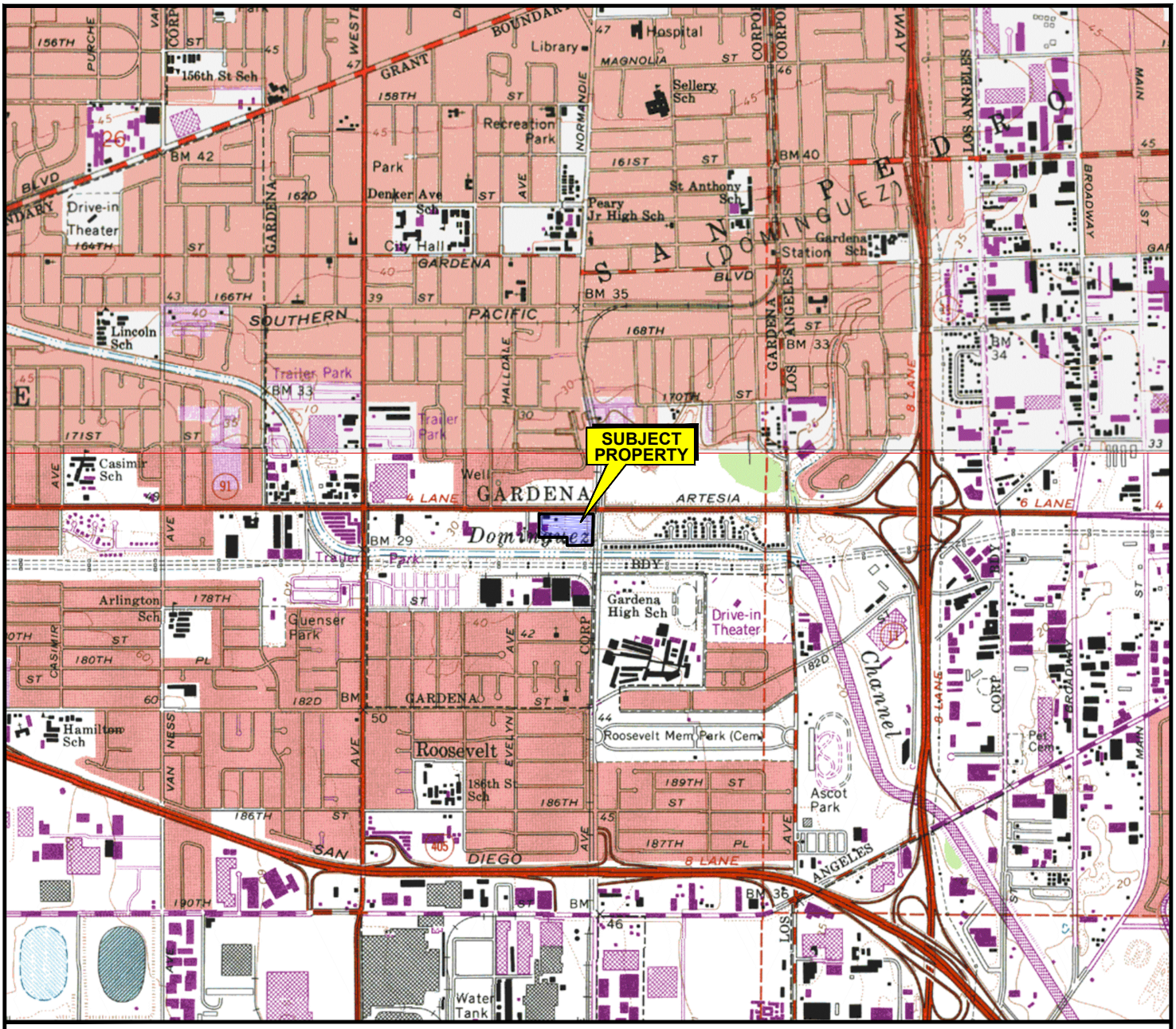
Reference: **Annual Cover Inspection and Maintenance Report**
January to December 2020Gardena Sumps Site, DTSC Project No. 400067
1440 West Artesia Boulevard, Gardena CA, 90247
Southwest Corner of West Artesia Boulevard and Normandie Avenue

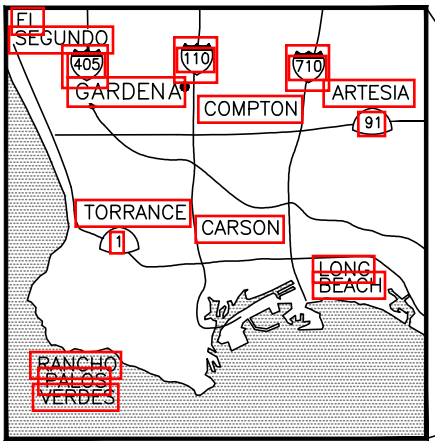
DISTRIBUTION

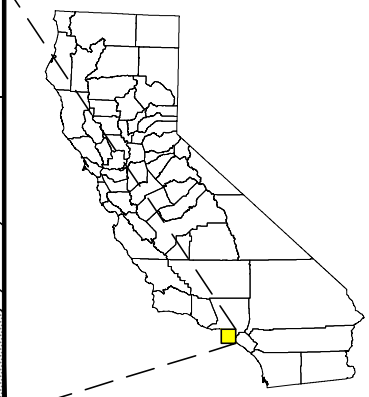
Mr. Nicholas Ta (Original and 1 Copy – paper format, and CD)
Southern California Cleanup Operations Branch
Cypress Office
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630-4732

Ms. Lynn Goldman, Esq. (Transmittal Letter Only – paper format)
Department of Toxic Substances Control
Office of Legal Affairs
P.O. Box 806
Sacramento, CA 95812-0806

Mr. Wade E. Melton (1 Electronic Copy to ROM)
Atlantic Richfield Company







SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC MAP, TORRANCE QUADRANGLE, 1964
PHOTOREVISED 1981
INGLEWOOD QUADRANGLE, 1964
PHOTOREVISED 1981

N

0 2000 4000

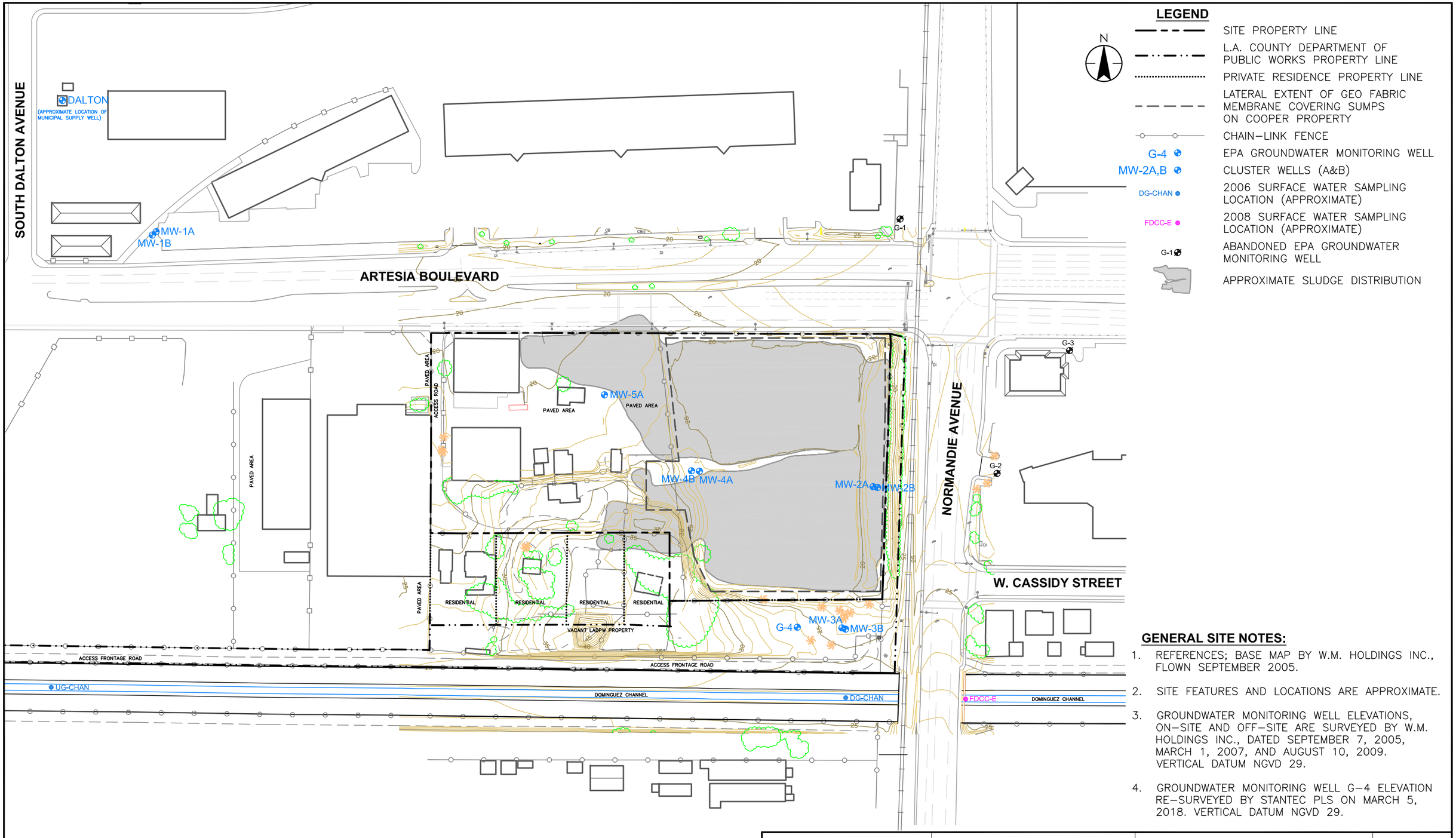
APPROXIMATE SCALE (FEET)

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
PHONE: (805) 230-1266 FAX: (805) 230-1277

FOR:		FIGURE:
GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA	SITE LOCATION MAP	1

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185850766	R. Roman	M. Mason	K. Brown	09/04/19

FILEPATH:E:\1858\active\185850766\03_data\cad\Groundwater\2019-Q3\20190904_dwg_bpgs_q3gwm19-slm.dwg|troman|Sep 04, 2019 at 12:06|Layout: F1_SLM (USGS)



LEGEND

- SITE PROPERTY LINE
- L.A. COUNTY DEPARTMENT OF PUBLIC WORKS PROPERTY LINE
- PRIVATE RESIDENCE PROPERTY LINE
- LATERAL EXTENT OF GEO FABRIC MEMBRANE COVERING SUMPS ON COOPER PROPERTY
- CHAIN–LINK FENCE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-2A,B — CLUSTER WELLS (A&B)
- DG-CHAN — 2006 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- FDCC-E — 2008 SURFACE WATER SAMPLING LOCATION (APPROXIMATE)
- G-1 — ABANDONED EPA GROUNDWATER MONITORING WELL
- APPROXIMATE SLUDGE DISTRIBUTION

GENERAL SITE NOTES:

1. REFERENCES; BASE MAP BY W.M. HOLDINGS INC., FLOWN SEPTEMBER 2005.
2. SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
3. GROUNDWATER MONITORING WELL ELEVATIONS, ON–SITE AND OFF–SITE ARE SURVEYED BY W.M. HOLDINGS INC., DATED SEPTEMBER 7, 2005, MARCH 1, 2007, AND AUGUST 10, 2009. VERTICAL DATUM NGVD 29.
4. GROUNDWATER MONITORING WELL G–4 ELEVATION RE–SURVEYED BY STANTEC PLS ON MARCH 5, 2018. VERTICAL DATUM NGVD 29.

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
PHONE:(805) 230-1266 FAX:(805) 230-1277

FOR:				FIGURE:
GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA		SITE MAP SHOWING GROUNDWATER MONITORING WELL LOCATIONS		2
JOB NUMBER: 185850766	DRAWN BY: R. Roman	CHECKED BY: M. Mason	APPROVED BY: K. Brown	DATE: 09/04/19

FILEPATH:E:\1858\active\185850766\03_data\cad\Groundwater\2019-Q3\20190904_dwg_bpgs_q3gwm19.dwg|troman|Sep 04, 2019 at 12:11|Layout: F2_GWBSM

Stantec Consulting Services Inc.
3777 Worsham Avenue Suite 200, Long Beach CA 90808-1774

Attachment A

First Quarter 2020 Cover Inspection Report

Stantec

SITE COVER INSPECTION LOG

Owner/ Developer: BP Date: 2.18.20

Project: GARDENA SUMPS Project Number:

I. **Type of Inspection:**

Inspections Required

- [x] Quarterly Monitoring
- [ ] Semi-Annual Monitoring
- [ ] Annual Monitoring

II. **Weather Conditions:**

Describe generally the weather conditions including temperature, cloud cover, approximate wind speed and direction.

CLEAR, 66°, SW 2MPH,

III. **Check the observed status of all appropriate items:**

Item #	Inspection Items	Yes	No	or	Condition: Good	Fair	Poor	Follow Up Required
	General Site Housekeeping							
1	Litter, Trash, Debris Accumulation	☐	☑		☐	☐	☐	☐
2	Evidence of Illegal Dumping or Waste Disposal Onsite	☐	☑		☐	☐	☐	☐
3	Condition of Access Roads, Ingress and Egress Driveways	☐	☐		☐	☑	☐	☐
	Site Security							
4	Condition of Perimeter Fence	☐	☐		☐	☐	☑	☑
5	Holes or Gaps at Bottom of Fence	☑	☐		☐	☐	☐	☑
6	Condition of Gates	☐	☐		☑	☐	☐	☐
7	Locks on Gates	☑	☐		☐	☐	☐	☐
	Signage (warning signs)							
8	Are Any Signs Missing?	☐	☑		☐	☐	☐	☐
9	Graffiti Obscuring Signage	☐	☑		☐	☐	☐	☐
	Slope Stability (Berms, Slopes)							
10	Tension Cracking	☐	☑		☐	☐	☐	☐

Stantec

SITE COVER INSPECTION LOG

Item #	Inspection Items	Yes	No	or	Condition Good	Fair	Poor	Follow Up Required
11	Slumping	☐	☑		☐	☐	☐	☐
12	Erosion of Toe or Slope Face	☐	☑		☐	☐	☐	☐
	Surface Erosion							
13	Evidence of Offsite Migration of Sediments	☐	☑		☐	☐	☐	☐
14	Berms Eroded, Breached, or Compromised	☐	☑		☐	☐	☐	☐
	Areas of Excessive Settlement or Subsidence							
15	Sink Holes	☐	☑		☐	☐	☐	☐
16	Ground Loss Near Below Grade Utilities	☐	☑		☐	☐	☐	☐
	Vegetation (Evidence of Distress, Weed Abatement)							
17	Distressed Vegetation (Discrete Areas of Dead or Dying Vegetation Compared to Nearby Areas)	☐	☑		☐	☐	☐	☐
18	Uncontrolled or Unsightly Weed Growth	☑	☐		☐	☐	☐	☑
	Storm Water Control (Containment, Structures, Berms, BMP Controls, Discharge Weirs, Piping, etc.)							
19	Storm Water Control Components in Proper Working Order	☑	☐		☐	☐	☐	☐
20	Evidence of Breaching or Weathering of Biodegradable Structures (i.e.; Straw Wattles, Mats, Straw Bales)	☐	☑		☐	☐	☐	☐
21	Condition of Sand Bag or Earthen Berms	☐	☐		☑	☐	☐	☐
	Evidence of Leachate or Leakage from the Sumps							
22	Tar Boils or other Seepage	☐	☑		☐	☐	☐	☐
23	Unnatural seeps or wet spots (odor, vegetation distress)	☐	☑		☐	☐	☐	☐
	Groundwater Monitoring Wells							
24	Condition of Well Covers (Broken Covers, Missing or Stripped Bolts)	☐	☑		☐	☐	☐	☐
25	Cracked or Broken Aprons	☐	☑		☐	☐	☐	☐
26	Surface Water Intrusion	☐	☑		☐	☐	☐	☐
27	Settled or Tilting Risers	☐	☑		☐	☐	☐	☐
28	Locks and Caps on all Casings	☑	☐		☐	☐	☐	☐

Stantec

SITE COVER INSPECTION LOG

Item #	Inspection Items	Yes	No	or	Condition: Good	Fair	Poor	Follow Up Required
	Interim rPP Cover							
29	Evidence of Leakage (i.e.; tar boils)	☐	☑		☐	☐	☐	☐
30	Evidence of Tears, Rips, Cracks, Punctures	☐	☑		☐	☐	☐	☐
31	Condition of Patches	☐	☐		☑	☐	☐	☐
32	Condition, Number and Spacing of Sand Bags or other Hold-Down on the Liner	☐	☐		☑	☐	☐	☐
33	Condition of Anchor Trench	☐	☐		☑	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐

IV.

As appropriate, describe required follow-up work based upon evaluation in Section III, above (Attach additional sheets as necessary):

*For example, removal of accumulated materials, additional training, and replacement of damaged BMPs or geomembrane liner, etc.

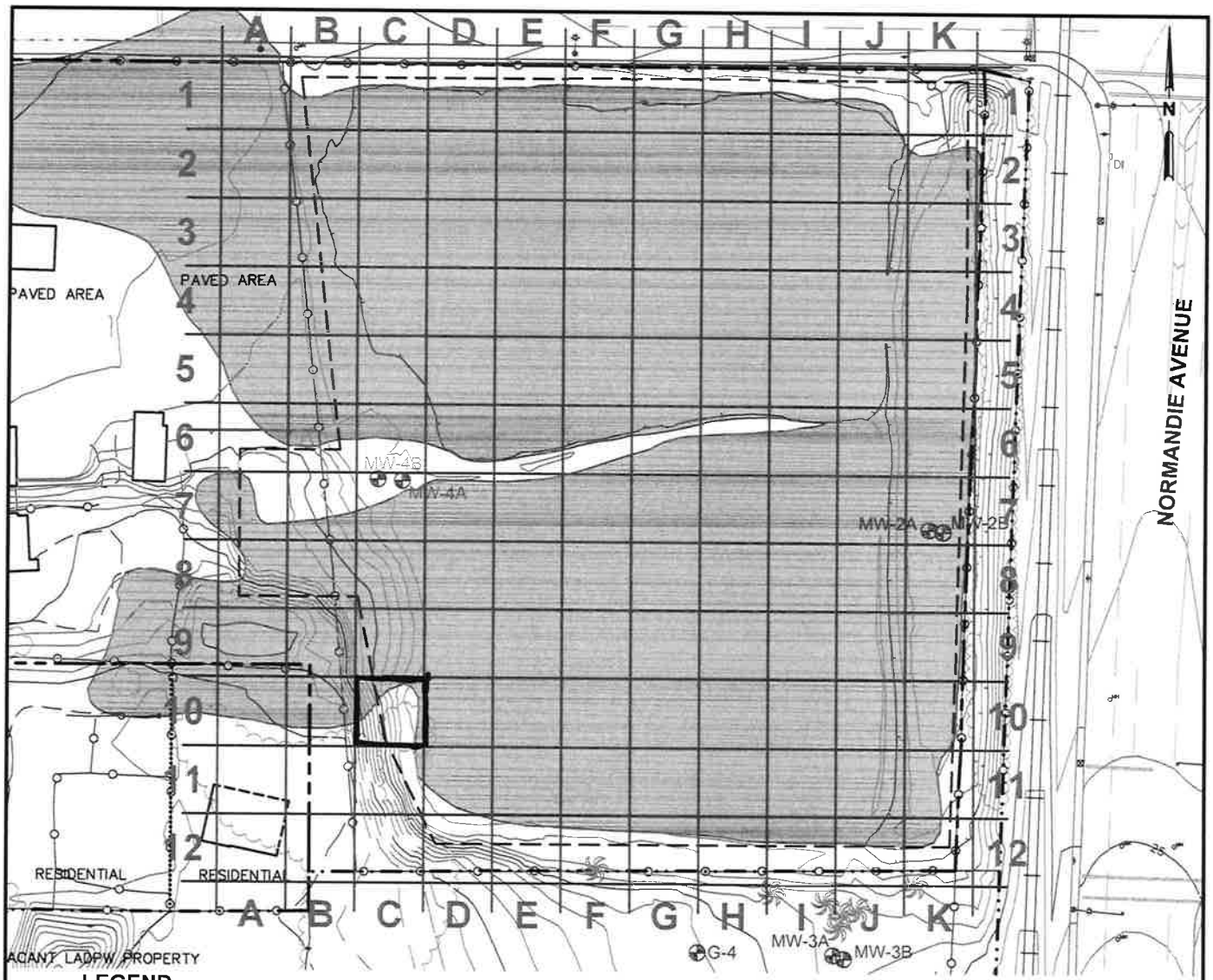
Item #	Description of Condition	Proposed Mitigation Measure	Date Mitigative Measure Completed (Date and Signature)
4	CHAINLINK DAMAGED	REPAIR AS NEEDED	
5	TREE FELL ON FENCE	CUT AND REMOVE TREE	
~~6~~			

A. GASTELUM
Inspection Performed By:

Date 2 18 20

Printed Name and Title: ALEJANDRO GASTELUM
SENIOR TECHNICIAN.

Date 2 18 20



LEGEND

- SITE PROPERTY LINE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-2A,B — CLUSTER WELLS (A&B)
- APPROXIMATE LOCATION OF SLUDGE DISTRIBUTION

NOTES:

① X **PUNCTURES**

① ~~~ **RIP (LINEAR FEET)**

PLEASE PAINT LOCATIONS OF COVER DAMAGES

0 80 160

APPROXIMATE SCALE IN FEET

FIELD INSPECTION CONDITONS ON ; CLEAR, 66°, SW 2MPH

INSPECTED BY ; ALEX GASTELUM

CONDITION OF EXISTING PATCHES ; GOOD

CONDITION OF PERIMETER FENCE ; DAMAGE FROM FALLEN TREE (C-10 AREA OF FENCE)

TOTAL AREA OF DAMAGES (Sq.Ft.) ; Approx 20 SQ FEET.

REMARKS ; (CONTINUED ON BACK OF SHEET)

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
PHONE: (805) 230-1266 FAX:(805) 230-1277

FOR:				FIGURE:
GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA		GEOTEXTILE MEMBRANE COVER FIELD CONDITION INSPECTION & DAMAGE LOCATION MAP		X
JOB NUMBER: 211802613	DRAWN BY: R. Roman	CHECKED BY:	APPROVED BY: K. Brown	DATE: 01/22/14

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\Field-Inspection\2014-Jun\BP-GS_CoverGrid_Blank.dwg|troman|Jun 24, 2014 at 10:15|Layout: X

Stantec Consulting Services Inc.
3777 Worsham Avenue Suite 200, Long Beach CA 90808-1774

Attachment B

Second Quarter 2020 Cover Inspection Report

Stantec

SITE COVER INSPECTION LOG

Owner/ Developer: British Petroleum Date: 5/1/2020

Project: Gardena Sumps Project Number: 185850766

I. **Type of Inspection:**

Inspections Required

- [x] Quarterly Monitoring
- [ ] Semi-Annual Monitoring
- [ ] Annual Monitoring

II. **Weather Conditions:**

Describe generally the weather conditions including temperature, cloud cover, approximate wind speed and direction.

72°F, Sunny, WSW 11 mph

III. **Check the observed status of all appropriate items:**

Item #	Inspection Items	Yes	No	or	Good	Condition Fair	Poor	Follow Up Required
	General Site Housekeeping							
1	Litter, Trash, Debris Accumulation	☐	☑		☐	☐	☐	☐
2	Evidence of Illegal Dumping or Waste Disposal Onsite	☐	☑		☐	☐	☐	☐
3	Condition of Access Roads, Ingress and Egress Driveways	☐	☐		☑	☑ (poor)	☐	☐
	Site Security							
4	Condition of Perimeter Fence	☐	☐		☐ (poor)	☑	☐	☑
5	Holes or Gaps at Bottom of Fence	☐	☑		☑	☐	☐	☐
6	Condition of Gates	☐	☐		☑	☐	☐	☐
7	Locks on Gates	☑	☐		☐	☐	☐	☐
	Signage (warning signs)							
8	Are Any Signs Missing?	☐	☑		☐	☐	☐	☐
9	Graffiti Obscuring Signage	☑	☐		☐	☐	☐	☑
	Slope Stability (Berms, Slopes)							
10	Tension Cracking	☐	☑		☐	☐	☐	☐

Stantec

SITE COVER INSPECTION LOG

Item #	Inspection Items	Yes	No	or	Good	Condition Fair	Poor	Follow Up Required
11	Slumping	☐	☑		☐	☐	☐	☐
12	Erosion of Toe or Slope Face	☐	☑		☐	☐	☐	☐
	Surface Erosion							
13	Evidence of Offsite Migration of Sediments	☐	☑		☐	☐	☐	☐
14	Berms Eroded, Breached, or Compromised	☐	☑		☐	☐	☐	☐
	Areas of Excessive Settlement or Subsidence							
15	Sink Holes	☐	☑		☐	☐	☐	☐
16	Ground Loss Near Below Grade Utilities	☐	☑		☐	☐	☐	☐
	Vegetation (Evidence of Distress, Weed Abatement)							
17	Distressed Vegetation (Discrete Areas of Dead or Dying Vegetation Compared to Nearby Areas)	☐	☑		☐	☐	☐	☐
18	Uncontrolled or Unsightly Weed Growth	☑	☐		☐	☐	☐	☐
	Storm Water Control (Containment, Structures, Berms, BMP Controls, Discharge Weirs, Piping, etc.)							
19	Storm Water Control Components in Proper Working Order	☑	☐		☐	☐	☐	☐
20	Evidence of Breaching or Weathering of Biodegradable Structures (i.e.; Straw Wattles, Mats, Straw Bales)	☐	☑		☐	☐	☐	☐
21	Condition of Sand Bag or Earthen Berms	☐	☐		☑	☐	☐	☐
	Evidence of Leachate or Leakage from the Sumps							
22	Tar Boils or other Seepage	☐	☑		☐	☐	☐	☐
23	Unnatural seeps or wet spots (odor, vegetation distress)	☐	☑		☐	☐	☐	☐
	Groundwater Monitoring Wells							
24	Condition of Well Covers (Broken Covers, Missing or Stripped Bolts)	☐	☑		☑	☐	☐	☐
25	Cracked or Broken Aprons	☐	☑		☐	☐	☐	☐
26	Surface Water Intrusion	☐	☑		☐	☐	☐	☐
27	Settled or Tilting Risers	☐	☑		☐	☐	☐	☐
28	Locks and Caps on all Casings	☑	☐		☐	☐	☐	☐

Stantec

SITE COVER INSPECTION LOG

Item #	Inspection Items	Yes	No	or	Good	Condition Fair	Poor	Follow Up Required
	Interim rPP Cover							
29	Evidence of Leakage (i.e.; tar boils)	☐	☑		☐	☐	☐	☐
30	Evidence of Tears, Rips, Cracks, Punctures	☐	☑		☐	☐	☐	☐
31	Condition of Patches	☐	☐		☑	☐	☐	☐
32	Condition, Number and Spacing of Sand Bags or other Hold-Down on the Liner	☐	☐		☑	☐	☐	☐
33	Condition of Anchor Trench	☐	☐		☑	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐

IV.

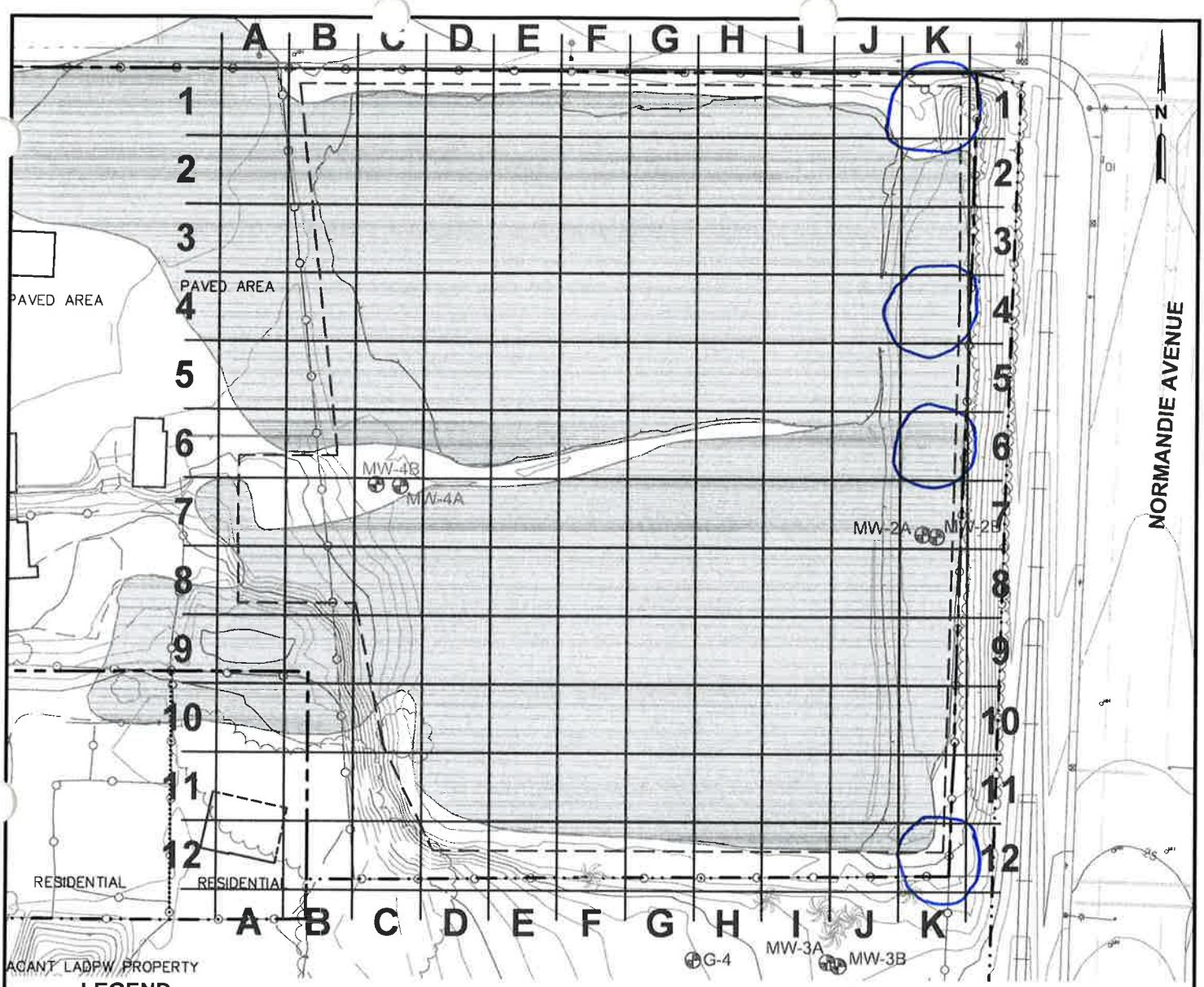
As appropriate, describe required follow-up work based upon evaluation in Section III, above (Attach additional sheets as necessary):

*For example, removal of accumulated materials, additional training, and replacement of damaged BMPs or geomembrane liner, etc.

Item #	Description of Condition	Proposed Mitigation Measure	Date Mitigative Measure Completed (Date and Signature)
4	Breaches (4 total) along east side of perimeter fence.	Rewire fencing and/or re-chain openings (chain w/ lock)	TBD
9	Graffiti present on 1 sign (Artesia, NE corner of Site) and on all 3 signs on Normandie.	Replace signs	5/1/2020 (signs were replaced)

Inspection Performed By: _____ Date 5/1/2020

Printed Name and Title: Garrett Pankratz Geologic Staff Date 5/1/2020



LEGEND

- SITE PROPERTY LINE
- G-4 ⊕ EPA GROUNDWATER MONITORING WELL
- MW-2A,B ⊕ CLUSTER WELLS (A&B)
- APPROXIMATE LOCATION OF SLUDGE DISTRIBUTION

NOTES:

① X **PUNCTURES**

① ~~~ **RIP (LINEAR FEET)**

PLEASE PAINT LOCATIONS OF COVER DAMAGES

0 80 160

APPROXIMATE SCALE IN FEET

FIELD INSPECTION CONDITONS ON : 5/1/2020

INSPECTED BY : Garrett Pankratz

CONDITION OF EXISTING PATCHES : Good

CONDITION OF PERIMETER FENCE : Breaches in inner perimeter fence (2 perimeter fences on east side of property). See K1, K4, K6, and K12 above

TOTAL AREA OF DAMAGES (Sq.Ft.) : No more than 15-20 square feet. See photos dated 5/1/2020.

REMARKS ; (CONTINUED ON BACK OF SHEET) See inspection log (cover inspection log) dated 5/1/2020

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
PHONE: (805) 230-1266 FAX: (805) 230-1277

FOR:		FIGURE:
GARDENA SUMPS Southwest Corner of Artesia Boulevard and Normandie Avenue Gardena, CA	GEOTEXTILE MEMBRANE COVER FIELD CONDITION INSPECTION & DAMAGE LOCATION MAP	X

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
211802613	R. Roman		K. Brown	01/22/14

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\Field-Inspection\2014-Jun\BP-GS_CoverGrid_Blank.dwg|troman|Jun 24, 2014 at 10:15|Layout: X

Stantec Consulting Services Inc.
3777 Worsham Avenue Suite 200, Long Beach CA 90808-1774

Attachment C

Third Quarter 2020 Cover Inspection Report

Stantec

SITE COVER INSPECTION LOG

Owner/ Developer: BP

Date: 8.19.20

Project: GARDENA SUMPS

Project Number: 185850766

I. **Type of Inspection:**

Inspections Required

- ☐ Quarterly Monitoring
- ☑ Semi-Annual Monitoring
- ☐ Annual Monitoring

II. **Weather Conditions:**

Describe generally the weather conditions including temperature, cloud cover, approximate wind speed and direction.

III. **Check the observed status of all appropriate items:**

Item #	Inspection Items	Yes	No	or	Condition: Good	Condition: Fair	Condition: Poor	Follow Up Required
	General Site Housekeeping							
1	Litter, Trash, Debris Accumulation	☑	☐		☐	☐	☐	☐
2	Evidence of Illegal Dumping or Waste Disposal Onsite	☐	☑		☐	☐	☐	☐
3	Condition of Access Roads, Ingress and Egress Driveways	☐	☐		☐	☑	☐	☐
	Site Security							
4	Condition of Perimeter Fence	☐	☐		☐	☑	☐	☐
5	Holes or Gaps at Bottom of Fence	☐	☑		☐	☐	☐	☐
6	Condition of Gates	☐	☐		☐	☑	☐	☐
7	Locks on Gates	☑	☐		☐	☐	☐	☐
	Signage (warning signs)							
8	Are Any Signs Missing?	☐	☑		☐	☐	☐	☐
9	Graffiti Obscuring Signage	☐	☑		☐	☐	☐	☐
	Slope Stability (Berms, Slopes)							
10	Tension Cracking	☐	☐		☑	☐	☐	☐

Stantec

SITE COVER INSPECTION LOG

Item #	Inspection Items	Yes	No	or	Condition: Good	Fair	Poor	Follow Up Required
11	Slumping	☐	☑		☐	☐	☐	☐
12	Erosion of Toe or Slope Face	☐	☑		☐	☐	☐	☐
	Surface Erosion							
13	Evidence of Offsite Migration of Sediments	☐	☑		☐	☐	☐	☐
14	Berms Eroded, Breached, or Compromised	☐	☑		☐	☐	☐	☐
	Areas of Excessive Settlement or Subsidence							
15	Sink Holes	☐	☑		☐	☐	☐	☐
16	Ground Loss Near Below Grade Utilities	☐	☑		☐	☐	☐	☐
	Vegetation (Evidence of Distress, Weed Abatement)							
17	Distressed Vegetation (Discrete Areas of Dead or Dying Vegetation Compared to Nearby Areas)	☐	☑		☐	☐	☐	☐
18	Uncontrolled or Unsightly Weed Growth	☑	☐		☐	☐	☐	☑
	Storm Water Control (Containment, Structures, Berms, BMP Controls, Discharge Weirs, Piping, etc.)							
19	Storm Water Control Components in Proper Working Order	☑	☐		☐	☐	☐	☐
20	Evidence of Breaching or Weathering of Biodegradable Structures (i.e.; Straw Wattles, Mats, Straw Bales)	☐	☑		☐	☐	☐	☐
21	Condition of Sand Bag or Earthen Berms	☐	☐		☑	☐	☐	☐
	Evidence of Leachate or Leakage from the Sumps							
22	Tar Boils or other Seepage	☐	☑		☐	☐	☐	☐
23	Unnatural seeps or wet spots (odor, vegetation distress)	☐	☑		☐	☐	☐	☐
	Groundwater Monitoring Wells							
24	Condition of Well Covers (Broken Covers, Missing or Stripped Bolts)	☐	☑		☐	☐	☐	☐
25	Cracked or Broken Aprons	☐	☑		☐	☐	☐	☐
26	Surface Water Intrusion	☐	☑		☐	☐	☐	☐
27	Settled or Tilting Risers	☐	☑		☐	☐	☐	☐
28	Locks and Caps on all Casings	☑	☐		☐	☐	☐	☐

Stantec

SITE COVER INSPECTION LOG

Item #	Inspection Items	Yes	No	or	Condition Good	Fair	Poor	Follow Up Required
	Interim rPP Cover							
29	Evidence of Leakage (i.e.; tar boils)	☐	☑		☐	☐	☐	☐
30	Evidence of Tears, Rips, Cracks, Punctures	☐	☑		☐	☐	☐	☐
31	Condition of Patches	☐	☐		☑	☐	☐	☐
32	Condition, Number and Spacing of Sand Bags or other Hold-Down on the Liner	☐	☐		☑	☐	☐	☐
33	Condition of Anchor Trench	☐	☐		☑	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐

IV.

As appropriate, describe required follow-up work based upon evaluation in Section III, above (Attach additional sheets as necessary):

*For example, removal of accumulated materials, additional training, and replacement of damaged BMPs or geomembrane liner, etc.

Item #	Description of Condition	Proposed Mitigation Measure	Date Mitigative Measure Completed (Date and Signature)
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

_____ Date _____

Inspection Performed By:

Printed Name and Title: ALEX GASTELUM SENIOR TECHNICIAN Date 8/19/20

Stantec Consulting Services Inc.
3777 Worsham Avenue Suite 200, Long Beach CA 90808-1774

Attachment D

Fourth Quarter 2020 Cover Inspection Report

Stantec

SITE COVER INSPECTION LOG

Owner/ Developer: BP

Date: 10-28-2020

Project: GARDENA SUMPS

Project Number: 185850766

I. **Type of Inspection:**

Inspections Required

- ☐ Quarterly Monitoring
- ☐ Semi-Annual Monitoring
- ☐ Annual Monitoring

II. **Weather Conditions:**

Describe generally the weather conditions including temperature, cloud cover, approximate wind speed and direction.

SUNNY, CALM & 76°F

III. **Check the observed status of all appropriate items:**

Item #	Inspection Items	Yes	No	or	Good	Condition Fair	Poor	Follow Up Required
	General Site Housekeeping							
1	Litter, Trash, Debris Accumulation	☐	☒		☒	☐	☐	☐
2	Evidence of Illegal Dumping or Waste Disposal Onsite	☐	☒		☒	☐	☐	☐
3	Condition of Access Roads, Ingress and Egress Driveways	☐	☐		☐	☒	☐	☐
	Site Security							
4	Condition of Perimeter Fence	☐	☐		☐	☒	☐	☒
5	Holes or Gaps at Bottom of Fence	☐	☒		☐	☐	☐	☐
6	Condition of Gates	☐	☐		☒	☐	☐	☐
7	Locks on Gates	☒	☐		☐	☐	☐	☐
	Signage (warning signs)							
8	Are Any Signs Missing?	☒	☐		☐	☐	☐	☒
9	Graffiti Obscuring Signage	☐	☒		☐	☐	☐	☐
	Slope Stability (Berms, Slopes)							
10	Tension Cracking	☐	☒		☐	☐	☐	☐

Stantec

SITE COVER INSPECTION LOG

Item #	Inspection Items	Yes	No	or	Condition: Good	Fair	Poor	Follow Up Required
11	Slumping	☐	☒		☐	☐	☐	☐
12	Erosion of Toe or Slope Face	☐	☒		☐	☐	☐	☐
	Surface Erosion							
13	Evidence of Offsite Migration of Sediments	☐	☒		☐	☐	☐	☐
14	Berms Eroded, Breached, or Compromised	☐	☒		☐	☐	☐	☐
	Areas of Excessive Settlement or Subsidence							
15	Sink Holes	☐	☒		☐	☐	☐	☐
16	Ground Loss Near Below Grade Utilities	☐	☒		☐	☐	☐	☐
	Vegetation (Evidence of Distress, Weed Abatement)							
17	Distressed Vegetation (Discrete Areas of Dead or Dying Vegetation Compared to Nearby Areas)	☐	☒		☐	☐	☐	☐
18	Uncontrolled or Unsightly Weed Growth	☒	☐		☐	☐	☐	☒
	Storm Water Control (Containment, Structures, Berms, BMP Controls, Discharge Weirs, Piping, etc.)							
19	Storm Water Control Components in Proper Working Order	☐	☐		☒	☐	☐	☐
20	Evidence of Breaching or Weathering of Biodegradable Structures (i.e.; Straw Wattles, Mats, Straw Bales)	☐	☒		☐	☐	☐	☐
21	Condition of Sand Bag or Earthen Berms	☐	☐		☐	☒	☐	☒
	Evidence of Leachate or Leakage from the Sumps							
22	Tar Boils or other Seepage	☐	☒		☐	☐	☐	☐
23	Unnatural seeps or wet spots (odor, vegetation distress)	☐	☒		☐	☐	☐	☐
	Groundwater Monitoring Wells							
24	Condition of Well Covers (Broken Covers, Missing or Stripped Bolts)	☐	☐		☒	☐	☐	☐
25	Cracked or Broken Aprons	☐	☒		☐	☐	☐	☐
26	Surface Water Intrusion	☐	☒		☐	☐	☐	☐
27	Settled or Tilting Risers	☐	☒		☐	☐	☐	☐
28	Locks and Caps on all Casings	☒	☐		☐	☐	☐	☐

Stantec

SITE COVER INSPECTION LOG

Item #	Inspection Items	Yes	No	or	Condition: Good	Fair	Poor	Follow Up Required
	Interim rPP Cover							
29	Evidence of Leakage (i.e.; tar boils)	☐	☒		☐	☐	☐	☐
30	Evidence of Tears, Rips, Cracks, Punctures	☒	☐		☐	☐	☐	☒
31	Condition of Patches	☐	☐		☒	☐	☐	☐
32	Condition, Number and Spacing of Sand Bags or other Hold-Down on the Liner	☐	☐		☒	☐	☐	☐
33	Condition of Anchor Trench	☐	☐		☒	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐
	_____	☐	☐		☐	☐	☐	☐

IV.

As appropriate, describe required follow-up work based upon evaluation in Section III, above (Attach additional sheets as necessary):

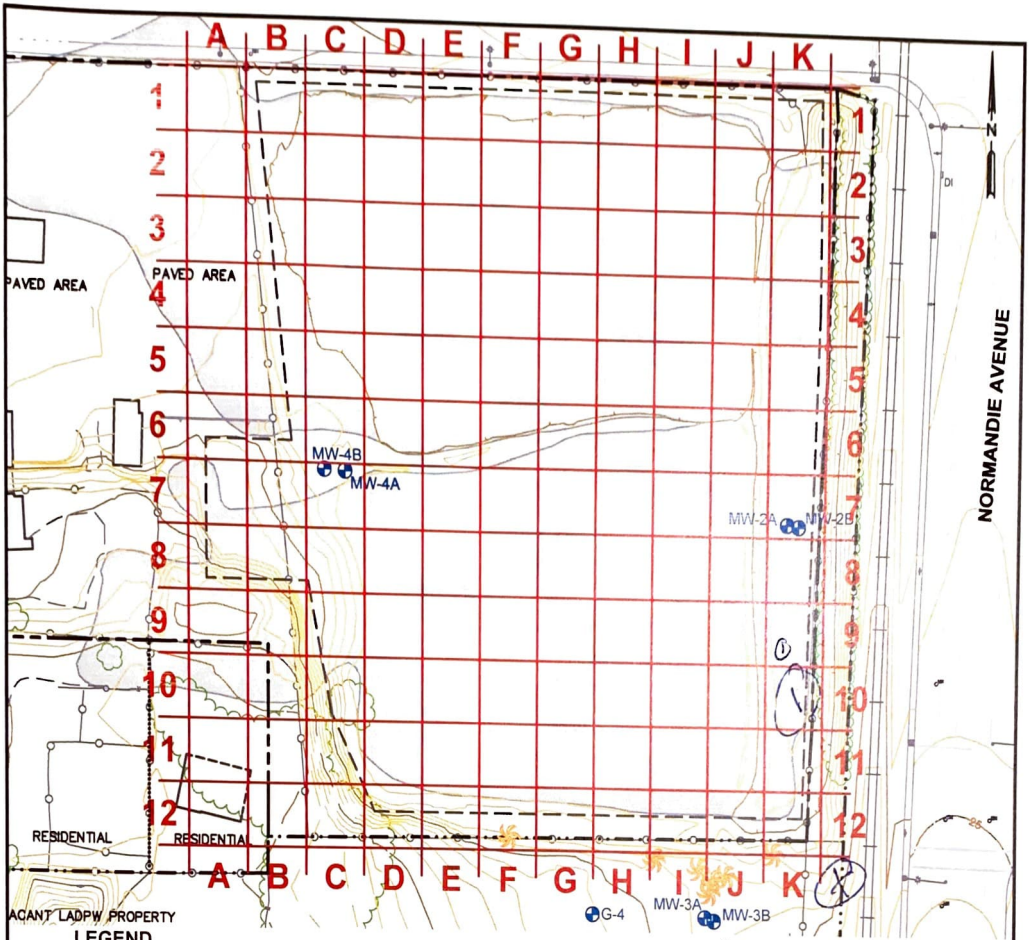
*For example, removal of accumulated materials, additional training, and replacement of damaged BMPs or geomembrane liner, etc.

Item #	Description of Condition	Proposed Mitigation Measure	Date Mitigative Measure Completed (Date and Signature)
4	EXTERIOR FENCE ON S.E. SIDE IS	REPAIRS	
	DAMAGED AGAIN.		
8	ONE OR MORE SIGNS ON SOUTH ENTRY		
	GATE ARE DOWN OR DAMAGED	REPAIR/RE-HANG	
18	WEED GROWTH IN INTERIOR PERIMETER &	WEED ABATEMENT	
	IN AREAS AROUND MW-3 & L-4 WELLS IS		
	EXCESSIVE.		
21	SAND BAGS IN AREAS 6, 7 & 8-B HAVE DETERIORATED.	REPLACE	

Inspection Performed By: MARK MASON Date 10-28-2020

Printed Name and Title: Mark Mason, ASSOCIATE GEOLOGIST Date 10-28-2020

30	APPROXIMATE 12" CUT IN MEMBRANE AREA K-10	PATCHING REQUIRED	



LEGEND

- SITE PROPERTY LINE
- G-4 — EPA GROUNDWATER MONITORING WELL
- MW-2A,B — CLUSTER WELLS (A&B)
- APPROXIMATE LOCATION OF SLUDGE DISTRIBUTION

NOTES:

- X — PUNCTURES
- RIP (LINEAR FEET)

PLEASE PAINT LOCATIONS OF COVER DAMAGES

FIELD INSPECTION
CONDITONS ON : 10-28-2020

INSPECTED BY : M. MASON

CONDITION OF EXISTING PATCHES : GOOD

CONDITION OF PERIMETER FENCE : FAIR, SOME DAMAGE OUTSIDE K-12

TOTAL AREA OF DAMAGES (Sq.Ft.) : 1-LINEAR FOOT CUT IN MEMBRANE IN AREA K-10

REMARKS ; (CONTINUED ON BACK OF SHEET)

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361
PHONE (805) 230-1266 FAX (805) 230-1277

FOR:
GARDENA SUMPS
Southwest Corner of Artesia Boulevard and Normandie Avenue
Gardena, CA

GEOTEXTILE MEMBRANE COVER FIELD CONDITION INSPECTION & DAMAGE LOCATION MAP

FIGURE: X

JOB NUMBER	DRAWN BY	CHECKED BY	APPROVED BY	DATE
211802613	R. Roman		K. Brown	01/22/14

FILEPATH:C:\CADD-37\Client\BP\Gardena_Sumps\Field-Inspection\2014-Jun\BP-GS_CoverGrid_Blank.dwg|troman|Jun 24, 2014 at 10:15|Layout: X

Stantec Consulting Services Inc.
3777 Worsham Avenue Suite 200, Long Beach CA 90808-1774

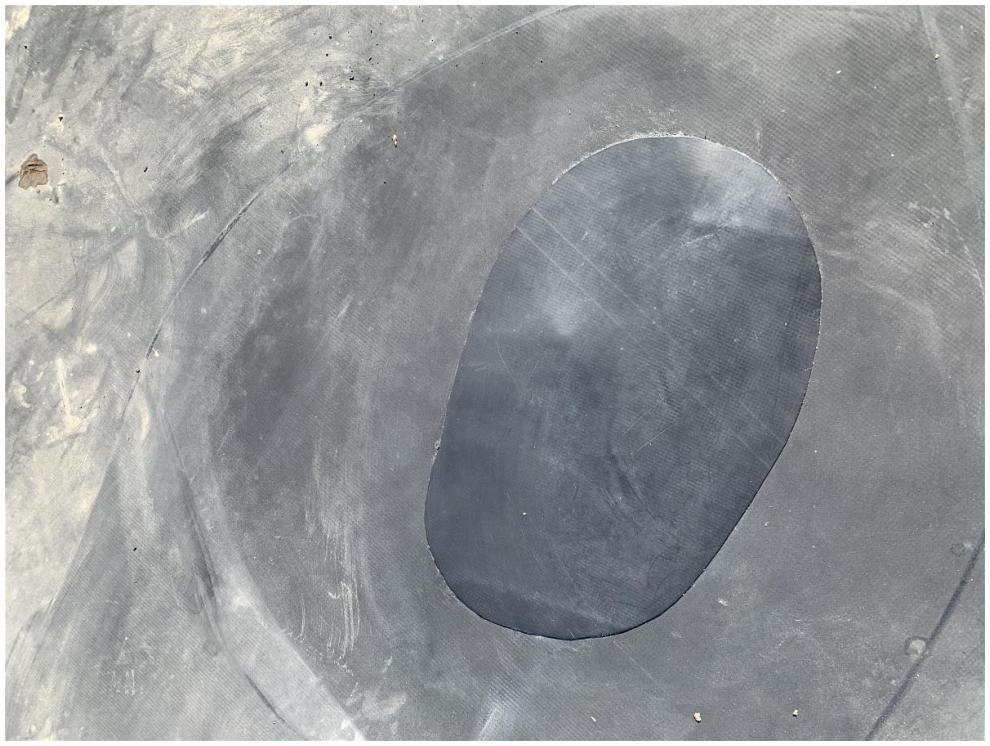
Attachment E

Before and After Repair Photo Log

Stantec

Photographic Log

Client:	**Atlantic Richfield Company**	**Project:**	**Annual Cover Inspection (November Cover Repair)**
Site Name:	**Gardena Sumps**	**Site Location:**	**1440 W. Artesia Blvd., Gardena, CA**

Photograph ID: 1 **Photo Location:** On-Site in the southeast portion of the cover. **Direction:** N/A **Survey Date:** 11/4/2020 **Comments:** Before Repair: ~12-inch cut identified.	
Photograph ID: 2 **Photo Location:** On-Site in the southeast portion of the cover. **Direction:** N/A **Survey Date:** 11/4/2020 **Comments:** After Repair: 1 patch (~1 square foot) used for repair.	

Stantec Consulting Services Inc.
3777 Worsham Avenue, Suite 200
Long Beach CA 90808-1774
Tel: (562) 354-2630
Fax: (562) 354-2669

June 30, 2021
File: 185850766.500

Attention: Mr. Nicholas Ta
Southern California Cleanup Operations Branch
Cypress Office
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630-4732

Dear Mr. Ta,

Reference: QUARTERLY PROGRESS REPORT – SECOND QUARTER 2021
GARDENA SUMPS SITE, DTSC Project No. 401218
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California 90247

On behalf of Atlantic Richfield Company (ARC), Stantec Consulting Services Inc. (Stantec) is submitting this Progress Report for the Second Quarter 2021 to the California Department of Toxic Substances Control (DTSC) per Section VI.D of the *Gardena Sumps/ARC Consent Decree*, CV04-7882-AHM(JTLx) (the Decree), effective November 4, 2004. The Gardena Sumps Site (the Site) is located at the southwest corner of West Artesia Boulevard and Normandie Avenue in the City of Gardena, California.

The progress updates included in this report describe: (1) specific actions taken by or on behalf of ARC during the previous reporting period; (2) actions expected to be undertaken during the current reporting period; (3) all planned activities for the next reporting period; (4) any requirements under the Decree that were not completed; (5) any problems or anticipated problems in complying with the Decree; and (6) results of sample analyses, tests, and other data generated under the Decree during the previous reporting period, and any significant findings from these data. Status of the primary action items are summarized here:

Primary Actions / Requirements	**Status**
• Notification of Project Coordinator and Project Team	(Completed – November 2004)
• Interim Cover Maintenance Plan	(Completed – December 2004)
• Communication and Coordination Plan (CCP)	(Completed – December 2004)
• Site and Adjacent Property Access	(Completed – December 2005)
• Site Maintenance & Removal Actions Workplan	(Completed – February 2005)
• Initial Site Maintenance, Fence, and Cover Repair	(Completed – September 2005)
• RI/FS Workplan, Final	(Completed – November 2005)
• Public Participation Plan (PPP), Final	(Completed – November 2005)
• RI/FS Field Investigation	(Completed – February 2007)
• Draft RI Report, submitted for DTSC review	(Completed – August 2007)
• Respond to DTSC comments on Draft RI Report	(Completed – August 20, 2008)
• Revised Draft RI Report, submitted to DTSC	(Completed – August 22, 2008)
• Quarterly Groundwater Monitoring & Sampling	(Ongoing from First Quarter 2006)

Reference: **QUARTERLY PROGRESS REPORT – SECOND QUARTER 2021**
GARDENA SUMPS SITE, DTSC Project No. 401218
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California 90247

- ARC, Stantec and Geosyntec prepared responses to DTSC comments within their November 21, 2008 letter. (Issued - February 12 and 26, 2009)
- RI Workplan Addendum submitted to DTSC (Completed - June 15, 2009)
- RI Field Investigation (Completed - October 2009)
- Draft Memorandum – Data Gap Analysis submitted to DTSC (Completed – February 2, 2010)
- Draft Human Health Risk Assessment, submitted to DTSC (Completed - May 25, 2010)
- Addendum to the August 22, 2008 Revised Draft 2006 Remedial Investigation Report, submitted to DTSC (Completed - December 14, 2010)
- Draft Feasibility Study Report submitted to DTSC (Issued - February 11, 2011)
- Revised Human Health Risk Assessment Report to DTSC (Issued - June 1, 2011)
- Addendum to Draft Feasibility Study Report to DTSC (Issued - September 30, 2011)
- Revised Draft Feasibility Study Report to DTSC (Issued April 4, 2012)
- Revised 2011 Annual Cover Repair and Maintenance Report and a Revised Interim Cover Maintenance Plan (ICMP) (Issued - June 27, 2012)
- Revised Final Draft Feasibility Study Report (includes responses to DTSC August 15, 2012 Remedy Review memorandum and September 5, 2012 Remedy Review letter) (Issued – November 5, 2012)
- Response to Comments on Revised Final Draft Feasibility Study Report (Issued – April 12, 2013)
- Placement of new liner material over existing liner on Cooper Property (Performed August / September 2013)
- Response to Comments on Revised Final Draft Feasibility Study Report (Issued – November 12, 2013)
- Final Feasibility Study Report to DTSC (Issued – May 21, 2014)
- Response to DTSC Comment Memorandums on Cover Inspection Report (Issued – June 23, 2014)
- Revised Final Feasibility Study Report to DTSC (Issued – July 1, 2014)
- Request to Remove Monitoring Wells MW-01A and MW01B from Groundwater Sampling Program
  - (Issued - October 16, 2014)
- Work Plan for Temporary Cover at the Haack Rework Area (Issued – October 21, 2014)
- Temporary Cover Installation at the Haack Rework Area Report (Issued – February 24, 2015)
- Request for Groundwater Monitoring and Sampling Reduction for the Gardena Sumps Site (Issued – March 9, 2017)
- Monitoring Well Sampling Reduction Request (Issued – September 8, 2017)
- Semi-Annual Groundwater Sampling Schedule (Issued – October 26, 2017)

Reference: **QUARTERLY PROGRESS REPORT – SECOND QUARTER 2021**
GARDENA SUMPS SITE, DTSC Project No. 401218
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California 90247

- Comments on Gardena's Sludge Excavation Pilot Test Work Plan submitted (Issued – August 13, 2018)
- Final Feasibility Study Certification Letter (Issued – August 3, 2020)
- Draft Remedial Action Plan (RAP) (Issued - January 18, 2021)

SUMMARY OF ACTIONS TAKEN DURING THE QUARTER (April - June, 2021)

Following is a summary of significant actions completed during the reporting period:

- Submitted the First Quarter 2021 Semi-Annual Groundwater Monitoring Report (April 7, 2021).
- Performed the Second Quarter 2021 site geomembrane cover inspection and maintenance activities.
- Conducted monthly inspection of site perimeter fence, gates, and locks, and signs for security breaches, maintenance, and/or graffiti removal.
- Draft RAP under review by DTSC.
- DTSC public participate and notification in progress.

SUMMARY OF ACTIONS TO BE TAKEN IN THE NEXT QUARTER (July - September, 2021)

The following actions are expected to be undertaken within the current quarter:

- Submit the Second Quarter 2021 Progress Report.
- Perform the Third Quarter 2021 Semi-Annual Groundwater Monitoring event.
- Perform the Third Quarter 2021 site geomembrane cover inspection and maintenance activities.
- Perform monthly perimeter fence, gate, and sign inspections for security breaches, maintenance, and/or graffiti removal.
- Perform weed abatement activities (as necessary).
- Prepare the Third Quarter 2021 Progress Report.
- Finalize RAP.

SECURITY MEASURES

The following actions were performed during the quarter to insure adequate security at the site:

- April 12, 2021: Stantec inspected the site perimeter fence and gates for integrity. No breaches were identified and the gate locks were present and locked. The hazardous waste signs were present. A portion of the wind screen along Artesia Boulevard was missing.

- May 14, 2021: Stantec inspected the site perimeter fence and gates for integrity. No breaches were identified, the gate locks were present and locked, and the hazardous waste signs were present. Minor

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Gardena, California 90247

repair to the wind screen along Artesia Boulevard was conducted as was weed abatement along outer perimeter fence.

- June 18, 2021: Stantec inspected the site perimeter fence and gates for integrity. No breaches were identified to the Gardena Sumps site, the gate locks were present and locked, and the hazardous waste signs were present. Stantec replaced 150 feet of windscreen along the Artesia Boulevard perimeter fence.

REQUIREMENTS NOT COMPLETED PER THE DECREE

To date all requirements have been initiated or completed per the Decree and DTSC-approved extensions. In letter dated October 30, 2014, the DTSC approved the removal of wells MW-01A and MW-01B from the sampling program. These wells will continue to be inspected for integrity annually during the First Quarter sampling events. On October 12, 2107, DTSC approved ARC's request dated September 8, 2017 to reduce quarterly groundwater sampling to semi-annual. Groundwater sampling is performed in the first and third quarters of each year.

POTENTIAL PROBLEMS IN COMPLYING WITH THE DECREE

DTSC has approved the Final Feasibility Study in letter dated July 14, 2020. On January 18, 2021, ARC submitted the draft RAP to DTSC for review.

RESULTS OF SAMPLE ANALYSES AND TESTS FROM FIRST QUARTER SEMI-ANNUAL 2021 FIELD ACTIVITIES

The results of groundwater monitoring from the First Quarter 2021 Semi-Annual event, including sample analysis, were submitted to the DTSC on April 7, 2021.

CLOSING

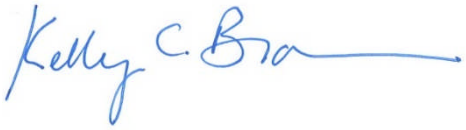
The next Progress Status Report will be submitted to the DTSC by October 6, 2021.

Should you have questions or need additional information regarding the current project status, please contact Mr. Wade Melton with the Atlantic Richfield Company at (360) 594-7978.

Reference: **QUARTERLY PROGRESS REPORT – SECOND QUARTER 2021**
GARDENA SUMPS SITE, DTSC Project No. 401218
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California 90247

Best Regards,

Stantec Consulting Services Inc.



Kelly C. Brown, P.G. #6714
Principal Geologist
Phone: 562-354-2638
Fax: 562-354-2669
kelly.brown@stantec.com

Reference: **QUARTERLY PROGRESS REPORT – SECOND QUARTER 2021**
GARDENA SUMPS SITE, DTSC Project No. 401218
Southwest Corner of West Artesia Boulevard and Normandie Avenue
Gardena, California 90247

Distribution:

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Southern California Cleanup Operations Branch
Cypress Office
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630-4732

Ms. Lynn Goldman, Esq. **(Transmittal Letter Only – paper format)**
Department of Toxic Substances Control
Office of Legal Counsel
1001 I Street
Mail Station 23A
Sacramento, CA 95814-2828

Mr. Wade Melton **(1 Copy – paper format)**
Atlantic Richfield Company
21040 Hermway Heights Drive
Mount Vernon, WA 98274