Appendix D
Noise Study

141st Street GPA and ZC Project

Noise Impact Study

City of Gardena, CA

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1.0 Introduction

1.1 Purpose of Analysis and Study Objectives

This noise assessment was prepared to evaluate the potential noise impacts for the project study area and to recommend noise mitigation measures, if necessary, to minimize the potential noise impacts. The assessment was conducted and compared to the noise standards set-forth by the Federal, State and Local agencies. Consistent with the City's Noise Guidelines, the project must demonstrate compliance to the applicable noise criterion as outlined within the City's Noise Element and Municipal Code.

The following is provided in this report:

- A description of the study area and the proposed project
- Information regarding the fundamentals of noise
- A description of the local noise guidelines and standards
- An analysis of traffic noise impacts to and from the project site
- An analysis of construction noise impacts

1.2 Site Location and Study Area

The 1108 W. 141st Street General Plan Amendment (GPA) and Zone Change (ZC) Project site is located in the eastern portion of the City of Gardena at the northeast corner of Rosecrans and Budlong Avenues. The Project site, approximately 4.59 acres in size, is shown on Exhibit A.

The site currently provides surface parking for the Lucky Lady Casino which is located directly east of the project site. Access to the site is available via a driveway on Rosecrans Avenue located between the parking area and the Lucky Lady Casino. A second gated driveway is located along Budlong Avenue at the northwest corner of the site. The perimeter of the site is surrounded on the south, west, and north by a mix of iron fence and block walls with landscape hedges. The eastern portion of the site is open to the driveway and surface parking north of the Lucky Lady Casino.

Uses surrounding the Project site include:

- North: Directly north of the Project site is the Church of the Holy Communion property, zoned Medium Density Multiple-Family Residential Zone (R-3). West 141st Street is a cul-de-sac that extends east from Budlong Avenue and terminates at the northeastern portion of the Project site.

- East: Directly east of the Project site is the Lucky Lady Casino and associated surface parking. To the east of the Lucky Lady Casino are commercial uses fronting Vermont Avenue. Uses to the east of the Project site are zoned General Commercial Zone (C-3).

- South: Rosecrans Avenue forms the southern boundary of the Project site. South of Rosecrans Avenue are an Airgas (gases, welding and safety products) store, Rosecrans Care Center, and a Popeyes Restaurant, zoned C-3. South of Rosecrans Avenue to the southeast of the Project site

is the Strawberry Square shopping center, also zoned C-3. South of Rosecrans Avenue to the southwest of the Project site, across Budlong Avenue are multiple-family residences zoned R-3.

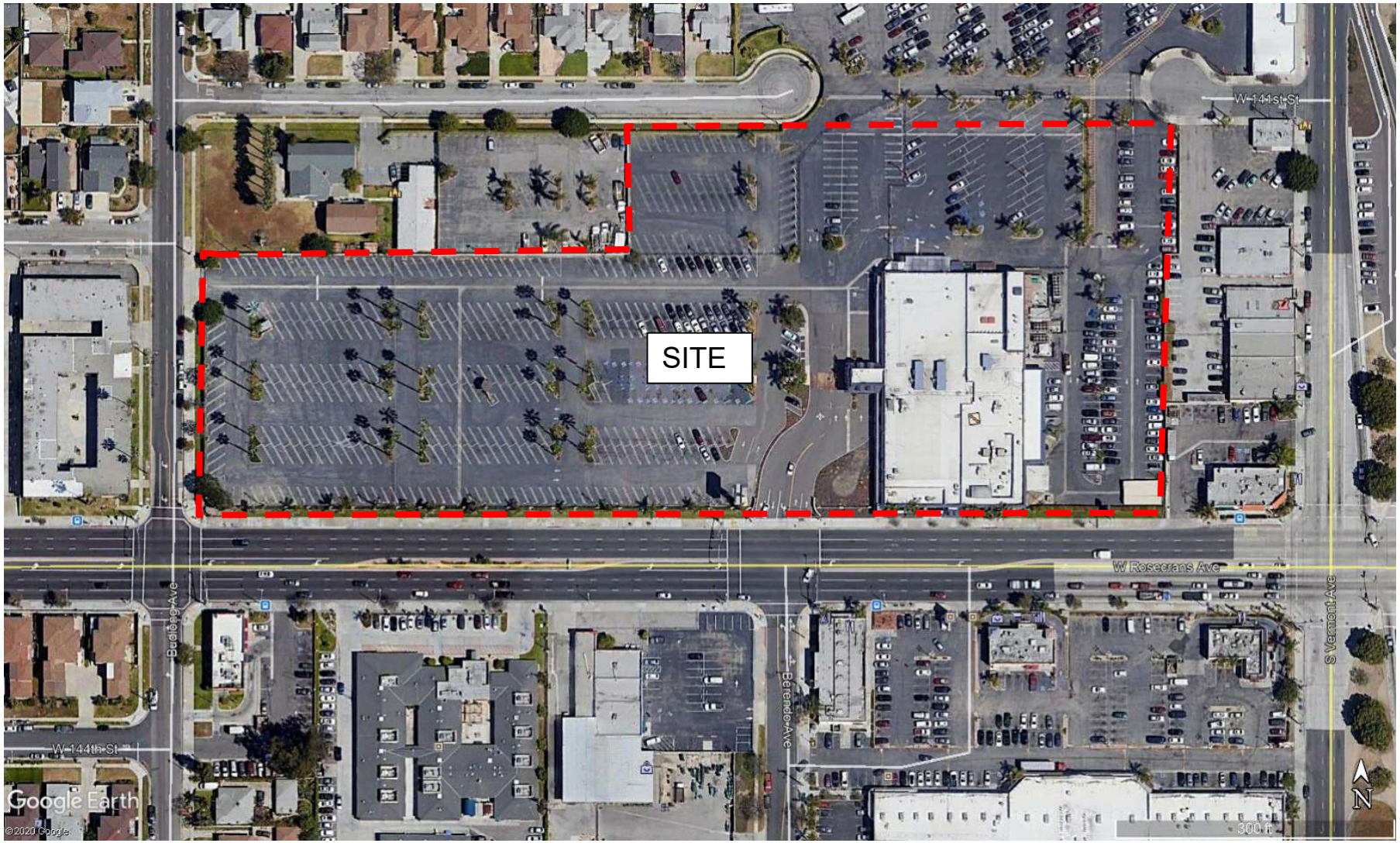
- West: Budlong Avenue forms the western boundary of the Project site. West of Budlong Avenue are multiple-family residences zoned R-4.

1.3 Project Characteristics

The proposed 141st Street GPA and ZC Project consists of a General Plan Amendment (GPA) #3-20 and Zone Change (ZC) #3-20 to re-designate the property as General Commercial with a Mixed-Use Overlay in the Land Use Plan and rezone the property as General Commercial (C-3) with a Mixed-Use (MU) Overlay designation.

Exhibit A

Location Map



2.0 Fundamentals of Noise

This section of the report provides basic information about noise and presents some of the terms used within the report.

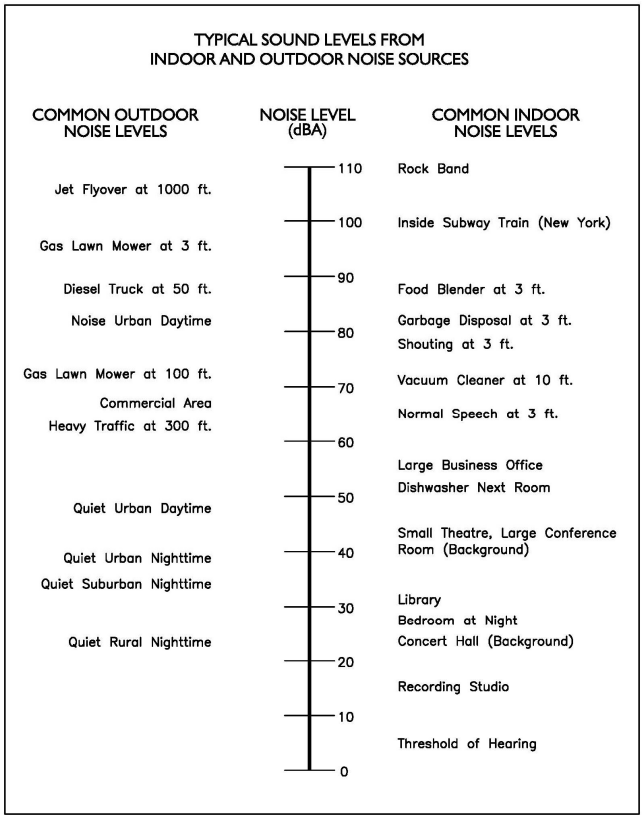
2.1 Sound, Noise and Acoustics

Sound is a disturbance created by a moving or vibrating source and is capable of being detected by the hearing organs. Sound may be thought of as mechanical energy of a moving object transmitted by pressure waves through a medium to a human ear. For traffic, or stationary noise, the medium of concern is air. *Noise* is defined as sound that is loud, unpleasant, unexpected, or unwanted.

2.2 Frequency and Hertz

A continuous sound is described by its *frequency* (pitch) and its *amplitude* (loudness). Frequency relates to the number of pressure oscillations per second. Low-frequency sounds are low in pitch (bass sounding) and high-frequency sounds are high in pitch (squeak). These oscillations per second (cycles) are commonly referred to as Hertz (Hz). The human ear can hear from the bass pitch starting out at 20 Hz all the way to the high pitch of 20,000 Hz.

Exhibit B: Typical A-Weighted Noise Levels



2.3 Sound Pressure Levels and Decibels

The *amplitude* of a sound determines it loudness. The loudness of sound increases or decreases as the amplitude increases or decreases. Sound pressure amplitude is measure in units of micro-Newton per square inch meter (N/m2), also called micro-Pascal (µPa). One µPa is approximately one hundred billionths (0.00000000001) of normal atmospheric pressure. Sound pressure level (SPL or L_p) is used to describe in logarithmic units the ratio of actual sound pressures to a reference pressure squared. These units are called decibels abbreviated dB. Exhibit B illustrates references sound levels for different noise sources.

2.4 Addition of Decibels

Because decibels are on a logarithmic scale, sound pressure levels cannot be added or subtracted by simple plus or minus addition. When two sounds or equal SPL are combined, they will produce an SPL 3 dB greater than the original single SPL. In other words, sound energy must be doubled to produce a 3 dB increase. If two sounds differ by approximately 10 dB, the higher sound level is the predominant sound.

2.5 Human Response to Changes in Noise Levels

In general, the healthy human ear is most sensitive to sounds between 1,000 Hz and 5,000 Hz, (A-weighted scale) and it perceives a sound within that range as being more intense than a sound with a higher or lower frequency with the same magnitude. For purposes of this report as well as with most environmental documents, the A-scale weighting is typically reported in terms of A-weighted decibel (dBA). Typically, the human ear can barely perceive the change in noise level of 3 dB. A change in 5 dB is readily perceptible, and a change in 10 dB is perceived as being twice or half as loud. As previously discussed, a doubling of sound energy results in a 3 dB increase in sound, which means that a doubling of sound energy (e.g. doubling the volume of traffic on a highway) would result in a barely perceptible change in sound level.

Changes in Intensity Level, dBA	Changes in Apparent Loudness
1	Not perceptible
3	Just perceptible
5	Clearly noticeable
10	Twice (or half) as loud

https://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/polguide/polguide02.cfm

2.6 Noise Descriptors

Noise in our daily environment fluctuates over time. Some noise levels occur in regular patterns, others are random. Some noise levels are constant while others are sporadic. Noise descriptors were created to describe the different time-varying noise levels.

A-Weighted Sound Level: The sound pressure level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear. A numerical method of rating human judgment of loudness.

Ambient Noise Level: The composite of noise from all sources, near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

Community Noise Equivalent Level (CNEL): The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of five (5) decibels to sound levels in the evening from 7:00 to 10:00 PM and after addition of ten (10) decibels to sound levels in the night before 7:00 AM and after 10:00 PM.

Decibel (dB): A unit for measuring the amplitude of a sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micro-pascals.

dB(A): A-weighted sound level (see definition above).

Equivalent Sound Level (LEQ): The sound level corresponding to a steady noise level over a given sample period with the same amount of acoustic energy as the actual time varying noise level. The energy average noise level during the sample period.

Habitable Room: Any room meeting the requirements of the Uniform Building Code or other applicable regulations which is intended to be used for sleeping, living, cooking or dining purposes, excluding such enclosed spaces as closets, pantries, bath or toilet rooms, service rooms, connecting corridors, laundries, unfinished attics, foyers, storage spaces, cellars, utility rooms and similar spaces.

L(n): The A-weighted sound level exceeded during a certain percentage of the sample time. For example, L10 in the sound level exceeded 10 percent of the sample time. Similarly, L50, L90 and L99, etc.

Noise: *A*ny unwanted sound or sound which is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying. The State Noise Control Act defines noise as "...excessive undesirable sound...".

Outdoor Living Area: Outdoor spaces that are associated with residential land uses typically used for passive recreational activities or other noise-sensitive uses. Such spaces include patio areas, barbecue areas, jacuzzi areas, etc. associated with residential uses; outdoor patient recovery or resting areas associated with hospitals, convalescent hospitals, or rest homes; outdoor areas associated with places of worship which have a significant role in services or other noise-sensitive activities; and outdoor school facilities routinely used for educational purposes which may be adversely impacted by noise. Outdoor areas usually not included in this definition are: front yard areas, driveways, greenbelts, maintenance areas and storage areas associated with residential land uses; exterior areas at hospitals that are not used for patient activities; outdoor areas associated with places of worship and principally used for short-term social gatherings; and, outdoor areas associated with school facilities that are not typically associated with educational uses prone to adverse noise impacts (for example, school play yard areas).

Percent Noise Levels: See L(n).

Sound Level (Noise Level): The weighted sound pressure level obtained by use of a sound level meter having a standard frequency-filter for attenuating part of the sound spectrum.

Sound Level Meter: An instrument, including a microphone, an amplifier, an output meter, and frequency weighting networks for the measurement and determination of noise and sound levels.

Single Event Noise Exposure Level (SENEL): The dB(A) level which, if it lasted for one second, would produce the same A-weighted sound energy as the actual event.

2.7 Traffic Noise Prediction

Noise levels associated with traffic depends on a variety of factors: (1) volume of traffic, (2) speed of traffic, (3) auto, medium truck (2–3 axle) and heavy truck percentage (4 axle and greater), and sound propagation. The greater the volume of traffic, higher speeds and truck percentages equate to a louder

volume in noise. A doubling of the Average Daily Traffic (ADT) along a roadway will increase noise levels by approximately 3 dB; reasons for this are discussed in the sections above.

2.8 Sound Propagation

As sound propagates from a source it spreads geometrically. Sound from a small, localized source (i.e., a point source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates at a rate of 6 dB per doubling of distance. The movement of vehicles down a roadway makes the source of the sound appear to propagate from a line (i.e., line source) rather than a point source. This line source results in the noise propagating from a roadway in a cylindrical spreading versus a spherical spreading that results from a point source. The sound level attenuates for a line source at a rate of 3 dB per doubling of distance.

As noise propagates from the source, it is affected by the ground and atmosphere. Noise models use hard site (reflective surfaces) and soft site (absorptive surfaces) to help calculate predicted noise levels. Hard site conditions assume no excessive ground absorption between the noise source and the receiver. Soft site conditions such as grass, soft dirt or landscaping attenuate noise at a rate of 1.5 dB per doubling of distance. When added to the geometric spreading, the excess ground attenuation results in an overall noise attenuation of 4.5 dB per doubling of distance for a line source and 7.5 dB per doubling of distance for a point source.

Research has demonstrated that atmospheric conditions can have a significant effect on noise levels when noise receivers are located 200 feet from a noise source. Wind, temperature, air humidity and turbulence can further impact have far sound can travel.

3.0 Ground-Bourne Vibration Fundamentals

3.1 Vibration Descriptors

Ground-borne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. The effects of ground-borne vibrations typically only cause a nuisance to people, but at extreme vibration levels, damage to buildings may occur. Although ground-borne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. Ground-borne noise is an effect of ground-borne vibration and only exists indoors, since it is produced from noise radiated from the motion of the walls and floors of a room and may also consist of the rattling of windows or dishes on shelves.

Several different methods are used to quantify vibration amplitude.

PPV – Known as the peak particle velocity (PPV) which is the maximum instantaneous peak in vibration velocity, typically given in inches per second.

RMS – Known as root mean squared (RMS) can be used to denote vibration amplitude

VdB – A commonly used abbreviation to describe the vibration level (VdB) for a vibration source.

3.2 Vibration Perception

Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. These continuous vibrations are not noticeable to humans whose threshold of perception is around 65 VdB. Outdoor sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible ground-borne noise or vibration. To counter the effects of ground-borne vibration, the Federal Transit Administration (FTA) has published guidance relative to vibration impacts. According to the FTA, fragile buildings can be exposed to ground-borne vibration levels of 0.3 inches per second without experiencing structural damage.

There are three main types of vibration propagation: surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wave front, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wave front. However, unlike P-waves, the particle motion is transverse, or side-to-side and perpendicular to the direction of propagation.

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil but has been shown to be

effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests.

4.0 Regulatory Setting

The proposed project is located in the City of Gardena and noise regulations are addressed through the efforts of various federal, state and local government agencies. The agencies responsible for regulating noise are discussed below.

4.1 Federal Regulations

The adverse impact of noise was officially recognized by the federal government in the Noise Control Act of 1972, which serves three purposes:

- Publicize noise emission standards for interstate commerce
- Assist state and local abatement efforts
- Promote noise education and research

The Federal Office of Noise Abatement and Control (ONAC) originally was tasked with implementing the Noise Control Act. However, it was eventually eliminated leaving other federal agencies and committees to develop noise policies and programs. Some examples of these agencies are as follows: The Department of Transportation (DOT) assumed a significant role in noise control through its various agencies. The Federal Aviation Agency (FAA) is responsible to regulate noise from aircraft and airports. The Federal Highway Administration (FHWA) is responsible to regulate noise from the interstate highway system. The Occupational Safety and Health Administration (OSHA) is responsible for the prohibition of excessive noise exposure to workers.

The federal government advocates that local jurisdiction use their land use regulatory authority to arrange new development in such a way that “noise sensitive” uses are either prohibited from being constructed adjacent to a highway or, or alternatively that the developments are planned and constructed in such a manner that potential noise impacts are minimized.

Since the federal government has preempted the setting of standards for noise levels that can be emitted by the transportation source, the City is restricted to regulating the noise generated by the transportation system through nuisance abatement ordinances and land use planning.

4.2 State Regulations

Established in 1973, the California Department of Health Services Office of Noise Control (ONC) was instrumental in developing regularity tools to control and abate noise for use by local agencies. One significant model is the “Land Use Compatibility for Community Noise Environments Matrix.” The matrix allows the local jurisdiction to clearly delineate compatibility of sensitive uses with various incremental levels of noise.

The State of California has established noise insulation standards as outlined in Title 24 and the Uniform Building Code (UBC) which in some cases requires acoustical analyses to outline exterior noise levels and to ensure interior noise levels do not exceed the interior threshold. The State mandates that the

legislative body of each county and city adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable. The City of Gardena has adopted their own version of the State's Land Use Compatibility Guidelines. These are presented on Exhibit C.

4.3 City of Gardena Regulations

The City of Gardena outlines their noise regulations and standards within the Noise Element of the City's General Plan and the Noise Ordinance located in the City's Municipal Code.

City of Gardena General Plan

Applicable policies and standards governing environmental noise in the City are set forth in the General Plan Noise Element. The City's noise and land use compatibility guidelines for land use planning are presented in Exhibit C. The guidelines rank noise land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable.

Exhibit C: Land Use Compatibility Guidelines

Land Use Category	CNEL, dB						
	55	60	65	70	75	80	
Residential - Single family, multifamily, duplex	A	A	B	C	C		
Residential - Mobile homes	A	A	B	C	C		
Transient Lodging - Motels, hotels	A	A	B	B	C	C	
Schools, Libraries, Churches, Hospitals, Nursing Homes	A	A	B	C	C		
Auditoriums, Concert Halls, Amphitheaters, Meeting Halls	B	B	C	C			
Sports Arenas, Outdoor Spectator Sports, Amusement Parks	A	A	A	B	B		
Playgrounds, Neighborhood Parks	A	A	A	B	C		
Golf Courses, Riding Stables, Cemeteries	A	A	A	A	B	C	C
Office and Professional Buildings	A	A	A	B	B	C	
Commercial Retail, Banks, Restaurants, Theaters	A	A	A	A	B	B	C
Industrial, Manufacturing, Utilities, Wholesale, Service Stations	A	A	A	A	B	B	B
Agriculture	A	A	A	A	A	A	A

Legend

A — NORMALLY ACCEPTABLE
Specified land use is satisfactory based on the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

B — CONDITIONALLY ACCEPTABLE
New construction or development should be undertaken only after a detailed analysis of the noise requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

C — NORMALLY UNACCEPTABLE
New construction or development should generally be discouraged. If it does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE
New construction or development should generally not be undertaken.

Source: Taken in part from "Aircraft Noise Impact Planning Guidelines for Local Agencies," U.S. Dept. of Housing and Urban Development, TE/NA-472, November 1972.

In addition to the noise standards, the City has outlined goals, policies and implementation measures to reduce potential noise impacts and are presented below:

Goals, Policies, and Implementation Measures

Policies, goals and implementation program measures from the Noise Element that are applicable to the proposed project are presented below.

Goal N 1.0: Use noise control measures to reduce the impact from transportation noise sources.

Policy N 1.1: Minimize noise conflicts between land uses and the circulation network, and mitigate sound levels where necessary or feasible to ensure the peace and quiet of the community.

Goal N 2.0: Incorporate noise considerations into land use planning decisions.

Policy N 2.2: Require noise/land use compatibility standards to guide future planning and development.

Policy N 2.4: Require mitigation of all significant noise impacts as a condition of project approval.

Policy N 2.5: Require proposed projects to be reviewed for compatibility with nearby noise sensitive land uses with the intent of reducing noise impacts.

Policy N 2:7 Require new commercial/industrial operations located in proximity to existing or proposed residential areas to incorporate noise mitigation into the project design.

Policy N 2.9: Encourage the creative use of site and building design techniques as a means to minimize noise impacts.

Goal 3.0: Develop measures to control non-transportation noise impacts.

Policy N 3.3: Require compliance with construction hours to minimize the impacts of construction noise on adjacent land.

City of Gardena Municipal Code

Sections 8.36.040 and 8.36.050 of the City's Noise Ordinance establish exterior and interior noise standards that limit how loud project operation noise can be. The allowable exterior noise levels presented in Table 1, limit project operational noise at nearby land uses; and the allowable interior noise levels presented in Table 2, limit how loud project operational noise can be inside nearby residential and mixed use structures. Subsection 8.36.040(C), states that in the event the ambient noise level exceeds the noise standard, the ambient noise level shall become the noise standard.

Table 1: Allowable Exterior Noise Level (dBA, Leq)

Type of Land Use	15-Minute Average Noise (dBA, Leq)		Maximum Noise Level (dBA, Lmax)	
	7 AM-10 PM	10 PM to 7 AM	7 AM-10 PM	10 PM to 7 AM
Residential	55	50	75	70
Residential portions of mixed use	60	50	80	70
Commercial	65	60	85	80
Industrial or manufacturing	70	70	90	90

Source: City of Gardena Municipal Code Section 8.36.040.
1) Measured noise levels are shown in Tables 3 and 4.
2) Lowest measured nighttime noise level (see Table 4).
A. The exterior noise standards, unless otherwise specifically indicated, shall apply to all property within the City. The Land Use category refers to the affected receiver property. In the event the alleged offensive noise contains a pure tone such as a whine, screech, or hum, or contains repetitive, impulsive or impact noise such as hammering or riveting, or contains music or speech conveying informational content, each of the above noise standards shall be reduced by 5 dB.
B. No person shall operate or cause to be operated, any source of sound at any location within the incorporated City or allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level when measured from any other property, either incorporated or unincorporated, to exceed the noise standards presented in the above table.
C. In the event the ambient noise level exceeds the noise standard, the ambient noise level shall become the noise standard.

Table 2: Allowable Interior Noise Level (dBA, Leq)

Type of Land Use	15-Minute Average Noise (dBA, Leq)		Maximum Noise Level (dBA, Lmax)	
	7 AM-10 PM	10 PM to 7 AM	7 AM-10 PM	10 PM to 7 AM
Residential	45	40	65	60
Residential portions of mixed use	45	40	70	60

Source: City of Gardena Municipal Code Section 8.36.050.
Notes:
A. The interior noise standards presented above, unless otherwise specifically indicated, shall apply to all residential dwellings with windows in their normal seasonal configuration, where such dwelling is the receiver of intrusive noise:
In the event the alleged offensive noise contains a pure tone such as a whine, screech, or hum, or contains repetitive, impulsive or impact noise such as hammering or riveting, or contains music or speech conveying informational content, each of the above noise standards shall be reduced by 5 dB.
B. No person shall operate or cause to be operated, any source of sound at any location within the incorporated City or allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level when measured within any residential dwelling, either incorporated or unincorporated, to exceed the noise standards of paragraph (A).
C. In the event the ambient noise level exceeds the noise standard, the ambient noise level shall become the noise standard.

Construction Noise Regulations

Per Section 8.36.080 of the City's Noise Ordinance, project construction activities are explicitly exempt from the exterior and interior noise standards presented in Sections 8.36.040 and 8.36.050. Specifically, the ordinance states that "noise associated with construction, repair, remodeling, grading or demolition of any real property are exempt from the provisions in Chapter 8.36 (City of Gardena Noise Ordinance), provided said activities do not take place between the hours of 6:00 PM and 7:00 AM on weekdays between the hours of 6:00 PM and 9:00 AM on Saturday or any time on Sunday or a Federal holiday".

5.0 Study Method and Procedure

The following section describes the noise modeling procedures and assumptions used for this assessment.

5.1 Noise Measurement Procedure and Criteria

Noise measurements are taken to determine the existing noise levels. A noise receiver or receptor is any location in the noise analysis in which noise might produce an impact. The following criteria are used to select measurement locations and receptors:

- Locations expected to receive the highest noise impacts, such as first row of houses
- Locations that are acoustically representative and equivalent of the area of concern
- Human land usage
- Sites clear of major obstruction and contamination

MD conducted the sound level measurements in accordance to the City of Gardena and Caltrans TeNS manual. All measurements equipment meets American National Standards Institute (ANSI) specifications for sound level meters (S1.4-1983 identified in Chapter 19.68.020.AA). MD noise measurement procedures are presented below:

- Microphones for sound level meters were placed 5-feet above the ground for all measurements
- Sound level meters were calibrated (Larson Davis CAL 200) before and after each measurement
- Following the calibration of equipment, a wind screen was placed over the microphone
- Frequency weighting was set on “A” and slow response
- Results of the noise measurements were recorded on field data sheets
- During any short-term noise measurements any noise contaminations such as barking dogs, local traffic, lawn mowers, or aircraft fly-overs were noted
- Temperature and sky conditions were observed and documented

5.2 Noise Measurement Locations

Noise monitoring locations were selected to obtain a baseline of the existing noise environment. One (1) 24-Hour long-term noise measurement was taken at the center of the project site and three (3) 10-min short-term noise measurements were conducted at nearby noise-sensitive land uses. Appendix A includes photos, field sheet, and measured noise data. Exhibit D illustrates the location of the measurements.

5.3 FHWA Traffic Noise Prediction Model

Existing, Existing Plus Project, and Future traffic noise from vehicular traffic was projected using a computer program that replicates the FHWA Traffic Noise Prediction Model (FHWA-RD-77-108). The FHWA model arrives at the predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level (REMEL). Data provided by the City of Gardena Department of Public Works (2015) and taken from the traffic study prepared for the project (Kittleson 2020) was utilized for modeling purposes. Data input is

provided in Appendix B. The following outlines the key adjustments made to the REMEL for the roadway inputs:

- Roadway classification – (e.g. freeway, major arterial, arterial, secondary, collector, etc.),
- Roadway Active Width – (distance between the center of the outer most travel lanes on each side of the roadway)
- Average Daily Traffic Volumes (ADT), Travel Speeds, Percentages of automobiles, medium trucks and heavy trucks
- Roadway grade and angle of view
- Site Conditions (e.g. soft vs. hard)
- Percentage of total ADT which flows each hour through-out a 24-hour period

5.4 Interior Noise Calculations

The interior noise level is the difference between the projected exterior noise level at the structure's facade and the noise reduction provided by the structure itself. Typical building construction will provide a conservative 12 dBA noise level reduction with a "windows open" condition and a very conservative 20 dBA noise level reduction with "windows closed". MD estimated the interior noise level by subtracting the building shell design from the predicted exterior noise level. A "windows closed" condition requires mechanical fresh air ventilation (e.g. air conditioning) be provided in habitable dwelling units.

5.5 Operational Noise Modeling

The stationary noise was projected using inverse square law calculations. The model arrives at the predicted noise level through a series of adjustments to the reference energy noise level. For each stationary source, the referenced noise level was applied to the model. The model outputs the projected noise level based on the following key parameters:

- Measured referenced noise level – (e.g. how loud a source is at a specific distance)
- Vertical and horizontal distances (sensitive receptor distance from noise source)
- Noise barrier vertical and horizontal distances (noise barrier distance from sound source and receptor). Typical noise source spectra
- Topography

To estimate the future noise levels during typical conditions, MD adjusted the reference noise levels. Reference noise levels were projected to the nearest property lines where sensitive receptors exist.

The noise levels assume that the stationary sources are operating continuously when in reality all noise sources will operate intermittently throughout the daily operation. Operational noise spreadsheets are provided in Appendix C.

5.6 Construction Noise Modeling

Construction noise associated with the proposed project was calculated utilizing methodology presented in the Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual (2018) together with several key construction parameters including: distance to each sensitive receiver, equipment usage, percent usage factor, and baseline parameters for the project site. Construction activities are anticipated to include four phases site preparation, grading, building construction, and architectural coating.

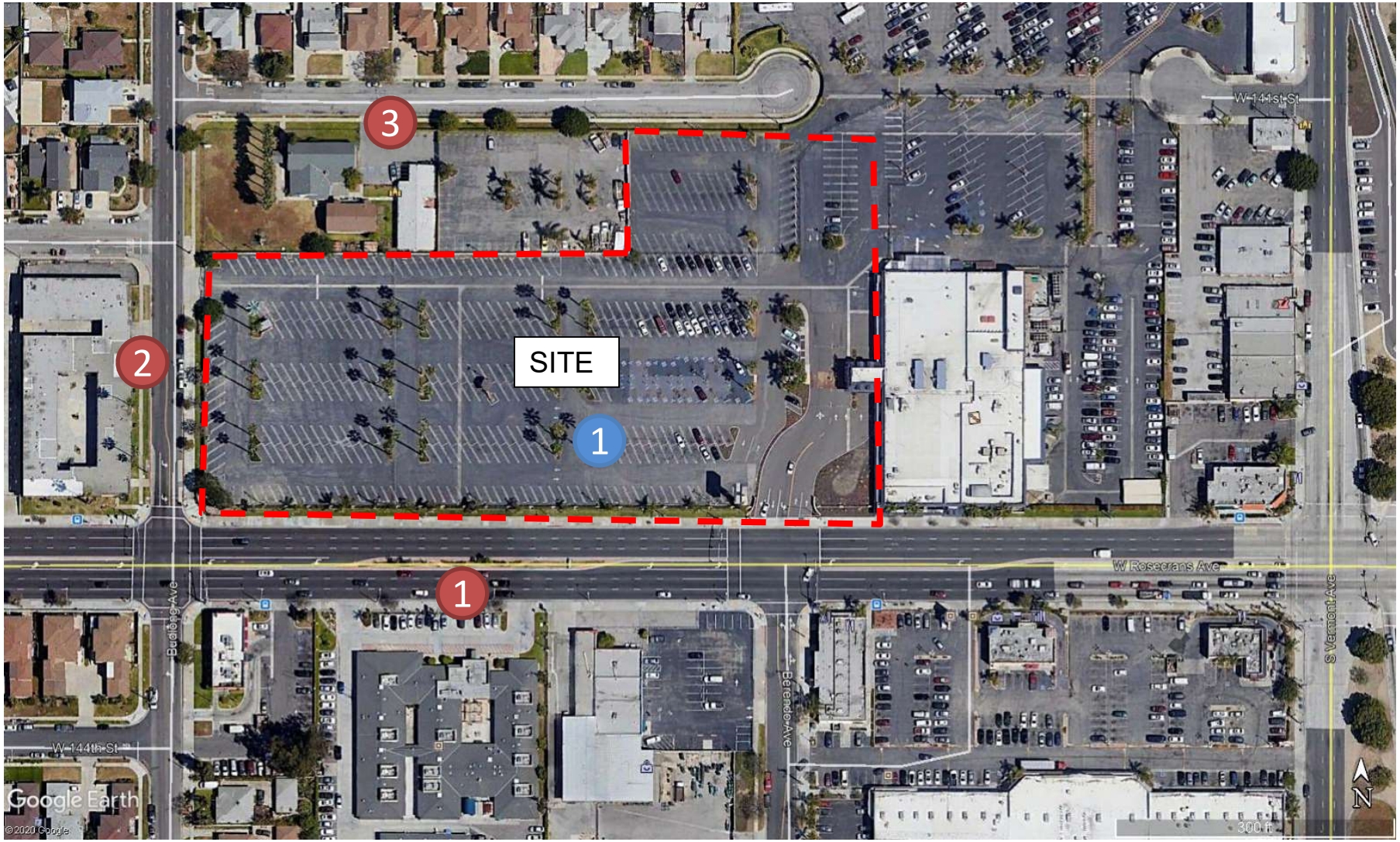
Construction noise levels were calculated for each phase based on CalEEMod Air Quality Model assumptions provided by the project proponent. All equipment was assumed to be situated at the center of the project site. Construction equipment typically moves back and forth across the site; and it is an industry standard to use the acoustical center of the site to model average construction noise levels. Construction noise spreadsheets are provided in Appendix D.

Exhibit D

Measurement Locations

1 = short term measurement

1 = long- and short-term measurements



6.0 Existing Noise Environment

Three (3) short-term and one (1) long-term 24-hour ambient noise measurements were conducted at the project site. The measurements measured the 1-hour Leq, Lmin, Lmax and other statistical data (e.g. L2, L8). The noise measurements were taken to determine the existing baseline noise conditions.

6.1 Short-Term Noise Measurement Results

The results of the short-term noise data are presented in Table 3.

Table 3: Short-Term Noise Measurement Data (dBA)[1]

Location	Date	Start Time	Leq	Lmax	Lmin	L(2)	L(8)	L(25)	L(50)
Site 1	06/18/20	7:23 AM	74.7	103.6	51.5	82.4	77.8	73.6	67.5
Site 2	06/18/20	7:39 AM	62.8	77.5	53.0	70.1	67.1	63.4	60.0
Site 3	06/18/20	7:53 AM	51.5	62.0	44.4	57.5	55.2	52.0	49.6

Notes:
1. Measurements were taken over a ten-minute interval. Measurement locations are indicated in Exhibit D.

Short-term noise data indicates the ambient noise levels at nearby land uses range between 51.5 to 74.7 dBA Leq. The measured noise levels and field notes indicate that traffic noise is the main source of noise impacting the project site.

6.2 Long-Term Noise Measurement Results

The results of the long-term noise data are presented in Table 4. Long-term noise data indicates the ambient noise levels range between 53.4 to 66.9 dBA Leq. The measured noise levels and field notes indicate that traffic noise is the main source of noise impacting the project site.

<Table 4, next page>

Table 4: Long-Term Noise Measurement Data (dBA)[1]

Time	LAeq	Lmax	L(2)	L(8)	L(25)	L(50)	L(90)
7:00 AM	62.8	84.5	69.1	66.1	64.4	61.5	58.4
8:00AM	62.1	81.8	67.1	65.1	64.4	61.3	58.4
9:00 AM	66.4	95.0	66.9	65.1	64.0	61.1	57.5
10:00 AM	62.0	66.2	65.7	65.4	64.1	61.4	58.6
11:00 AM	61.9	75.4	66.0	65.0	64.4	61.2	58.6
12:00 PM	62.6	79.1	67.1	66.5	65.0	61.8	59.0
1:00 PM	61.5	78.1	64.4	64.2	63.6	61.5	58.5
2:00 PM	61.5	83.2	66.3	65.2	63.5	60.5	57.6
3:00 PM	64.1	91.5	69.0	68.3	66.5	61.2	57.3
4:00 PM	60.6	74.4	64.1	63.7	62.8	59.9	57.3
5:00 PM	60.8	78.5	65.5	64.9	64.2	59.5	56.7
6:00 PM	65.4	87.4	73.0	65.8	63.4	59.9	57.2
7:00 PM	60.2	81.7	66.6	63.5	61.7	59.1	56.9
8:00 PM	66.9	89.7	75.9	73.5	69.9	59.2	55.8
9:00 PM	64.7	88.2	73.7	71.9	67.3	59.2	54.8
10:00 PM	62.2	87.7	67.6	64.2	63.0	58.3	53.8
11:00 PM	57.6	81.8	65.0	62.5	60.4	56.2	52.3
12:00 AM	55.8	75.5	62.2	60.1	58.5	53.9	50.1
1:00 AM	57.8	86.6	60.9	58.4	56.4	52.3	47.8
2:00 AM	53.4	71.9	58.9	57.2	55.9	52.6	49.2
3:00 AM	54.5	70.4	60.0	58.6	57.4	53.0	49.4
4:00 AM	59.2	83.2	63.9	62.3	61.5	56.4	52.7
5:00 AM	61.0	77.1	66.1	64.6	63.9	60.2	55.0
6:00 AM	63.3	83.0	68.8	66.5	65.5	61.9	58.4

Notes:
[1.] Measurements were taken over one 24-hour interval. Noise measurement field sheets are provided in Appendix A. Measurement location is indicated in Exhibit D.

7.0 Future Noise Environment Impacts and Mitigation

This assessment analyzes future noise impacts to the project and compares the results to the City's Noise Standards. The analysis details the estimated exterior noise levels associated with traffic from adjacent roadway sources.

7.1 Off-Site Traffic Noise Impacts

The potential off-site noise impacts caused by the increase in vehicular traffic as a result of the project were calculated at a distance of 50 feet. The distance to the 55, 60, 65, and 70 dBA CNEL noise contours are also provided for reference. The noise level at 50 feet is representative of approximate distances to existing land uses along the subject roadway. The noise contours were calculated for the following scenarios and conditions:

- Existing Condition: This scenario refers to the existing year traffic noise condition and is demonstrated in Table 5.

- Existing + Project Condition: This scenario refers to the existing year plus project traffic noise condition and is demonstrated in Table 5.

Existing/Existing + Project Scenario Comparison

Existing and Existing + Project noise levels, and the resulting increase due to implementation of the project are shown in Table 5. This analysis assumed a worst-case scenario by placing 100% of the project trips on each road segment (Rosecrans Avenue east and west of the project site). Table 6 shows that project implementation would not result in noticeable increase in ambient noise levels at 50 feet from the centerline of the Rosecrans Avenue.

Table 5: Exterior Noise Levels Along Roadways (dBA CNEL)

Existing Without Project

Roadway	Segment	CNEL at 50 Ft (dBA)	Distance to Contour (Ft)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
Rosecrans Avenue	East and West of Project Site	71.1	64	201	637	2015

Existing + Project

Roadway	Segment	CNEL at 50 Ft (dBA)	Distance to Contour (Ft)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
Rosecrans Avenue	East and West of Project Site	71.1	64	202	640	2024

Increase in Noise Levels as a Result of Project Generated Vehicle Traffic

Roadway[1]	Segment	CNEL at 50 Feet dBA[2]			
		Existing Without Project	Existing With Project	Change in Noise Level	Potential Significant Impact
Rosecrans Avenue	East and West of Project Site	71.1	71.1	0.0	No

Notes:
[1] Exterior noise levels calculated at 5 feet above ground level.
[2] Noise levels calculated from centerline of subject roadway.

7.2 On-Site Traffic Noise Impacts

The proposed project consists of a General Plan Amendment (GPA) #3-20 and Zone Change (ZC) #3-20 to re-designate the property as General Commercial with a Mixed-Use Overlay in the Land Use Plan and rezone the property as General Commercial (C-3) with a Mixed-Use (MU) Overlay designation.

In order to assess the noise/land use compatibility of future land uses that may be developed on the project site future traffic noise contours were calculated on the project site. Buildout capacity LOS C noise contours are presented in Table 6. These contours can be utilized to evaluate the project's compatibility with the future noise environment and to recommend measures to minimize potential noise impacts.

Table 6: Future Traffic Noise Levels on the Project Site (dBA, CNEL)

	Noise Contours		
	70 dBA	65 dBA	60 dBA
Noise Levels (CNEL)	75	238	753

Condition of Approval – On-Site Traffic Noise Impacts

The following Condition of Approval has been provided to assure that the project will meet state and local standards.

1. At which time a detailed site plan becomes available, a final noise study shall be prepared in order to ensure that the proposed project will be consistent with City of Gardena exterior and interior noise standards. Measures that may be used to achieve City of Gardena noise standards may include sound barriers and/or upgraded window and sliding glass doors.

For future reference, a 12 dBA exterior to interior reduction can be assumed for a "windows open" condition; and a 20 dBA exterior to interior reduction can be assumed for a "windows closed" condition.

7.3 Off-Site Stationary Noise Impacts

The proposed project consists of a General Plan Amendment (GPA) #3-20 and Zone Change (ZC) #3-20 to re-designate the property as General Commercial with a Mixed-Use Overlay in the Land Use Plan and rezone the property as General Commercial (C-3) with a Mixed-Use (MU) Overlay designation.

Noise associated with a reasonable development scenario on the project site, including a hotel, commercial uses, and a drive-thru speaker, were calculated at the project boundaries. The analysis and findings are intended to be applicable to general mixed-use development but additional analysis may be required if an especially noisy land use (i.e. car wash) is proposed to be developed on the project site.

Project generated operational noise sources will include parking lot noise, i.e. vehicle start up, slamming car doors, occasional alarms, etc., heating and ventilation, conversation, and a drive-thru speaker. The noise level associated with the combined operational noise was calculated at the nearest sensitive receptors to the north (Holy Communion Church property), to the south (Rosecrans Care Center), and to the west (multiple family residential land uses) are presented in Table 7. Noise levels are expected to range between 38.1 and 50.0 dBA Leq at nearby receptors and are not expected to exceed the City's 55 dBA residential limit, or the 65 commercial limit as outlined within the City's noise ordinance (see Table 1).

Project Plus Ambient Operational Noise Levels

As shown in Table 7, project plus ambient noise level projections are anticipated to range between 53.9 to 74.7 dBA Leq at receptors (R1 – R3). The project will increase the worst-case noise level by 0.0 to 2.4 dBA Leq at receptors. As discussed in Section 2.5 of this report, an increase in 1 dB is not perceptible; an increase of 3 dB is just perceptible, and an increase of 5 dB is clearly perceptible to the human ear. The project's contribution to existing noise levels would fall into the "not perceptible" acoustic characteristic.

Table 7: Predicted Operational Noise Levels

Receptor	Land Use	Floor	Existing Ambient Noise Level (dBA, Leq)[1]	Project Noise Level (dBA, Leq)[2]	Total Combined Noise Level (dBA, Leq)	Daytime (7AM - 10PM) Stationary Noise Limit (dBA, Leq)	Change in Noise Level as Result of Project
1	Church	1	51.5	50.1	53.9	**65.0**	2.4
2	Care Home	1	74.7	38.2	74.7	**65.0**	0.0
3	Multi-Family	1	62.8	42.1	62.8	**65.0**	0.0

Notes:
[1] Noise Measurement locations are shown in Exhibit D and results are shown in Table 3.
[2] Project generated noise calculation sheets are provided in Appendix C.

8.0 Construction Noise and Vibration Impacts

The degree of construction noise may vary for different areas of the project site and also vary depending on the construction activities. Project construction will occur in four phases, site preparation, grading, building construction and architectural coating. This section summarizes discusses noise and ground-borne vibration modeling efforts, impact analysis, and mitigation, if necessary.

8.1 Construction Noise

Typical construction equipment noise levels are presented in Table 8.

Table 8: Typical Construction Equipment Noise Levels

Type of Equipment	Range of Maximum Sound Levels Measured (dBA at 50 feet)	Suggested Maximum Sound Levels for Analysis (dBA at 50 feet)
Rock Drills	83-99	96
Jack Hammers	75-85	82
Pneumatic Tools	78-88	85
Pumps	74-84	80
Dozers	77-90	85
Scrappers	83-91	87
Haul Trucks	83-94	88
Cranes	79-86	82
Portable Generators	71-87	80
Rollers	75-82	80
Tractors	77-82	80
Front-End Loaders	77-90	86
Hydraulic Excavators	81-90	86
Graders	79-89	86
Air Compressors	76-89	86
Trucks	81-87	86

[1] Source: Bolt, Beranek & Newman; Noise Control for Buildings and Manufacturing Plants, 1987.

Construction noise associated with each phase of the project was calculated at nearby sensitive receptors utilizing methodology presented in the Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual (2018) together with several key construction parameters including: distance to each sensitive receiver, equipment usage, percent usage factor, and baseline parameters for the project site. Construction activities are anticipated to include four phases site preparation, grading, building construction, and architectural coating. Worst-case noise levels at each receptor are shown in Table 9. The construction noise calculation output worksheet is located in Appendix D.

Table 9: Construction Noise Level by Phase

Activity	Receptor to the North		Receptor to the South		Receptor to the West	
	Leq at 110 FT	Lmax at 110 FT	Leq at 290 FT	Lmax at 290 FT	Leq at 495 FT	Lmax at 495 FT
Site Preparation	79	83	68	72	62	66
Grading	79	80	68	69	63	64
Building Construction	77	78	66	68	60	62
Architectural Coating	73	77	63	67	57	61

Note:
Construction Modeling Data is provided in Appendix D.

As shown in Table 9, project construction noise will range between 57 and 79 dBA Leq and 61 and 77 dBA Lmax at nearby sensitive receptors. Existing ambient noise levels at nearby land uses range between 51.5 to 74.7 dBA Leq and 44.4 to 103.6 Lmax. Although project construction may result in short-term increases in ambient noise levels, Section 8.36.080 of the City's Noise Ordinance, exempts project construction activities from Sections 8.36.040 and 8.36.050 of the City's Noise Ordinance provided that they do not take place between the hours of 6:00 PM and 7:00 AM on weekdays between the hours of 6:00 PM and 9:00 AM on Saturday or any time on Sunday or a Federal holiday. Construction is anticipated to occur during the permissible hours. Noise reduction measures are provided below to further reduce construction noise.

Condition of Approval -Construction Noise

To minimize construction noise at adjacent land uses, the following noise reduction measures should be taken:

1. Construction shall occur during the hours of 7:00 AM to 6:00 PM on weekdays and 9:00 AM to 6:00 PM on Saturday and Sunday, and do not take place on Federal holidays.

2. Stationary construction noise sources such as generators or pumps should be located as far as feasibly possible from any existing adjacent residential units, as feasible.

3. Construction staging areas should be located as far as feasibly possible from any adjacent sensitive land uses, as feasible.

4. During construction, the contactor shall ensure all construction equipment is equipped with appropriate noise attenuating devices.

5. Equipment shall be maintained so that vehicles and their loads are secured from rattling and banging.

8.2 Construction Vibration

Construction activities can produce vibration that may be felt by adjacent land uses. The construction of the proposed project would not require the use of equipment such as pile drivers, which are known to generate substantial construction vibration levels. The primary vibration source during construction may be from a bull dozer. A large bull dozer has a vibration impact of 0.089 inches per second peak particle velocity (PPV) at 25 feet which is perceptible but below any risk to architectural damage.

The fundamental equation used to calculate vibration propagation through average soil conditions and distance is as follows:

$$PPV_{equipment} = PPV_{ref} (100/D_{rec})^{n}$$

Where: PPV_{ref} = reference PPV at 100ft.
D_{rec} = distance from equipment to receiver in ft.
n = 1.1 (the value related to the attenuation rate through ground)

The thresholds from the Caltrans Transportation and Construction Induced Vibration Guidance Manual in Table 10 (below) provides general thresholds and guidelines as to the vibration damage potential from vibratory impacts.

Table 10: Guideline Vibration Damage Potential Threshold Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Table 19, Transportation and Construction Vibration Guidance Manual, Caltrans, Sept. 2013.
Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Table 11 gives approximate vibration levels for particular construction activities. This data provides a reasonable estimate for a wide range of soil conditions.

Table 11: Vibration Source Levels for Construction Equipment

Equipment	Peak Particle Velocity (inches/second) at 25 feet	Approximate Vibration Level LV (dVB) at 25 feet
Pile driver (impact)	1.518 (upper range)	112
	0.644 (typical)	104
Pile driver (sonic)	0.734 upper range	105
	0.170 typical	93
Clam shovel drop (slurry wall)	0.202	94
Hydromill	0.008 in soil	66
(slurry wall)	0.017 in rock	75
Vibratory Roller	0.21	94
Hoe Ram	0.089	87
Large bulldozer	0.089	87
Caisson drill	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006.

The closest existing off-site structure is approximately 5 feet north of the project site. A large bulldozer would yield a worst-case 0.5 PPV (in/sec) which is perceptible but sustainably below any risk of damage (0.5 in/sec PPV is the threshold of residential structures). The impact is less than significant, and no mitigation is required.

9.0 References

City of Gardena
2006a General Plan
2006b Municipal Code

California Department of Transportation (Caltrans)
2013 Transportation and Construction Induced Vibration Guidance Manual.

Federal Transit Administration (FTA)
2018 Transit Noise and Vibration Impact Assessment Manual

Governor's Office of Planning and Research
State of California General Plan Guidelines, 1998

Kittleson & Associates
Trip Generation for the Gardena 141st St GPA/ZC Project. August, 2020.

Appendix A:

Field Measurement Data

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4960 S. Gilbert Rd, Ste 1-461
Chandler, AZ 85249

CA Office
1197 E Los Angeles Ave, C-256
Simi Valley, CA 93065

10-Minute Continuous Noise Measurement Datasheet

Project:	Lucky Lady Gardena
Site Address/Location:	1108 W 141ST ST Gardena Ca
Date:	6/18/2020
Field Tech/Engineer:	Jason Schuyler

Site Observations: Overcast temps in the 70's. No wind traffic patterns seem to be normalized, a large number of trucks are moving up and down the rd.

General Location:

Sound Meter:	NTi Audio **SN:** A2A-05967-E0
Settings:	A-weighted, slow, 1-sec, 10-minute interval
Meteorological Con.:	72 degrees F Cloudy some rain
Site ID:	ST-1 thru ST-3

Site Topo: Flat
Ground Type: Hard site conditions, reflective

Noise Source(s) w/ Distance:

1 - is 5' from P/L of Care Cntr. 44'from C/L of Rosecrans Ave.

2 - 5' from curb 17' from C/L of rd.

3 - 5' from fence of Church property 22' from C/L of 141st ST.

Figure 1: Monitoring Locations

Figure 2: ST-1 Photo

Figure 3: ST-2 Photo

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10-Minute Noise Measurement Datasheet - Cont.

Project: Lucky Lady Gardena
Site Address/Location: 1108 W 141ST ST Gardena Ca
Site ID: ST-1 thru ST-3

Figure 4: ST-3 Photo

Figure 5: ST-3 Photo

Table 1: Morning - Baseline Noise Measurement Summary

Location	Start	Stop	Leq	Lmax	Lmin	L2	L8	L25	L50	L90
1	7:23 AM	7:33 AM	74.7	103.6	51.5	82.4	77.8	73.6	67.5	52.7
2	7:39 AM	7:49 AM	62.8	77.5	53.0	70.1	67.1	63.4	60.0	53.6
3	7:53 AM	8:03 AM	51.5	62.0	44.4	57.5	55.2	52.0	49.6	46.0

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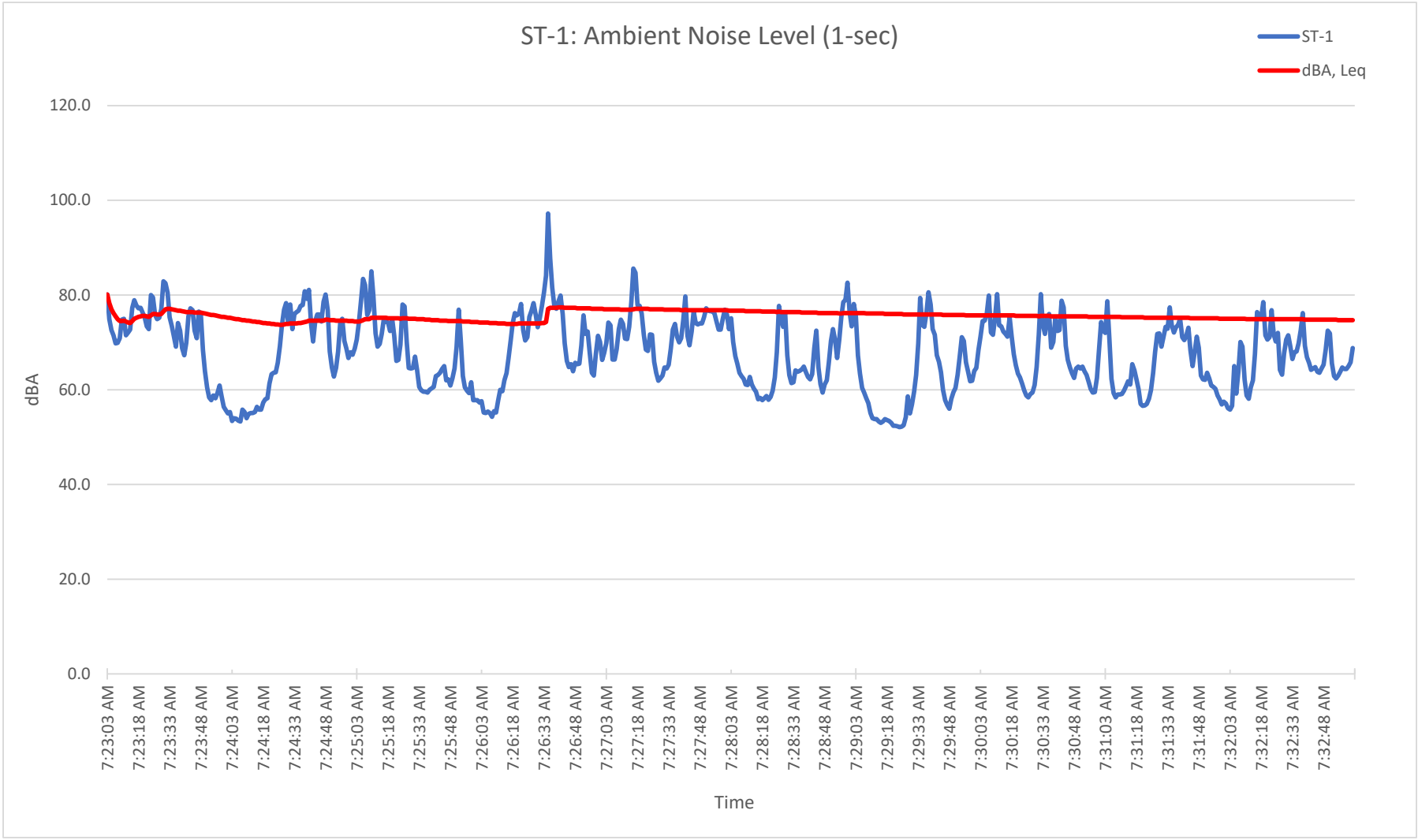
10-Minute Noise Measurement Datasheet - Cont.

Project: Lucky Lady Gardena
Site Address/Location: 1108 W 141ST ST Gardena Ca
Site ID: ST-1



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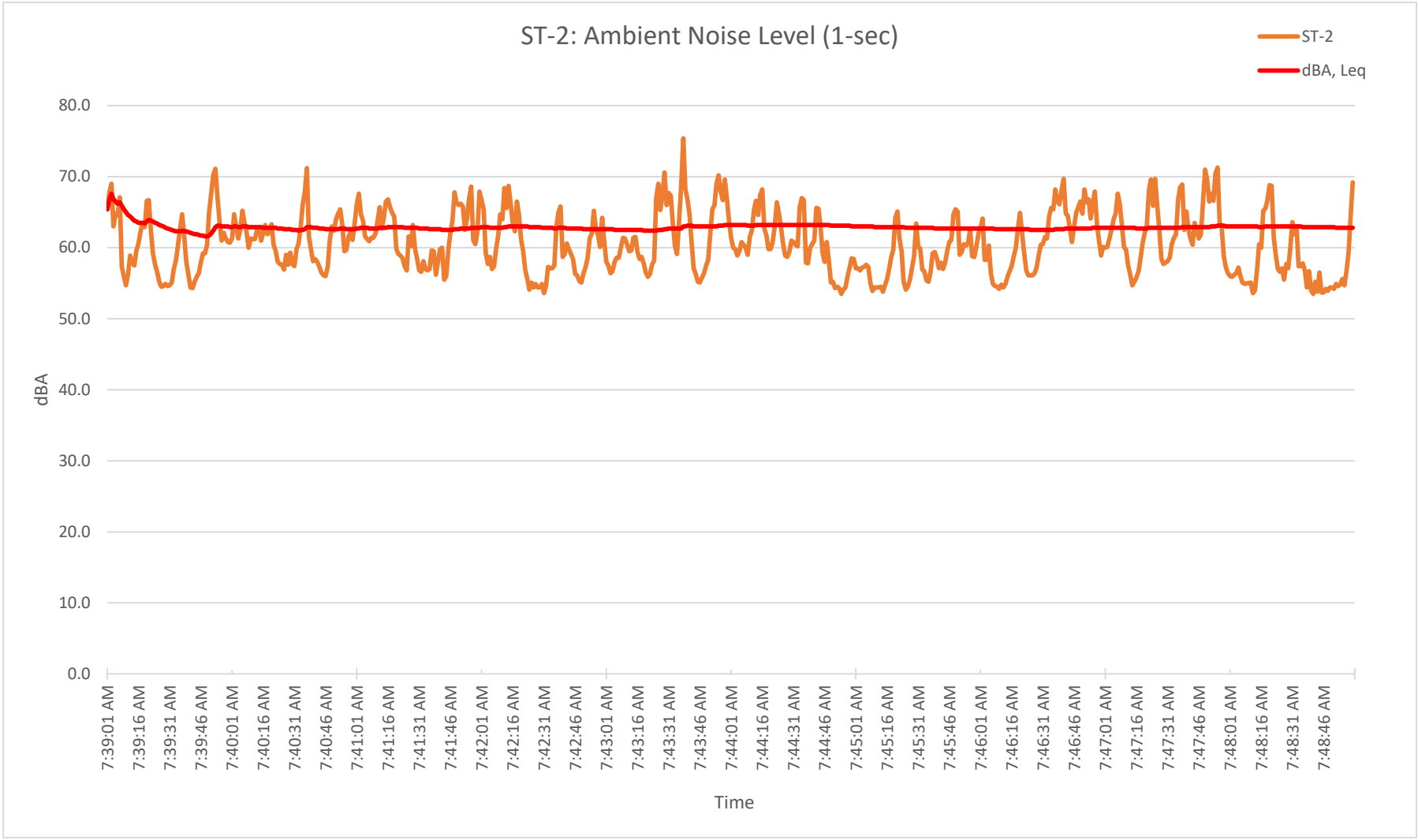
10-Minute Noise Measurement Datasheet - Cont.

Project: Lucky Lady Gardena
Site Address/Location: 1108 W 141ST ST Gardena Ca
Site ID: ST-2



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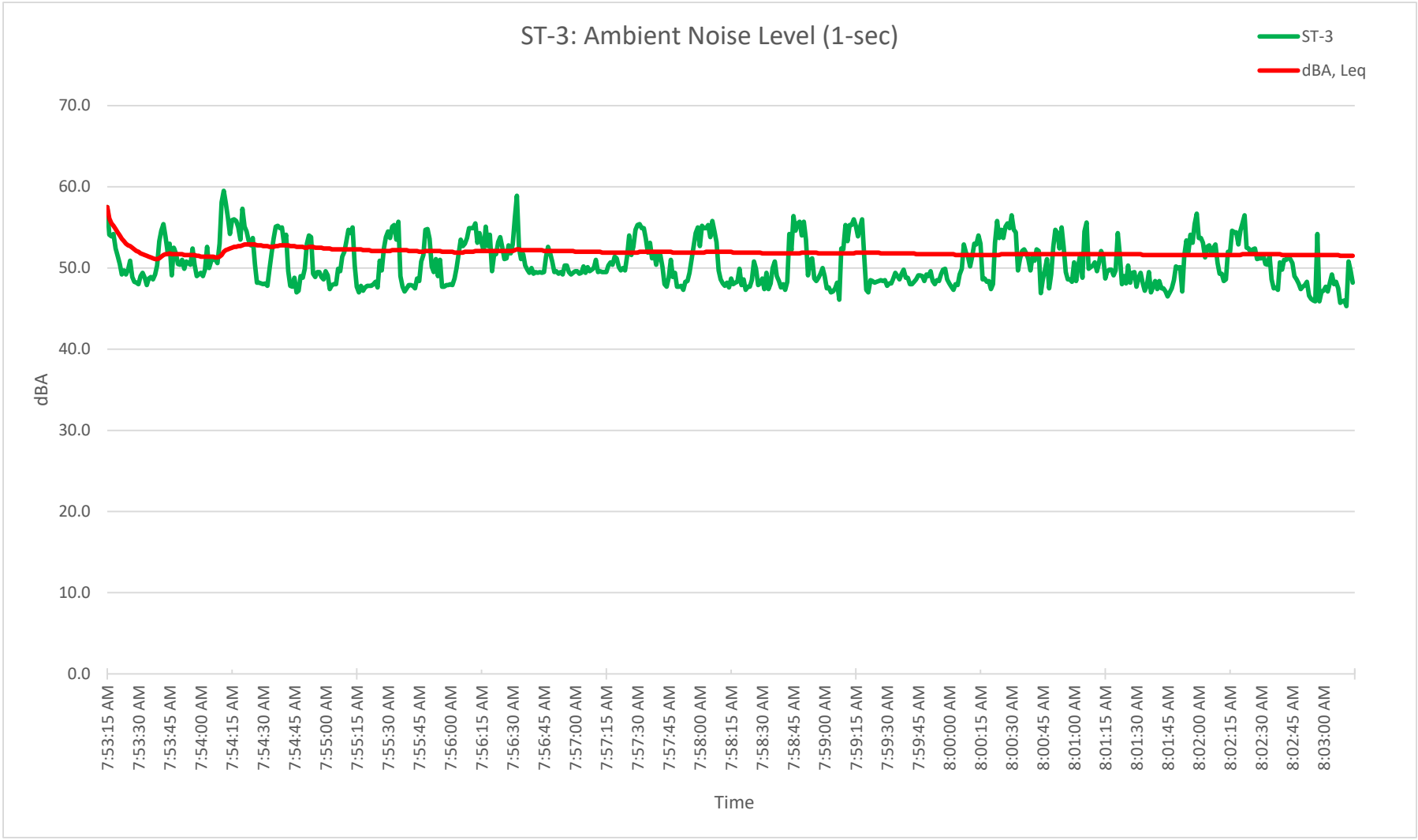
10-Minute Noise Measurement Datasheet - Cont.

Project: Lucky Lady Gardena
Site Address/Location: 1108 W 141ST ST Gardena Ca
Site ID: ST-3



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24-Hour Continuous Noise Measurement Datasheet

Project:	Gardenia APA-CZ
Site Address/Location:	at 1108 W 141ST ST Gardena, CA
Date:	6/17/2020-6/18/2020
Field Tech/Engineer:	Jason Schuyler

Site Observations: Overcast in the morning, but the sky's cleared later in the day. Temps in the low to mid 80's durring the day and mid 60's at night.

General Location:

Sound Meter:	Piccolo **SN:** 21908207
Settings:	A-weighted, slow, 1-min, 24-hour duration
Meteorological Con.:	77 degrees F, 2 to 5 mph wind, eastern direction
Site ID:	LT-1

Site Topo: Flat
Ground Type: Hard site, parking lot

Noise Source(s) w/ Distance:
LT1 is 54' from the P/L of the parking lot

Figure 1: LT-1 Monitoring Location

Figure 1: LT-1 Photo

Figure 2: LT-1 Photo

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24-Hour Noise Measurement Datasheet - Cont.

Project: Gardenia APA-CZ **Day:** 1 of 1

Site Address/Location: at 1108 W 141ST ST Gardena, CA

Site ID: LT-1

Date	Start	Stop	Leq	Lmax	Lmin	L2	L8	L25	L50	L90
6/18/2020	7:12 AM	8:12 AM	62.8	84.5	51.6	69.1	66.1	64.4	61.5	58.4
6/18/2020	8:12 AM	9:12 AM	62.1	81.8	49.7	67.1	65.1	64.4	61.3	58.4
6/18/2020	9:12 AM	10:12 AM	66.4	95.0	50.9	66.9	65.1	64.0	61.1	57.5
6/18/2020	10:12 AM	11:12 AM	62.0	66.2	61.4	65.7	65.4	64.1	61.4	58.6
6/18/2020	11:12 AM	12:12 PM	61.9	75.4	51.3	66.0	65.0	64.4	61.2	58.6
6/18/2020	12:12 PM	1:12 PM	62.6	79.1	52.8	67.1	66.5	65.0	61.8	59.0
6/18/2020	1:12 PM	2:12 PM	61.5	78.1	51.3	64.4	64.2	63.6	61.5	58.5
6/18/2020	2:12 PM	3:12 PM	61.5	83.2	50.2	66.3	65.2	63.5	60.5	57.6
6/18/2020	3:12 PM	4:12 PM	64.1	91.5	50.4	69.0	68.3	66.5	61.2	57.3
6/18/2020	4:12 PM	5:12 PM	60.6	74.4	49.8	64.1	63.7	62.8	59.9	57.3
6/18/2020	5:12 PM	6:12 PM	60.8	78.5	49.7	65.5	64.9	64.2	59.5	56.7
6/18/2020	6:12 PM	7:12 PM	65.4	87.4	49.8	73.0	65.8	63.4	59.9	57.2
6/18/2020	7:12 PM	8:12 PM	60.2	81.7	48.5	66.6	63.5	61.7	59.1	56.9
6/19/2020	8:12 PM	9:12 PM	66.9	89.7	46.9	75.9	73.5	69.9	59.2	55.8
6/19/2020	9:12 PM	10:12 PM	64.7	88.2	46.4	73.7	71.9	67.3	59.2	54.8
6/19/2020	10:12 PM	11:12 PM	62.2	87.7	44.3	67.6	64.2	63.0	58.3	53.8
6/19/2020	11:12 PM	12:12 AM	57.6	81.8	42.7	65.0	62.5	60.4	56.2	52.3
6/19/2020	12:12 AM	1:12 AM	55.8	75.5	42.0	62.2	60.1	58.5	53.9	50.1
6/19/2020	1:12 AM	2:12 AM	57.8	86.6	41.5	60.9	58.4	56.4	52.3	47.8
6/19/2020	2:12 AM	3:12 AM	53.4	71.9	41.6	58.9	57.2	55.9	52.6	49.2
6/19/2020	3:12 AM	4:12 AM	54.5	70.4	41.5	60.0	58.6	57.4	53.0	49.4
6/19/2020	4:12 AM	5:12 AM	59.2	83.2	41.9	63.9	62.3	61.5	56.4	52.7
6/19/2020	5:12 AM	6:12 AM	61.0	77.1	46.3	66.1	64.6	63.9	60.2	55.0
6/19/2020	6:12 AM	7:12 AM	63.3	83.0	49.3	68.8	66.5	65.5	61.9	58.4

DNL: 67.4

24-Hour Noise Measurement Datasheet - Cont.

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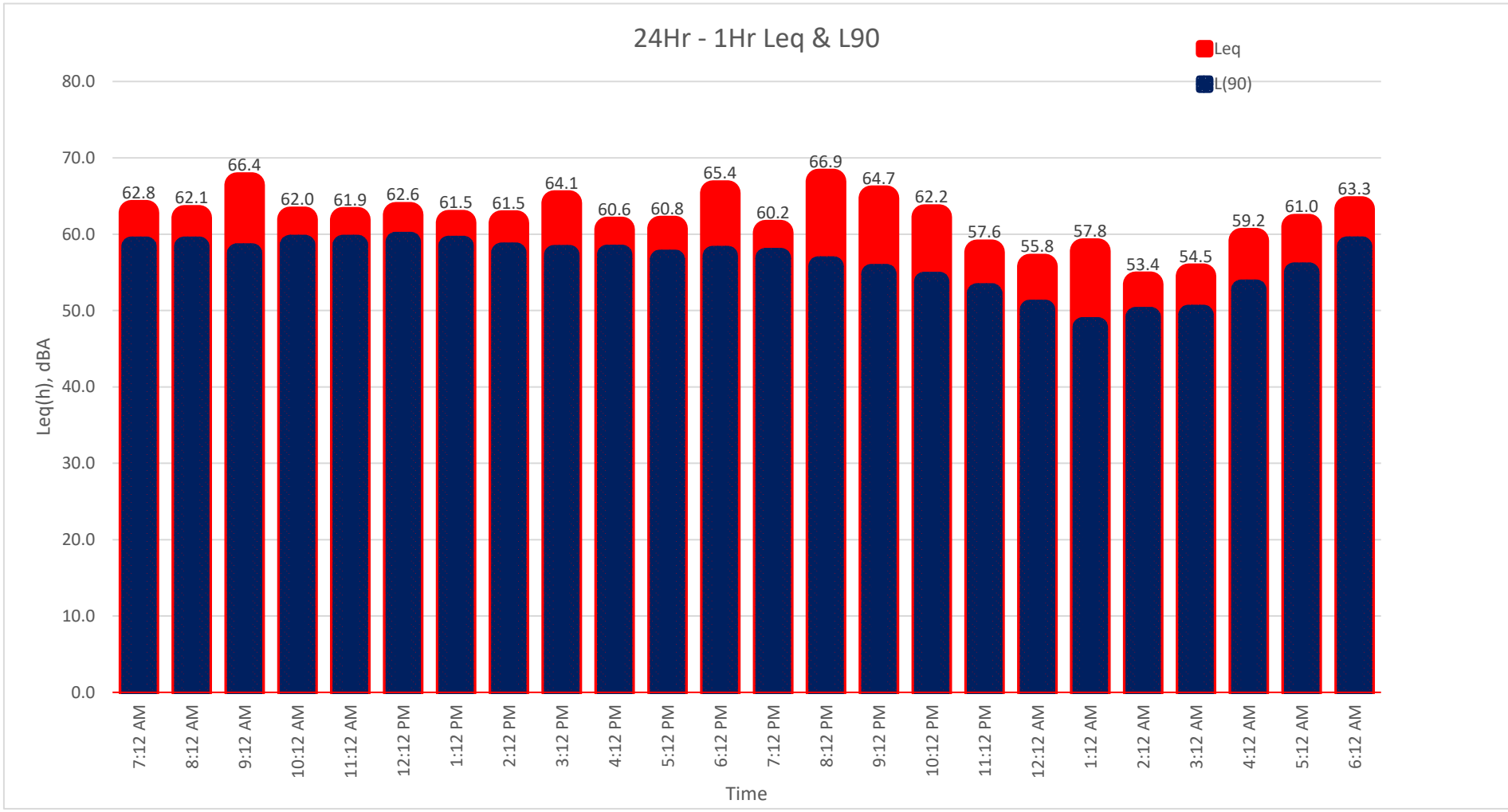
Project: Gardenia APA-CZ **Day:** 1 of 1

Site Address/Location: at 1108 W 141ST ST Gardena, CA

Site ID: LT-1



24-Hour Noise Measurement Datasheet - Cont.

Project: Gardenia APA-CZ **Day:** 1 of 1

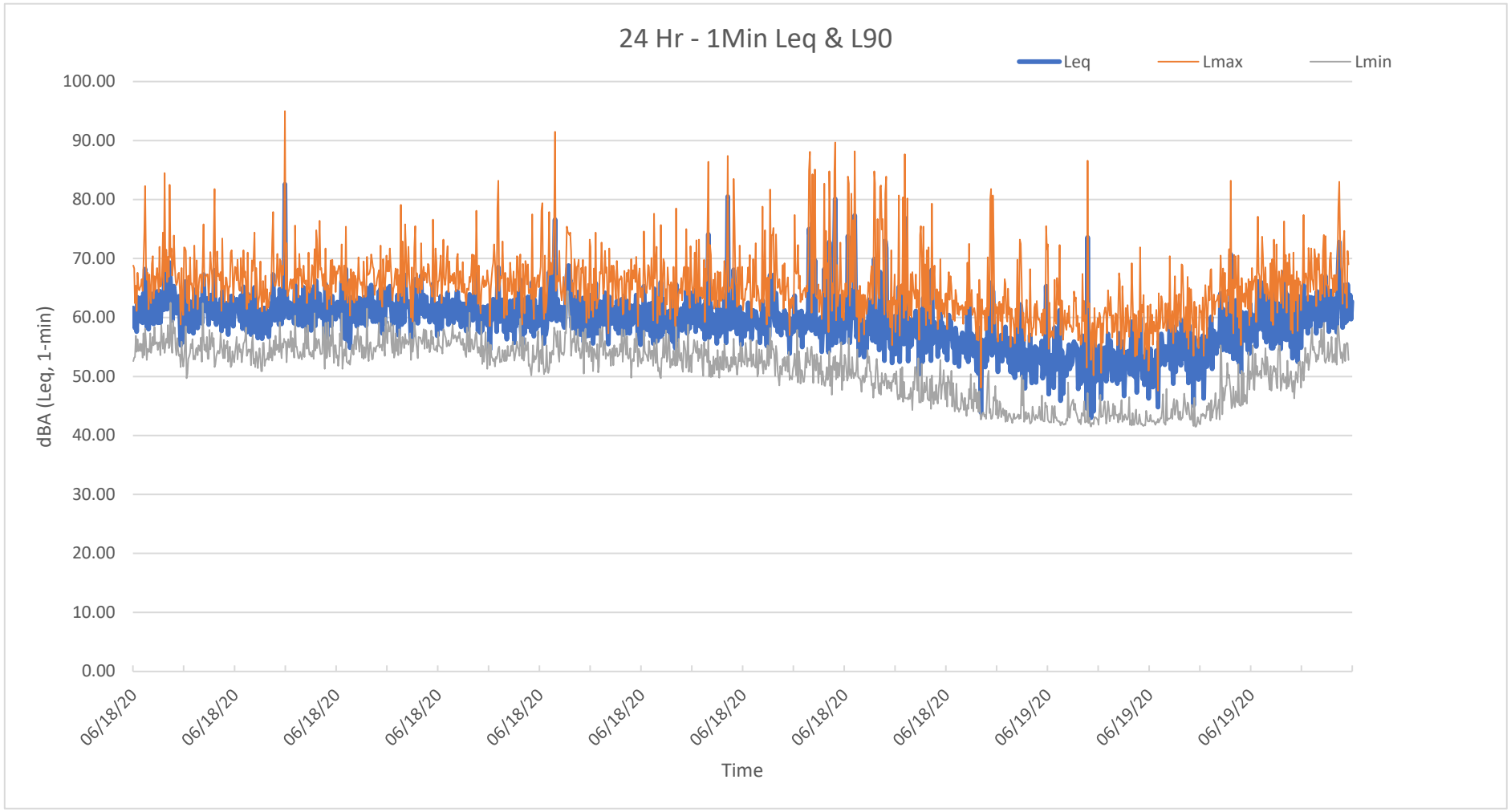
MD ACOUSTICS
Sound Solutions for Planning and Design
www.mdacoustics.com

AZ Office
4960 S. Gilbert Rd, Ste 1-461
Chandler, AZ 85249

CA Office
1197 E Los Angeles Ave, C-256
Simi Valley, CA 93065

Site Address/Location: at 1108 W 141ST ST Gardena, CA

Site ID: LT-1



Appendix B:
Traffic FHWA Worksheets

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT:	Gardena APA-ZC 04622012	JOB #:	04622001
ROADWAY:	Rosecrans Avenue Existing ADT	DATE:	24-Aug-20
LOCATION:	50-Feet from Centerline	ENGINEER:	R. Stromberg

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	34,200	
SPEED =	40	
PK HR % =	10	
NEAR LANE/FAR LANE DIS	0	
ROAD ELEVATION =	0.0	
GRADE =	1.0	%
PK HR VOL =	3,420	

RECEIVER INPUT DATA

RECEIVER DISTANCE =		50
DIST C/L TO WALL =		50
RECEIVER HEIGHT =		5.0
WALL DISTANCE FROM RECEIVER		0
PAD ELEVATION =		0.5
ROADWAY VIEW:	LF ANGLE=	-90
	RT ANGLE=	90
	DF ANGLE=	180

SITE CONDITIONS

AUTOMOBILES =	10	
MEDIUM TRUCKS =	10	(10 = HARD SITE, 15 = SOFT SITE)
HEAVY TRUCKS =	10	

WALL INFORMATION

HTH WALL	0.0	
AMBIENT=	0.0	
BARRIER =	0	(0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.695	0.129	0.096	0.9200
MEDIUM TRUCK	0.014	0.001	0.015	0.0300
HEAVY TRUCKS	0.024	0.001	0.025	0.0500

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	50.12	- -
MEDIUM TRUCKS	4.0	50.02	- -
HEAVY TRUCKS	8.0	50.06	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	70.9	68.6	67.3	61.2	69.6	70.3
MEDIUM TRUCKS	65.0	45.8	38.0	47.2	53.4	53.4
HEAVY TRUCKS	72.1	55.1	47.3	56.5	62.7	62.7
NOISE LEVELS (dBA)	75.0	68.8	67.3	62.6	70.5	71.1

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	70.9	68.6	67.3	61.2	69.6	70.3
MEDIUM TRUCKS	65.0	45.8	38.0	47.2	53.4	53.4
HEAVY TRUCKS	72.1	55.1	47.3	56.5	62.7	62.7
NOISE LEVELS (dBA)	75.0	68.8	67.3	62.6	70.5	71.1

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	64	201	637	2015
LDN	56	178	564	1785

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT:	Gardena APA-ZC 04622012	JOB #:	04622001
ROADWAY:	Rosecrans Avenue Existing + Project ADT	DATE:	24-Aug-20
LOCATION:	50-Feet from Centerline	ENGINEER:	R. Stromberg

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	34,359	
SPEED =	40	
PK HR % =	10	
NEAR LANE/FAR LANE DIS	0	
ROAD ELEVATION =	0.0	
GRADE =	1.0	%
PK HR VOL =	3,436	

RECEIVER INPUT DATA

RECEIVER DISTANCE =	50	
DIST C/L TO WALL =	50	
RECEIVER HEIGHT =	5.0	
WALL DISTANCE FROM RECEIVER	0	
PAD ELEVATION =	0.5	
ROADWAY VIEW: LF ANGLE=	-90	
RT ANGLE=	90	
DF ANGLE=	180	

SITE CONDITIONS

AUTOMOBILES =	10	
MEDIUM TRUCKS =	10	(10 = HARD SITE, 15 = SOFT SITE)
HEAVY TRUCKS =	10	

WALL INFORMATION

HTH WALL	0.0	
AMBIENT=	0.0	
BARRIER =	0	(0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.695	0.129	0.096	0.9200
MEDIUM TRUCK	0.014	0.001	0.015	0.0300
HEAVY TRUCKS	0.024	0.001	0.025	0.0500

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	50.12	- -
MEDIUM TRUCKS	4.0	50.02	- -
HEAVY TRUCKS	8.0	50.06	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	71.0	68.6	67.3	61.2	69.7	70.3
MEDIUM TRUCKS	65.0	45.8	38.1	47.3	53.4	53.5
HEAVY TRUCKS	72.1	55.1	47.3	56.5	62.7	62.7
NOISE LEVELS (dBA)	75.0	68.8	67.3	62.6	70.5	71.1

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	71.0	68.6	67.3	61.2	69.7	70.3
MEDIUM TRUCKS	65.0	45.8	38.1	47.3	53.4	53.5
HEAVY TRUCKS	72.1	55.1	47.3	56.5	62.7	62.7
NOISE LEVELS (dBA)	75.0	68.8	67.3	62.6	70.5	71.1

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	64	202	640	2024
LDN	57	179	567	1793

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT:	Gardena APA-ZC 04622012	JOB #:	04622012
ROADWAY:	Rosecrans Avenue Capacity at LOS C	DATE:	25-Aug-20
LOCATION:	Project Site 1st Floor	ENGINEER:	R. Stromberg

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	40,425	
SPEED =	40	
PK HR % =	10	
NEAR LANE/FAR LANE DIS	0	
ROAD ELEVATION =	0.0	
GRADE =	1.0	%
PK HR VOL =	4,043	

RECEIVER INPUT DATA

RECEIVER DISTANCE =	50	
DIST C/L TO WALL =	0	
RECEIVER HEIGHT =	5.0	
WALL DISTANCE FROM RECEIVER	0	
PAD ELEVATION =	0.5	
ROADWAY VIEW: LF ANGLE=	-90	
RT ANGLE=	90	
DF ANGLE=	180	

SITE CONDITIONS

AUTOMOBILES =	10	
MEDIUM TRUCKS =	10	(10 = HARD SITE, 15 = SOFT SITE)
HEAVY TRUCKS =	10	

WALL INFORMATION

HTH WALL	0.0	
AMBIENT=	0.0	
BARRIER =	0	(0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.695	0.129	0.096	0.9200
MEDIUM TRUCK	0.014	0.001	0.015	0.0300
HEAVY TRUCKS	0.024	0.001	0.025	0.0500

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	50.12	- -
MEDIUM TRUCKS	4.0	50.02	- -
HEAVY TRUCKS	8.0	50.06	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	71.7	69.3	68.0	61.9	70.4	71.0
MEDIUM TRUCKS	65.8	46.5	38.8	48.0	54.1	54.2
HEAVY TRUCKS	72.8	55.8	48.0	57.3	63.4	63.4
NOISE LEVELS (dBA)	75.7	69.5	68.0	63.3	71.3	71.8

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	71.7	69.3	68.0	61.9	70.4	71.0
MEDIUM TRUCKS	65.8	46.5	38.8	48.0	54.1	54.2
HEAVY TRUCKS	72.8	55.8	48.0	57.3	63.4	63.4
NOISE LEVELS (dBA)	75.7	69.5	68.0	63.3	71.3	71.8

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	75	238	753	2382
LDN	67	211	667	2109

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT:	Gardena APA-ZC 04622012	JOB #:	04622012
ROADWAY:	Rosecrans Avenue Capacity at LOS C	DATE:	25-Aug-20
LOCATION:	Project Site 2nd Floor	ENGINEER:	R. Stromberg

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	40,425
SPEED =	40
PK HR % =	10
NEAR LANE/FAR LANE DIS	0
ROAD ELEVATION =	0.0
GRADE =	1.0 %
PK HR VOL =	4,043

RECEIVER INPUT DATA

RECEIVER DISTANCE =		50
DIST C/L TO WALL =		70
RECEIVER HEIGHT =		15.0
WALL DISTANCE FROM RECEIVER		(20)
PAD ELEVATION =		0.5
ROADWAY VIEW:	LF ANGLE=	-90
	RT ANGLE=	90
	DF ANGLE=	180

SITE CONDITIONS

AUTOMOBILES =	10	
MEDIUM TRUCKS =	10	(10 = HARD SITE, 15 = SOFT SITE)
HEAVY TRUCKS =	10	

WALL INFORMATION

HTH WALL	0.0
AMBIENT=	0.0
BARRIER =	0 (0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.695	0.129	0.096	0.9200
MEDIUM TRUCK	0.014	0.001	0.015	0.0300
HEAVY TRUCKS	0.024	0.001	0.025	0.0500

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	51.79	- -
MEDIUM TRUCKS	4.0	51.31	- -
HEAVY TRUCKS	8.0	50.56	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	71.5	69.1	67.9	61.8	70.2	70.9
MEDIUM TRUCKS	65.6	46.4	38.7	47.9	54.0	54.1
HEAVY TRUCKS	72.8	55.8	48.0	57.2	63.4	63.4
NOISE LEVELS (dBA)	75.7	69.4	67.9	63.2	71.1	71.7

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	71.5	69.1	67.9	61.8	70.2	70.9
MEDIUM TRUCKS	65.6	46.4	38.7	47.9	54.0	54.1
HEAVY TRUCKS	72.8	55.8	48.0	57.2	63.4	63.4
NOISE LEVELS (dBA)	75.7	69.4	67.9	63.2	71.1	71.7

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	73	231	731	2313
LDN	65	205	648	2049

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT:	Gardena APA-ZC 04622012	JOB #:	04622012
ROADWAY:	Rosecrans Avenue Capacity at LOS C	DATE:	25-Aug-20
LOCATION:	Project Site 1st Floor	ENGINEER:	R. Stromberg

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	40,425	
SPEED =	40	
PK HR % =	10	
NEAR LANE/FAR LANE DIS	0	
ROAD ELEVATION =	0.0	
GRADE =	1.0	%
PK HR VOL =	4,043	

RECEIVER INPUT DATA

RECEIVER DISTANCE =	50	
DIST C/L TO WALL =	0	
RECEIVER HEIGHT =	5.0	
WALL DISTANCE FROM RECEIVER	0	
PAD ELEVATION =	0.5	
ROADWAY VIEW: LF ANGLE=	-90	
RT ANGLE=	90	
DF ANGLE=	180	

SITE CONDITIONS

AUTOMOBILES =	10	
MEDIUM TRUCKS =	10	(10 = HARD SITE, 15 = SOFT SITE)
HEAVY TRUCKS =	10	

WALL INFORMATION

HTH WALL	0.0	
AMBIENT=	0.0	
BARRIER =	0	(0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.695	0.129	0.096	0.9200
MEDIUM TRUCK	0.014	0.001	0.015	0.0300
HEAVY TRUCKS	0.024	0.001	0.025	0.0500

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	50.12	- -
MEDIUM TRUCKS	4.0	50.02	- -
HEAVY TRUCKS	8.0	50.06	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	71.7	69.3	68.0	61.9	70.4	71.0
MEDIUM TRUCKS	65.8	46.5	38.8	48.0	54.1	54.2
HEAVY TRUCKS	72.8	55.8	48.0	57.3	63.4	63.4
NOISE LEVELS (dBA)	75.7	69.5	68.0	63.3	71.3	71.8

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	71.7	69.3	68.0	61.9	70.4	71.0
MEDIUM TRUCKS	65.8	46.5	38.8	48.0	54.1	54.2
HEAVY TRUCKS	72.8	55.8	48.0	57.3	63.4	63.4
NOISE LEVELS (dBA)	75.7	69.5	68.0	63.3	71.3	71.8

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	75	238	753	2382
LDN	67	211	667	2109

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT:	Gardena APA-ZC 04622012	JOB #:	04622012
ROADWAY:	Rosecrans Avenue Capacity at LOS C	DATE:	25-Aug-20
LOCATION:	Project Site 2nd Floor	ENGINEER:	R. Stromberg

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	40,425
SPEED =	40
PK HR % =	10
NEAR LANE/FAR LANE DIS	0
ROAD ELEVATION =	0.0
GRADE =	1.0 %
PK HR VOL =	4,043

RECEIVER INPUT DATA

RECEIVER DISTANCE =		50
DIST C/L TO WALL =		70
RECEIVER HEIGHT =		15.0
WALL DISTANCE FROM RECEIVER		(20)
PAD ELEVATION =		0.5
ROADWAY VIEW:	LF ANGLE=	-90
	RT ANGLE=	90
	DF ANGLE=	180

SITE CONDITIONS

AUTOMOBILES =	10	
MEDIUM TRUCKS =	10	(10 = HARD SITE, 15 = SOFT SITE)
HEAVY TRUCKS =	10	

WALL INFORMATION

HTH WALL	0.0
AMBIENT=	0.0
BARRIER =	0 (0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.695	0.129	0.096	0.9200
MEDIUM TRUCK	0.014	0.001	0.015	0.0300
HEAVY TRUCKS	0.024	0.001	0.025	0.0500

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	51.79	- -
MEDIUM TRUCKS	4.0	51.31	- -
HEAVY TRUCKS	8.0	50.56	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	71.5	69.1	67.9	61.8	70.2	70.9
MEDIUM TRUCKS	65.6	46.4	38.7	47.9	54.0	54.1
HEAVY TRUCKS	72.8	55.8	48.0	57.2	63.4	63.4
NOISE LEVELS (dBA)	75.7	69.4	67.9	63.2	71.1	71.7

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	71.5	69.1	67.9	61.8	70.2	70.9
MEDIUM TRUCKS	65.6	46.4	38.7	47.9	54.0	54.1
HEAVY TRUCKS	72.8	55.8	48.0	57.2	63.4	63.4
NOISE LEVELS (dBA)	75.7	69.4	67.9	63.2	71.1	71.7

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	73	231	731	2313
LDN	65	205	648	2049

Appendix C:
Operational Noise Modeling

NOISE BARRIER CALCULATIONS - BASED UPON FHWA - RD-77-108

PROJECT:	141st St GPA and Zone Change	JOB #:	0462-2020-12
SOURCE:	ON-SITE NOISE (PARKING/HVAC/Drive Thru Speaker)	DATE:	02-Sep-20
LOCATION:	Receptor to the North	BY:	M. DICKERSON

NOISE INPUT DATA

OBS DIST=	50.0			
DT WALL=	0.0			
DT W/OB=	50.0			
HTH WALL=	0.0	********		
BARRIER =	0.0	(0=WALL,1=BERM)		
OBS HTH=	5.0			
NOISE HTH=	0.0		BARRIER+	
OBS EL =	0.0		TOPO SHIELDING =	-4.96
NOISE EL =	0.0		NOISE HTH EL=	0.0
DROP-OFF=	20.0	(20 = 6 dBA PER DOUBLING OF DISTANCE)		
COFF				

NOISE OUTPUT DATA (dBA)

	DIST (FT)	Leq	Lmax	L2	L8	L25	L50
REF LEVEL	20	63.0	63.0	63.0	63.0	63.0	63.0
PROJ LEVEL	50	55.0	55.0	55.0	55.0	55.0	55.0
SHIELDING	50	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
ADJ LEVEL	50	***50.1***	***50.1***	***50.1***	***50.1***	***50.1***	***50.1***

NOISE LEVEL REDUCTION DUE TO DISTANCE = -7.9588002

NOISE BARRIER CALCULATIONS - BASED UPON FHWA - RD-77-108

PROJECT:	141st St GPA and Zone Change	JOB #:	0462-2020-12
SOURCE:	ON-SITE NOISE (PARKING/HVAC/Drive Thru Speaker)	DATE:	02-Sep-20
LOCATION:	Receptor to the South	BY:	M. DICKERSON

NOISE INPUT DATA

OBS DIST=	110.0			
DT WALL=	0.0			
DT W/OB=	110.0			
HTH WALL=	0.0	********		
BARRIER =	0.0	(0=WALL,1=BERM)		
OBS HTH=	0.0			
NOISE HTH=	0.0		BARRIER+	
OBS EL =	0.0		TOPO SHIELDING =	-4.96
NOISE EL =	0.0		NOISE HTH EL=	0.0
DROP-OFF=	20.0	(20 = 6 dBA PER DOUBLING OF DISTANCE)		
COFF				

NOISE OUTPUT DATA (dBA)

	DIST (FT)	Leq	Lmax	L2	L8	L25	L50
REF LEVEL	20	58.0	58.0	58.0	58.0	58.0	58.0
PROJ LEVEL	110	43.2	43.2	43.2	43.2	43.2	43.2
SHIELDING	110	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
ADJ LEVEL	110	***38.2***	***38.2***	***38.2***	***38.2***	***38.2***	***38.2***

NOISE LEVEL REDUCTION DUE TO DISTANCE = -14.807254

NOISE BARRIER CALCULATIONS - BASED UPON FHWA - RD-77-108

PROJECT:	141st St GPA and Zone Change	JOB #:	0462-2020-12
SOURCE:	ON-SITE NOISE (PARKING/HVAC/Drive Thru Speaker)	DATE:	02-Sep-20
LOCATION:	Receptor to the West	BY:	M. DICKERSON

NOISE INPUT DATA

OBS DIST=	125.0			
DT WALL=	0.0			
DT W/OB=	125.0			
HTH WALL=	0.0	********		
BARRIER =	0.0	(0=WALL,1=BERM)		
OBS HTH=	5.0			
NOISE HTH=	0.0		BARRIER+	
OBS EL =	0.0		TOPO SHIELDING =	-4.96
NOISE EL =	0.0		NOISE HTH EL=	0.0
DROP-OFF=	20.0	(20 = 6 dBA PER DOUBLING OF DISTANCE)		
COFF				

NOISE OUTPUT DATA (dBA)

	DIST (FT)	Leq	Lmax	L2	L8	L25	L50
REF LEVEL	20	63.0	63.0	63.0	63.0	63.0	63.0
PROJ LEVEL	125	47.1	47.1	47.1	47.1	47.1	47.1
SHIELDING	125	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
ADJ LEVEL	125	***42.1***	***42.1***	***42.1***	***42.1***	***42.1***	***42.1***

NOISE LEVEL REDUCTION DUE TO DISTANCE = -15.9176

Appendix D:

Construction Noise Modeling Output

Construction Noise Levels at Senstiive Receptors by Phase

Activity	Leq at 110 Feet (North)	Lmax at 110 FT (North)	Leq at 290 FT (South)	Lmax at 290 FT (South)	Leq at 495 FT (West)	Lmax at 495 FT (West)
Site Preparation	79	83	68	72	62	66
Grading	79	80	68	69	63	64
Building Construction	77	78	66	68	60	62
Architectural Coating	73	77	63	67	57	61

Equipment Summary	Reference (dBA) 50 ft Lmax
Rock Drills	96
Jack Hammers	82
Pneumatic Tools	85
Pavers	80
Dozers	85
Scrappers	87
Haul Trucks	88
Cranes	82
Portable Generators	80
Rollers	80
Tractors	80
Front-End Loaders	86
Hydraulic Excavators	86
Graders	86
Air Compressors	86
Trucks	86

Site Preparation

Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
1	Dozer	85	3	40	110	0.5	0	81.2	77.2	52859681.7
2	Tractor/Backhoe	80	4	40	110	0.5	0	77.5	73.5	22287598.8
							Lmax*	**83**	**Leq**	**79**
							Lw	**113**	**Lw**	**110**

Source: MD Acoustics, May. 2019.
1- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	15.2	0.5	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
60	18.3	0.5	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62
70	21.3	0.5	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60
80	24.4	0.5	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59
90	27.4	0.5	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57
100	30.5	0.5	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56
110	33.5	0.5	70	69	68	**67**	66	65	64	63	62	61	60	59	58	57	56	55
120	36.6	0.5	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54
130	39.6	0.5	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53
140	42.7	0.5	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53
150	45.7	0.5	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52
160	48.8	0.5	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51
170	51.8	0.5	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50
180	54.9	0.5	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50
190	57.9	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
200	61.0	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
210	64.0	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
220	67.1	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
230	70.1	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
240	73.1	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
250	76.2	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
260	79.2	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
270	82.3	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
280	85.3	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
290	88.4	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
300	91.4	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
310	94.5	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
320	97.5	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
330	100.6	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
340	103.6	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
350	106.7	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
360	109.7	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
370	112.8	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42

Grading

Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
1	Grader	86	1	40	110	0.5	0	77.4	73.5	22182132.2
2	Dozer	85	1	40	110	0.5	0	76.4	72.5	17619893.9
3	Excavator	86	1	40	110	0.5	0	77.4	73.5	22182132.2
4	Tractor/Backhoe	80	3	40	110	0.5	0	76.2	72.2	16715699.1
							Lmax*	**80**	**Leq**	**79**
							Lw	**109**	**Lw**	**111**

Source: MD Acoustics, May. 2019.
1- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	15.2	0.5	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
60	18.3	0.5	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62
70	21.3	0.5	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60
80	24.4	0.5	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59
90	27.4	0.5	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58
100	30.5	0.5	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56
110	33.5	0.5	70	69	68	**67**	66	65	64	63	62	61	60	59	58	57	56	55
120	36.6	0.5	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54
130	39.6	0.5	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54
140	42.7	0.5	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53
150	45.7	0.5	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52
160	48.8	0.5	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51
170	51.8	0.5	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51
180	54.9	0.5	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50
190	57.9	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
200	61.0	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
210	64.0	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
220	67.1	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
230	70.1	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
240	73.1	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
250	76.2	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
260	79.2	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
270	82.3	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
280	85.3	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
290	88.4	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
300	91.4	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
310	94.5	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
320	97.5	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
330	100.6	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
340	103.6	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
350	106.7	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
360	109.7	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
370	112.8	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42

Building Construction

Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
1	Cranes	82	1	40	110	0.5	0	73.4	69.5	8830865.89
2	Forklift/Tractor	80	3	40	110	0.5	0	76.2	72.2	16715699.1
3	Generator	80	1	40	110	0.5	0	71.4	67.5	5571899.69
4	Tractor/Backhoe	80	3	40	110	0.5	0	76.2	72.2	16715699.1
							Lmax*	**78**	**Leq**	**77**
							Lw	**110**	**Lw**	**108**

Source: MD Acoustics, May. 2019.
1- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	**15.2**	**0.5**	**77**	**76**	**75**	**74**	**73**	**72**	**71**	**70**	**69**	**68**	**67**	**66**	**65**	**64**	**63**	**62**
60	18.3	0.5	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60
70	21.3	0.5	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58
80	24.4	0.5	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57
90	27.4	0.5	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55
100	30.5	0.5	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54
110	33.5	0.5	68	67	66	65	64	63	62	61	60	59	58	57	56	55	**54**	53
120	36.6	0.5	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52
130	39.6	0.5	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51
140	42.7	0.5	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51
150	45.7	0.5	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50
160	48.8	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
170	51.8	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
180	54.9	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
190	57.9	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
200	61.0	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
210	64.0	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
220	67.1	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
230	70.1	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
240	73.1	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
250	76.2	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
260	79.2	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
270	82.3	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
280	85.3	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
290	88.4	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
300	91.4	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
310	94.5	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
320	97.5	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
330	100.6	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
340	103.6	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
350	106.7	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
360	109.7	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
370	112.8	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40

Architectural Coating

Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
1	Air Compressor	86	1	40	110	0.5	0	77.4	73.5	22182132.2
2										
3										
							Lmax*	**77**	**Leq**	**73**
							Lw	**109**	**Lw**	**105**

Source: MD Acoustics, May. 2019.
1- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	**15.2**	**0.5**	**73**	**72**	**71**	**70**	**69**	**68**	**67**	**66**	**65**	**64**	**63**	**62**	**61**	**60**	**59**	**58**
60	18.3	0.5	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56
70	21.3	0.5	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55
80	24.4	0.5	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53
90	27.4	0.5	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52
100	30.5	0.5	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51
110	33.5	0.5	65	64	63	**62**	61	60	59	58	57	56	55	54	53	52	**51**	50
120	36.6	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
130	39.6	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
140	42.7	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
150	45.7	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
160	48.8	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
170	51.8	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
180	54.9	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
190	57.9	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
200	61.0	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
210	64.0	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
220	67.1	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
230	70.1	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
240	73.1	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
250	76.2	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
260	79.2	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
270	82.3	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
280	85.3	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
290	88.4	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
300	91.4	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
310	94.5	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
320	97.5	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
330	100.6	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
340	103.6	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
350	106.7	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
360	109.7	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
370	112.8	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37

Site Preparation

Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
1	Dozer	85	3	40	290	0.5	0	70.7	66.7	4683939.34
2	Tractor/Backhoe	80	4	40	290	0.5	0	66.9	63.0	1974922.23
							Lmax*	**72**	**Leq**	**68**
							Lw	**102**	**Lw**	**100**

Source: MD Acoustics, May. 2019.
1- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	15.2	0.5	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53
60	18.3	0.5	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51
70	21.3	0.5	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50
80	24.4	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
90	27.4	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
100	30.5	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
110	33.5	0.5	60	59	58	**57**	56	55	54	53	52	51	50	49	48	47	46	45
120	36.6	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
130	39.6	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
140	42.7	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
150	45.7	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
160	48.8	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
170	51.8	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
180	54.9	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
190	57.9	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
200	61.0	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
210	64.0	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
220	67.1	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
230	70.1	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
240	73.1	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
250	76.2	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
260	79.2	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
270	82.3	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
280	85.3	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
290	88.4	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
300	91.4	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
310	94.5	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
320	97.5	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
330	100.6	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
340	103.6	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
350	106.7	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
360	109.7	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
370	112.8	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32

Grading

Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
1	Grader	86	1	40	290	0.5	0	66.9	62.9	1965576.75
2	Dozer	85	1	40	290	0.5	0	65.9	61.9	1561313.11
3	Excavator	86	1	40	290	0.5	0	66.9	62.9	1965576.75
4	Tractor/Backhoe	80	3	40	290	0.5	0	65.7	61.7	1481191.67
							Lmax*	**69**	**Leq**	**68**
							Lw	**99**	**Lw**	**100**

Source: MD Acoustics, May. 2019.
1- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	15.2	0.5	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53
60	18.3	0.5	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51
70	21.3	0.5	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50
80	24.4	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
90	27.4	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
100	30.5	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
110	33.5	0.5	60	59	58	**57**	56	55	54	53	52	51	50	49	48	47	46	45
120	36.6	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
130	39.6	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
140	42.7	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
150	45.7	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
160	48.8	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
170	51.8	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
180	54.9	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
190	57.9	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
200	61.0	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
210	64.0	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
220	67.1	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
230	70.1	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
240	73.1	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
250	76.2	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
260	79.2	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
270	82.3	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
280	85.3	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
290	88.4	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
300	91.4	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
310	94.5	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
320	97.5	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
330	100.6	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
340	103.6	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
350	106.7	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
360	109.7	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
370	112.8	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32

Building Construction

		Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements								
No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
1	Cranes	82	1	40	290	0.5	0	62.9	58.9	782510.2
2	Forklift/Tractor	80	3	40	290	0.5	0	65.7	61.7	1481191.67
3	Generator	80	1	40	290	0.5	0	60.9	56.9	493730.558
4	Tractor/Backhoe	80	3	40	290	0.5	0	65.7	61.7	1481191.67
							Lmax*	68	Leq	66
							Lw	99	Lw	98

Source: MD Acoustics, May. 2019.
1- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	**15.2**	**0.5**	**66**	**65**	**64**	**63**	**62**	**61**	**60**	**59**	**58**	**57**	**56**	**55**	**54**	**53**	**52**	**51**
60	18.3	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
70	21.3	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
80	24.4	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
90	27.4	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
100	30.5	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
110	33.5	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	**44**	43
120	36.6	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
130	39.6	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
140	42.7	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
150	45.7	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
160	48.8	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
170	51.8	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
180	54.9	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
190	57.9	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
200	61.0	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
210	64.0	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
220	67.1	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
230	70.1	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
240	73.1	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
250	76.2	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
260	79.2	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
270	82.3	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
280	85.3	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
290	88.4	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
300	91.4	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
310	94.5	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
320	97.5	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
330	100.6	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
340	103.6	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
350	106.7	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
360	109.7	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
370	112.8	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30

Architectural Coating

Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
1	Air Compressor	86	1	40	290	0.5	0	66.9	62.9	1965576.75
2										
3										
							Lmax*	**67**	**Leq**	**63**
							Lw	**99**	**Lw**	**95**

Source: MD Acoustics, May. 2019.
1- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	**15.2**	**0.5**	**63**	**62**	**61**	**60**	**59**	**58**	**57**	**56**	**55**	**54**	**53**	**52**	**51**	**50**	**49**	**48**
60	18.3	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
70	21.3	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
80	24.4	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
90	27.4	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
100	30.5	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
110	33.5	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	**40**	39
120	36.6	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
130	39.6	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
140	42.7	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
150	45.7	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
160	48.8	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
170	51.8	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
180	54.9	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
190	57.9	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
200	61.0	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
210	64.0	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
220	67.1	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
230	70.1	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
240	73.1	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
250	76.2	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
260	79.2	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
270	82.3	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
280	85.3	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
290	88.4	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
300	91.4	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
310	94.5	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
320	97.5	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
330	100.6	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
340	103.6	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
350	106.7	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
360	109.7	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
370	112.8	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26

Site Preparation

Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA)		Energy
								Lmax	Leq	
1	Dozer	85	3	40	495	0.5	0	64.9	60.9	1230532.98
2	Tractor/Backhoe	80	4	40	495	0.5	0	61.1	57.2	518838.262
							Lmax*	**66**	**Leq**	**62**
							Lw	**97**	**Lw**	**94**

Source: MD Acoustics, May. 2019.
1- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	15.2	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
60	18.3	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
70	21.3	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
80	24.4	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
90	27.4	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
100	30.5	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
110	33.5	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
120	36.6	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
130	39.6	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
140	42.7	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
150	45.7	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
160	48.8	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
170	51.8	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
180	54.9	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
190	57.9	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
200	61.0	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
210	64.0	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
220	67.1	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
230	70.1	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
240	73.1	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
250	76.2	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
260	79.2	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
270	82.3	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
280	85.3	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
290	88.4	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
300	91.4	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
310	94.5	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
320	97.5	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
330	100.6	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
340	103.6	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
350	106.7	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
360	109.7	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
370	112.8	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26

Grading

Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
1	Grader	86	1	40	495	0.5	0	61.1	57.1	516383.081
2	Dozer	85	1	40	495	0.5	0	60.1	56.1	410177.662
3	Excavator	86	1	40	495	0.5	0	61.1	57.1	516383.081
4	Tractor/Backhoe	80	3	40	495	0.5	0	59.9	55.9	389128.697
							Lmax*	**64**	**Leq**	**63**
							Lw	**93**	**Lw**	**94**

Source: MD Acoustics, May. 2019.
1- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	15.2	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
60	18.3	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
70	21.3	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
80	24.4	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
90	27.4	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
100	30.5	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
110	33.5	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
120	36.6	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
130	39.6	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
140	42.7	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
150	45.7	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
160	48.8	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
170	51.8	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
180	54.9	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
190	57.9	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
200	61.0	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
210	64.0	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
220	67.1	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
230	70.1	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
240	73.1	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
250	76.2	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
260	79.2	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
270	82.3	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
280	85.3	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
290	88.4	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
300	91.4	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
310	94.5	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
320	97.5	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
330	100.6	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
340	103.6	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
350	106.7	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
360	109.7	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
370	112.8	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26

Building Construction

Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
1	Cranes	82	1	40	495	0.5	0	57.1	53.1	205575.807
2	Forklift/Tractor	80	3	40	495	0.5	0	59.9	55.9	389128.697
3	Generator	80	1	40	495	0.5	0	55.1	51.1	129709.566
4	Tractor/Backhoe	80	3	40	495	0.5	0	59.9	55.9	389128.697
							Lmax*	**62**	**Leq**	**60**
							Lw	**93**	**Lw**	**92**

Source: MD Acoustics, May. 2019.
1- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	**15.2**	**0.5**	**60**	**59**	**58**	**57**	**56**	**55**	**54**	**53**	**52**	**51**	**50**	**49**	**48**	**47**	**46**	**45**
60	18.3	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
70	21.3	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
80	24.4	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
90	27.4	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
100	30.5	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
110	33.5	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	**38**	37
120	36.6	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
130	39.6	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
140	42.7	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
150	45.7	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
160	48.8	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
170	51.8	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
180	54.9	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
190	57.9	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
200	61.0	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
210	64.0	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
220	67.1	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
230	70.1	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
240	73.1	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
250	76.2	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
260	79.2	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
270	82.3	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
280	85.3	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
290	88.4	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
300	91.4	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
310	94.5	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
320	97.5	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
330	100.6	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
340	103.6	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
350	106.7	0.5	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
360	109.7	0.5	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
370	112.8	0.5	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24

Architectural Coating

Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA)		Energy
								Lmax	Leq	
1	Air Compressor	86	1	40	495	0.5	0	61.1	57.1	516383.081
2										
3										
							Lmax*	**61**	**Leq**	**57**
							Lw	**93**	**Lw**	**89**

Source: MD Acoustics, May. 2019.
1- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	**15.2**	**0.5**	**57**	**56**	**55**	**54**	**53**	**52**	**51**	**50**	**49**	**48**	**47**	**46**	**45**	**44**	**43**	**42**
60	18.3	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
70	21.3	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
80	24.4	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
90	27.4	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
100	30.5	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
110	33.5	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	**35**	34
120	36.6	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
130	39.6	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
140	42.7	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
150	45.7	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
160	48.8	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
170	51.8	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
180	54.9	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
190	57.9	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
200	61.0	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
210	64.0	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
220	67.1	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
230	70.1	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
240	73.1	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
250	76.2	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
260	79.2	0.5	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
270	82.3	0.5	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
280	85.3	0.5	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
290	88.4	0.5	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
300	91.4	0.5	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
310	94.5	0.5	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22
320	97.5	0.5	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22
330	100.6	0.5	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22
340	103.6	0.5	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21
350	106.7	0.5	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21
360	109.7	0.5	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21
370	112.8	0.5	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20