NOISE AND VIBRATION IMPACT ANALYSIS

205TH STREET INDUSTRIAL PROJECT

TORRANCE, CALIFORNIA

LSA

May 2023

NOISE AND VIBRATION IMPACT ANALYSIS

205[TH] STREET INDUSTRIAL PROJECT

TORRANCE, CALIFORNIA

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May 2023

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LIST OF ABBREVIATIONS AND ACRONYMS

CALGreen Code	California Green Building Standards Code
CEQA	California Environmental Quality Act
City	City of Torrance
CNEL	Community Noise Equivalent Level
dB	decibel
dBA	A-weighted decibel
EPA	United States Environmental Protection Agency
ft	foot/feet
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HVAC	heating, ventilation, and air conditioning
in/sec	inches per second
L_{dn}	day-night average noise level
L_{eq}	equivalent continuous sound level
L_{max}	maximum instantaneous sound level
Noise Element	City of Torrance General Plan Noise Element
PCE	passenger car equivalent
PPV	peak particle velocity
project	205th Street Industrial Project
RMS	root-mean-square
SPL	sound power level
VdB	vibration velocity decibels

INTRODUCTION

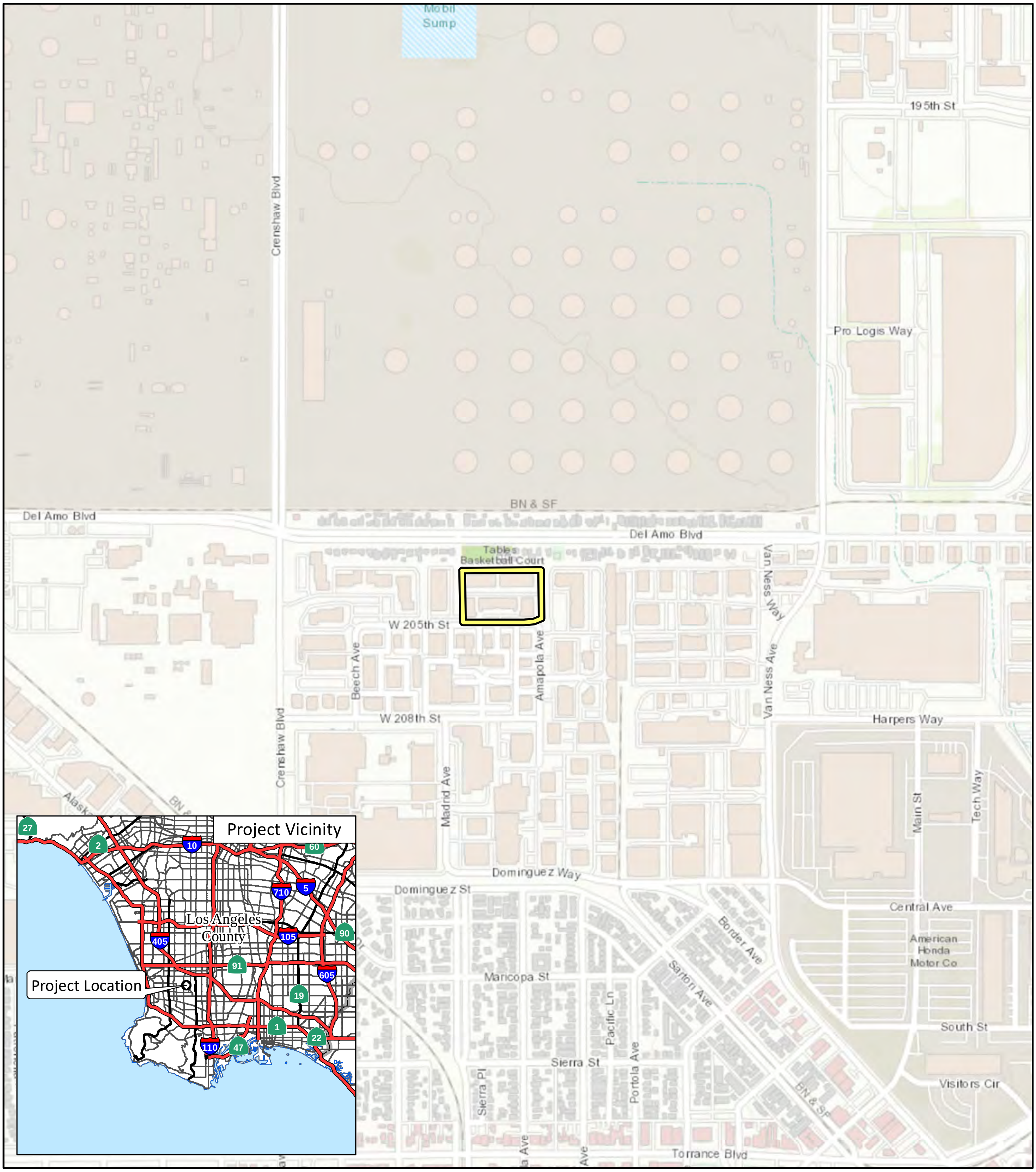
This noise and vibration impact analysis has been prepared to evaluate the potential noise and vibration impacts and reduction measures associated with the 205th Street Industrial Project (project) in Torrance, California. This report is intended to satisfy the City of Torrance's (City) requirement for a project-specific noise impact analysis by examining the impacts of the project site and evaluating noise reduction measures that the project may require.

PROJECT LOCATION AND DESCRIPTION

The 6.26-acre project site is at 2271-2311 and 2341 West 205th Street in Torrance, California. The project would demolish the current buildings and construct a 132,425-square-foot light industrial building with approximately 50 percent used for cold storage. The project would include a parking lot, ornamental landscaping, employee patio area, and associated infrastructure. Regional access to the project site is provided via Interstate 110, 1 mile to the east, and Interstate 405, approximately 1 mile north of the site. The project site is north of 205th Street, east of Crenshaw Boulevard, south of Del Amo Boulevard, and west of Van Ness Avenue. Additionally, the site is within Lot 37, Township 4 South, Range 14 West, San Bernardino Baseline and Meridian (see Figure 1, Project Location and Vicinity, and Figure 2, Site Plan).

The tilt-up building would include 127,425 square feet of light industrial space with 5,000 square feet of mezzanine. Additionally, there would be 25 dock doors on the northern side of the proposed building. An 8-foot-high concrete screen wall with wing walls is proposed to the north of the building's loading dock and trailer parking areas.

Typical operational characteristics include employees traveling to and from the site, delivery of materials and supplies to the site, and truck loading and unloading. To provide a conservative environmental analysis, industrial operations were assumed to be 24 hours per day, 7 days per week. Construction is anticipated to start in the first quarter of 2024 and be completed by the first quarter of 2025.



LSA

LEGEND

Project Location

FIGURE 1

0 400 800
FEET

SOURCE: ESRI Maps 2023

205th Torrance Industrial

Project Location and Vicinity

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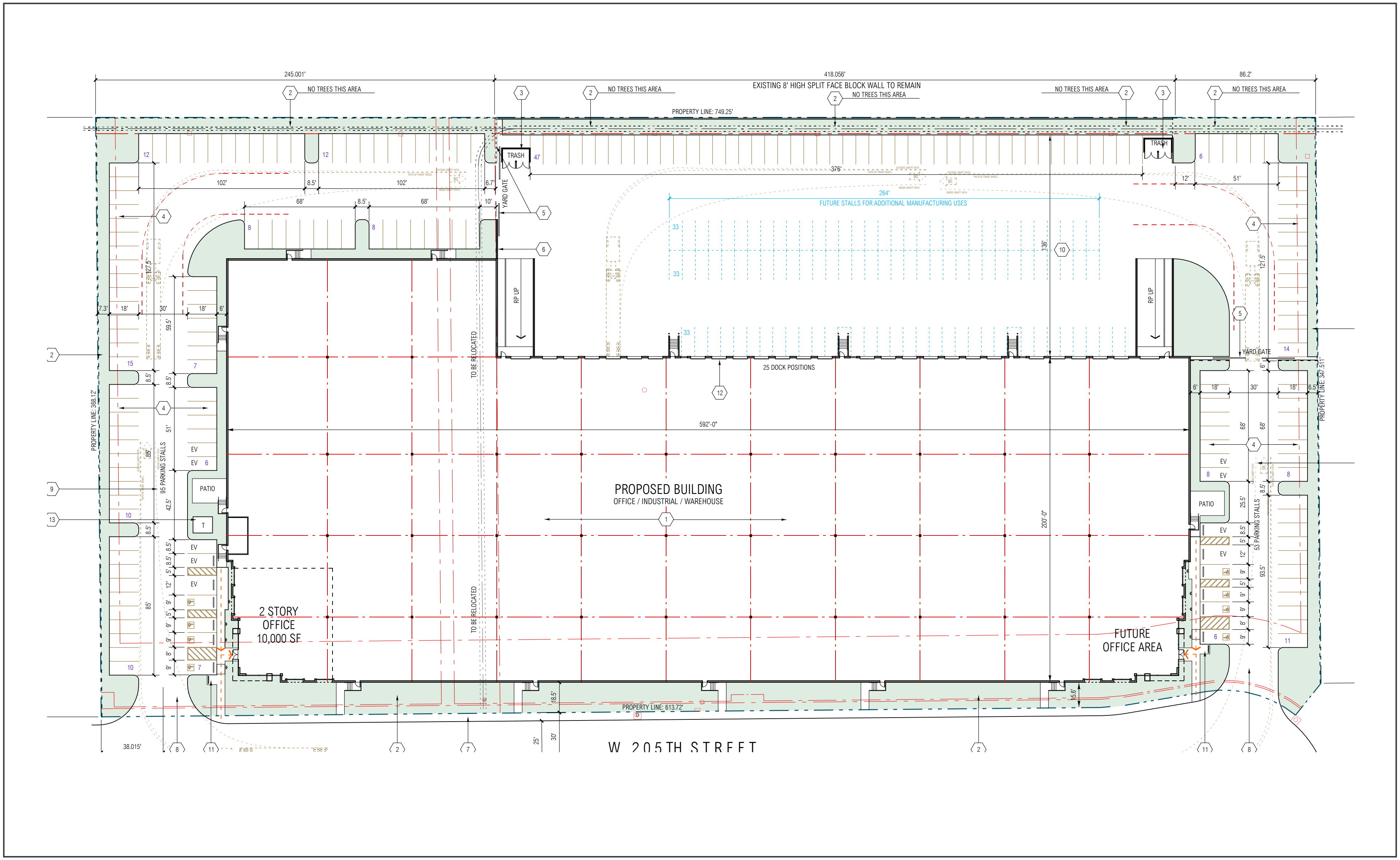

FIGURE 2

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0 50 100

FEET

SOURCE: RGA

205th Torrance Industrial

Site Plan

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EXISTING LAND USES IN THE PROJECT AREA

The project site is surrounded primarily by residential, light industrial, and office uses. The areas adjacent to the project site include the following uses.

- **North:** Existing single-family residence and Pueblo Park.
- **East:** Existing light industrial and office uses.
- **South:** Existing light industrial uses opposite West 205th Street.
- **West:** Existing light industrial and office uses.

The nearest sensitive receptors are:

- **North**: Single-family residences and Pueblo Park on Del Amo Boulevard approximately 10 feet (ft) away from the project boundary line.

NOISE AND VIBRATION FUNDAMENTALS

CHARACTERISTICS OF SOUND

Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a sound wave, which results in the tone's range from high to low. Loudness is the strength of a sound, and it describes a noisy or quiet environment; it is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity is the average rate of sound energy transmitted through a unit area perpendicular to the direction in which the sound waves are traveling. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

MEASUREMENT OF SOUND

Sound intensity is measured with the A-weighted decibel (dBA) scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound, similar to the human ear's de-emphasis of these frequencies. Decibels (dB), unlike the linear scale (e.g., inches or pounds), are measured on a logarithmic scale representing points on a sharply rising curve.

For example, 10 dB is 10 times more intense than 0 dB, 20 dB is 100 times more intense than 0 dB, and 30 dB is 1,000 times more intense than 0 dB. Thirty decibels (30 dB) represents 1,000 times as much acoustic energy as 0 dB. The decibel scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 dB. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10 dB increase in sound level is perceived by the human ear as only a doubling of the sound's loudness. Ambient sounds generally range from 30 dB (very quiet) to 100 dB (very loud).

Sound levels are generated from a source, and their decibel level decreases as the distance from that source increases. Sound levels dissipate exponentially with distance from their noise sources. For a single point source, sound levels decrease approximately 6 dB for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source (e.g., highway traffic or railroad operations), the sound decreases 3 dB for each doubling of distance in a hard site environment. Line source sound levels decrease 4.5 dB for each doubling of distance in a relatively flat environment with absorptive vegetation.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. The equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and Community Noise Equivalent Level (CNEL) or the day-night average noise level (L_{dn}) based on A-weighted decibels. CNEL is the time-weighted average noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noises occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during the relaxation. CNEL and L_{dn} are within 1 dBA of each other and are normally interchangeable. The City uses the CNEL noise scale for long-term traffic noise impact assessment.

Other noise rating scales of importance when assessing the annoyance factor include the maximum instantaneous noise level (L_{max}), which is the highest sound level that occurs during a stated time period. The noise environments discussed in this analysis for short-term noise impacts are specified in terms of maximum levels denoted by L_{max}, which reflects peak operating conditions and addresses the annoying aspects of intermittent noise. It is often used together with another noise scale, or noise standards in terms of percentile noise levels, in noise ordinances for enforcement purposes. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. Half the time the noise level exceeds this level, and half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

Noise impacts can be described in three categories. The first category includes audible impacts, which are increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3 dB or greater because this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1 dB and 3 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category includes changes in noise levels of less than 1 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure to sound levels higher than 85 dBA. Exposure to high sound levels affects the entire system, with prolonged sound exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and the nervous system. In comparison, extended periods of sound exposure above 90 dBA would result in permanent cell damage. When the sound level reaches 120 dBA, a tickling sensation occurs in the human ear, even with short-term exposure. This level of sound is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by a feeling of pain in the ear (i.e., the threshold of pain). A sound level of 160–165 dBA will result in dizziness or a loss of equilibrium. The ambient or background noise problem is widespread and generally more concentrated in urban areas than in outlying, less developed areas.

Table A lists definitions of acoustical terms, and Table B shows common sound levels and their sources.

Table A: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit of sound measurement that denotes the ratio between two quantities that are proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in 1 second (i.e., the number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. (All sound levels in this report are A-weighted unless reported otherwise.)
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels that are equaled or exceeded by a fluctuating sound level 1%, 10%, 50%, and 90% of a stated time period, respectively.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time-varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 dBA to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 dBA to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 dBA to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time. Usually a composite of sound from many sources from many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, and tonal or informational content, as well as the prevailing ambient noise level.

Source: *Handbook of Acoustical Measurements and Noise Control* (Harris 1991).

Table B: Common Sound Levels and Their Noise Sources

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Evaluations
Near Jet Engine	140	Deafening	128 times as loud
Civil Defense Siren	130	Threshold of Pain	64 times as loud
Hard Rock Band	120	Threshold of Feeling	32 times as loud
Accelerating Motorcycle at a Few Feet Away	110	Very Loud	16 times as loud
Pile Driver; Noisy Urban Street/ Heavy City Traffic	100	Very Loud	8 times as loud
Ambulance Siren; Food Blender	95	Very Loud	—
Garbage Disposal	90	Very Loud	4 times as loud
Freight Cars; Living Room Music	85	Loud	—
Pneumatic Drill; Vacuum Cleaner	80	Loud	2 times as loud
Busy Restaurant	75	Moderately Loud	—
Near Freeway Auto Traffic	70	Moderately Loud	Reference level
Average Office	60	Quiet	One-half as loud
Suburban Street	55	Quiet	—
Light Traffic; Soft Radio Music in Apartment	50	Quiet	One-quarter as loud
Large Transformer	45	Quiet	—
Average Residence without Stereo Playing	40	Faint	One-eighth as loud
Soft Whisper	30	Faint	—
Rustling Leaves	20	Very Faint	—
Human Breathing	10	Very Faint	Threshold of Hearing
—	0	Very Faint	—

Source: Compiled by LSA (2022).

FUNDAMENTALS OF VIBRATION

Vibration refers to ground-borne noise and perceptible motion. Ground-borne vibration is almost exclusively a concern inside buildings and is rarely perceived as a problem outdoors, where the motion may not be discernible, but without the effects associated with the shaking of a building there is less adverse reaction. Vibration energy propagates from a source through intervening soil and rock layers to the foundations of nearby buildings. The vibration then propagates from the foundation throughout the remainder of the structure. Building vibration may be perceived by occupants as the motion of building surfaces, the rattling of items sitting on shelves or hanging on walls, or a low-frequency rumbling noise. The rumbling noise is caused by the vibration of walls, floors, and ceilings that radiate sound waves. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by 10 dB or less. This is an order of magnitude below the damage threshold for normal buildings.

Typical sources of ground-borne vibration are construction activities (e.g., blasting, pile-driving, and operating heavy-duty earthmoving equipment), steel-wheeled trains, and occasional traffic on rough roads. Problems with both ground-borne vibration and noise from these sources are usually localized to areas within approximately 100 feet from the vibration source, although there are examples of ground-borne vibration causing interference out to distances greater than 200 feet (FTA 2018). When roadways are smooth, vibration from traffic, even heavy trucks, is rarely perceptible. It is assumed for most projects that the roadway surface will be smooth enough that ground-borne vibration from street traffic will not exceed the impact criteria; however, construction of the project could result in ground-borne vibration that may be perceptible and annoying.

Ground-borne noise is not likely to be a problem because noise arriving via the normal airborne path will usually be greater than ground-borne noise.

Ground-borne vibration has the potential to disturb people and damage buildings. Although it is very rare for train-induced ground-borne vibration to cause even cosmetic building damage, it is not uncommon for construction processes such as blasting and pile-driving to cause vibration of sufficient amplitudes to damage nearby buildings (FTA 2018). Ground-borne vibration is usually measured in terms of vibration velocity, either the root-mean-square (RMS) velocity or peak particle velocity (PPV). The RMS is best for characterizing human response to building vibration, and PPV is used to characterize the potential for damage. Decibel notation acts to compress the range of numbers required to describe vibration. Vibration velocity level in decibels is defined as

$$L_v = 20 \log_{10} [V/V_{ref}]$$

where “L_v” is the vibration velocity in decibels (VdB), “V” is the RMS velocity amplitude, and “V_{ref}” is the reference velocity amplitude, or 1×10^{-6} inches/second (in/sec) used in the United States.

REGULATORY SETTING

APPLICABLE NOISE STANDARDS

The applicable noise standards governing the project site include the criteria in the City of Torrance's General Plan Noise Element (Noise Element) and the City of Torrance Municipal Code (TMC).

City of Torrance

Noise Element of the General Plan

The Noise Element provides guidelines related to noise, including the land use compatibility guidelines for community exterior noise environments. The Noise Element indicates that for industrial buildings an exterior level of 75 dBA CNEL is normally acceptable. A CNEL above 75 dBA requires that noise insulation features are included in the project design. The Noise Element requires an interior level no higher than 55 dBA CNEL for industrial uses.

Municipal Code

Operational Noise Standards. Chapter 6, Article 7, Section 46.7.2 of the TMC sets the noise limits at industrial and commercial boundaries for non-transportation or stationary noise sources. For the purposes of Chapter 6 of the TMC, the City is divided into 3 regions. Each region has its own set noise limits that future development shall not exceed. The project is located within Region 1 and the limits are as summarized in Table C. These standards are designed to protect noise sensitive land uses adjacent to stationary sources from excessive noise and represent the acceptable exterior noise levels at the sensitive receptor.

Table C: Maximum Allowable Noise Exposure – Stationary Noise Sources

Region	Daytime (7:00 a.m. to 10:00 p.m.) L_{eq}	Nighttime (10:00 p.m. to 7:00 a.m.) L_{eq}
1	70 dBA	65 dBA

Source: City of Torrance (2023).
Notes:
[1] Region 1 includes the predominantly industrial areas in and around the refineries and industrial uses on the northern edge of the City.
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level

Construction Noise Standards. The City addresses construction noise in Section 46.3.1, Construction of buildings and projects, of the TMC which states that construction noise shall not exceed 50 dBA as measured at property lines, except between the hours of 7:30 A.M. to 6:00 P.M. Monday through Friday and 9:00 A.M. to 5:00 P.M. on Saturdays. Construction shall be prohibited on Sundays and Holidays observed by City Hall.

State of California Green Building Standards Code

The State of California's Green Building Standards Code (CALGreen Code) contains mandatory measures for non-residential building construction in Section 5.507 on Environmental Comfort. These noise standards are applied to new construction in California for controlling interior noise levels resulting from exterior noise sources. The regulations specify that acoustical studies must be prepared when non-residential structures are developed in areas where the exterior noise levels exceed 65 dBA CNEL, such as within a noise contour of an airport, freeway, railroad, and other noise source. If the development falls within an airport or freeway 65 dBA CNEL noise contour, buildings shall be constructed to provide an interior noise level environment attributable to exterior sources that does not exceed an hourly equivalent level of 50 dBA L_{eq} in occupied areas during any hour of operation.

Federal Transit Administration

Though the City does not have daytime construction noise level limits for activities that occur with the specified hours of the TMC, to determine potential California Environmental Quality Act (CEQA) noise impacts, construction noise was assessed using criteria from the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018) (FTA Manual). Table D shows the FTA's Detailed Assessment Construction Noise Criteria based on the composite noise levels per construction phase.

Table D: Detailed Assessment Daytime Construction Noise Criteria

Land Use	Daytime 1-hour L_{eq} (dBA)
Residential	80
Commercial	85
Industrial	90

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level

APPLICABLE VIBRATION STANDARDS

Federal Transit Administration

Vibration standards included in the FTA Manual are used in this analysis for ground-borne vibration impacts on human annoyance. The criteria for environmental impact from ground-borne vibration and noise are based on the maximum levels for a single event. Table E provides the criteria for assessing the potential for interference or annoyance from vibration levels in a building.

Table E: Interpretation of Vibration Criteria for Detailed Analysis

Land Use	Max L_v (VdB)[1]	Description of Use
Workshop	90	Vibration that is distinctly felt. Appropriate for workshops and similar areas not as sensitive to vibration.
Office	84	Vibration that can be felt. Appropriate for offices and similar areas not as sensitive to vibration.
Residential Day	78	Vibration that is barely felt. Adequate for computer equipment and low-power optical microscopes (up to 20×).
Residential Night and Operating Rooms	72	Vibration is not felt, but ground-borne noise may be audible inside quiet rooms. Suitable for medium-power microscopes (100×) and other equipment of low sensitivity.

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
[1] As measured in 1/3-Octave bands of frequency over the frequency range 8 to 80 Hertz.
FTA = Federal Transit Administration
Max = maximum
L_V = velocity in decibels
VdB = vibration velocity decibels

California Department of Transportation

Table F lists the potential vibration building damage criteria associated with construction activities, as suggested in the California Department of Transportation (Caltrans) *Transportation and Construction Vibration Guidance Manual*. (Caltrans 2020) (Caltrans Manual). Caltrans guidelines show that a vibration level of up to 0.5 in/sec in PPV is considered safe for newer residential structures and modern industrial or commercial buildings and would not result in any construction vibration damage. For older residential structures, the construction building vibration damage criterion is 0.3 in/sec in PPV.

Table F: Construction Vibration Damage Criteria

Structure / Condition	PPV (in/sec)
Extremely fragile historic buildings, ruins, ancient monuments	0.08
Fragile buildings	0.10
Historic and some old buildings	0.25
Older residential structures	0.30
New residential structures	0.50
Modern industrial / commercial buildings	0.50

Source: Table 19-*Transportation and Construction Vibration Guidance Manual* (Caltrans 2020).
in/sec = inch/inches per second
PPV = peak particle velocity

OVERVIEW OF THE EXISTING NOISE ENVIRONMENT

The primary existing noise sources in the project area are traffic on Del Amo Boulevard, industrial uses in the vicinity of the project site, and infrequent parking lot activities.

AMBIENT NOISE MEASUREMENTS

Long-Term Noise Measurements

To assess existing noise levels, LSA conducted three long-term noise measurements in the vicinity of the project site. The long-term (24-hour) noise level measurements were conducted on April 19 through April 20, 2022, using two Larson Davis Spark 706RC dosimeters. Table G provides a summary of the measured hourly noise levels and calculated CNEL level from the long-term noise level measurements. As shown in Table G, the calculated CNEL levels range from 58.1 dBA CNEL to 61.2 dBA CNEL. Hourly noise levels at surrounding sensitive uses are as low as 44.1 dBA L_{eq} during nighttime hours and 51.4 dBA L_{eq} during daytime hours. Noise measurement sheets are provided in Appendix A. Figure 3 shows the long-term monitoring locations.

Table G: Long-Term 24-Hour Ambient Noise Monitoring Results

Location		Daytime Noise Levels[1] (dBA L_{eq})	Evening Noise Levels[2] (dBA L_{eq})	Nighttime Noise Levels[3] (dBA L_{eq})	Daily Noise Levels (dBA CNEL)
LT-1	Northwest corner of the project site, on a light pole near 2336 Madrid Avenue, approximately 150 feet away from Del Amo Boulevard centerline.	56.7 – 59.9	54.7 – 57.5	47.4 – 58.6	61.2
LT-2	Northeast corner of the project site, on a tree south of 2272 Del Amo Boulevard, approximately 160 feet away from Del Amo Boulevard centerline.	51.4 – 58.3	53.7 – 56.6	44.1 – 52.8	58.1

Source: Compiled by LSA (2023).
Note: Noise measurements were conducted from April 19 to April 20, 2022, starting at 3:00 p.m.
1 Daytime Noise Levels = noise levels during the hours from 7:00 a.m. to 7:00 p.m.
2 Evening Noise Levels = noise levels during the hours from 7:00 p.m. to 10:00 p.m.
3 Nighttime Noise Levels = noise levels during the hours from 10:00 p.m. to 7:00 a.m.
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level
CNEL = Community Noise Equivalent Level

EXISTING AIRCRAFT NOISE

Aircraft flyovers may be audible on the project site due to aircraft activity in the vicinity. The nearest airport to the project is Torrance Municipal Airport, approximately 8 miles to the south. The project site is well outside the 60 dBA CNEL noise contour based on Figure N-3 of the City's Noise Element (City of Torrance 2010). Because the project site is outside the 60 dBA CNEL noise contour, no further analysis associated with aircraft noise impacts is necessary.

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FIGURE 3

LEGEND

Project Site Boundary

LT-1 Long-Term Noise Monitoring Location

N

0 170 340
FEET

SOURCE: Google Earth 2021

205th Torrance Industrial

Noise Monitoring Locations

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PROJECT IMPACTS

SHORT-TERM CONSTRUCTION NOISE IMPACTS

Two types of short-term noise impacts could occur during the construction of the proposed project. First, construction crew commutes and the transport of construction equipment and materials to the site for the proposed project would incrementally increase noise levels on access roads leading to the site. Although there would be a relatively high single-event noise-exposure potential causing intermittent noise nuisance (passing trucks at 50 feet would generate up to 84 dBA L_{max}), the effect on longer-term ambient noise levels would be small compared to existing daily traffic volumes on West 205th Street. The results of the California Emissions Estimator Model (CalEEMod) for the proposed project indicate during the building construction phase an additional 645 passenger car equivalent (PCE) vehicles, composed of worker and hauling trips, would be added to the adjacent roadway to the project site. Based on the *Citywide Traffic Analysis for the City of Torrance* (RBF Consulting 2008) the traffic volume on 208th Street, assumed to be the main construction access, is 2,900 vehicles. The expected traffic noise level increase would be slightly less than 1 dBA. A noise level increase of less than 3 dBA would not be perceptible to the human ear in an outdoor environment. Therefore, short-term, construction-related impacts associated with worker commute and equipment transport to the project site would be less than significant.

The second type of short-term noise impact is related to noise generated during construction, which includes demolition of the existing structures and other site improvements, site preparation, grading, building construction, paving, and architectural coating on the project site. Construction is completed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the site and, therefore, the noise levels surrounding the site as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table H lists typical construction equipment noise levels recommended for noise impact assessments, based on a distance of 50 feet between the equipment and a noise receptor, taken from the FHWA *Roadway Construction Noise Model* (FHWA 2006).

In addition to the reference maximum noise level, the usage factor provided in Table H is used to calculate the hourly noise level impact for each piece of equipment based on the following equation:

$$L_{eq}(equip) = E.L. + 10\log(U.F.) - 20\log\left(\frac{D}{50}\right)$$

where: $L_{eq}(equip)$ = L_{eq} at a receiver resulting from the operation of a single piece of equipment over a specified time period.

E.L. = noise emission level of the particular piece of equipment at a reference distance of 50 ft.

U.F. = usage factor that accounts for the fraction of time that the equipment is in use over the specified period of time.

D = distance from the receiver to the piece of equipment.

Table H: Typical Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (%)[1]	Maximum Noise Level (L_{max}) at 50 Feet[2]
Auger Drill Rig	20	84
Backhoes	40	80
Compactor (ground)	20	80
Compressor	40	80
Cranes	16	85
Dozers	40	85
Dump Trucks	40	84
Excavators	40	85
Flat Bed Trucks	40	84
Forklift	20	85
Front-end Loaders	40	80
Graders	40	85
Impact Pile Drivers	20	95
Jackhammers	20	85
Paver	50	77
Pickup Truck	40	55
Pneumatic Tools	50	85
Pumps	50	77
Rock Drills	20	85
Rollers	20	85
Scrapers	40	85
Tractors	40	84
Trencher	50	80
Welder	40	73

Source: FHWA Roadway Construction Noise Model User's Guide, Table 1 (FHWA 2006).
Note: Noise levels reported in this table are rounded to the nearest whole number.

[1] Usage factor is the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power.

[2] Maximum noise levels were developed based on Specification 721.560 from the Central Artery/Tunnel program to be consistent with the City of Boston's Noise Code for the "Big Dig" project.

FHWA = Federal Highway Administration
L_{max} = maximum instantaneous sound level

Each piece of construction equipment operates as an individual point source. Using the following equation, a composite noise level can be calculated when multiple sources of noise operate simultaneously:

$$Leq\ (composite) = 10 * \log_{10}\left(\sum_{1}^{n} 10^{\frac{Ln}{10}}\right)$$

Using the equations from the methodology above, the reference information in Table H, and the construction equipment list provided, the composite noise level of each construction phase was calculated. The project construction composite noise levels at a distance of 50 feet would range from 74 dBA L_{eq} to 88 dBA L_{eq}, with the highest noise levels occurring during the site preparation phase.

Once composite noise levels are calculated, reference noise levels can then be adjusted for distance using the following equation:

$$Leq\ (at\ distance\ X) = Leq\ (at\ 50\ feet) - 20 * \log_{10}\left(\frac{X}{50}\right)$$

In general, this equation shows that doubling the distance would decrease noise levels by 6 dBA while halving the distance would increase noise levels by 6 dBA.

Table I shows the nearest sensitive uses to the project site, their distance from the center of construction activities, and composite noise levels expected during construction. These noise level projections do not consider intervening topography or barriers. Construction equipment calculations are provided in Appendix B.

Table I: Potential Construction Noise Impacts at Nearest Receptor

Receptor (Location)	Composite Noise Level (dBA L_{eq}) at 50 feet[1]	Distance (feet)	Composite Noise Level (dBA L_{eq})
Residence (North)	88	215	75
Light industrial Uses (South)		255	74
Light industrial Uses (East)		340	71
Light industrial Uses (West)		340	71

Source: Compiled by LSA (2023).
[1] The composite construction noise level represents the site preparation phase which is expected to result in the greatest noise level as compared to other phases.
dBA L_{eq} = average A-weighted hourly noise level

While construction noise will vary, it is expected that composite noise levels during construction at the nearest off-site light industrial uses to the south would approach 74 dBA L_{eq} while construction noise levels would approach 75 dBA L_{eq} at the nearest sensitive residential use to the north during daytime hours. These predicted noise levels would only occur when all construction equipment is operating simultaneously and, therefore, are assumed to be rather conservative in nature. While construction-related short-term noise levels have the potential to be higher than existing ambient noise levels in the project area under existing conditions, the noise impacts would no longer occur once project construction is completed.

As stated above, the City's Noise Ordinance regulates noise impacts associated with construction activities. The proposed project would comply with the construction hours specified in the City's Noise Ordinance, which states that construction activities are allowed between the hours of 7:30 A.M. to 6:00 P.M. Monday through Friday and 9:00 A.M. to 5:00 P.M. on Saturdays.

As it relates to off-site uses, construction-related noise impacts would remain below the 80 dBA L_{eq} and 90 dBA L_{eq} 1-hour construction noise level criteria for daytime construction noise level criteria as established by the FTA for residential and industrial land uses, respectively; therefore, the impact would be considered less than significant.

SHORT-TERM CONSTRUCTION VIBRATION IMPACTS

This construction vibration impact analysis discusses the level of human annoyance using vibration levels in RMS (VdB) and assesses the potential for building damages using vibration levels in PPV (in/sec). This is because vibration levels calculated in RMS are best for characterizing human response to building vibration, while vibration level in PPV is best for characterizing potential for damage.

Table J shows the PPV and VdB values at 25 feet from the construction vibration source. As shown in Table J, bulldozers, and other heavy-tracked construction equipment (expected to be used for this project) generate approximately 0.089 PPV in/sec or 87 VdB of ground-borne vibration when measured at 25 ft, based on the FTA Manual. The distance to the nearest buildings for vibration impact analysis is measured between the nearest off-site buildings and the project construction boundary (assuming the construction equipment would be used at or near the project setback line).

Table J: Vibration Source Amplitudes for Construction Equipment

Equipment	Reference PPV/L_V at 25 ft	
	PPV (in/sec)	L_V (VdB)[1]
Pile Driver (Impact), Typical	0.644	104
Pile Driver (Sonic), Typical	0.170	93
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Large Bulldozer[2]	**0.089**	**87**
Caisson Drilling	0.089	87
Loaded Trucks[2]	**0.076**	**86**
Jackhammer	0.035	79
Small Bulldozer	0.003	58

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).

1 RMS vibration velocity in decibels (VdB) is 1 µin/sec.

2 Equipment shown in **bold** is expected to be used on site.

µin/sec = microinches per second
ft = foot/feet
FTA = Federal Transit Administration
in/sec = inch/inches per second
L_V = velocity in decibels
PPV = peak particle velocity
RMS = root-mean-square
VdB = vibration velocity decibels

The formulae for vibration transmission are provided below, and Tables K and L below provide a summary of off-site construction vibration levels.

$$L_v dB (D) = L_v dB (25 ft) – 30 Log (D/25)$$

$$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$$

Table K: Potential Construction Vibration Annoyance Impacts at Nearest Receptor

Receptor (Location)	Reference Vibration Level (VdB) at 25 ft[1]	Distance (ft)[2]	Vibration Level (VdB)
Residence (North)	87	215	59
Light industrial Uses (South)		255	57
Light industrial Uses (East)		340	53
Light industrial Uses (West)		340	53

Source: Compiled by LSA (2023).

[1] The reference vibration level is associated with a large bulldozer, which is expected to be representative of the heavy equipment used during construction.

[2] The reference distance is associated with the average condition, identified by the distance from the center of construction activities to surrounding uses.

ft = foot/feet

VdB = vibration velocity decibels

Table L: Potential Construction Vibration Damage Impacts at Nearest Receptor

Receptor (Location)	Reference Vibration Level (PPV) at 25 ft[1]	Distance (ft)[2]	Vibration Level (PPV)
Residence (North)	0.089	10	0.352
Light industrial Uses (South)		80	0.016
Light industrial Uses (East)		70	0.019
Light industrial Uses (West)		55	0.027

Source: Compiled by LSA (2023).

[1] The reference vibration level is associated with a large bulldozer, which is expected to be representative of the heavy equipment used during construction.

[2] The reference distance is associated with the peak condition, identified by the distance from the perimeter of construction activities to surrounding structures.

ft = foot/feet

PPV = peak particle velocity

As shown in Table E, above, the threshold at which vibration levels would result in annoyance would be 84 VdB for office type uses and 78 VdB for daytime residential uses. As shown in Table F, the Caltrans Manual guidelines indicate that, for older residential uses, the construction vibration damage criterion is 0.3 in/sec in PPV and for modern industrial or commercial buildings, the construction vibration damage criterion is 0.5 in/sec in PPV.

Based on the information provided in Table K, vibration levels are expected to approach 59 VdB at the closest residence to the north and 57 VdB at the closest light industrial uses to the south and would not exceed the annoyance thresholds.

Based on the information provided in Table L, vibration levels are expected to approach 0.352 in/sec PPV at the nearest surrounding structures to the north and would exceed the Caltrans Manual threshold of 0.3 in/sec PPV for building damage potential. Vibration levels at all other buildings would be lower. Although construction vibration levels at the nearest buildings would have the potential to result in annoyance, these vibration levels would no longer occur once construction of the project is completed. Therefore, construction would not result in any vibration damage, and impacts would be less than significant with the incorporation of Mitigation Measure NOI-1 as detailed below.

Mitigation Measure NOI-1 Due to the close proximity to surrounding structures, the City of Torrance (City) Director of Community Development, or designee, shall verify prior to issuance of demolition or grading permits, that the approved plans require that the construction contractor shall implement the following mitigation measures during project construction activities to ensure that damage does not occur at surrounding structures should heavy equipment be necessary within 12 feet of surrounding structures:

- Identify structures that are located within 12 feet (ft) of heavy construction activities and that have the potential to be affected by ground-borne vibration. This task shall be conducted by a qualified structural engineer as approved by the City's Director of Community Development, or designee.
- Develop a vibration monitoring and construction contingency plan for approval by the City Director of Community Development, or designee, to identify structures where monitoring would be conducted; set up a vibration monitoring schedule; define structure-specific vibration limits; and address the need to conduct photo, elevation, and crack surveys to document before and after construction conditions. Construction contingencies would be identified for when vibration levels approached the limits.
- At a minimum, monitor vibration during initial site preparation activities. Monitoring results may indicate the need for more or less intensive measurements.
- When vibration levels approach limits, suspend construction and implement contingencies as identified in the approved vibration monitoring and construction contingency plan to either lower vibration levels or secure the affected structures.

Because construction activities are regulated by the City's Municipal Code, which states that construction activities are allowed between the hours of 7:30 A.M. to 6:00 P.M. Monday through Friday and 9:00 A.M. to 5:00 P.M. on Saturdays, vibration impacts would not occur during the more sensitive nighttime hours.

LONG-TERM OFF-SITE TRAFFIC NOISE IMPACTS

As a result of the implementation of the proposed project, off-site traffic volumes on surrounding roadways have the potential to increase. The proposed project trips generated were obtained from the *Trip Generation and Vehicle Miles Traveled (VMT) Screening Analysis* (EPD Solutions, Inc. 2023). The proposed project would generate a net decrease of 138 daily PCE trips compared to the existing use. Due to the daily decrease in traffic volumes associated with the proposed project, there would be no traffic noise impacts from project-related traffic to off-site sensitive receptors. No noise reduction measures are required.

LONG-TERM TRAFFIC-RELATED VIBRATION IMPACTS

The proposed project would not generate vibration levels related to on-site operations. In addition, vibration levels generated from project-related traffic on the adjacent roadways are unusual for on-road vehicles because the rubber tires and suspension systems of on-road vehicles provide vibration isolation. Based on a reference vibration level of 0.076 in/sec PPV, structures greater than 20 feet from the roadways that contain project trips would experience vibration levels below the most conservative standard of 0.3 in/sec PPV; therefore, vibration levels generated from project-related traffic on the adjacent roadways would be less than significant, and no mitigation measures are required.

LONG-TERM OFF-SITE STATIONARY NOISE IMPACTS

Adjacent off-site land uses would be potentially exposed to stationary-source noise impacts from the proposed on-site heating, ventilation, and air conditioning (HVAC) equipment, and truck deliveries and loading and unloading activities. The potential noise impacts to off-site sensitive land uses from the proposed HVAC equipment and truck delivery activities are discussed below. To provide a conservative analysis, it is assumed that operations would occur equally during all hours of the day and that half the 25 loading docks would be active at all times. Additionally, it is assumed that within any given hour, 3 heavy trucks would maneuver to park near or back into one of the proposed loading docks. To determine the future noise impacts from project operations to the noise sensitive uses, a 3-D noise model, SoundPLAN, was used to incorporate the site topography as well as the shielding from the proposed building on-site and the proposed 8 feet wall at the northern boundary of the project site. Appendix C presents a graphic representation of the operational noise impacts.

Heating, Ventilation, and Air Conditioning Equipment

The project would have various rooftop mechanical equipment, including HVAC units, atop the proposed building. Based on the project site plan, the project is proposed to have four rooftop HVAC units assumed to operate 24 hours per day. The HVAC equipment could operate 24 hours per day and would generate sound power levels (SPL) of up to 87 dBA SPL or 72 dBA L_{eq} at 5 feet, based on manufacturer data (Trane n.d.).

Trash Bin Emptying Activities

The project is estimated to have two trash dumpsters near the northern property line of the proposed project site. The trash emptying activities would take place for a period less than 1 minute and would generate SPLs of up to 118.6 dBA SPL or 84 dBA L_{eq} at 50 feet, based on reference information within SoundPLAN.

Cold Storage Fan Units

According to the project description, approximately 50 percent of the project site would be cold storage. Noise levels generated by cold storage fan units would be similar to noise readings from previously gathered reference noise level measurements, which generate a noise level of 57.5 dBA L_{eq} at 60 feet based on measurements taken by LSA (*Operational Noise Impact Analysis for Richmond Wholesale Meat Distribution Center* [LSA 2016]).

Truck Deliveries and Truck Loading and Unloading Activities

Noise levels generated by delivery trucks would be similar to noise readings from truck loading and unloading activities, which generate a noise level of 75 dBA L_{eq} at 20 feet based on measurements taken by LSA (*Operational Noise Impact Analysis for Richmond Wholesale Meat Distribution Center* [LSA 2016]). Shorter term noise levels that occurred during the docking process taken by LSA were measured to be 76.3 dBA L_8 at 20 ft. Delivery trucks would arrive on site and maneuver their trailers so that trailers would be parked within the loading docks. During this process, noise levels are associated with the truck engine noise, air brakes, and back-up alarms while the truck is backing into the dock. These noise levels would occur for a shorter period of time (less than 5 minutes). After a truck enters the loading dock, the doors would be closed, and the remainder of the truck loading activities would be enclosed and therefore much less perceptible. To present a conservative assessment, it is assumed that truck arrivals and departure activities could take place at 3 spaces for a period of less than 5 minutes each and unloading activities could occur at 13 docks simultaneously for a period of more than 30 minutes in a given hour.

Cumulative Operations Noise Assessment

Tables M and N below show the combined hourly noise levels generated by HVAC equipment, trash bin emptying activities, cold storage fan units, and truck delivery activities at the closest off-site sensitive land uses.

The results in Tables M and N show that project-generated noise levels will not exceed the residential use daytime noise standard of 70 dBA L_{eq} and the residential use nighttime noise standard of 65 dBA L_{eq} at the closest sensitive uses to the north. Therefore, the impact would be less than significant, and no noise reduction measures are required.

Table M: Daytime Exterior Noise Level Impacts

Receptor	Direction	Existing Quietest Daytime Noise Level (dBA L_{eq})	Project Generated Noise Levels (dBA L_{eq})	Potential Operational Noise Impact?[1]
Residence (2264 Del Amo Blvd)	Northeast	51.4	60.6	No
Residence (2276 Del Amo Blvd)	North	51.4	59.0	No
Pueblo Park	North	56.7	55.6	No
Residence (2334 Madrid Ave.)	Northwest	56.7	59.0	No

Source: Compiled by LSA (2023).

[1] A potential operational noise impact would occur if (1) the quietest daytime ambient hour is less than 70 dBA L_{eq} and project noise impacts are greater than 70 dBA L_{eq}, OR (2) the quietest daytime ambient hour is greater than 70 dBA L_{eq} and project noise impacts are 3 dBA greater than the quietest daytime ambient hour.

dBA = A-weighted decibels

L_{eq} = equivalent noise level

Table N: Nighttime Exterior Noise Level Impacts

Receptor	Direction	Existing Quietest Nighttime Noise Level (dBA L_{eq})	Project Generated Noise Levels (dBA L_{eq})	Potential Operational Noise Impact?[1]
Residence (2264 Del Amo Blvd)	Northeast	44.1	60.4	No
Residence (2276 Del Amo Blvd)	North	44.1	58.7	No
Pueblo Park	North	47.4	55.3	No
Residence (2334 Madrid Ave.)	Northwest	47.4	58.7	No

Source: Compiled by LSA (2023).

[1] A potential operational noise impact would occur if (1) the quietest nighttime ambient hour is less than 65 dBA L_{eq} and project noise impacts are greater than 65 dBA L_{eq}, OR (2) the quietest nighttime ambient hour is greater than 65 dBA L_{eq} and project noise impacts are 3 dBA greater than the quietest nighttime ambient hour.

dBA = A-weighted decibels

L_{eq} = equivalent noise level

REFERENCES

City of Torrance. 2010. *General Plan Noise Element*. April.

_______. 2023. Municipal Code. January. Website: https://www.codepublishing.com/CA/Torrance (accessed May 2023).

EPD Solutions, Inc. 2023. *Trip Generation and Vehicle Miles Traveled (VMT) Screening Analysis.* February 14.

Federal Highway Administration (FHWA). 2006. *FHWA Roadway Construction Noise Model User's Guide.* January. Washington, D.C. Website: www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/rcnm.pdf (accessed May 2023).

Federal Transit Administration (FTA). 2018. *Transit Noise and Vibration Impact Assessment Manual*. Office of Planning and Environment. Report No. 0123. September.

Harris, Cyril M., editor. 1991. *Handbook of Acoustical Measurements and Noise Control*. Third Edition.

LSA Associates, Inc. (LSA). 2016. *Operational Noise Impact Analysis for Richmond Wholesale Meat Distribution Center*. May.

RBF Consulting. 2008. *Citywide Traffic Analysis for the City of Torrance.* June 3.

State of California. 2020. *2019 California Green Building Standards Code.*

Trane. n.d. *Fan Performance - Product Specifications RT-PRC023AU-EN.*

United States Environmental Protection Agency (EPA). 1978. *Protective Noise Levels, Condensed Version of EPA Levels Document*, EPA 550/9-79-100. November.

APPENDIX A

NOISE MONITORING DATA

Noise Measurement Survey – 24 HR

Project Number: ESL2201.18
Project Name: 205th Torrance Warehouse

Test Personnel: Kevin Nguyendo
Equipment: Spark 706RC (SN:18906)

Site Number: LT-1 Date: 4/19/22

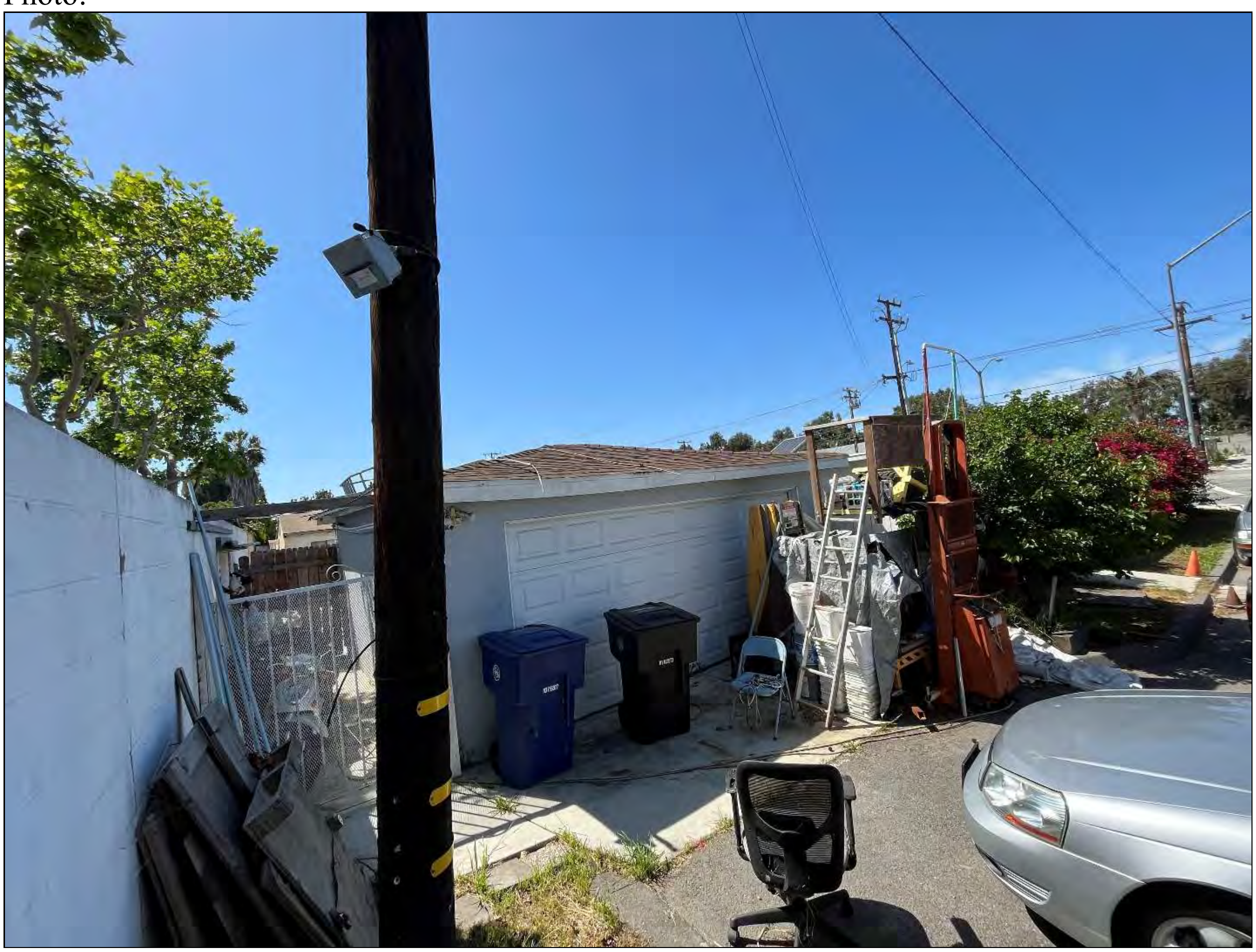
Time: From 3:00 p.m. To 3:00 p.m.

Site Location: Near northwest corner of project site on a light pole. The light pole is on the side of residential address of 2336 Madrid Ave. Torrance, CA 90501. Next to a 6'7" retaining wall.

Primary Noise Sources: Regular traffic noise on Del Amo Blvd and faint parking activity noise from the parking spots north of the project site.

Comments: The retaining wall near the light pole is 6 feet tall.

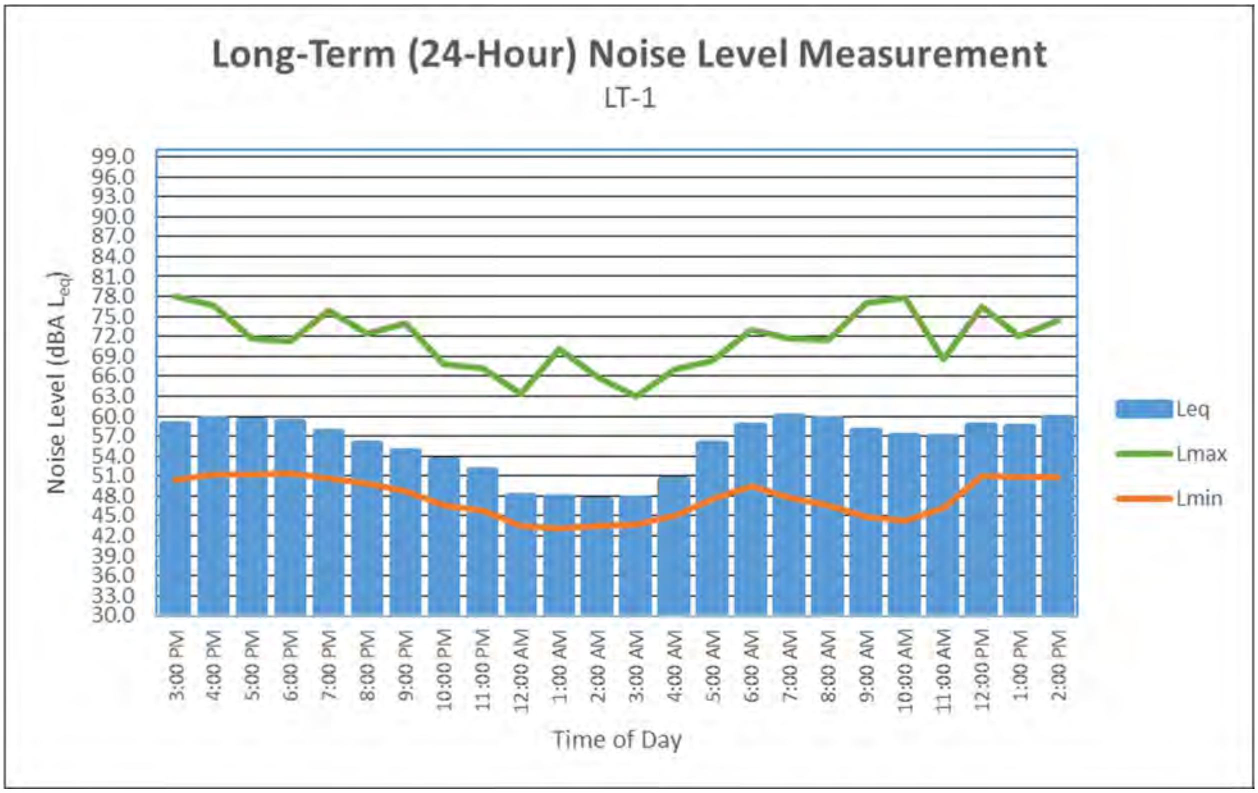
Photo:



Long-Term (24-Hour) Noise Level Measurement Results at LT-1

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
3:00 PM	4/19/22	58.8	78.0	50.5
4:00 PM	4/19/22	59.6	76.7	51.2
5:00 PM	4/19/22	59.3	71.7	51.3
6:00 PM	4/19/22	59.1	71.2	51.4
7:00 PM	4/19/22	57.5	75.9	50.7
8:00 PM	4/19/22	55.8	72.5	49.9
9:00 PM	4/19/22	54.7	73.9	48.7
10:00 PM	4/19/22	53.3	67.9	46.6
11:00 PM	4/19/22	51.8	67.2	45.8
12:00 AM	4/20/22	48.0	63.4	43.5
1:00 AM	4/20/22	47.7	70.1	43.1
2:00 AM	4/20/22	47.4	65.9	43.6
3:00 AM	4/20/22	47.7	62.9	43.7
4:00 AM	4/20/22	50.5	67.1	45.1
5:00 AM	4/20/22	55.8	68.4	47.5
6:00 AM	4/20/22	58.6	73.0	49.5
7:00 AM	4/20/22	59.9	71.6	47.7
8:00 AM	4/20/22	59.5	71.4	46.7
9:00 AM	4/20/22	57.8	77.0	44.8
10:00 AM	4/20/22	57.1	77.8	44.3
11:00 AM	4/20/22	56.7	68.6	46.3
12:00 PM	4/20/22	58.6	76.5	51.0
1:00 PM	4/20/22	58.3	72.0	50.8
2:00 PM	4/20/22	59.7	74.3	50.8

Source: Compiled by LSA Associates, Inc. (2022).
dBA = A-weighted decibel
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level
L_{min} = minimum measured sound level



Long-Term (24-Hour) Noise Level Measurement
LT-1
Noise Level (dBA L_{eq})
99.0
96.0
93.0
90.0
87.0
84.0
81.0
78.0
75.0
72.0
69.0
66.0
63.0
60.0
57.0
54.0
51.0
48.0
45.0
42.0
39.0
36.0
33.0
30.0
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
Time of Day
Leq
Lmax
Lmin

Noise Measurement Survey – 24 HR

Project Number: ESL2201.18
Project Name: 205th Torrance Warehouse

Test Personnel: Kevin Nguyendo
Equipment: Spark 706RC (SN:18907)

Site Number: LT-2 Date: 4/19/22

Time: From 3:00 p.m. To 3:00 p.m.

Site Location: Near northeast corner of project site on a tree. It is the second tree to the west starting at the most northeast tree.

Primary Noise Sources: Intermittent noise from cars parking and loading/unloading cargo.

Comments:

Photo:

Long-Term (24-Hour) Noise Level Measurement Results at LT-2

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
3:00 PM	4/19/22	58.3	78.5	51.8
4:00 PM	4/19/22	57.6	72.3	51.5
5:00 PM	4/19/22	57.2	70.9	52.4
6:00 PM	4/19/22	58.3	69.4	52.1
7:00 PM	4/19/22	56.6	70.2	52.3
8:00 PM	4/19/22	54.5	62.2	51.2
9:00 PM	4/19/22	53.7	64.2	50.5
10:00 PM	4/19/22	52.8	70.3	48.2
11:00 PM	4/19/22	52.3	57.9	48.0
12:00 AM	4/20/22	47.3	58.8	41.3
1:00 AM	4/20/22	44.1	57.8	41.1
2:00 AM	4/20/22	44.7	58.9	41.0
3:00 AM	4/20/22	44.4	52.1	41.1
4:00 AM	4/20/22	45.5	54.1	42.6
5:00 AM	4/20/22	48.8	57.2	44.6
6:00 AM	4/20/22	50.9	64.0	45.9
7:00 AM	4/20/22	52.9	67.3	45.5
8:00 AM	4/20/22	54.8	77.4	44.1
9:00 AM	4/20/22	51.4	63.1	43.2
10:00 AM	4/20/22	51.9	71.6	42.4
11:00 AM	4/20/22	55.1	66.6	45.3
12:00 PM	4/20/22	56.5	65.0	52.3
1:00 PM	4/20/22	55.9	72.7	51.2
2:00 PM	4/20/22	58.1	76.4	51.6

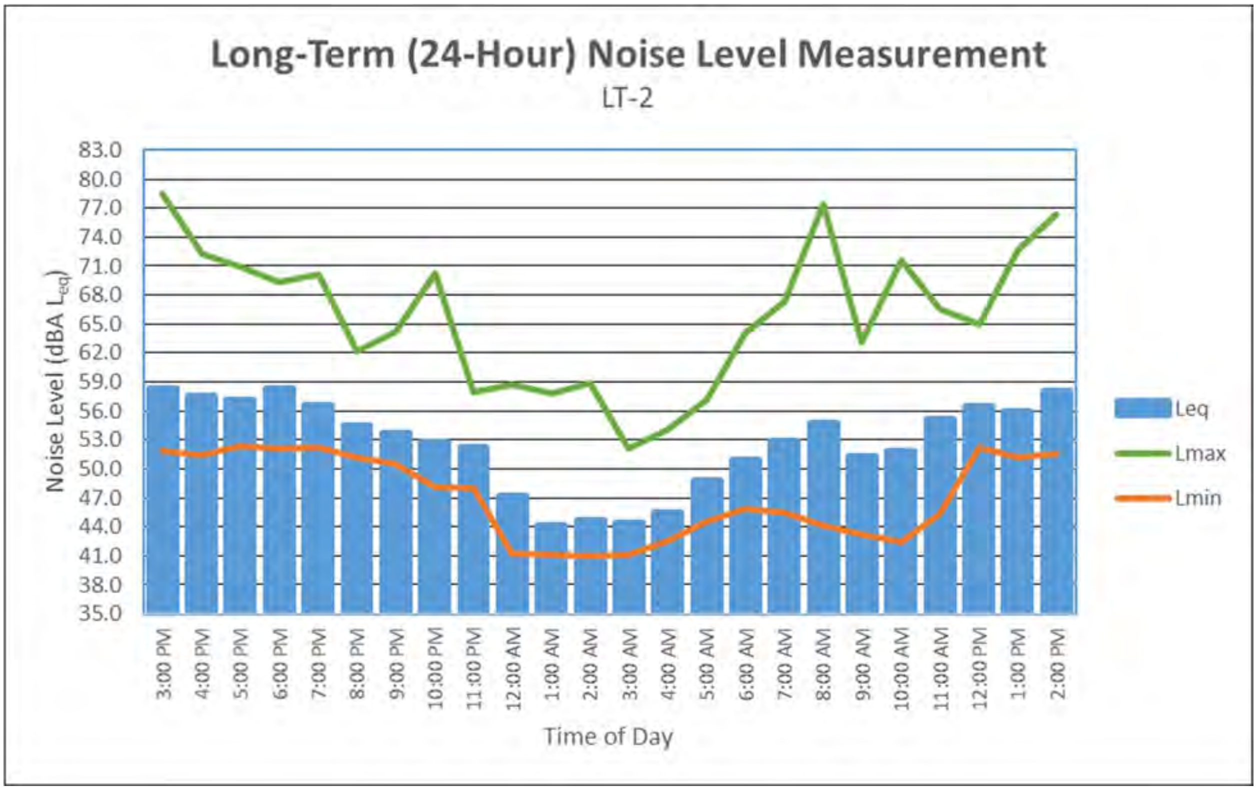
Source: Compiled by LSA Associates, Inc. (2022).

dBA = A-weighted decibel

L_{eq} = equivalent continuous sound level

L_{max} = maximum instantaneous noise level

L_{min} = minimum measured sound level



Long-Term (24-Hour) Noise Level Measurement
LT-2
83.0
80.0
77.0
74.0
71.0
68.0
65.0
62.0
59.0
56.0
53.0
50.0
47.0
44.0
41.0
38.0
35.0
Noise Level (dBA Leq)
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
Time of Day
Leq
Lmax
Lmin

APPENDIX B

CONSTRUCTION NOISE LEVEL CALCULATIONS

Construction Calculations

Phase: Demolition

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Concrete Saw	1	90	20	50	0.5	90	83
Excavator	3	81	40	50	0.5	81	82
Dozer	2	82	40	50	0.5	82	81
					Combined at 50 feet	**91**	**87**
					Combined at Receptor 215 feet	**78**	**74**

Phase: Site Preparation

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Tractor	4	84	40	50	0.5	84	86
Dozer	3	82	40	50	0.5	82	83
					Combined at 50 feet	**86**	**88**
					Combined at Receptor 215 feet	**73**	**75**
					Combined at Receptor 255 feet	**72**	**74**
					Combined at Receptor 340 feet	**69**	**71**

Phase: Grading

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Grader	1	85	40	50	0.5	85	81
Dozer	1	82	40	50	0.5	82	78
Tractor	3	84	40	50	0.5	84	85
Excavator	1	81	40	50	0.5	81	77
					Combined at 50 feet	**89**	**87**
					Combined at Receptor 215 feet	**77**	**75**

Phase:Building Construstion

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Crane	1	81	16	50	0.5	81	73
Man Lift	3	75	20	50	0.5	75	73
Generator	1	81	50	50	0.5	81	78
Tractor	3	84	40	50	0.5	84	85
Welder / Torch	1	74	40	50	0.5	74	70
					Combined at 50 feet	**87**	**86**
					Combined at Receptor 215 feet	**75**	**73**

Phase:Paving

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Paver	2	77	50	50	0.5	77	77
All Other Equipment > 5 HP	2	85	50	50	0.5	85	85
Roller	2	80	20	50	0.5	80	76
					Combined at 50 feet	**87**	**86**
					Combined at Receptor 215 feet	**74**	**73**

Phase:Architectural Coating

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Compressor (air)	1	78	40	50	0.5	78	74
					Combined at 50 feet	**78**	**74**
					Combined at Receptor 215 feet	**65**	**61**

Sources: RCNM

[1]- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

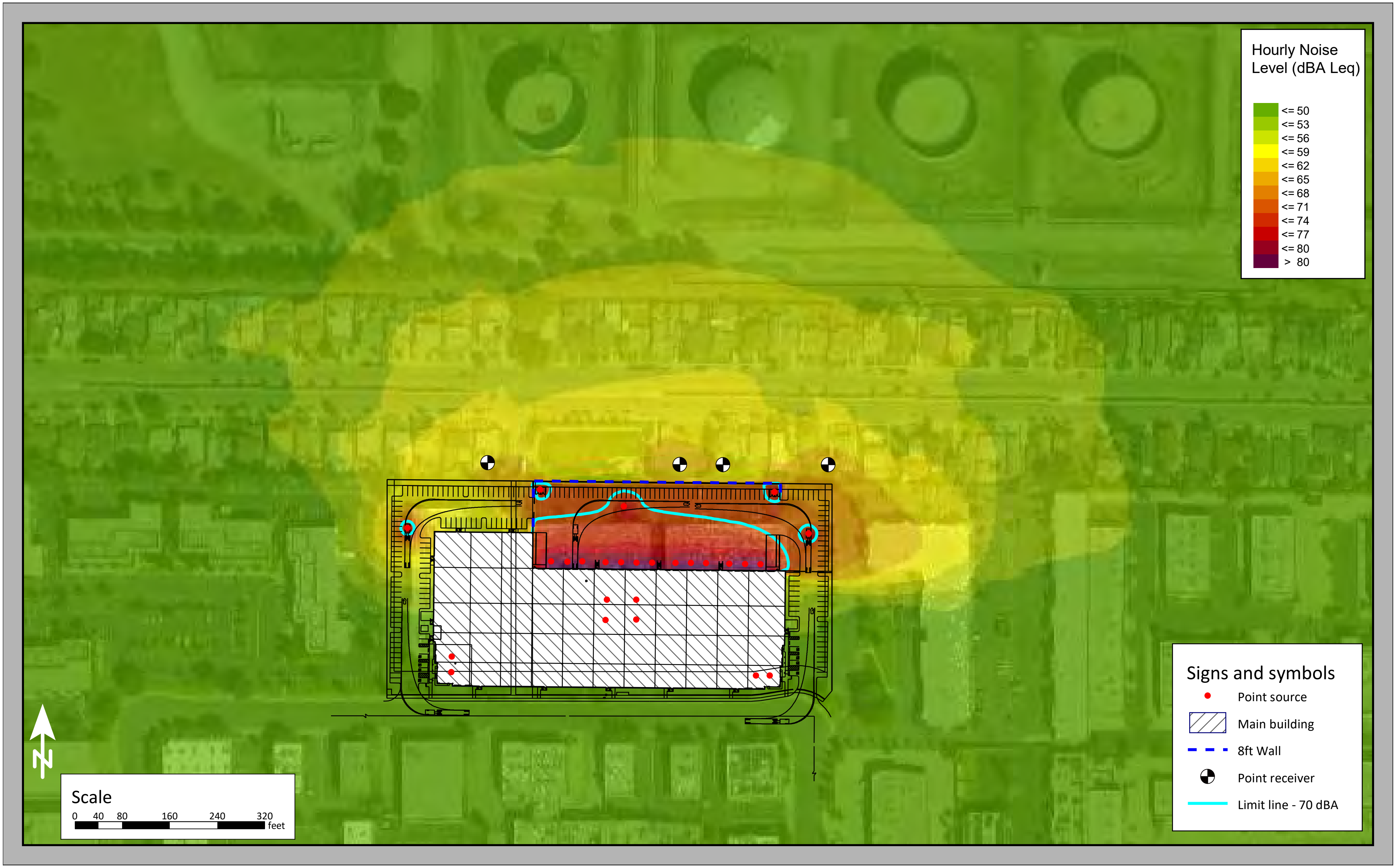
APPENDIX C

SOUNDPLAN NOISE MODEL PRINTOUTS

205th Torrance Industrial

Project No. ESL2201.18

Project Operational Noise Levels - Daytime



205th Torrance Industrial

Project No. ESL2201.18

Project Operational Noise Levels - Nighttime