# TORRANCE PRAIRIE AVENUE WAREHOUSE PROJECT

# NOISE & VIBRATION IMPACT STUDY

**Prepared for**
**CITY OF TORRANCE**

**Prepared by**
**TERRY A. HAYES ASSOCIATES INC.**

environmental planners

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taha 2019-057

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## 1.0 SUMMARY OF FINDINGS

Terry A. Hayes Associates Inc. (TAHA) completed a noise and vibration impact analysis for the proposed Prairie Avenue Warehouse Project (proposed project). The analysis assesses construction and operational impacts associated with the proposed project. Conclusions that address significance determinations under the California Environmental Quality Act (CEQA) Environmental Checklist criteria are shown in **Table 1-1**. All impacts were determined to be less-than-significant and no mitigation measures are required.

**TABLE 1-1: SUMMARY OF IMPACTS**

| Impact Statement | Proposed Project Level of Significance | Applicable Mitigation Measures |
|---|---|---|
| Would the proposed project result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies? | Less-Than-Significant Impact | None |
| Would the proposed project result in the generation of excessive ground-borne vibration or ground-borne noise levels? | Less-Than-Significant Impact | None |
| For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels? | Less-Than-Significant Impact | None |

**SOURCE**: TAHA, 2019.

# 2.0 INTRODUCTION

## 2.1 PURPOSE OF REPORT

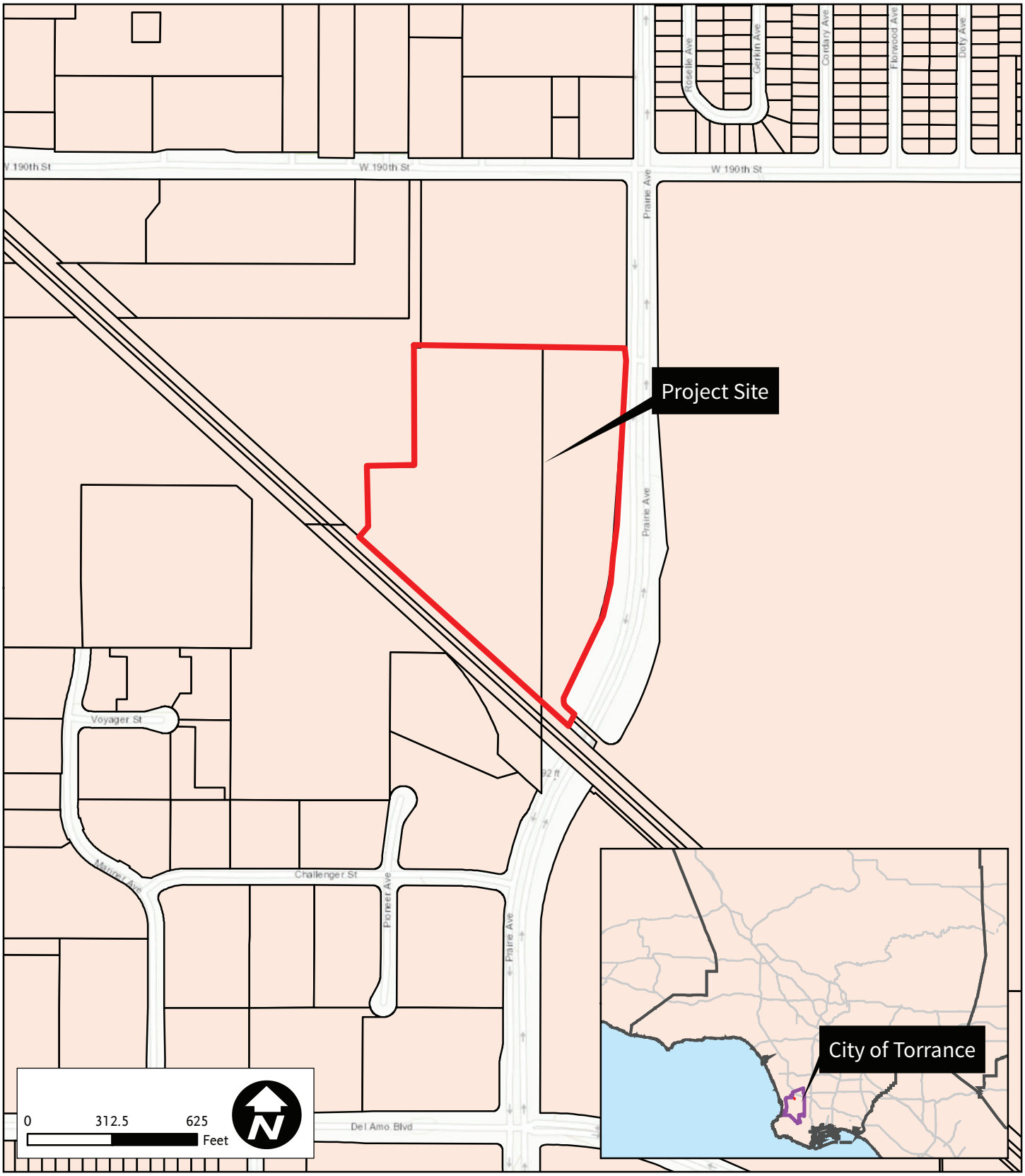
The purpose of this report is to evaluate the potential noise and vibration impacts associated with the proposed project.

## 2.2 PROJECT DESCRIPTION

The proposed project includes the construction of two warehouse buildings totaling 428,020 square feet. The 20.73-acre project site is located west of Prairie Avenue and south of 190th Street in the City of Torrance. There is no assigned street address for this property. The project site is directly adjacent to the Torrance Refinery and is currently used for Torrance Refinery employee parking. It has never been developed for commercial, residential, or agricultural uses. The location of the project site is shown in **Figure 2-1**.

The proposed warehouse buildings would be supported by truck yards, vehicular parking, drive aisles and landscaping. An approximately three-acre area is proposed to be set aside in the northwest portion of the site for a future electrical substation to serve the refinery to the east. Access would be provided from two shared driveways along Prairie Avenue. The existing drive entrance at the northeast corner of the project site would be modified and would also provide access to the future electrical substation. The other proposed entrance is still in the preliminary design phase but anticipates a deceleration lane and ramp down the project site. Proposed off-site improvements include storm drain, street and parkway improvements. Proposed on-site improvements include storm drains, water quality systems, water and sewer systems, and new sewer, water and dry utility connections. The site plan is shown in **Figure 2-2**.

Construction is anticipated to begin in April 2021 and last approximately 11 months. Construction plans estimate 35,500 cubic yards of excavated soil for soil remediation to remain on site and 31,763 cubic yards of imported material for foundations.




Source: TAHA, 2019.

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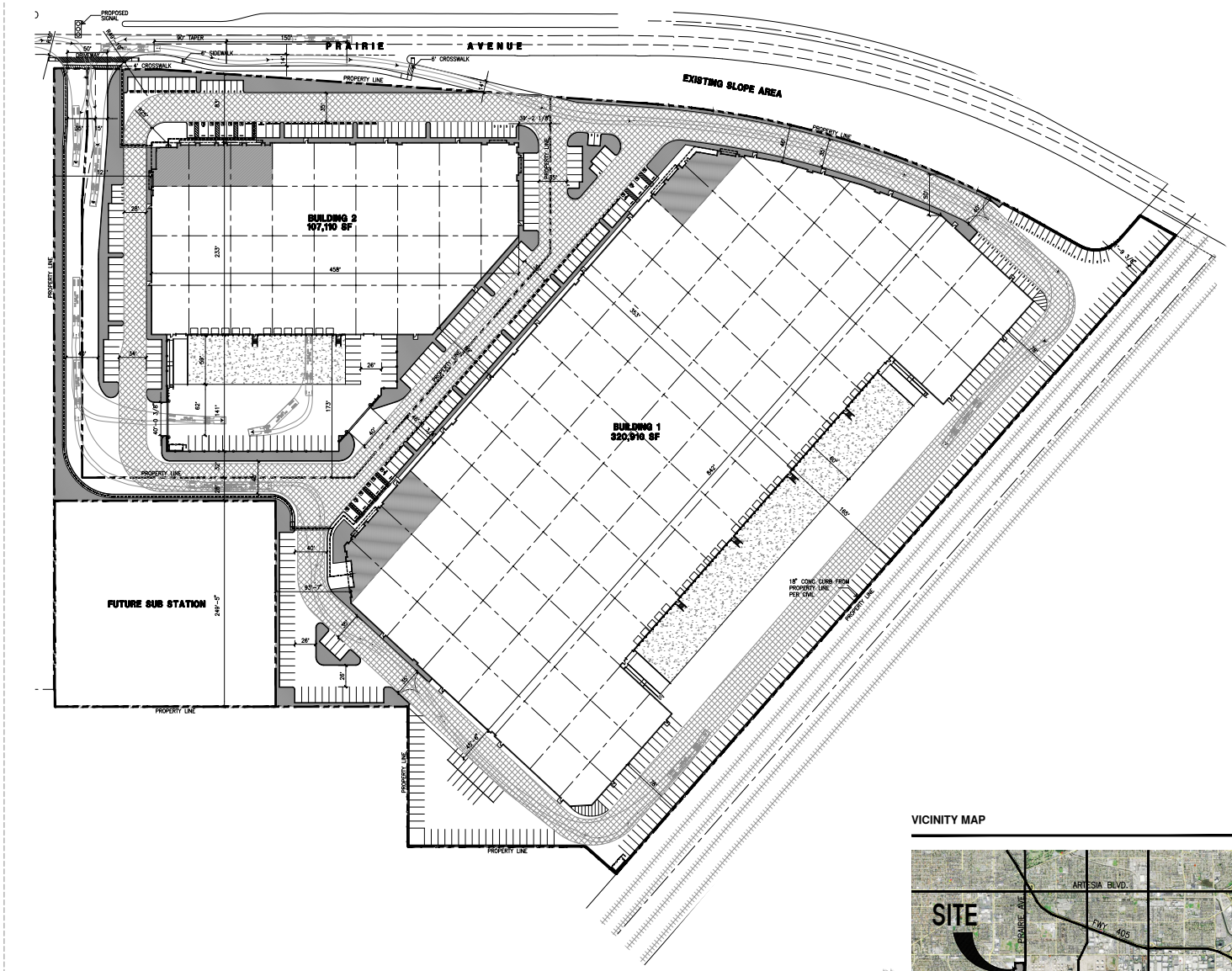
*FIGURE 2-1*

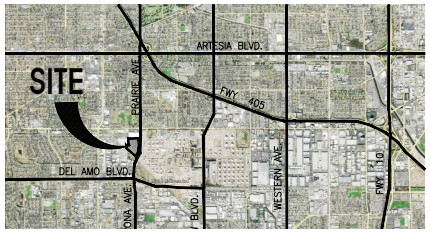
PROJECT LOCATION




## PROJECT DATA

| | BLDG. 1 | BLDG. 2 | TOTAL | |
|---|---|---|---|---|
| **SITE AREA** | | | | |
| in s.f. | 656,582 | 246,449 | 903,031 | s.f. |
| in acres | 15.07 | 5.66 | 20.731 | ac |
| **BUILDING AREA** | | | | |
| Building Foot Print | 305,910 | 99,610 | | |
| Office 1st Floor | 15,000 | 7,500 | 22,500 | s.f. |
| Office 2nd Floor | 15,000 | 7,500 | 22,500 | s.f. |
| Warehouse | 290,910 | 92,110 | 383,020 | s.f. |
| TOTAL | 320,910 | 107,110 | 428,020 | s.f. |
| **COVERAGE** | 48.9% | 43.5% | 47.4% | |
| **BUILDING INT. CLEAR HEGHT** | 36' | 32' | | |
| **AUTO PARKING REQUIRED** | | | | |
| Office: 1/250 s.f. | 120 | 60 | 180 | stalls |
| Whse: 1/1,500 s.f. | 194 | 62 | 256 | stalls |
| TOTAL | 314 | 122 | 436 | stalls |
| **AUTO PARKING PROVIDED** | | | | |
| Standard ( 8.5' x 19' ) | 250 | 119 | 369 | stalls |
| Compact Parking ( 7.5' x 15' ) 10% ma | 35 | 14 | 49 | stalls |
| Accessible Parking ( 9' x 19' ) | 6 | 5 | 11 | stalls |
| Accessible Van Parking ( 12' x 19' ) | 2 | 1 | | |
| Future EV - Conduits only (8.5' x 19' ) | 19 | 8 | 27 | stalls |
| EV standard Accessible ( 9' x 19') | 1 | 1 | 2 | |
| EV Van Accessible ( 12' x 19' ) | 1 | 1 | | |
| Clean Air/ Van pool ( 9' x 19' ) | 28 | 16 | | |
| TOTAL | 342 | 165 | 507 | stalls |
| Parking Total Difference | 28 | 43 | | |
| **ZONING ORDINANCE FOR CITY** | | | | |
| Zoning Designation - Heavy Manufacturing District (M2) | | | | |
| **MAXIMUM FLOOR AREA RATIO** | | | | |
| F.A.R. - 0.60 | | | | |
| **LANDSCAPE REQUIRED** | | | | |
| In Percentage - 5% | | | | |
| **LANDSCAPE PROVIDED** | | | | |
| In s.f. | 22,365 | 25,415 | 47,780 | s.f. |
| In Percentage - | | | 5.3% | |

## VICINITY MAP




HPA architecture
hpa, inc.
18831 bardeen avenue, - ste. #100
irvine, ca
92612
tel: 949•863•1770
fax: 949•863•0851
email: hpa@hparchs.com

Owner:
KEARNY Real Estate Company
Address:
1875 Century Park East, Suite 380
Los Angeles, CA 90067
Phone: (310) 203-1840

Project:
PRAIRIE AVE
CALIFORNIA, TORRANCE

Consultants:
CIVIL Thienes Engineering
STRUCTURAL
MECHANICAL
PLUMBING
ELECTRICAL
LANDSCAPE
FIRE PROTECTION
SOILS ENGINEER

Title: MASTER SITE PLAN
Project Number: 18631
Drawn by: AW/YG
Date: 8/22/19
Revision:

Source: HPA Architecture, 2019; TAHA, 2019.



*FIGURE 2-2*
SITE PLAN

# 3.0 NOISE AND VIBRATION

This section describes the characteristics and effects of noise and vibration, the applicable regulatory setting, existing setting, methodology and significance criteria, and environmental impacts related to noise and vibration associated with the proposed project.

## 3.1 NOISE AND VIBRATION CHARACTERISTICS AND EFFECTS

### 3.1.1 Noise

#### Characteristics of Sound

Sound is technically described in terms of the loudness (amplitude) and frequency (pitch).[1] The standard unit of measurement for sound is the decibel (dB). The human ear is not equally sensitive to sound at all frequencies. The A-weighted scale, abbreviated dBA, reflects the normal hearing sensitivity range of the human ear. On this scale, the range of human hearing extends from approximately 3 to 140 dBA. **Figure 3-1** provides examples of A-weighted noise levels from common sounds.

#### Noise Definitions

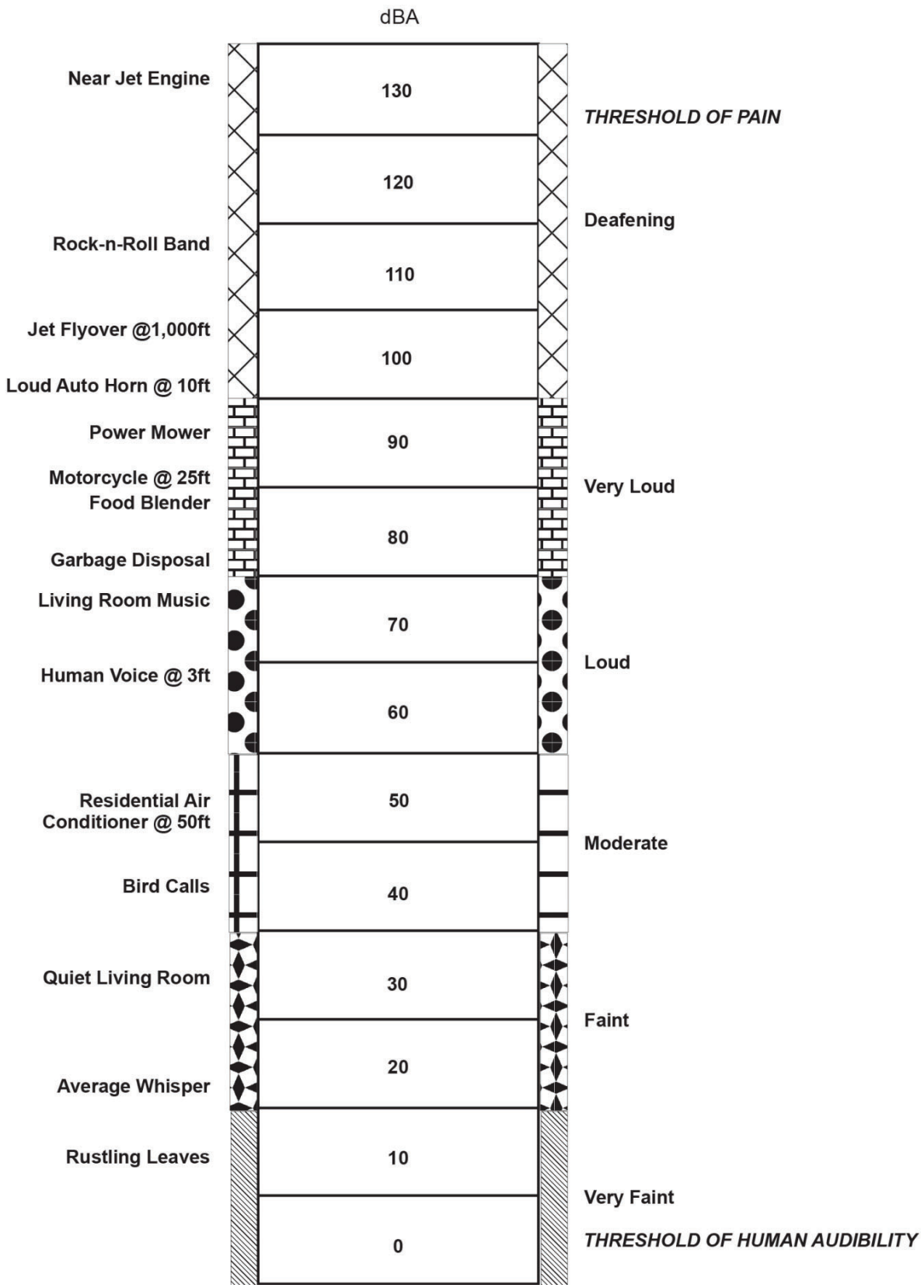
This noise analysis discusses sound levels in terms of Community Noise Equivalent Level (CNEL) and Equivalent Noise Level ($L_{eq}$). CNEL is an average sound level during a 24-hour period. CNEL is a noise measurement scale, which accounts for noise source, distance, single event duration, single event occurrence, frequency, and time of day. Human reaction to sound between 7:00 p.m. and 10:00 p.m. is as if the sound were actually 5 dBA higher than if it occurred from 7:00 a.m. to 7:00 p.m. From 10:00 p.m. to 7:00 a.m., humans perceive sound as if it were 10 dBA higher due to the lower background level. Hence, the CNEL is obtained by adding an additional 5 dBA to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and 10 dBA to sound levels in the night from 10:00 p.m. to 7:00 a.m. Because CNEL accounts for human sensitivity to sound, the CNEL is always a higher number than the actual 24-hour average.

$L_{eq}$ is the average noise level on an energy basis for any specific time period. The $L_{eq}$ for one hour is the average energy noise level during the hour. The average noise level is based on the energy content (acoustic energy) of the sound. $L_{eq}$ can be thought of as the level of a continuous noise which has the same energy content as the fluctuating noise level. The equivalent noise level is expressed in units of dBA.

#### Sound Propagation and Shielding

Noise levels decrease as the distance from the noise source to the receiver increases. Noise generated by a stationary noise source, or “point source,” will decrease by approximately 6 dBA over hard surfaces (e.g., reflective surfaces such as parking lots or smooth bodies of water) and 7.5 dBA over soft surfaces (e.g., absorptive surfaces such as soft dirt, grass, or scattered bushes and trees) for each doubling of the distance.[2] For example, if a noise source produces a noise level of 89 dBA at a reference distance of 50 feet, then the noise level would be 83 dBA at a distance of 100 feet from the noise source, 77 dBA at a distance of 200 feet, and so on. Noise generated by a mobile source will decrease by approximately 3 dBA over hard surfaces and 4.8 dBA over soft surfaces for each doubling of the distance.

[1]California Department of Transportation, *Technical Noise Supplement*, September 2013.
[2]*Ibid*.




Source: Cowan, James P., Handbook of Environmental Acoustics, 1993.

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*FIGURE 3-1*

A-WEIGHTED DECIBEL SCALE

Noise is most audible when there is a direct line-of-sight. Line-of-sight is an unobstructed visual path between the noise source and the noise receptor. Solid barriers, such as walls, berms, or buildings that break the line-of-sight between the source and the receiver greatly reduce noise levels from the source since sound can only reach the receiver by bending over the top of the barrier. However, if a barrier is not solid, high or long enough to break the line-of-sight from the source to the receiver, its effectiveness is greatly reduced.

**Health Effects of Noise[3]**

The most obvious negative effects of noise are physical damage to hearing. Other obvious effects are the interference of noise with certain activities, such as sleeping and conversation. Less obvious are the stress effects of noise.

**Hearing Damage**. A person exposed to high noise levels can suffer hearing damage, either gradual or traumatic. Sustained exposure to moderately high noise levels over a period of time can cause gradual hearing loss. It starts out as a temporary hearing loss, such as immediately after a loud rock concert. The hearing usually restores itself within a few hours after exposure, although not quite to its pre-exposure level. This is also called a temporary threshold shift. Although the permanent deterioration may be negligible, it will become significant after many repetitions of the exposure. At that time, it is considered permanent hearing damage. The primary cause of permanent hearing damage is daily exposure to industrial noise.

Short, sudden exposure to an extremely high noise level, such as a gunshot or explosion at very close range, can cause a traumatic hearing loss, which is very sudden and can be permanent. Occupational exposure to noise is controlled at the federal level by Occupational Safety and Health Administration and at the state level by the state level by the California Division of Safety and Health. The maximum allowable noise exposure over an eight hours period is a level of 90 dBA. For each halving of the exposure time, the maximum noise level is allowed to increase 5 dBA. Therefore, the maximum allowable noise exposure (100 percent) is 90 dBA for 8 hours, 95 dBA for four hours, 100 dBA for 2 hours, 105 dBA for 1 hour, 110 dBA for 30 minutes, and 115 dBA for 15 minutes.

**Stress-Related Diseases**. Noise can cause stress in humans and may be responsible for stress-related diseases, such as hypertension, anxiety, and heart disease. Although noise is probably not the sole culprit in these diseases, it can be a contributor. The degree to which noise contributes to stress-related diseases depends on noise frequencies, their bandwidths, noise levels, and time patterns. In general, higher frequencies, pure tones, and fluctuating noise levels tend to be more stressful than lower frequencies, broadband, and constant-level noise.

### 3.1.2 Vibration[4]

**Characteristics of Vibration**

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. Vibration can be a serious concern, causing buildings to shake and rumbling sounds to be heard. In contrast to noise, vibration is not a common environmental problem. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. Some common sources of vibration are trains, buses on rough roads, and construction activities, such as rock blasting, pile driving, and heavy earth-moving equipment.

[3]California Department of Transportation, *Technical Noise Supplement*, September 2013.
[4]Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, September 2018.

### Vibration Definitions

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings and is usually measured in inches per second. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (VdB) is commonly used to measure RMS as the velocity level in decibels. The VdB acts to compress the range of numbers required to describe vibration.

### Health Effects of Vibration

Ground-borne vibration levels rarely affect human health. Instead, most people consider ground-borne vibration to be an annoyance that can affect concentration or disturb sleep. Although responses to vibration differ, 65 Vdb is the approximate threshold of perception for many people. The approximate dividing line between barely and distinctly perceptible is 75 Vdb and 85 Vdb is typically only acceptable if there are an infrequent number of events per day.

### Effects of Vibration on Buildings

High levels of ground-borne vibration can damage fragile buildings or interfere with equipment that is highly sensitive to ground-borne vibration (e.g., electron microscopes). Factors that influence ground-borne vibration effects include the foundation type and building materials (e.g., masonry).

## 3.2 REGULATORY SETTING

### 3.2.1 Noise

### Federal

The Noise Control Act of 1972 established programs and guidelines to identify and address the effects of noise on public health, welfare, and the environment. In 1981, the United States Environmental Protection Agency (USEPA) determined that subjective issues such as noise would be better addressed at local levels of government, thereby allowing more individualized control for specific issues by designated federal, state, and local government agencies. Consequently, in 1982, responsibilities for regulating noise-control policies were transferred to specific federal agencies, and state and local governments. However, noise-control guidelines and regulations contained in the USEPA rulings in prior years remain in place. No federal noise regulations are directly applicable to the proposed project.

### State

The State of California has adopted noise standards in areas of regulation not preempted by the federal government. State standards regulate noise levels of motor vehicles, sound transmission through buildings, occupational noise control, and noise insulation. State regulations governing noise levels generated by individual motor vehicles and occupational noise control are not applicable to planning efforts, nor are these areas typically subject to CEQA analysis.

### Local

**City of Torrance Municipal Code***.* The City of Torrance has established noise standards to control unnecessary, excessive and annoying noise. The standards are codified in Division 4, Chapter 6 (Noise Regulation) of the Municipal Code. Construction noise is governed by Section 46.3.1 (Construction of Buildings and Projects) of the Municipal Code, which prohibits the use of construction tools, equipment, or the performance of any outside construction or repair work on buildings, structures, or projects in or adjacent to a residential area involving the creation of noise beyond 50 db as measured at property lines, except for the times restrictions outlined in **Table 3-1**.

| TABLE 3-1: CONSTRUCTION TIME LIMITS | |
|---|---|
| **Time Period** | **Time Restriction** |
| Monday – Friday | 7:30 a.m. to 6:00 p.m. |
| Saturday | 9:00 a.m. to 5:00 p.m. |
| Sundays and Holidays observed by City Hall | Construction Prohibited |
| **SOURCE**: City of Torrance Municipal Code, *Chapter 6, Noise Regulation, Section 46.3.1(a)*. | |

The Municipal Code also outlines noise standards that are not to be exceeded. The City has been divided up into four different regions each with their own noise standard, which are listed in **Table 3-2**. The proposed project is located in Region 1 and, as such, would be subject to 70 dBA during daytime hours and 65 dBA during nighttime hours. In addition, if the noise contains a steady, audible tone, such as a whine, screech, or hum, the noise standard shall be corrected with a reduction of 5 dB. The same correction applies to noise is a repetitive and impulsive, such as hammering or riveting.

| TABLE 3-2: EXTERIOR NOISE STANDARDS | | |
|---|---|---|
| | **Noise Standard (dB)** | |
| **Region** | **Day (7:00 a.m. to 10:00 p.m.)** | **Night (10:00 p.m. to 7:00 a.m.)** |
| **Region 1** (Predominantly industrial areas in and around the refineries and industrial uses on the western edge of the City) | 70 | 65 |
| **Region 2** (Area in and around the airport and includes the commercial and industrial uses south of Lomita Blvd. and north of Pacific Coast Highway) | 60 | 55 |
| **Region 3** (Area including residential neighborhoods south of the Pacific Coast Highway and west of Hawthorne Blvd.) | 50 | 45 |
| **Region 4** (Includes the remainder of the City) | 55 | 50 |
| **SOURCE**: City of Torrance Municipal Code, *Chapter 6, Noise Regulation, Section 46.7.2*. | | |

**City of Torrance General Plan**. The City of Torrance General Plan Noise Element provides guidance on improving the safety and health of the community and abatement of excessive noise. The noise section provides information on the existing and projected noise environment and includes goals, objectives, policies, and implementation programs to ensure an acceptable noise environment. The predominant noise source in most of the City is vehicular traffic from local arterials. Commercial activities, including air compressors and commercial compactors, landscaping maintenance equipment, and daily activities also contribute to noise levels. The Noise Element references 75 dBA as the upper threshold before having an adverse effect on humans and states that the likelihood of hearing loss strongly increases at prolonged exposure to sound levels over 85 dBA.

### 3.2.2 Vibration

#### Federal

Federal regulations governing vibration levels are primarily related to occupational vibration control are not applicable to planning efforts, nor are these areas typically subject to CEQA analysis. The Federal Transit Administration (FTA) has published guidance and impact criteria that can be used to assess the potential for impacts. The FTA impact criteria are discussed below under Significance Thresholds.

### State

There are no adopted State vibration standards.

### Local

There are no adopted local vibration standards.

## 3.3 EXISTING SETTING

### 3.3.1 Existing Noise and Vibration Environment

To characterize the existing noise environment around the project site, short-term noise measurements were taken using a SoundPro DL Sound Level Meter on Tuesday, August 6, 2019 between 11:30 a.m. and 12:30 p.m. Hourly noise levels within the project area ranged from 71.4 to 72.7 dBA $L_{eq}$. Roadway noise was the most significant source of noise in the project area. Monitoring locations are shown in Figure 3-2 and existing noise levels are shown in Table 3-3. Monitoring data is included in **Appendix A**.

**TABLE 3-3: EXISTING AMBIENT NOISE LEVELS**

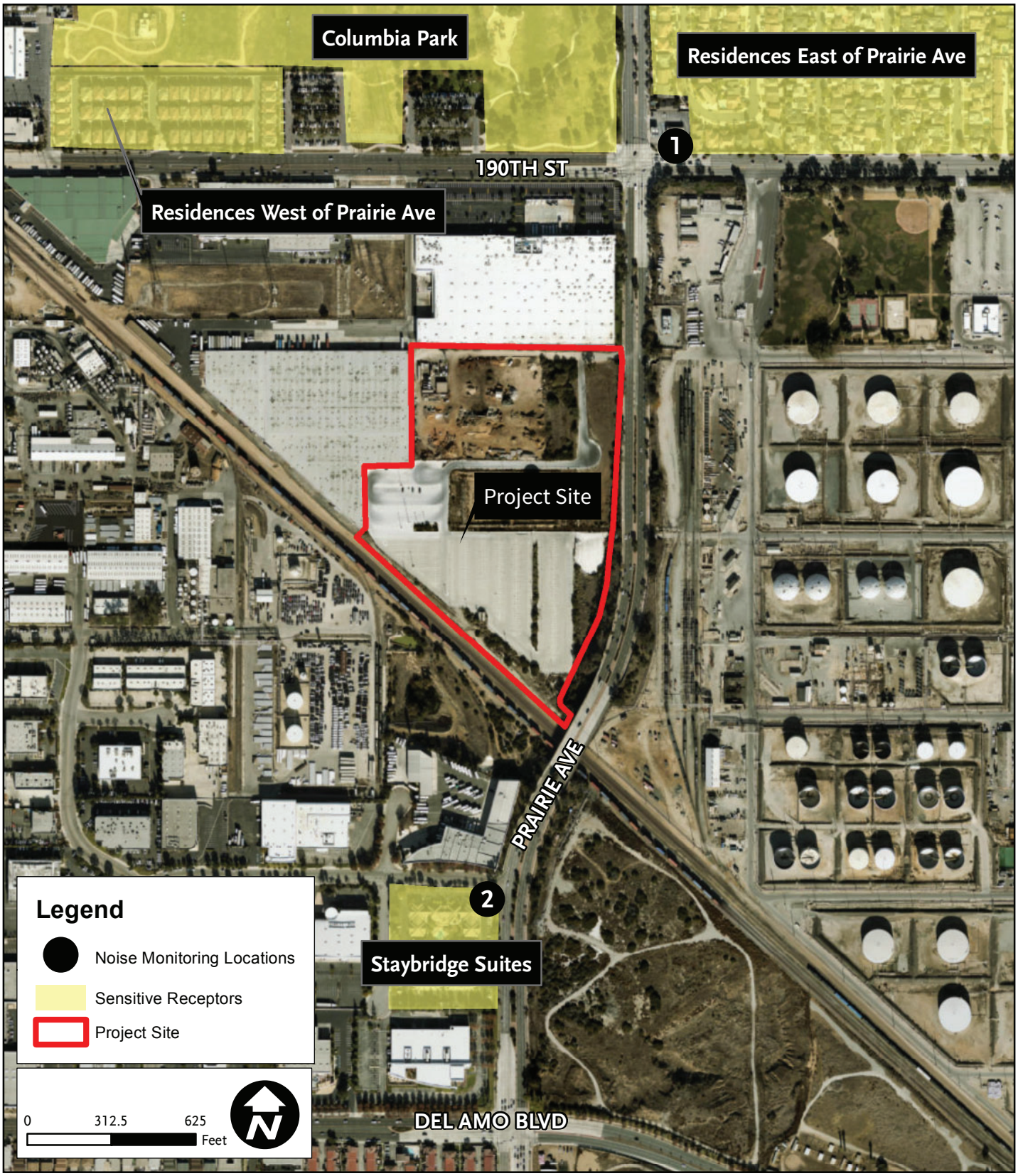
| Key to Figure 3-2 | Noise Monitoring Location | Sound Level (dBA, $L_{eq}$) |
|---|---|---|
| 1 | Columbia Park and Residences on Prairie Ave. | 72.7 |
| 2 | Staybridge Suites | 71.4 |

**SOURCE**: TAHA, 2019.

Existing vibration in the project site vicinity is largely related to heavy truck traffic along major streets. Heavy trucks can generate vibrations that depend on vehicle type, weight, and pavement conditions. Based on site visits, vibration is not perceptible at the project site.

### 3.3.2 Sensitive Receptors

Noise- and vibration-sensitive land uses are locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Residences, schools, hospitals, guest lodging, libraries, and some passive recreation areas would each be considered noise- and vibration-sensitive and may warrant unique measures for protection from intruding noise. The project area is primarily developed with industrial and commercial uses and no residences are located in close proximity. There are no residences, schools, hospitals, guest lodging, and libraries located within 500 feet of the project site. The northern boundary of the project site is located approximately 700 feet from the edge of Columbia Park and approximately 800 feet from the nearest residence. The southern boundary of the project site is located approximately 800 feet from the Staybridge Suites and approximately 1,600 feet from the nearest residence. Sensitive receptors are shown in **Figure 3-2**.




Source: TAHA, 2019.

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*FIGURE 3-2*

NOISE MONITORING LOCATIONS AND SENSITIVE RECEPTORS

## 3.4 METHODOLOGY AND SIGNIFICANCE THRESHOLDS

### 3.4.1 Methodology

The noise and vibration analysis consider construction and operational sources. Noise levels associated with typical construction equipment were obtained from the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM).[5] This model predicts noise from construction based on a compilation of empirical data and the application of acoustical propagation formulas. Maximum equipment noise levels were adjusted based on anticipated percent of use. Combined construction activity noise levels were estimated by combining anticipated equipment for each activity using RCNM. The projected noise level during the construction period at receptors was calculated by (1) making a distance adjustment to the construction source sound level and (2) logarithmically adding the adjusted construction noise source level to the ambient noise level. Air temperature and humidity affect molecular absorption differently depending on the frequency spectrum and can vary significantly over long distances in a complex manner.[6] Molecular absorption in air also reduces noise levels with distance. This process only accounts for about 1 dBA per 1,000 feet, which is an inaudible and negligible difference in noise levels. Noise levels have been estimated using a decrease of 6 dBA over hard surfaces for each doubling of the distance. The following includes the methodology and formulas used in the analysis.[7]

*Noise Distance Attenuation Formula:* $dBA_2 = dBA1 + 20 \times LOG_{10} (D_1/D_2)$

*Where:*

$dBA_1$ *= Noise level at the reference distance of 50 feet*

$dBA_2$ *= Noise level at the receptor*

$D_1$ *= Reference distance (50 feet)*

$D_2$ *= Distance from source to receptor (measured distance)*

Operational mobile noise was assessed using the FHWA Traffic Noise Model Version 2.5 (TNM 2.5). TNM 2.5 is a computer model based on two FHWA reports: FHWA-PD-96-009 and FHWA-PD-96-010 (FHWA 1998a, 1998b). Key inputs to the traffic noise model were roadway widths, traffic mix, and speed. Noise levels were modeled for Existing (2019) conditions; Existing Plus Project with Traffic Signal (2019) conditions; Existing Plus Project without Traffic Signal (2019) conditions; Opening Year (2021) conditions; Opening Year Plus Project (2021) with Traffic Signal (2019) conditions; and Opening Year Plus Project without Traffic Signal (2021) conditions. CNEL was calculated from the hourly noise levels using guidance provided by Caltrans.[8] Traffic data was obtained from the Traffic Impact Analysis prepared by RK Engineering Group.

Operational stationary noise related to heating, ventilation, and air conditioning (HVAC) equipment and loading dock noise was assessed using Soundplan Essential 4.0 acoustical modeling software. The model incorporated a three-dimensional geometric model of the project site developed from digital terrain information, available Geographic Information Systems (GIS) information, aerial photography and the site plan. A reference noise level of 60 dBA $L_{eq}$ at 50 feet was used for HVAC equipment.[9] Loading dock noise was analyzed using a reference noise level of 80 dBA at five feet, which is derived from the Soundplan model.

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[5]Federal Highway Administration, *Roadway Construction Noise Model*, Version 1.1, August 2008.
[6]California Department of Transportation, *Technical Noise Supplement*, September 2013.
[7]*Ibid*.
[8]California Department of Transportation, *Technical Noise Supplement Section 2.2.3*, September 2013.
[9]Cowan, James P., *Handbook of Environmental Acoustics*, 1993.

Vibration levels generated by construction equipment were estimated using example vibration levels and propagation formulas provided by FTA.[10] The following formula was used to assess potential vibration damage at nearby structures.

*Vibration Damage Attenuation Formula:* $PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$

*Where:*

$PPV_{equip}$ *= Peak particles velocity in inches per second of the equipment adjusted for distance*

$PPV_{ref}$ *= Reference vibration level in inches per second at 25 feet*

*D = Distance from the equipment to the receptor in feet*

### 3.4.2 Significance Thresholds

In accordance with Appendix G of the State CEQA Guidelines, the proposed project would have a significant impact related to noise and vibration if it would:

- Result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Result in the generation of excessive ground-borne vibration or ground-borne noise levels; and/or
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels.

#### Noise Significance Thresholds

Section 46.3.1 of the Municipal Code governs construction noise and prohibits the use of construction tools, equipment, or the performance of any outside construction or repair work on buildings, structures, or projects in or adjacent to a residential area involving the creation of noise beyond 50 dB as measured at property lines, except for the times outlined in **Table 3-1**. Construction occurring outside these times would result in a significant impact. In addition, based on the General Plan Noise Element, the proposed project would have a significant impact related to construction activities if noise levels exceed 75 dBA at land uses sensitive to increase noise.

For operational activity, non-transportation noise was assessed based on the Municipal Code, transportation noise based on audible changes to local roadway noise, and land use compatibility based on General Plan policies. The proposed project would have a significant impact related to operational noise if:

- Operational noise levels at the property line exceed 70 dBA during daytime hours and 65 dBA during nighttime hours, as shown in **Table 3-2**;
- The applicable threshold for HVAC noise, which produces a steady humming noise would be 55 dBA during daytime hours and 50 dBA during nighttime hours;
- Project-related traffic would increase transportation noise on the local roadway system by 3 dBA CNEL; and/or
- Workers at the project site would be exposed to excessive aircraft noise levels.

[10] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, September 2018.

### Vibration Significance Thresholds

The City has not adopted construction-related vibration significance thresholds. Based on FTA guidance and the surrounding land uses, the proposed project would result in a significant vibration impact if:

- Construction-related levels exceed 0.3 inches per second PPV at engineered concrete and masonry buildings; and/or
- Operational-related vibration levels exceed 75 VdB, which is the approximate dividing line between barely and distinctly perceptible.

## 3.5 ENVIRONMENTAL IMPACTS

### 3.5.1 Would the proposed project result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies? (Less-Than-Significant Impact)

### Impact Analysis

#### *Construction*

Construction activity would result in temporary increases in ambient noise levels in the project area on an intermittent basis. Noise levels would fluctuate depending on the construction phase, equipment type and duration of use, distance between the noise source and receptor, and presence or absence of noise attenuation barriers. Typical noise levels from various types of equipment that may be used during construction are listed in **Table 3-4**.

**TABLE 3-4: CONSTRUCTION EQUIPMENT NOISE LEVEL RANGES**

| Construction Equipment | Noise Level at 50 feet (dBA) |
|---|---|
| Backhoe (small bulldozer) | 73.6 |
| Crane | 72.6 |
| Dozer | 77.7 |
| Drum Mixer | 77.0 |
| Dump Truck | 72.5 |
| Excavator | 76.7 |
| Front End Loader | 75.1 |
| Jackhammer | 81.9 |
| Man Lift | 67.7 |
| Paver | 74.2 |
| Welder/Torch | 70.0 |

**SOURCE**: FHWA, *Roadway Construction Noise Model*, Version 1.1.

Construction activities typically require the use of numerous pieces of noise-generating equipment. The noise levels shown in **Table 3-5** take into account the likelihood that multiple pieces of construction equipment would be operating simultaneously and the typical overall noise levels that would be expected for each phase of construction. When considered as an entire process with multiple pieces of equipment, demolition activity would be the loudest phase of construction and would generate a noise level of approximately 85.5 dBA $L_{eq}$ at 50 feet.

| TABLE 3-5: CONSTRUCTION NOISE LEVEL BY PHASE | |
|---|---|
| **Noise Source** | **Noise Level (dBA) $L_{eq}$ at 50 Feet** |
| **DEMOLITION** | |
| Concrete Saw | 82.6 |
| Dozer | 77.7 |
| Excavator | 76.7 |
| Backhoe | 73.6 |
| Excavator | 76.7 |
| Demolition Combined Noise Level | 85.5 |
| **GRADING** | |
| Grader | 81.0 |
| Backhoe | 73.6 |
| Dozer | 77.7 |
| Excavator | 76.7 |
| Scraper | 79.6 |
| Grading Combined Noise Level | 85.4 |
| **BUILDING CONSTRUCTION** | |
| Forklift | 79.4 |
| Generator | 77.6 |
| Backhoe | 73.6 |
| Welder | 70.0 |
| Crane | 72.6 |
| Building Construction Combined Noise Level | 85.4 |
| **PAVING** | |
| Pavers | 74.2 |
| Rollers | 73.0 |
| Paving Combined Noise Level | 76.7 |
| **ARCHITECTURAL COATING** | |
| Compressor | 73.7 |
| Architectural Coating Combined Noise Level | 73.7 |
| **SOURCE**: FHWA, *Roadway Construction Noise Model (RCNM) Version 1.1*. | |

**Table 3-6** presents the estimated noise levels at the sensitive receptors nearest to the project site for informational purposes. The most noise-intensive construction activities would occur during the early phases of construction (e.g., demolition, site preparation, and structural framing). The majority of the latter phases of construction would occur within the newly constructed building, and result in lower noise levels than exterior construction.

| TABLE 3-6: UNMITIGATED CONSTRUCTION NOISE LEVELS | | | | | |
|---|---|---|---|---|---|
| **Sensitive Receptors** | **Distance to Construction Centroid (feet) /a/** | **Existing Ambient Noise Level (dBA, $L_{eq}$)** | **Typical Construction Noise Level at Sensitive Receptor (dBA, $L_{eq}$)** | **Threshold (dBA)** | **Exceed?** |
| Columbia Park | 1,400 | 72.7 | 56.6 | 75 | No |
| Staybridge Suites | 1,400 | 71.4 | 56.6 | 75 | No |
| Residences on 190th St., east of Prairie Ave. | 1,500 | 72.7 | 56.0 | 75 | No |
| Residences on 190th St., west of Prairie Ave. | 1,650 | 72.7 | 55.1 | 75 | No |
| /a/ The construction centroid represents the distance from the center of the project site to the sensitive land uses. This distance is a reasonable representation of the typical source distance anticipated from heavy-duty equipment as the equipment moves around the project site.<br>**SOURCE**: TAHA, 2019. | | | | | |

The proposed project would be constructed in a manner typical of urban infill projects and would not require unusually noisy activities such as pile driving. In addition, the proposed project would not require nighttime construction activities. Construction would comply with the time restrictions

shown in **Table 3-1**, which include allowable hours of Monday through Friday from 7:30 a.m. to 6:00 p.m., Saturday from 9:00 a.m. to 5:00 p.m. and no construction on Sundays and City holidays. **Table 3-6** shows that construction-related noise levels would not exceed the 75-dBA City standard at sensitive land uses. Therefore, the proposed project would result in a less-than-significant impact related to on site construction noise.

Construction activity would also generate noise through off-site truck trips. Construction would require the import of approximately 31,763 cubic yards of material for foundations. It is anticipated that approximately 80 trips per day or 10 truck trips per hour would occur. Haul trucks would likely travel from the I-405 to Crenshaw Boulevard, along 190th Street, and down Prairie Avenue to the development site. A doubling of traffic volume is typically needed to audibly increase noise levels along a roadway segment. The existing traffic volumes along roadways likely to be utilized by haul trucks is shown in **Table 3-7**. An additional 80 trucks per day would not double the volume on any roadway segment. It is not anticipated that off-site vehicle activity would audibly change average daily noise levels due to the low volume of haul truck trips per day. The proposed project would not result in a short-term and temporary noise impact from construction trucks.

**TABLE 3-7: HAUL ROUTE TRAFFIC VOLUMES**

| Roadway | PM Peak Hour Traffic Volume (2019) |
|---|---|
| Crenshaw Blvd. North of 190th St. | 4,110 |
| 190th St. between Prairie Ave. and Crenshaw Blvd. | 3,246 |
| Prairie Ave. between 190th St. and Del Amo Blvd. | 3,596 |

**SOURCE**: RK Engineering Group Inc., *Torrance Prairie Avenue Warehouse Project Traffic Impact Study*, July 26, 2019.

### *Operations*

The potential for a substantial permanent increase in noise levels was assessed for stationary sources and mobile sources.

*Stationary Sources.* The proposed project would include stationary source noise related to HVAC systems, truck loading docks, and parking. The proposed project is located in Region 1 and, as such, would generally be subject by Section 46.7.2 (Noise Limits) of the Municipal Code to 70 dBA during daytime and 65 dBA during nighttime hours. The Municipal Code states that a correction of -5 dB should be made to the noise standards outlined in **Table 3-2**, if the noise sources produces a steady, audible tone, such as a whine, screech or hum. HVAC noise, which produces a steady hum, would be held to a daytime standard of 65 dBA and a nighttime standard of 60 dBA. HVAC equipment without muffling or enclosures typically generates a noise level of approximately 60 dBA at 50 feet.[11] HVAC equipment would be located on the rooftops of the warehouse buildings. The loading docks would generate noise related to the loading and operation of trucks. Loading docks typically generate a noise level of approximately 80 dBA at 5 feet.[12] A composite noise level was calculated based on the combination of HVAC and loading dock noise. The maximum noise level generated at the any property line would be approximately 43.0 dBA $L_{eq}$. HVAC noise would not exceed the 65 dBA daytime standard or the 60 dBA nighttime standard. Loading dock noise would not exceed the 70 dBA daytime noise standard or 65 dB nighttime noise standards at any property line. Soundplan noise contours are included in **Appendix B**. Loading dock noise would largely be contained within the building envelopes and HVAC noise would be located on rooftops and not readily audible at the ground level. Parking would be provided in the form of a surface parking lot. Sources of noise would include engines accelerating, doors slamming, car alarms, and people

[11]Cowan, James P., *Handbook of Environmental Acoustics*, 1993.
[12]Soundplan Essential 4.0, *Truck Loading Noise*, 2017.

talking. The existing uses on the project site include surface parking currently used for Torrance Refinery employee parking and the proposed project would not result in a substantial change that would audibly increase the noise levels at nearby land uses. Therefore, the proposed project would result in a less-than-significant impact related to HVAC equipment, loading docks, and parking.

*Mobile Sources*. The proposed project would generate 748 daily trips, of which 601 would be passenger vehicle trips and 147 would be truck trips. Peak hour trips would be divided as follows: 73 AM peak hour trips and 82 PM peak hour vehicle trips. The project truck trips are anticipated to mainly access the Interstate (I)-405 northbound and southbound ramps to reach the intended trip destinations farther away to the north and south for delivery of freight and goods. Project trips were distributed in congruence with the Traffic Impact Study prepared for the proposed project. **Table 3-8** presents noise levels associated with traffic signalization at the driveway and **Table 3-9** presents mobile noise levels without traffic signalization. The tables present the same noise levels because the traffic signal would not affect noise and the analyzed roadway segments. The roadway noise increase attributed to the proposed project would be less than 3 dBA on the local roadway network, and it is not anticipated that the 0.2-dBA CNEL increase would be a perceptible change in sound level for a person with normal hearing sensitivity. Therefore, the proposed project would result in a less-than-significant impact related to mobile noise levels.

**TABLE 3-8: ESTIMATED MOBILE SOURCE NOISE LEVELS WITH TRAFFIC SIGNAL**

| | Estimated dBA, CNEL | | | | | |
|---|---|---|---|---|---|---|
| **Roadway Segment** | **Existing (2019)** | **Existing With Project (2019)** | **Change** | **Opening Year (2021)** | **Opening year With Project (2021)** | **Change** |
| Prairie Ave. from Driveway to 190th St. | 67.8 | 67.9 | 0.1 | 67.8 | 68.0 | 0.2 |
| Prairie Ave. from Driveway to Del Amo Blvd. | 67.8 | 67.8 | 0.0 | 67.8 | 67.9 | 0.1 |
| 190th St. from Prairie Ave. to Crenshaw Blvd. | 67.3 | 67.5 | 0.2 | 67.5 | 67.6 | 0.1 |
| Crenshaw Blvd. from 190th St. to I-405 Fwy. | 65.3 | 65.4 | 0.1 | 65.5 | 65.5 | 0.0 |
| Del Amo Blvd. from Prairie Ave. to Crenshaw Blvd. | 66.0 | 66.1 | 0.1 | 66.2 | 66.3 | 0.1 |

**SOURCE**: TAHA, 2019.

**TABLE 3-9: ESTIMATED MOBILE SOURCE NOISE LEVELS WITHOUT TRAFFIC SIGNAL**

| | Estimated dBA, CNEL | | | | | |
|---|---|---|---|---|---|---|
| **Roadway Segment** | **Existing (2019)** | **Existing With Project (2019)** | **Change** | **Opening Year (2021)** | **Opening year With Project (2021)** | **Change** |
| Prairie Ave. from Driveway to 190th St. | 67.8 | 67.9 | 0.1 | 67.8 | 68.0 | 0.2 |
| Prairie Ave. from Driveway to Del Amo Blvd. | 67.8 | 67.8 | 0.0 | 67.8 | 67.9 | 0.1 |
| 190th St. from Prairie Ave. to Crenshaw Blvd. | 67.3 | 67.4 | 0.1 | 67.5 | 67.6 | 0.1 |
| Crenshaw Blvd. from 190th St. to I-405 Fwy. | 65.3 | 65.4 | 0.1 | 65.5 | 65.5 | 0.0 |
| Del Amo Blvd. from Prairie Ave. to Crenshaw Blvd. | 66.0 | 66.1 | 0.1 | 66.2 | 66.3 | 0.1 |

**SOURCE**: TAHA, 2019.

### Mitigation Measures

No mitigation measures are required.

### 3.5.2 Would the proposed project result in generation of excessive groundborne vibration or groundborne noise levels? (Less-Than-Significant Impact)

### Impact Analysis

#### *Construction*

Construction activity can generate varying degrees of vibration, depending on the construction procedure and the construction equipment used. Operation of construction equipment generates vibrations that spread through the ground and diminish in amplitude with distance from the source. The effect on buildings located in the vicinity of a construction site often varies depending on soil type, ground strata, and construction characteristics of the receiver building(s). The results from vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibration at moderate levels, and to damage at the highest levels.

Because construction activity is short-term and equipment moves around a project site, the primary concern regarding construction vibration relates to building damage. Activities that can result in damage include demolition and site preparation in close proximity to sensitive structures. Typical vibration levels associated with relevant construction equipment are provided in **Table 3-10**.

**TABLE 3-10: VIBRATION VELOCITIES FOR CONSTRUCTION EQUIPMENT**

| Equipment | PPV at 25 feet (Inches/Second) |
|---|---|
| Large Bulldozer | 0.089 |
| Loaded Truck | 0.076 |
| Jackhammer | 0.035 |
| Small Bulldozer | 0.003 |

**SOURCE**: FTA, *Transit Noise and Vibration Impact Assessment*, September 2018.

FTA has published guidance stating that engineered concrete and masonry buildings (e.g., typical commercial buildings) can withstand peak particle velocity levels of at least 0.3 inches per second without experiencing damage. Vibration is a localized event and attenuates rapidly with distance and at this distance vibration damage would not occur. Heavy-duty equipment operating within 12 feet of a structure would generate vibration levels that exceed 0.3 inches per second. Construction equipment would not operate within 12 feet of an existing, off-site building. The nearest structures are located north and west of the project site and would be at least 25 feet from heavy-duty equipment activities (e.g., grading passbys). The maximum vibration level at 25 feet would be 0.089 inches per second. Therefore, the proposed project would result in a less-than-significant impact related to building damage from construction vibration.

Regarding annoyance/disruption, land uses particularly sensitive to vibration annoyance during daytime construction hours include, but are not limited to, hospitals, schools, museums, concert halls, television studios, recording studios, auditoriums, theaters, and research facilities with sensitive equipment (e.g., microscopes). None of these land uses have been identified adjacent to the project site. Therefore, the proposed project would result in a less-than-significant impact related to annoyance/disruption from construction vibration.

### *Operations*

As previously discussed, the FTA has published guidance stating that 75 VdB is the dividing line between barely and distinctly perceptible. The proposed project does not include stationary sources of vibration, such as heavy-duty industrial equipment. Regarding additional traffic, the FTA has stated that rubber-tired vehicles do not typically generate perceptible vibration levels outside of the right-of-way. There are no operational sources of vibration that would generate vibration levels that exceed 75 VdB. Therefore, the proposed project would result in a less-than-significant impact related to operational vibration.

### Mitigation Measures

No mitigation measures are required.

### 3.5.3 For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels? (Less-Than-Significant Impact)

The proposed project is located approximately three miles north of the northern runway at the Zamperini Field Torrance Municipal Airport. The project site is not within two miles of the Airport and is not within an airport land use plan. Therefore, the proposed project would result in a less-than-significant impact related to excessive noise levels associated with public airports.

### Mitigation Measures

No mitigation measures are required.

## 4.0 REFERENCES

California Department of Transportation, *Technical Noise Supplement*, September 2013.

City of Torrance General Plan, *Noise Element*, April 6, 2010.

City of Torrance Municipal Code, *Division 4, Chapter 6 (Noise Regulation)*.

Cowan, James P., *Handbook of Environmental Acoustics*, 1993.

Federal Highway Administration, *Roadway Noise Construction Model*, Software Version 1.1.

Federal Highway Administration, *Traffic Noise Analysis and Abatement Guidance*, December 2011.

Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, September 2018.

RK Engineering Group Inc., *Torrance Prairie Avenue Warehouse Project Traffic Impact Study*, July 26, 2019.

Soundplan Essential 4.0, *Truck Loading Noise*, 2017.

# APPENDIX A

Monitoring Data

# Torrance Prairie Avenue Warehouse ST-1

8/8/2019

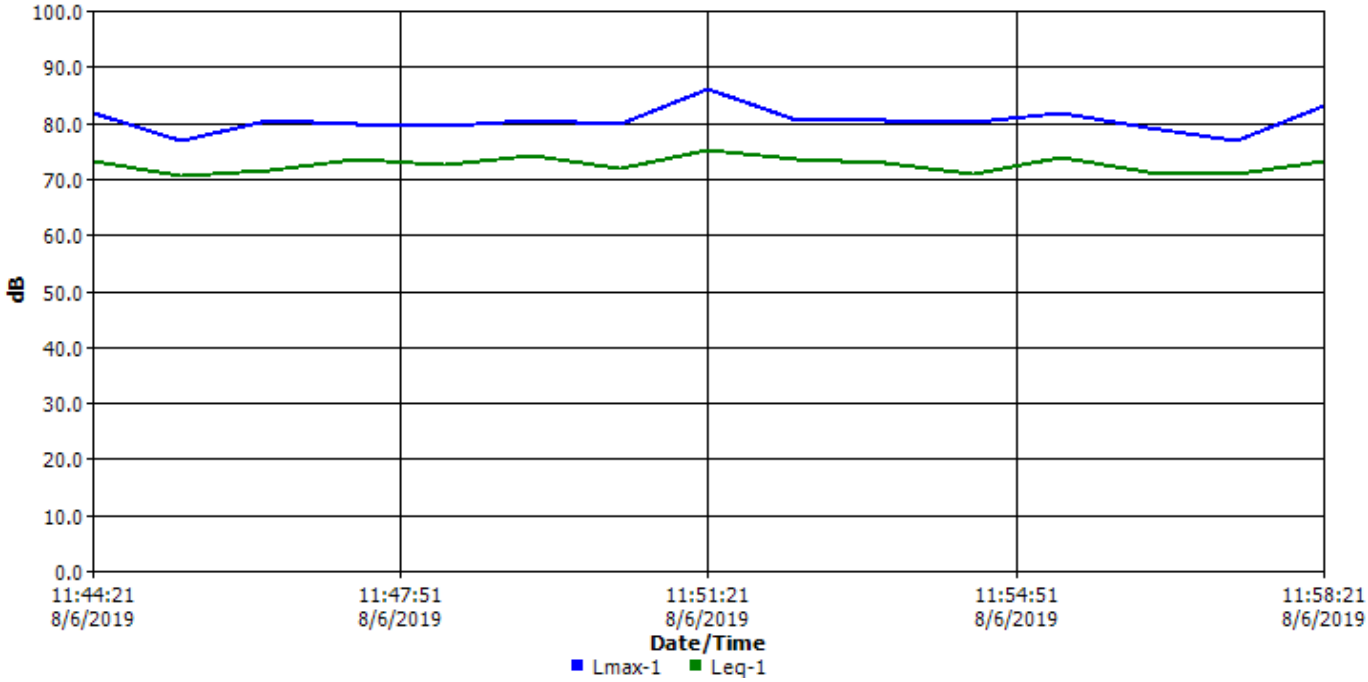
## Information Panel

| | |
|---|---|
| Name | Torrance Prairie Avenue Warehouse ST-1 |
| Start Time | Tuesday, August 06, 2019 11:43:21 |
| Stop Time | Tuesday, August 06, 2019 11:58:21 |
| Device Model Type | SoundPro DL |
| Comments | |

## General Data Panel

| Description | Meter | Value | Description | Meter | Value |
|---|---|---|---|---|---|
| Leq | 1 | 72.7 dB | Exchange Rate | 1 | 3 dB |
| Weighting | 1 | A | Response | 1 | SLOW |
| Bandwidth | 1 | OFF | Exchange Rate | 2 | 3 dB |
| Weighting | 2 | A | Response | 2 | SLOW |

## Logged Data Chart




## Logged Data Table

| Timestamp | Lmax-1 | Leq-1 |
|---|---|---|
| 8/6/2019 11:44:21 AM | 81.8 | 73.1 |
| 8/6/2019 11:45:21 AM | 76.8 | 70.6 |
| 8/6/2019 11:46:21 AM | 80.4 | 71.6 |
| 8/6/2019 11:47:21 AM | 79.8 | 73.4 |
| 8/6/2019 11:48:21 AM | 79.5 | 72.6 |
| 8/6/2019 11:49:21 AM | 80.4 | 74.2 |
| 8/6/2019 11:50:21 AM | 79.6 | 71.7 |
| 8/6/2019 11:51:21 AM | 85.9 | 75.1 |
| 8/6/2019 11:52:21 AM | 80.3 | 73.5 |
| 8/6/2019 11:53:21 AM | 80.5 | 72.7 |
| 8/6/2019 11:54:21 AM | 80.1 | 70.9 |
| 8/6/2019 11:55:21 AM | 81.6 | 73.9 |
| 8/6/2019 11:56:21 AM | 79.1 | 71.0 |
| 8/6/2019 11:57:21 AM | 76.7 | 70.8 |
| 8/6/2019 11:58:21 AM | 82.9 | 73.1 |

# Noise Measurement Report Form

Project: _____ Contract No (s): N/A

Date: 8/06/2019 Day of Week: Tuesday Time: 12:00

Monitoring Site Number: _____ Monitoring Site Address: 3441 Challenger St. Torrance, CA

Measurement Taken By: Blaire Frei

Approximate Wind Speed: 6-8 mph [km/hr] Approximate Wind Direction: From the West

Approximate distance of Sound Level Meter from Receptor Location: 50ft

Approximate distance of Sound Level Meter from Project Site: _____

Receptor Land Use (Check One) ☐ Residential / Institutional ☐ Commercial / Recreational

Sound Level Meter: Make and Model: _____ Serial Number: _____

Meter Setting ☑ A-Weighted Sound Level (SLOW) ☐ C-Weighted Sound Level (FAST) for Impacts

During of Measurement: 15 min

Check the measurement purpose:

☑ Baseline condition ☐ Ongoing construction ☐ Major change ☐ Complaint response

**Measurement Results:**

| Measurement Type | Measured Level | Noise Criteria Threshold | Exceedance |
|---|---|---|---|
| Calibration | 114.0 | n/a | n/a |
| $L_{eq}$ | 71.4 | | |
| $L_{max}$ | | | |
| $L_{dn}$ | | | |
| CNEL | | | |

Field Notes:

1. Project adjacent major corridor w/ 45 mph traffic. Next to ~~residential~~ low density commercial use & Torrance Oil Refinery on other side
2. Mostly car traffic w/ some trucks. Little traffic off Challenger St.
3. 1st time accidentally forgot wind muffler. ~~Changed study~~ ~~not deleted~~. Deleted this study & re-recorded it.
4. _____

**Site 1: 3441 Challenger Street**

# Torrance Prairie Avenue Warehouse ST-2

8/8/2019

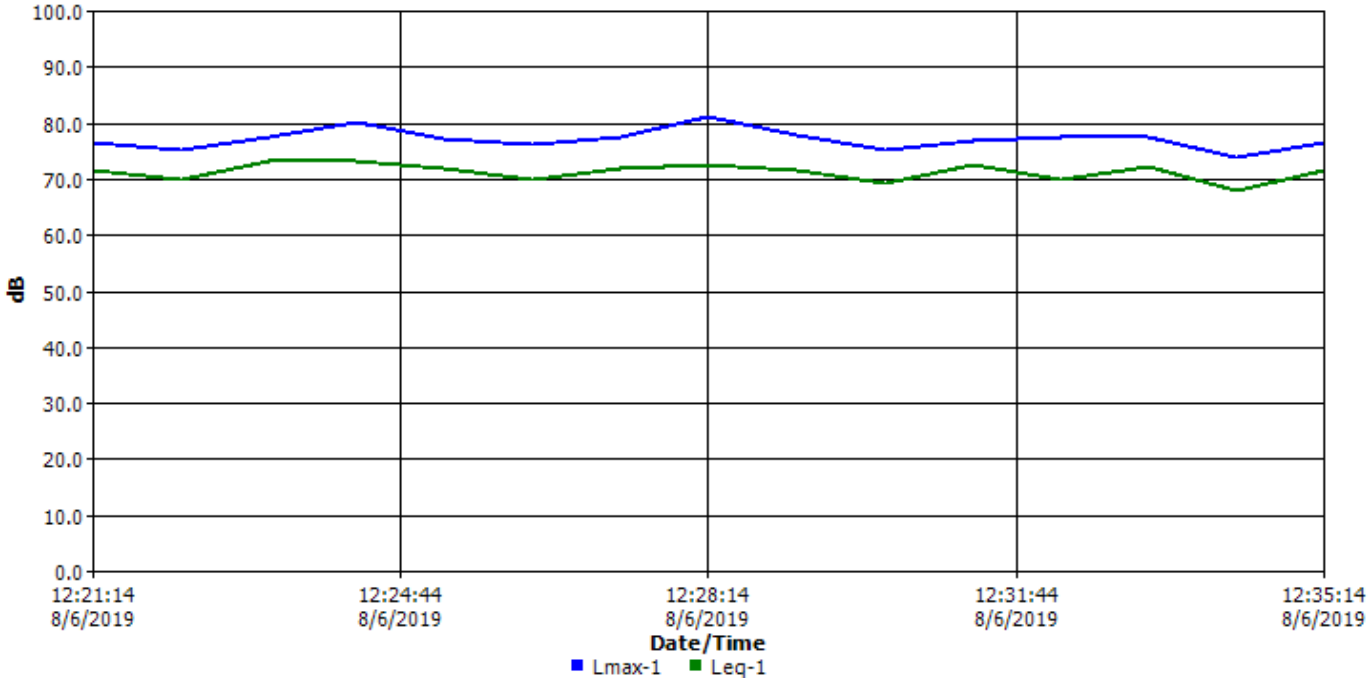
## Information Panel

| | |
|---|---|
| Name | Torrance Prairie Avenue Warehouse ST-2 |
| Start Time | Tuesday, August 06, 2019 12:20:14 |
| Stop Time | Tuesday, August 06, 2019 12:35:14 |
| Device Model Type | SoundPro DL |
| Comments | |

## General Data Panel

| Description | Meter | Value | Description | Meter | Value |
|---|---|---|---|---|---|
| Leq | 1 | 71.4 dB | Exchange Rate | 1 | 3 dB |
| Weighting | 1 | A | Response | 1 | SLOW |
| Bandwidth | 1 | OFF | Exchange Rate | 2 | 3 dB |
| Weighting | 2 | A | Response | 2 | SLOW |

## Logged Data Chart




## Logged Data Table

| Timestamp | Lmax-1 | Leq-1 |
|---|---|---|
| 8/6/2019 12:21:14 PM | 76.3 | 71.4 |
| 8/6/2019 12:22:14 PM | 75.2 | 69.8 |
| 8/6/2019 12:23:14 PM | 77.3 | 73.1 |
| 8/6/2019 12:24:14 PM | 80.1 | 73.2 |
| 8/6/2019 12:25:14 PM | 77.0 | 71.9 |
| 8/6/2019 12:26:14 PM | 76.2 | 69.9 |
| 8/6/2019 12:27:14 PM | 77.3 | 71.8 |
| 8/6/2019 12:28:14 PM | 81.1 | 72.3 |
| 8/6/2019 12:29:14 PM | 77.6 | 71.5 |
| 8/6/2019 12:30:14 PM | 75.2 | 69.3 |
| 8/6/2019 12:31:14 PM | 76.7 | 72.6 |
| 8/6/2019 12:32:14 PM | 77.5 | 69.9 |
| 8/6/2019 12:33:14 PM | 77.5 | 72.0 |
| 8/6/2019 12:34:14 PM | 73.8 | 67.9 |
| 8/6/2019 12:35:14 PM | 76.4 | 71.5 |

# Noise Measurement Report Form

Project: _____ Contract No (s): N/A

Date: 8/06/2019 Day of Week: Tuesday Time: ~~12:00~~ 11:45

Monitoring Site Number: _____ Monitoring Site Address: 3983 W. 190th St. Torrance, CA

Measurement Taken By: Blaire Frey

Approximate Wind Speed: ~~3 ft~~ 4-5 (mph) [km/hr] Approximate Wind Direction: From the West

Approximate distance of Sound Level Meter from Receptor Location: 20ft

Approximate distance of Sound Level Meter from Project Site: _____

Receptor Land Use (Check One) ☑ Residential / Institutional ☐ Commercial / Recreational

Sound Level Meter: Make and Model: TSI Quest Serial Number: _____

Meter Setting ☑ A-Weighted Sound Level (SLOW) ☐ C-Weighted Sound Level (FAST) for Impacts

Duration ~~During~~ of Measurement: 15 min

Check the measurement purpose:

☑ Baseline condition ☐ Ongoing construction ☐ Major change ☐ Complaint response

**Measurement Results:**

| Measurement Type | Measured Level | Noise Criteria Threshold | Exceedance |
|---|---|---|---|
| Calibration | 114.0 | n/a | n/a |
| $L_{eq}$ | 72.7 | | |
| $L_{max}$ | | | |
| $L_{dn}$ | | | |
| CNEL | | | |

Field Notes:

1. Prairie & 190th are major corridors w/ high traffic approx 45mph. Low walkability; little to no pedestrian traffic. Traffic is mostly cars, some cargo trucks.
2. Next to Columbia Park
3. Wall around perimeter of residential zone
4. Monitor under tree on sidewalk fronting 190th. 76 Gas station to my back.

**Site 2: 3983 190th Street**

# APPENDIX B

## Noise and Vibration Calculations

## Noise Formulas

### Noise Distance Attenuation

**Hard Site**

**Equation:** Ni = No - 20 X (log Di/Do)

**Di** = distance to receptor (Di>Do)

**Ni** = attenuated noise level of interest

**Do** = reference distance

**No** = reference noise level

**Source:** California Department of Transportation, *Technical Noise Supplement* , 2013

### Summation of Noise Levels

**Equation:** Ns=10 x LOG10((10^(N1/10))+(10^(N2/10))+(10^(N3/10))+(10^(N4/10)))

Ns = Noise Level Sum
N1 = Noise Level 1
N2 = Noise Level 2
N3 = Noise Level 3
N4 = Noise Level 4

**Source:** California Department of Transportation, *Technical Noise Supplement* , 2013

## Construction Noise Analysis

| Phased Construction Noise Levels | |
|---|---|
| **Construction Equipment** | **feet (dBA)** |
| **Demolition** | |
| Concrete Saw | 82.6 |
| Dozer | 77.7 |
| Excavator | 76.7 |
| Backhoe | 73.6 |
| Excavator | 76.7 |
| | |
| Site Preparation Combined | 85.5 |
| **Grading** | |
| Grader | 81 |
| Backhoe | 73.6 |
| Dozer | 77.7 |
| Excavator | 76.7 |
| Scraper | 79.6 |
| Grading Combined | 85.4 |
| **Building Construction** | |
| Grader | 81 |
| Backhoe | 73.6 |
| Dozer | 77.7 |
| Excavator | 76.7 |
| Scraper | 79.6 |
| Building Construction Combined | 85.4 |
| **Paving** | |
| Pavers | 74.2 |
| Rollers | 73 |
| Paving Combined | 76.7 |
| **Architectural Coating** | |
| Compressor | 73.7 |

| On-Site Construction Noise: Resulting Noise Level Increases - Unmitigated | | | | | |
|---|---|---|---|---|---|
| **Sensitive Receptor** | **Distance (feet) /a/** | **Reference Noise Level (dBA)** | **Max Construction Noise (dBA, Leq)** | **Threshold** | **Exceed** |
| Columbia Park | 1400 | 85.5 | 56.6 | 75 | No |
| Staybridge Suites | 1400 | 85.5 | 56.6 | 75 | No |
| Residences on 190th Street, East of Prairie Avenue | 1500 | 85.5 | 56.0 | 75 | No |
| Residences on 190th Street, West of Prairie Avenue | 1650 | 85.5 | 55.1 | 75 | No |

/a/ The construction centroid represents the distance from the center of the project site to the sensitive land uses. This distance is a reasonable representation of the typical source distance anticipated from heavy-duty equipment as the equipment moves around the project site.

## Vibration Formulas

### Vibration PPV Attenuation

**Equation:** PPVequip = PPVref x (25/D)^1.5
**PPV (equip)** is the peak particle velocity in in/sec of the equipment adjusted for distance
**PPV (ref)** is the reference vibration level in in/sec at 25 feet from Table 12-2
**D** is the distance from the equipment to the receiver.

**Source**: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, September 2018.

Conversion Formulas

Ldn = Leq - 3.8

CNEL = Ldn + (10*LOG(0.85+4.77*0.05+10*0.15)-
10*LOG(0.85+0.05+10*0.15))

Source: Caltrans, *Technical Noise Supplement*, September 2013.

Existing (2019)

| Roadway Segment | Leq | Ldn | CNEL |
|---|---|---|---|
| Prairie Ave. from Driveway to 190th St. | 71.3 | 67.5 | 67.8 |
| Prairie Ave. from Driveway to Del Amo Blvd. | 71.3 | 67.5 | 67.8 |
| 190th St. from Prairie Ave. to Crenshaw Blvd. | 70.8 | 67.0 | 67.3 |
| Crenshaw Blvd. from 190th St. to I-405 Fwy. | 68.8 | 65.0 | 65.3 |
| Del Amo Blvd. from Prairie Ave. to Crenshaw Blvd. | 69.5 | 65.7 | 66.0 |

Existing Plus Project (2019) traffic signal

| Roadway Segment | Leq | Ldn | CNEL |
|---|---|---|---|
| Prairie Ave. from Driveway to 190th St. | 71.4 | 67.6 | 67.9 |
| Prairie Ave. from Driveway to Del Amo Blvd. | 71.3 | 67.5 | 67.8 |
| 190th St. from Prairie Ave. to Crenshaw Blvd. | 71 | 67.2 | 67.5 |
| Crenshaw Blvd. from 190th St. to I-405 Fwy. | 68.9 | 65.1 | 65.4 |
| Del Amo Blvd. from Prairie Ave. to Crenshaw Blvd. | 69.6 | 65.8 | 66.1 |

Existing Plus Project (2019) no signal

| Roadway Segment | Leq | Ldn | CNEL |
|---|---|---|---|
| Prairie Ave. from Driveway to 190th St. | 71.4 | 67.6 | 67.9 |
| Prairie Ave. from Driveway to Del Amo Blvd. | 71.3 | 67.5 | 67.8 |
| 190th St. from Prairie Ave. to Crenshaw Blvd. | 70.9 | 67.1 | 67.4 |
| Crenshaw Blvd. from 190th St. to I-405 Fwy. | 68.9 | 65.1 | 65.4 |
| Del Amo Blvd. from Prairie Ave. to Crenshaw Blvd. | 69.6 | 65.8 | 66.1 |

Opening Year (2021)

| Roadway Segment | Leq | Ldn | CNEL |
|---|---|---|---|
| Prairie Ave. from Driveway to 190th St. | 71.3 | 67.5 | 67.8 |
| Prairie Ave. from Driveway to Del Amo Blvd. | 71.3 | 67.5 | 67.8 |
| 190th St. from Prairie Ave. to Crenshaw Blvd. | 71 | 67.2 | 67.5 |
| Crenshaw Blvd. from 190th St. to I-405 Fwy. | 69 | 65.2 | 65.5 |
| Del Amo Blvd. from Prairie Ave. to Crenshaw Blvd. | 69.7 | 65.9 | 66.2 |

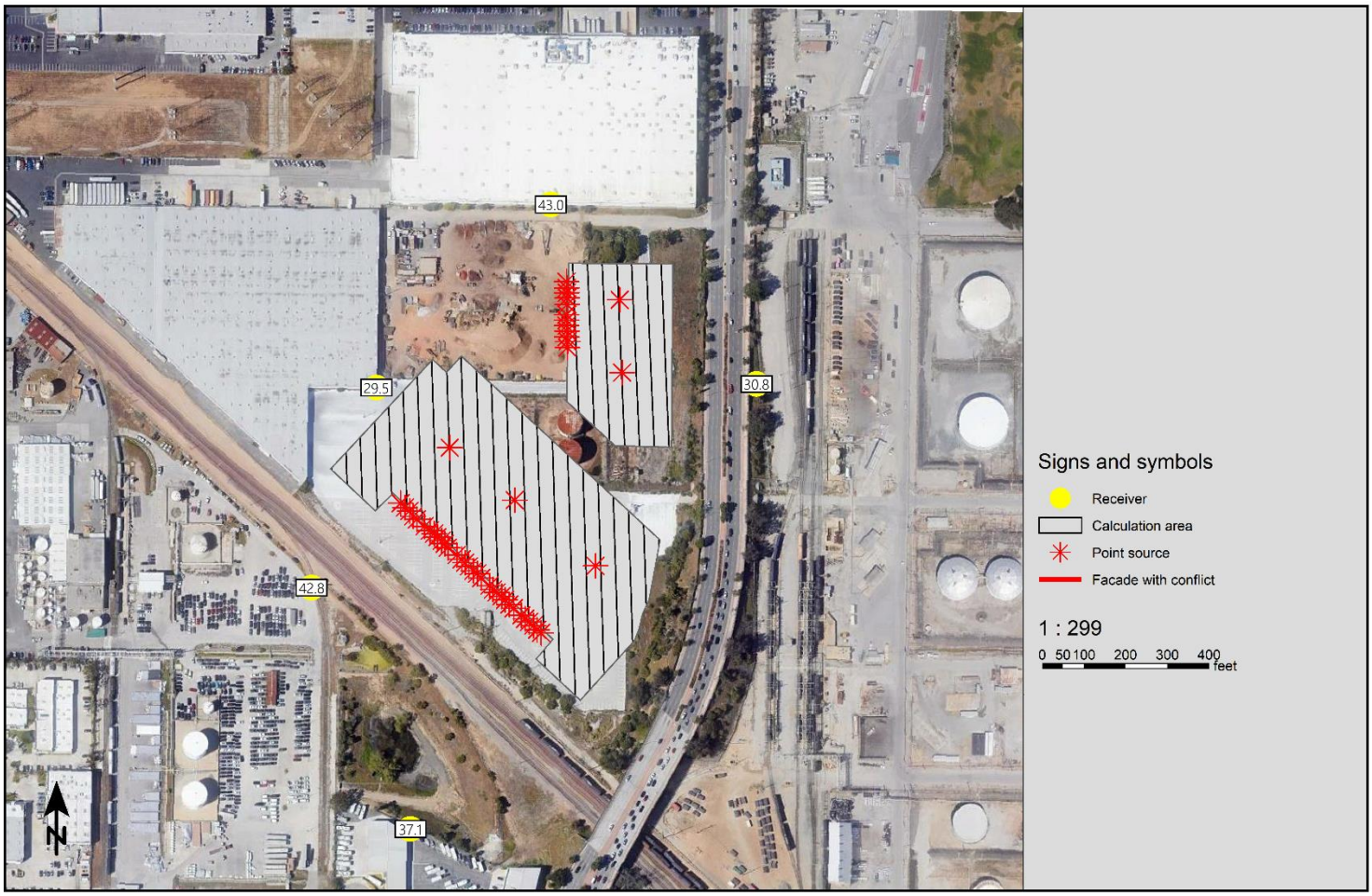
Opening Year Plus Project (2021) traffic signal

| Roadway Segment | Leq | Ldn | CNEL |
|---|---|---|---|
| Prairie Ave. from Driveway to 190th St. | 71.5 | 67.7 | 68.0 |
| Prairie Ave. from Driveway to Del Amo Blvd. | 71.4 | 67.6 | 67.9 |
| 190th St. from Prairie Ave. to Crenshaw Blvd. | 71.1 | 67.3 | 67.6 |
| Crenshaw Blvd. from 190th St. to I-405 Fwy. | 69 | 65.2 | 65.5 |
| Del Amo Blvd. from Prairie Ave. to Crenshaw Blvd. | 69.8 | 66.0 | 66.3 |

Opening Year Plus Project (2021) no signal

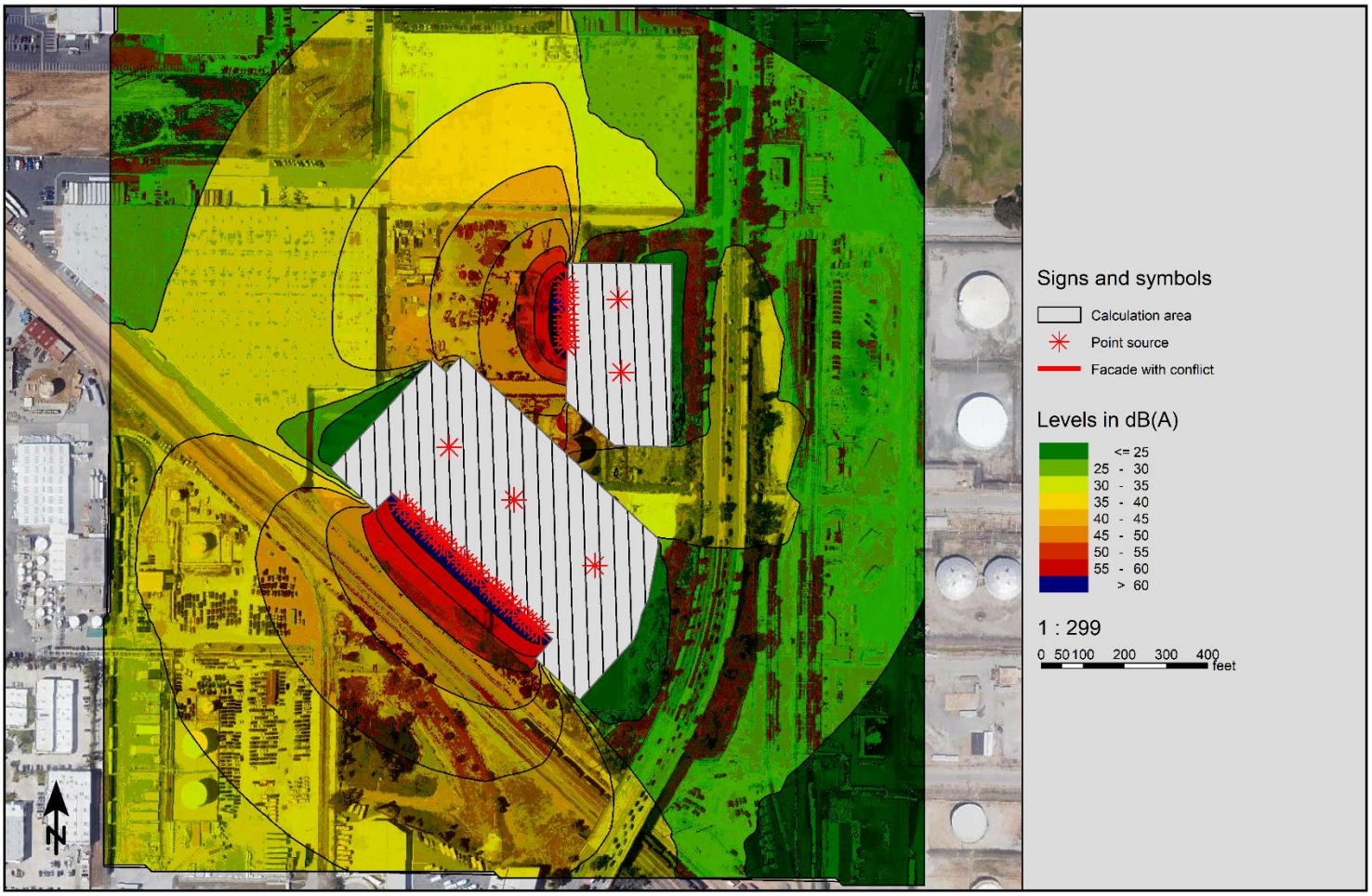
| Roadway Segment | Leq | Ldn | CNEL |
|---|---|---|---|
| Prairie Ave. from Driveway to 190th St. | 71.5 | 67.7 | 68.0 |
| Prairie Ave. from Driveway to Del Amo Blvd. | 71.4 | 67.6 | 67.9 |
| 190th St. from Prairie Ave. to Crenshaw Blvd. | 71.1 | 67.3 | 67.6 |
| Crenshaw Blvd. from 190th St. to I-405 Fwy. | 69 | 65.2 | 65.5 |
| Del Amo Blvd. from Prairie Ave. to Crenshaw Blvd. | 69.8 | 66.0 | 66.3 |

Soundplan Single Point Noise at Property Boundary




Source: Soundplan Essential 4.0, 2017; TAHA, 2019.

Soundplan Noise Contours




Source: Soundplan Essential 4.0, 2017; TAHA, 2019.