NOISE AND VIBRATION IMPACT ANALYSIS

190TH AND WESTERN COMMERCIAL CENTER

TORRANCE, CALIFORNIA

LSA

February 2022

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February 2022

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LIST OF ABBREVIATIONS AND ACRONYMS

ac	acres
ADT	average daily traffic
ALUC	Airport Land Use Commission
City	City of Torrance
CNEL	Community Noise Equivalent Level
dB	decibels
dBA	A-weighted decibels
FHWA	Federal Highway Administration
ft	foot/feet
FTA	Federal Transit Administration
HVAC	heating, ventilation, and air conditioning
I-405	Interstate 405
in/sec	inches per second
L_{dn}	day-night average noise level
L_{eq}	equivalent continuous sound level
L_{max}	maximum instantaneous noise level
LSA	LSA Associates, Inc.
mi	miles
PPV	peak particle velocity
project	190th and Western Commercial Center Project
RCNM	Roadway Construction Noise Model
RMS	root-mean-square (velocity)
sf	square feet
VdB	vibration velocity decibels

INTRODUCTION

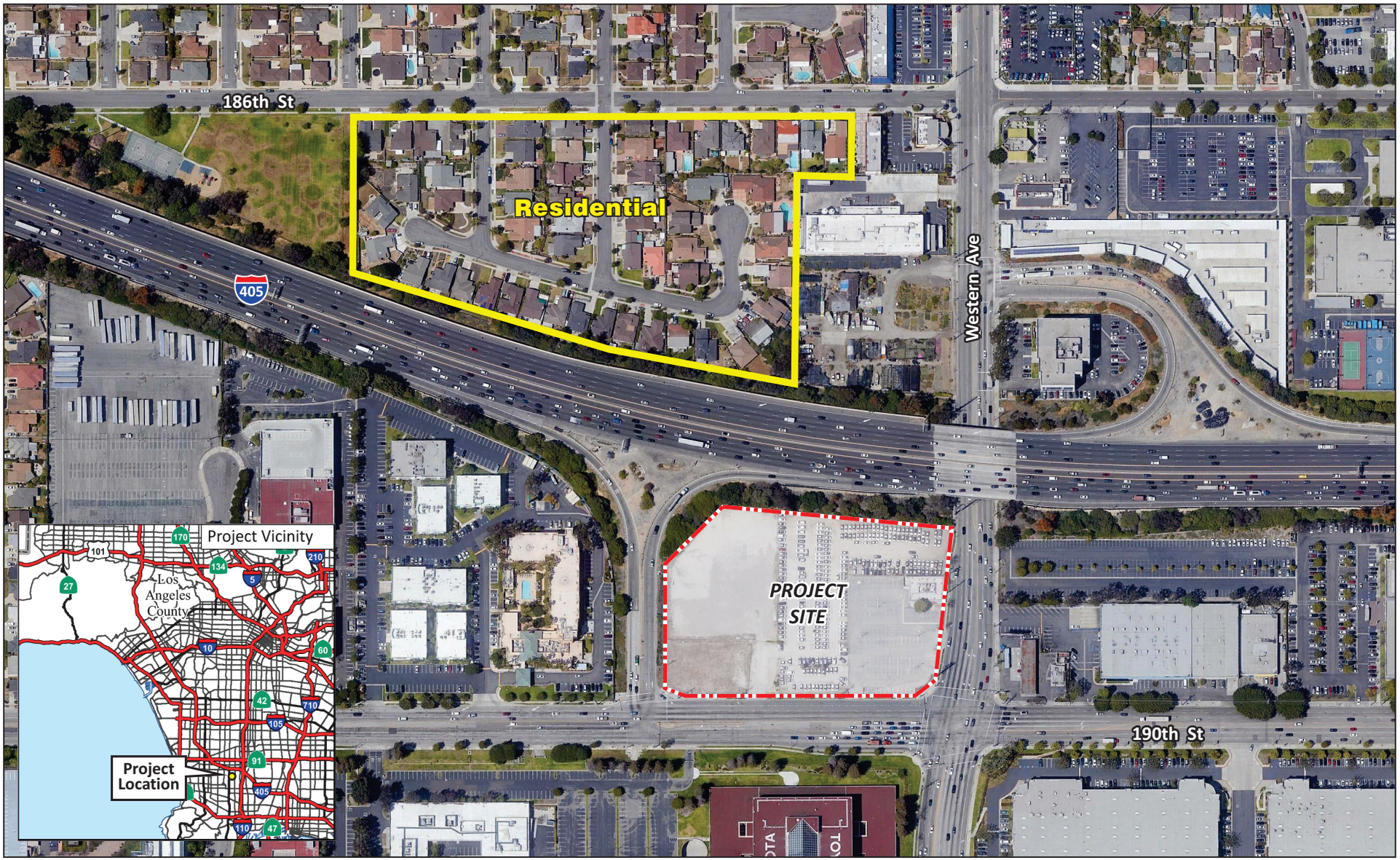
This noise and vibration impact analysis has been prepared to evaluate the potential noise and vibration impacts associated with the 190th Street and Western Commercial Center project (project) in Torrance, Los Angeles County, California. This report is intended to satisfy the requirements of the City of Torrance (City) and the California Environmental Quality Act (CEQA) for a project-specific noise and vibration impact analysis by examining the impacts of the proposed uses on the project site and evaluating any reduction measures the project may require.

PROJECT LOCATION

The project site is located at the northwestern corner of 190th Street and Western Avenue in Torrance, California, as shown on Figure 1. Regional access to the site is provided by Interstate 405 (I-405), which is located just north of the site.

PROJECT DESCRIPTION

Calbay Development, LLC, proposes to construct a commercial center comprising five buildings totaling 22,939 square feet (sf), as shown on Figure 2. The buildings would consist of two high-turnover sit-down restaurants and three fast-food restaurants with drive-through windows. The project would include a 260-stall parking lot and water-efficient landscaping. The 5.28-acre (ac) site is currently vacant and zoned as Commercial, which is consistent with the proposed land uses. The project would be constructed starting in late 2022 and would become operational later in 2023.



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N

0 150 300

FEET

SOURCE: Google Earth

LEGEND

Project Site

Sensitive Receptors

FIGURE 1

190th and Western Commercial Center

Regional and Project Location and Sensitive Receptors

I:\CBT1901\G\Location&Receptors.cdr (12/27/2019)

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FIGURE 2

0 15 30
FEET

SOURCE: McKently Malak Architects, Inc.

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190th and Western Commercial Center

Site Plan

CHARACTERISTICS OF SOUND

Sound is increasing to such disagreeable levels in the environment that it can threaten quality of life. 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 wave resulting in the tone's range from high to low. Loudness is the strength of a sound that describes a noisy or quiet environment and 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 through the A-weighted 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, unlike the linear scale (e.g., inches or pounds), is a scale based on powers of 10.

For example, 10 decibels (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 loudness of the sound. 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 dissipates exponentially with distance from the noise source. 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, such as highway traffic or railroad operations, the sound decreases 3 dB for each doubling of distance in a hard site environment. Line source noise in a relatively flat environment with absorptive vegetation decreases 4.5 dB for each doubling of distance.

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 (dBA). CNEL is the time-weighted 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 hours. CNEL and L_{dn} are within 1 dBA of each other and are normally interchangeable.

Other noise rating scales of importance when assessing the annoyance factor include the maximum noise level (L_{max}), which is the highest exponential time-averaged 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 that refer to 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 noise levels higher than 85 dBA. Exposure to high noise levels affects the entire system, with prolonged noise 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 noise exposure above 90 dBA would result in permanent cell damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear, even with short-term exposure. This level of noise is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by the feeling of pain in the ear (the threshold of pain). A sound level of 160–165 dBA will result in dizziness or loss of equilibrium. The ambient or background noise problem is widespread and generally more concentrated in urban areas than in outlying, less developed area. 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 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., number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. The A-weighting filter deemphasizes 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.
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 PM to 10:00 PM and after the addition of 10 dBA to sound levels occurring in the night between 10:00 PM and 7:00 AM.
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 PM and 7:00 AM.
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 at 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, and 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	—
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 Associates, Inc. (2015).

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 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 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 vibration velocity decibels (VdB) 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. Ground-borne vibration and noise from these sources are usually localized to areas within approximately 100 feet (ft) from the vibration source, although there are examples of ground-borne vibration causing interference out to distances greater than 200 ft (*Transit Noise and Vibration Impact Assessment Manual* [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, both construction of a project and freight train operations on railroad tracks 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 cosmetic building damage, it is not uncommon for heavy duty construction processes (e.g., 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 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 VdB, "V" is the RMS velocity amplitude, and "V_{ref}" is the reference velocity amplitude, or 1 x 10^{-6} inches per second (in/sec) used in the United States.

REGULATORY SETTING

FEDERAL REGULATIONS

Federal Transit Administration

Vibration standards included in the Federal Transit Administration's (FTA) *Transit Noise and Vibration Impact Assessment Manual* (2018) are used in this analysis for ground-borne vibration impacts on human annoyance. Table C provides the criteria for assessing the potential for interference or annoyance from vibration levels in a building.

Table C: 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 20X).
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 (100X) 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 Hz.
FTA = United States Federal Transit Administration
Hz = hertz
L_V = velocity in decibels
Max = maximum
VdB = vibration velocity decibels

The criteria for environmental impact from ground-borne vibration and noise are based on the maximum levels for a single event. Table D lists the potential vibration building damage criteria associated with construction activities, as suggested in the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018). FTA guidelines show that a vibration level of up to 0.5 in/sec in PPV [FTA 2018]) is considered safe for buildings consisting of reinforced concrete, steel, or timber (no plaster), and would not result in any construction vibration damage. For non-engineered timber and masonry buildings, the construction building vibration damage criterion is 0.2 in/sec in PPV. For a fragile building, the construction vibration damage criterion is 90 VdB (0.12 PPV [in/sec]).

Table D: Construction Vibration Damage Criteria

Building Category	PPV (in/sec)	Approximate L_V (VdB)[1]
Reinforced concrete, steel, or timber (no plaster)	0.50	102
Engineered concrete and masonry (no plaster)	0.30	98
Non-engineered timber and masonry buildings	0.20	94
Buildings extremely susceptible to vibration damage	0.12	90

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
[1] RMS vibration velocity in decibels (VdB) re 1 µin/sec.
µin/sec = microinches per second
FTA = Federal Transit Administration
in/sec = inches per second
L_V = velocity in decibels
PPV = peak particle velocity
RMS = root-mean-square
VdB = vibration velocity decibels

LOCAL REGULATIONS

City of Torrance

Noise Element of the General Plan

The City has established the noise/land use compatibility criteria for determining whether a new use is appropriate within a given noise environment. Table E shows land use noise compatibility from Table N-3 of the City's General Plan Noise Element. As shown in Table E, a noise level of 70 dBA CNEL is the maximum exterior noise level allowed for commercial uses. These compatibility criteria serve as guidelines. For example, an acoustical analysis must be prepared when noise-sensitive land uses are proposed within noise impact areas. The analysis must show that the project is designed to attenuate noise to meet the City's noise standards in order to receive approval. If the project design does not meet the noise standards, mitigation can be recommended in the analysis. If the analysis demonstrates that the noise standards can be met by implementing the mitigation measures, the project can be approved conditioned upon implementation of the mitigation measures.

Table E: Noise/Land Use Compatibility Guidelines

Property Receiving Noise		Maximum Noise Level L_{dn} or CNEL (dBA)	
Type of Use	**Land Use Designations**	**Interior**	**Exterior**
Residential[3]	Low Density Residential Low Medium Density Residential Medium Density Residential	45	60/65[1]
	Medium High Density Residential	45	65/70[2]
	High Density Residential	45	70[1]
Commercial and Office	General Commercial Commercial Center	—	70
	Residential Office	50	70
Industrial	Business Park	55	75
	Light Industrial		
	Heavy Industrial		
Public and Medical Uses	Public/Quasi-Public/Open Space	50	65
	Hospital/Medical	50	70
Airport	Airport	—	70

Source: Table N-3, City of Torrance General Plan, Noise Element (City of Torrance 2010).

[1] The normally acceptable standard is 60 dBA. The higher standard is acceptable subject to inclusion of noise-reduction features in project design and construction.

[2] Maximum exterior noise levels up to 70 dBA CNEL are allowed for Multiple-Family Housing.

[3] Regarding aircraft-related noise, the maximum acceptable exposure for new residential development is 60 dBA CNEL.

CNEL = Community Noise Equivalent Level

dBA = A-weighted decibels

L_{dn} = day-night average noise level

Municipal Code

Section 46.2.6 of the City's Municipal Code limits noise levels at the property line of any residential land to exceed the ambient noise level by more than 5 dBA from machinery, equipment, pump, fan, air conditioning apparatus or similar mechanical device.

Section 46.3.1 of the City's Municipal Code prohibits the operation of power construction tools or equipment, or engage in 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 dBA as measured at property lines, except between the hours of 7:30 a.m. and 6:00 p.m. Monday through Friday and between 9:00 a.m. and 5:00 p.m. on Saturdays. Construction shall be prohibited on Sundays and holidays observed by City Hall, except between the hours of 10:00 a.m. and 4:00 p.m. for homeowners that reside at the property.

Sections 46.7.2(a) and 46.7.2(b) of the City's Municipal Code limits stationary noise based on four regions. The four regions within the City are defined below, and a map showing the locations of these regions are provided in Appendix A.

- **Region 1** includes the predominantly industrial areas in and around the refineries and industrial uses on the western edge of the City.
- **Region 2** includes the area in and around the airport and includes the commercial and industrial uses south of Lomita Boulevard and north of Pacific Coast Highway.
- **Region 3** encompasses the residential neighborhoods south of Pacific Coast Highway and west of Hawthorne Boulevard.
- **Region 4** includes the remainder of the City.

Section 46.7.2(a) of the City Municipal Code limits stationary noise on residential land, which is shown in Table F. The noise limits shown in Table F are adjusted using the corrections provided in Table G for noise that are steady with an audible tone (such as a whine, screech or hum), repetitive impulsive noise (such as hammering or riveting), or noise that is not continuous.

Table F: City of Torrance Noise Limits

Land Use Category	Region	Noise Level (dBA L_{eq})[1]	
		Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)
Residential	3	50[2] (55[3])	45[2] (50[3])
Residential	4	55[2] (60[3])	50[2] (55[3])

Source: Municipal Code (City of Torrance 2021).

[1] The noise descriptor was assumed to be L_{eq} because noise levels are continuous. In addition, these noise limits are adjusted using the corrections provided in Table G for noise that are steady with an audible tone (such as a whine, screech or hum), repetitive impulsive noise (such as hammering or riveting), or noise that is not continuous.

[2] The noise limit for noise receivers located on residential land 500 ft or more from the boundaries of Regions 1 or 2.

[3] The noise limit for noise receivers located on residential land within 500 ft from the boundaries of Regions 1 or 2 or 5 dBA above the ambient noise level, whichever is lower.

dBA = A-weighted decibels

L_{eq} = equivalent continuous sound level

Table G: Corrections to the Noise Limits

Noise Conditions	Correction to the Limits (dB)
1. Noise contains a steady, audible tone, such as a whine, screech or hum	-5
2. Noise is a repetitive impulsive noise, such as hammering or riveting	-5
3. If the noise is not continuous, one of the following corrections to the limits shall be applied:	
a. Noise occurs less than 5 hours per day or less than 1 hour per night	+5
b. Noise occurs less than 90 minutes per day or less than 20 minutes per night	+10
c. Noise occurs less than 30 minutes per day or less than 6 minutes per night	+15
4. Noise occurs on Sunday morning (between 12:01 a.m. and 12:01 p.m.)	-5

Source: Municipal Code (City of Torrance 2021).
dB = decibels

Section 46.7.2(b) of the City's Municipal Code limits noise at industrial and commercial boundaries, as listed below. These noise limits are adjusted using the corrections provided in Table G for noise that is steady with an audible tone (such as a whine, screech or hum), repetitive impulsive noise (such as hammering or riveting), or noise that is not continuous. The proposed project is commercial and is located in Region 4. Therefore, stationary noise generated by the proposed project is limited to 60 dBA L_{eq} during daytime hours and 55 dBA L_{eq} during nighttime hours at the proposed project's property boundary.

1. **Noise Sources in Region 1:** It shall be unlawful for any person in Region 1 to produce noise levels at the boundary of Region 1 in excess of 70 dB during the day or 65 dB during the night.

2. **Noise Sources in Region 2:** It shall be unlawful for any person in Region 2 to produce noise levels at the boundary of Region 2 in excess of 60 dBA during the day or 55 dBA during the night.

3. **Noise Sources in All Remaining Industrial Use Land:** It shall be unlawful for any person on industrial use land outside Regions 1 and 2 to produce noise levels at his own property boundary in excess of 60 dBA during the day or 55 dBA during the night.

4. **Noise Sources on All Land Use for Commercial Purposes:** It shall be unlawful for any person on land used for commercial purposes to produce noise levels at his own property boundary in excess of 60 dBA during the day or 55 dBA during the night.

Section 46.7.2(c) of the City's Municipal Code provides corrections to the noise limits in Sections 46.7.2(a) and 46.7.2(b), which are shown in Table G.

APPLICABLE NOISE AND VIBRATION STANDARDS

Based on the regulatory information above, the following provides the noise and vibration standards used to determine project-related noise and vibration impacts.

Short-term Construction Vibration

The closest commercial and residential building structures surrounding the project site was observed to be constructed equivalent to non-engineered timber and masonry. Therefore, commercial and residential building structures surrounding the project site was evaluated based on the FTA damage threshold of 0.2 PPV (in/sec).

Long-Term Stationary Noise

The closest single-family residences are located north of the project site across I-405 and are more than 500 ft from the boundaries of Regions 1 and 2. Therefore, the closest residences in the project area are located in Region 4, and the daytime and nighttime noise limits at these residences are 55 dBA and 50 dBA, respectively.

The proposed project includes commercial uses and stationary noise generated by the proposed project is limited to 60 dBA L_{eq} during daytime hours and 55 dBA L_{eq} during nighttime hours at the proposed project's property boundary.

EXISTING SETTING

SENSITIVE LAND USES IN THE PROJECT VICINITY

Land uses located adjacent to the project site include a hotel, a business park, and commercial and industrial uses. Single-family residences are located north of the project site across I-405. Commercial uses are located east of the project site across Western Avenue. Industrial uses are located southeast of the project site. A business park is located south of the project site across 190th Street, and a hotel and business park are located west of the project site across the I-405 southbound ramps.

OVERVIEW OF THE EXISTING NOISE ENVIRONMENT

Transportation facilities make up the primary existing noise sources in the project area. Traffic on the adjacent I-405 mainline, I-405 southbound ramps, Western Avenue, and 190th Street is the primary source of noise in the project vicinity.

AMBIENT NOISE LEVEL MEASUREMENTS

Short-Term Noise Level Measurement

One short-term (20-minute) noise level measurement was conducted on November 12, 2019 to document the existing noise environment on the project site. Table H shows the results of the noise level measurement. Noise sources at the measurement location are primarily traffic on I-405 and the ramps. Figure 3 shows the short-term monitoring locations.

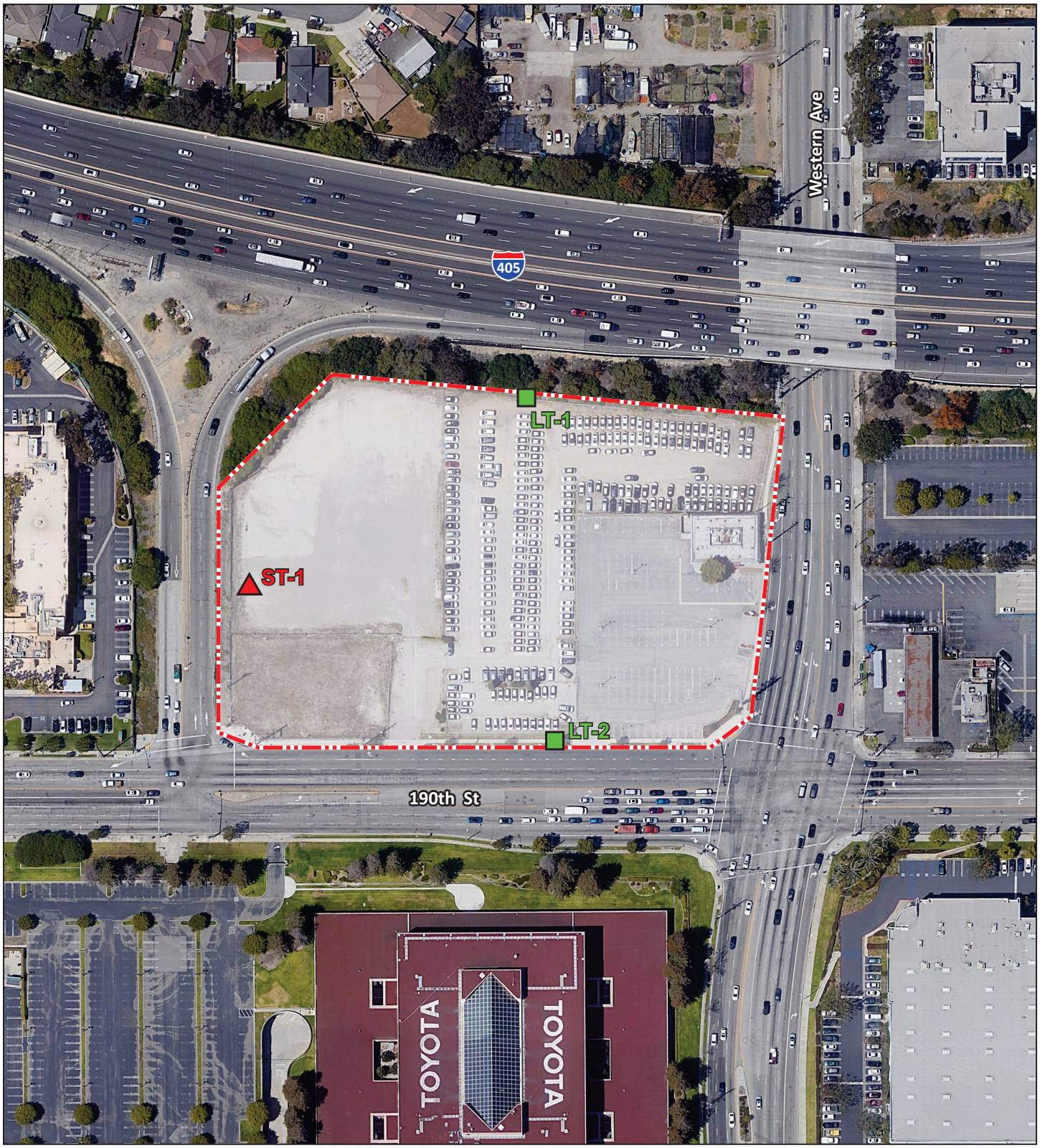
Table H: Short-Term Ambient Noise Monitoring Results

Monitoring No.	Location	Date	Start Time	Duration (minutes)	Noise Level (dBA L_{eq})	Noise Source
ST-1	West side of project site, approximately 32 ft from the fence.	11/12/19	10:27 a.m.	20	64.1	Traffic on I-405 mainline and I-405 ramps at Western Avenue.

Source: Compiled by LSA Associates, Inc. (2020).
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level

Long-Term Noise Level Measurements

Two long-term (24-hour) noise level measurements were conducted on November 12, 2019, using Larson Davis Spark 706RC noise dosimeters. Tables I and J show the hourly L_{eq} results from the long-term measurements, and Table K shows the calculated CNEL level from the long-term noise level measurements. As shown in Table K, the calculated CNEL levels are 69.0 dBA CNEL and 76.6 dBA CNEL at LT-1 and LT-2, respectively. Figure 3 shows the long-term monitoring locations.



LSA

LEGEND

- Long Term Monitoring Locations
- Short Term Monitoring Locations
- Project Site

N

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FEET

SOURCE: Google Earth

FIGURE 3

190th and Western Commercial Center

Noise Monitoring Locations

I:\CBT1901\G\Noise Monitoring Locations.cdr (1/10/2020)

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

	Start Time	Date	Noise Level (dBA L_{eq})
1	10:00 AM	11/12/19	62.4
2	11:00 AM	11/12/19	62.8
3	12:00 PM	11/12/19	62.1
4	1:00 PM	11/12/19	59.2
5	2:00 PM	11/12/19	59.9
6	3:00 PM	11/12/19	58.5
7	4:00 PM	11/12/19	59.0
8	5:00 PM	11/12/19	57.8
9	6:00 PM	11/12/19	57.7
10	7:00 PM	11/12/19	61.2
11	8:00 PM	11/12/19	64.5
12	9:00 PM	11/12/19	64.5
13	10:00 PM	11/12/19	63.7
14	11:00 PM	11/12/19	62.2
15	12:00 AM	11/13/19	61.7
16	1:00 AM	11/13/19	59.7
17	2:00 AM	11/13/19	58.5
18	3:00 AM	11/13/19	58.3
19	4:00 AM	11/13/19	62.4
20	5:00 AM	11/13/19	65.0
21	6:00 AM	11/13/19	64.3
22	7:00 AM	11/13/19	63.1
23	8:00 AM	11/13/19	62.9
24	9:00 AM	11/13/19	63.6

Source: Compiled by LSA Associates, Inc. (2020).
dBA L_{eq} = equivalent continuous sound level measured in A-weighted decibels

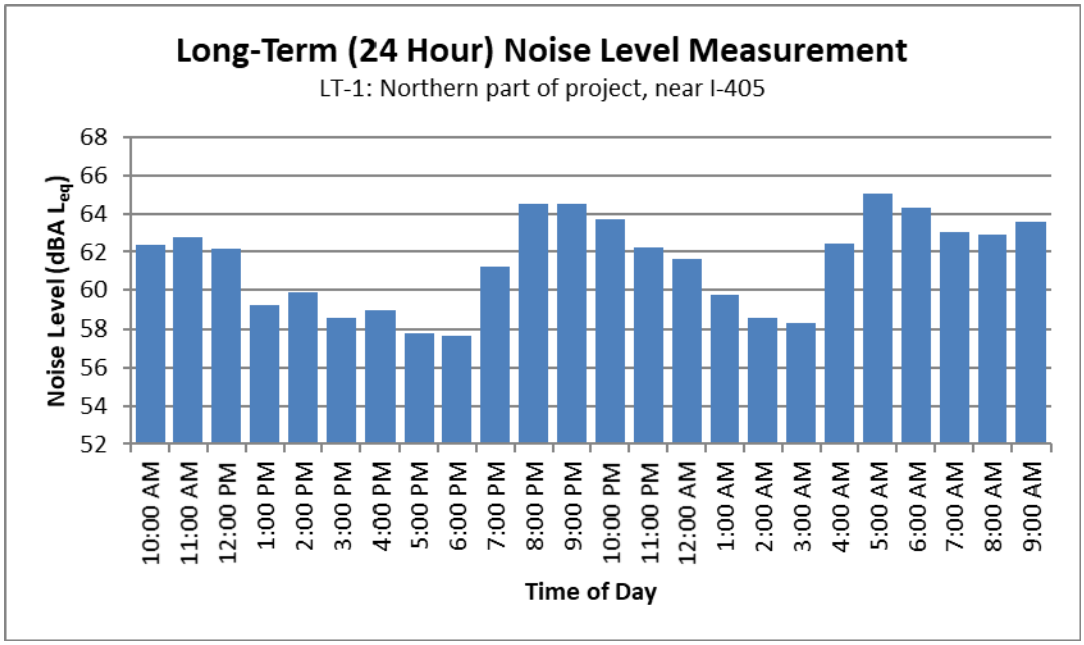

Table J: Long-Term (24-Hour) Noise Level Measurement Results at LT-2

	Start Time	Date	Noise Level (dBA L_{eq})
1	10:00 AM	11/12/19	72.8
2	11:00 AM	11/12/19	72.3
3	12:00 PM	11/12/19	73.0
4	1:00 PM	11/12/19	72.9
5	2:00 PM	11/12/19	72.1
6	3:00 PM	11/12/19	74.7
7	4:00 PM	11/12/19	74.9
8	5:00 PM	11/12/19	74.1
9	6:00 PM	11/12/19	73.6
10	7:00 PM	11/12/19	70.9
11	8:00 PM	11/12/19	70.4
12	9:00 PM	11/12/19	71.0
13	10:00 PM	11/12/19	69.5
14	11:00 PM	11/12/19	67.2
15	12:00 AM	11/13/19	67.3
16	1:00 AM	11/13/19	65.8
17	2:00 AM	11/13/19	67.1
18	3:00 AM	11/13/19	65.7
19	4:00 AM	11/13/19	68.7
20	5:00 AM	11/13/19	71.8
21	6:00 AM	11/13/19	72.4
22	7:00 AM	11/13/19	73.0
23	8:00 AM	11/13/19	72.3
24	9:00 AM	11/13/19	73.4

Source: Compiled by LSA Associates, Inc. (2020).
dBA L_{eq} = equivalent continuous sound level measured in A-weighted decibels

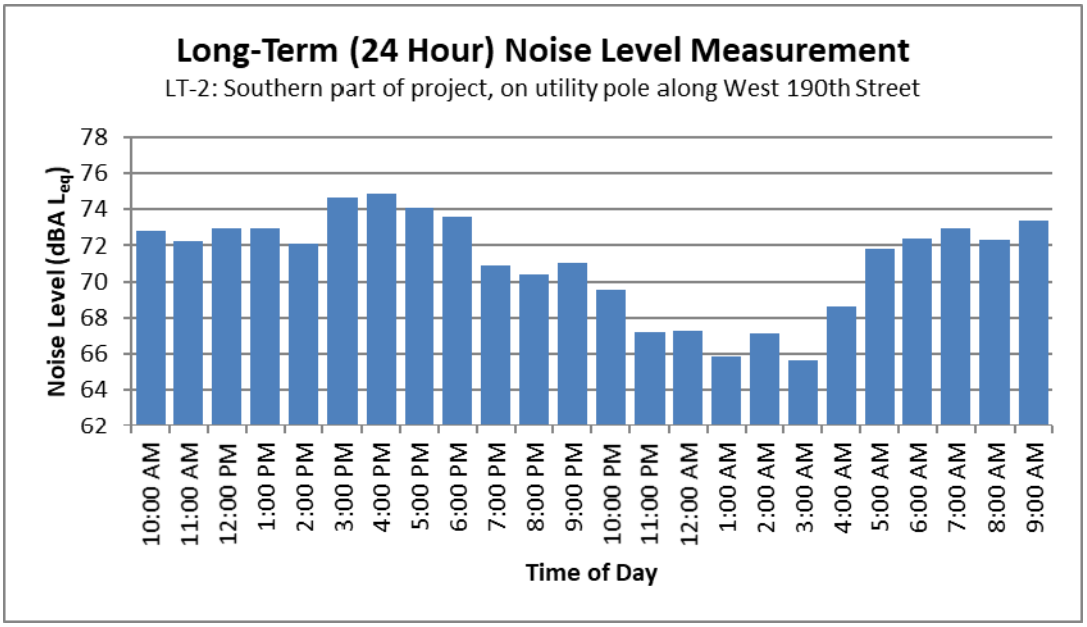

Table K: Long-Term Ambient Noise Level Measurements

Location Number	Location	Start Date	Start Time	Duration (hours)	Noise Level (dBA CNEL)	Noise Sources
LT-1	Northern part of project, on fence near I-405.	7/12/19	10:00 a.m.	24	69.0	Traffic on I-405 mainline
LT-2	Southern part of project, on utility pole along West 190th Street.	7/12/19	10:00 a.m.	24	76.6	Traffic on West 190th Street

Source: Compiled by LSA Associates, Inc. (2020).
dBA = A-weighted decibels
CNEL = Community Noise Equivalent Level
I-405 = Interstate 405

AIRCRAFT NOISE

The Los Angeles International Airport, Compton/Woodley Airport, Hawthorne Municipal Airport, Torrance Airport, and Long Beach Airport are located 6.6 miles (mi) northwest, 4 mi northeast, 4.4 mi northwest, 3.9 mi southwest, and 8.8 mi southeast of the project site, respectively. Based on the Los Angeles County Airport Land Use Plan (ALUC 2004), the project site is outside the 65 dBA CNEL noise contours for all of these airports.

TRAFFIC NOISE

The guidelines included in the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (1977; FHWA RD-77-108) were used to evaluate highway traffic-related noise conditions along roadway segments in the project vicinity. This model requires various parameters, including traffic volumes, vehicle mix, vehicle speed, and roadway geometry to compute typical equivalent noise levels during daytime, evening, and nighttime hours. The resultant noise levels are weighted and summed over 24-hour periods to determine the CNEL values. The vehicle mix obtained from classified vehicle counts (Albert Grover & Associates 2019) were used for roadways in the project vicinity. The existing average daily traffic (ADT) volumes were obtained from the project's *Traffic Impact Analysis* (Albert Grover & Associates 2022). Table L shows the existing traffic noise levels. These noise levels represent the worst-case scenario, which assumes that no shielding is provided between the traffic and the location where the noise contours are drawn. The specific assumptions used in developing these noise levels and the model printouts are provided in Appendix B.

Table L shows that traffic noise levels along 190th Street and Western Avenue are moderately high. As Table L shows, the 70, 65, and 60 dBA CNEL impact zones extend up to 142, 299, and 639 ft, respectively, from the centerline of 190th Street. For Western Avenue, the 70, 65, and 60 dBA CNEL impact zones extend up to 100, 207, and 442 ft, respectively, from the roadway centerline.

Table L: Existing Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 dBA CNEL (ft)	Centerline to 65 dBA CNEL (ft)	Centerline to 60 dBA CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane
190th Street West of I-405 EB Ramps	32,500	140	296	635	74.0
190th Street between I-405 EB Ramps and Project Driveway West	32,845	142	299	639	73.7
190th Street between Project Driveway West and Project Driveway East	32,845	142	299	639	73.7
190th Street between Project Driveway East and Western Avenue	32,845	142	299	639	73.7
190th Street East of Western Avenue	27,350	126	265	566	73.0
Western Avenue between I-405 WB Ramps and Project Driveway North	36,750	100	207	442	71.5
Western Avenue between Project Driveway North and 190th Street	36,750	100	207	442	71.5
Western Avenue South of 190th Street	34,850	98	200	426	71.1

Source: Compiled by LSA Associates, Inc. (2022).
Note: Traffic noise within 50 ft of the roadway centerline should be evaluated with site-specific information.
ADT = average daily traffic
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
EB = eastbound
ft = feet
I-405 = Interstate 405
WB = westbound

IMPACTS

CONSTRUCTION NOISE IMPACTS

Two types of short-term noise impacts could occur during construction on the project site. First, construction crew commutes and the transport of construction equipment and materials to the site for the project would incrementally increase noise levels on roadways leading to the project site. The pieces of construction equipment for construction activities would move on site, would remain for the duration of each construction phase, and would not add to the daily traffic volume in the project vicinity. Although there would be a relatively high single-event noise exposure potential causing intermittent noise nuisance (passing trucks at 50 ft would generate up to a maximum of 84 dBA), the effect on longer-term (hourly or daily) ambient noise levels would be small because the hourly/daily construction-related vehicle trips are small when compared to existing hourly/daily traffic volume on 190th Street and Western Avenue. The building construction phase would generate the most trips out of all of the construction phases (i.e., 135 trips per hour and 270 trips per day based on the project's California Emissions Estimator Model results in Appendix A of the *Air Quality and Greenhouse Gas Impact Analysis* [LSA 2022]). Roadways that would be used to access the project site are 190th Street and Western Avenue. Based on Table L, 190th Street and Western Avenue have estimated existing hourly/daily traffic volumes of 2,735/27,350 and 3,585/34,850, respectively, near the project site. Based on the information above, construction-related traffic would increase noise by up to 0.2 dBA. A noise level increase of less than 3 dBA would not be perceptible to the human ear in an outdoor environment. Therefore, no short-term construction-related noise impacts associated with worker commute and equipment transport to the project site would occur, and no noise reduction measures are required.

The second type of short-term noise impact is related to noise generated from construction activities. Construction is performed in discrete steps, each of which has its own mix of equipment and consequently its own noise characteristics. The project anticipates demolition, site preparation, and grading; building construction; paving; and architectural coating phases of construction. These various sequential phases change the character of the noise generated on a project site. Therefore, the noise levels vary 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 M lists typical construction equipment noise levels (L_{max}) recommended for noise impact assessments for typical construction equipment included in the FHWA Highway Construction Noise Handbook (FHWA 2006), based on a distance of 50 ft between the equipment and a noise receptor.

Typical noise levels at 50 ft from an active construction area range up to 88 dBA L_{max} during the noisiest construction phases. The site preparation phase, which includes grading and paving, tends to generate the highest noise levels because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery, such as backfillers, bulldozers, and front loaders. Earthmoving and compacting equipment include compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full-power operation followed by 3 or 4 minutes at lower power settings.

Table M: Typical Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor[1]	Maximum Noise Level (L_{max}) at 50 ft[2]
Backhoe	40	80
Compactor (ground)	20	80
Compressor	40	80
Crane	16	85
Dozer	40	85
Dump Truck	40	84
Excavator	40	85
Flatbed Truck	40	84
Forklift	20	85
Front-End Loader	40	80
Grader	40	85
Impact Pile Driver	20	95
Jackhammer	20	85
Pickup Truck	40	55
Pneumatic Tools	50	85
Pump	50	77
Rock Drill	20	85
Roller	20	85
Scraper	40	85
Tractor	40	84
Welder	40	73

Source: Table 9.1, *FHWA Highway Construction Noise Handbook* (FHWA 2006).
Note: The 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 Spec 721.560 from the CA/T program to be consistent with the City of Boston, Massachusetts, Noise Code for the "Big Dig" project.
CA/T = Central Artery/Tunnel
FHWA = Federal Highway Administration
ft = feet
L_{max} = maximum instantaneous noise level

Project construction is expected to require the use of bulldozers, graders, and water trucks/pickup trucks. Noise associated with the use of construction equipment is estimated to be between 55 and 85 dBA L_{max} at a distance of 50 ft from the active construction area for the grading phase. As shown in Table M, the maximum noise level generated by each dozer is assumed to be approximately 85 dBA L_{max} at 50 ft from the dozer in operation. Each grader would generate approximately 85 dBA L_{max} at 50 ft. The maximum noise level generated by water trucks/pickup trucks is approximately 55 dBA L_{max} at 50 ft from these vehicles. Each doubling of the sound source with equal strength increases the noise level by 3 dBA. Each piece of construction equipment operates as an individual point source. The worst-case composite noise level residence during this phase of construction would be 88 dBA L_{max} at a distance of 50 ft from an active construction area. Based on a usage factor of 40 percent, the worst-case combined noise level during this phase of construction would be 84 dBA L_{eq} at a distance of 50 ft from the active construction area.

The closest residence is located across the I-405, approximately 275 ft north of the project construction boundary, and would be exposed to construction noise reaching 73 dBA L_{max} (69 dBA L_{eq}). These residences on the other side of I-405 are approximately 16 ft lower in elevation than I-405 and are located behind a 10 ft high noise barrier, which would provide a minimum noise reduction of 10 dBA. With the 10 ft high noise barrier and elevation difference between I-405 and these residences, the residences would be exposed to construction noise reaching 63 dBA L_{max} (59 dBA L_{eq}). Ambient noise levels at the closest residence would be similar to LT-1 (Table I) with noise levels ranging from 57.7 to 63.6 dBA L_{eq} during the hours of construction. Ambient noise level would generally be higher than construction noise levels because I-405 traffic noise levels would dominate the noise environment at the closest residence, and noise levels generated by construction activities would not increase ambient noise levels at the closest residence.

The proposed project would be required to comply with the construction hours allowed under the City's Municipal Code Noise Ordinance, and the best construction practices listed below would minimize construction noise:

- During all project site excavation and grading, the project contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers consistent with manufacturers' standards.

- The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and most noise-sensitive receptors nearest the project site during all project construction.

- The construction contractor shall place all stationary construction equipment so that the emitted noise is directed away from the sensitive receptors nearest the project site.

Therefore, no noise impacts from construction activities would occur. No noise reduction measures are required.

CONSTRUCTION VIBRATION IMPACTS

This construction vibration impact analysis discusses the level of human annoyance using vibration levels in VdB and assesses the potential for building damage using vibration levels in PPV (in/sec). Vibration levels calculated in RMS velocity are best for characterizing human response to building vibration, whereas vibration levels in PPV are best for characterizing damage potential. As shown in Table D, the FTA guidelines indicate that a vibration level up to 0.5 PPV (in/sec) is considered safe for buildings consisting of reinforced concrete, steel, or timber (no plaster), and would not result in any construction vibration damage (FTA 2018). For a non-engineered timber and masonry building, the construction vibration damage criterion is 0.2 PPV (in/sec). For a fragile building, the construction vibration damage criterion is 90 VdB (0.12 PPV [in/sec]).

Table N shows the reference vibration levels at a distance of 25 ft for each type of standard construction equipment from the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018). Outdoor site preparation for the proposed project is expected to require the use of a large

Table N: 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	**0.076**	**86**
Jackhammer	0.035	79
Small Bulldozer	0.003	58

Sources: *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 = feet
FTA = Federal Transit Administration
in/sec = inches per second
L_V = velocity in decibels
PPV = peak particle velocity
RMS = root-mean-square
VdB = vibration velocity decibels

bulldozer and loaded trucks, which would generate ground-borne vibration of up to 87 VdB (0.089 PPV [in/sec]) and 86 VdB (0.076 PPV [in/sec] when measured at 25 ft, respectively.

The greatest vibration levels are anticipated to occur during the site preparation phase. All other phases are expected to result in lower vibration levels. The distance to the nearest buildings for vibration impact analysis is measured between the nearest off-site buildings and the project boundary (assuming the construction equipment would be used at or near the project boundary) because vibration impacts normally occur within the buildings.

The formula for vibration transmission is provided below.

$$L_vdB\ (D) = L_vdB\ (25\ ft) - 30\ Log\ (D/25)$$
$$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$$

Table O lists the projected vibration level from various construction equipment expected to be used on the project site to the nearest buildings in the project vicinity. As shown in Table O, the closest structure to the project construction boundary is the hotel building located approximately 180 ft west of the project site, which would experience vibration levels of up to 61 VdB (0.005 PPV [in/sec]). This vibration level would not result in community annoyance because vibration levels would not exceed the FTA community annoyance threshold of 78 VdB for residential uses during daytime hours. In addition, this vibration level would not have the potential to result in building damage because the hotel building was observed to be constructed of non-engineered timber and masonry and because the vibration level would not exceed the FTA vibration damage threshold of 94 VdB (0.2 PPV [in/sec]). All other buildings in the vicinity are farther away and would experience lower vibration levels. Therefore, no construction vibration impacts would occur during project construction, and no vibration reduction measures are required.

Table O: Summary of Construction Equipment and Activity Vibration

Land Use	Direction	Equipment/ Activity	Reference Vibration Level (VdB) at 25 ft	Reference Vibration Level (PPV) at 25 ft	Distance (ft)	Maximum Vibration Level (VdB)	Maximum Vibration Level (PPV)
Residential	North	Large Bulldozers	87	0.089	290	55	0.002
		Loaded Trucks	86	0.076	290	54	0.002
Convenience Store	East	Large Bulldozers	87	0.089	230	58	0.003
		Loaded Trucks	86	0.076	230	57	0.003
Commercial/ Light Industrial	Southeast	Large Bulldozers	87	0.089	280	56	0.002
		Loaded Trucks	86	0.076	280	55	0.002
Office	South	Large Bulldozers	87	0.089	185	61	0.004
		Loaded Trucks	86	0.076	185	60	0.004
Hotel	West	Large Bulldozers	87	0.089	180	61	0.005
		Loaded Trucks	86	0.076	180	60	0.004

Source: Compiled by LSA Associates, Inc. (2020).
Note: The FTA-recommended building damage threshold is 94 VdB (0.2 PPV [in/sec]) for building structures constructed of non-engineered timber and masonry (FTA 2018).
ft = feet
in/sec = inches per second
FTA = Federal Transit Administration
PPV = peak particle velocity
VdB = vibration velocity decibels

LONG-TERM AIRCRAFT NOISE IMPACTS

As discussed above, the Los Angeles International Airport, Compton/Woodley Airport, Hawthorne Municipal Airport, Torrance Airport, and Long Beach Airport are 6.6 mi northwest, 4 mi northeast, 4.4 mi northwest, 3.9 mi southwest, and 8.8 mi southeast of the project site, respectively. The Airport Influence Area maps within the Los Angeles County Airport Land Use Plan (ALUC 2004) show that the project site is outside the 65 dBA CNEL noise contour for all of these airports. Therefore, the project would not expose people working in the project area to excessive noise levels.

LONG-TERM TRAFFIC NOISE IMPACTS

The FHWA Highway Traffic Noise Prediction Model (RD-77-108) was used to evaluate traffic-related noise conditions along street segments in the project vicinity. This model requires various parameters, including traffic volumes, vehicle mix, vehicle speed, and roadway geometry, to compute typical equivalent noise levels during daytime, evening, and nighttime hours. The resulting noise levels are weighted and summed over 24 hour periods to determine the CNEL values. The vehicle mix obtained from classified vehicle counts (Albert Grover & Associates 2019) were used for roadways in the project vicinity. The Existing (2019) and Opening Year (2023) ADT volumes were obtained from the project's *Traffic Impact Analysis* (Albert Grover & Associates 2022) for the proposed project. Tables P and Q list the traffic noise levels for the Existing (2019) and Opening Year (2023) without and with project scenarios, respectively. These noise levels represent the worst-case scenario, which assumes that no shielding is provided between the traffic and the location where the noise contours are drawn. The specific assumptions used in developing these noise levels and the model printouts are provided in Appendix B.

Table P: Existing (2019) Traffic Noise Levels Without and With Project

Roadway Segment	Without Project Traffic Conditions					With Project Traffic Conditions					
	ADT	Centerline to 70 dBA CNEL (ft)	Centerline to 65 dBA CNEL (ft)	Centerline to 60 dBA CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane	ADT	Centerline to 70 dBA CNEL (ft)	Centerline to 65 dBA CNEL (ft)	Centerline to 60 dBA CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane	Increase from Baseline Conditions
190th Street West of I-405 EB Ramps	32,500	140	296	635	74.0	33,210	142	300	644	74.1	0.1
190th Street between I-405 EB Ramps and Project Driveway West	32,845	142	299	639	73.7	33,830	145	304	652	73.8	0.1
190th Street between Project Driveway West and Project Driveway East	32,845	142	299	639	73.7	33,880	145	305	653	73.8	0.1
190th Street between Project Driveway East and Western Avenue	32,845	142	299	639	73.7	34,965	148	311	666	74.0	0.3
190th Street East of Western Avenue	27,350	126	265	566	73.0	28,470	130	272	581	73.2	0.2
Western Avenue between I-405 WB Ramps and Project Driveway North	36,750	100	207	442	71.5	37,670	102	210	449	71.6	0.1
Western Avenue between Project Driveway North and 190th Street	36,750	100	207	442	71.5	38,380	103	213	454	71.7	0.2
Western Avenue South of 190th Street	34,850	98	200	426	71.1	36,020	100	205	436	71.3	0.2

Source: Compiled by LSA Associates, Inc. (2022).
ADT = average daily traffic
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibel
EB eastbound
ft = feet
I-405 = Interstate 405
WB = westbound

Table Q: Opening Year (2023) Traffic Noise Levels Without and With Project

Roadway Segment	Without Project Traffic Conditions					With Project Traffic Conditions					
	ADT	Centerline to 70 dBA CNEL (ft)	Centerline to 65 dBA CNEL (ft)	Centerline to 60 dBA CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane	ADT	Centerline to 70 dBA CNEL (ft)	Centerline to 65 dBA CNEL (ft)	Centerline to 60 dBA CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane	Increase from Baseline Conditions
190th Street West of I-405 EB Ramps	34,380	145	307	659	74.2	35,090	147	311	668	74.3	0.1
190th Street between I-405 EB Ramps and Project Driveway West	35,050	148	312	668	74.0	36,000	151	317	680	74.1	0.1
190th Street between Project Driveway West and Project Driveway East	35,050	148	312	668	74.0	35,935	150	317	679	74.1	0.1
190th Street between Project Driveway East and Western Avenue	34,420	146	308	660	73.9	36,425	152	320	685	74.1	0.2
190th Street East of Western Avenue	28,260	129	270	579	73.1	29,380	132	277	594	73.3	0.2
Western Avenue between I-405 WB Ramps and Project Driveway North	38,580	103	214	456	71.7	39,500	105	217	463	71.8	0.1
Western Avenue between Project Driveway North and 190th Street	38,580	103	214	456	71.7	40,225	106	219	469	71.9	0.2
Western Avenue South of 190th Street	38,565	104	214	456	71.6	39,735	106	218	465	71.7	0.1

Source: Compiled by LSA Associates, Inc. (2022).
Note: Opening Year 2023 traffic includes cumulative projects.
ADT = average daily traffic
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibel
EB eastbound
ft = feet
I-405 = Interstate 405
WB = westbound

Off-site Traffic Noise Impacts

Tables P and Q show that the proposed project would result in a project-related traffic noise increase of up to 0.3 dBA in the project vicinity. This noise level increase is below 3 dBA and would not be perceptible to the human ear in an outdoor environment. Therefore, no off-site traffic noise impacts would occur, and no noise reduction measures are required.

On-site Traffic Noise Impacts

The proposed project would include a number of outdoor patios for outdoor eating. The outdoor patios would not be used as full-service for any of the tenants at Buildings 1, 2, 3, 4a, and 4b and there would be no server or table bussers servicing those areas on any long-term basis. In addition, the outdoor patios are short-term seating areas for patrons as an alternate option to the indoor seating. Therefore, the City's noise standard of 70 dBA CNEL for commercial uses would not be applicable to the outdoor patios associated with the proposed project and no on-site traffic noise impacts would occur. No noise reduction measures are required.

LONG-TERM STATIONARY NOISE IMPACTS

Delivery trucks/truck-unloading activities, parking activities, and heating, ventilation, and air conditioning (HVAC) equipment associated with the project would potentially impact off-site land uses. The following provides a detailed noise analysis and discussion of each stationary noise source.

Truck Delivery and Truck Unloading Activities

The proposed project would have three dedicated loading areas for delivery trucks near Buildings 1, 2, and 4b, as shown on Figure 2. Truck delivery and truck unloading activities would occur at these designated locations. Truck delivery consists of arrivals and departures at the project site. Although a typical truck unloading process takes an average of 15 to 20 minutes, the maximum unloading noise level occurs in a much shorter period of time, in a few minutes (at most 5 minutes) over each truck delivery. These activities are assumed to occur anytime during daytime or nighttime hours because the project uses could operate 24-hours per day. The proposed on-site commercial uses would use medium-sized delivery trucks that would generate a noise level of 60 to 65 dBA L_{eq} at a distance of 50 ft.

The closest residential property line is located north of the project site, across I-405, and approximately 405 ft from the nearest on-site truck delivery and truck unloading activity. At a distance of 405 ft, noise would be attenuated by 18.2 dBA compared to the noise level measured at 50 ft from the source. Noise levels from on-site truck delivery and truck loading activities at the closest residence would reach noise levels of 46.8 dBA L_{eq} (65 dBA – 18.2 dBA = 46.8 dBA). Noise levels at the property line of the closest residence would not exceed the City's daytime and nighttime noise standards of 65 and 60 dBA L_{eq}, respectively. These noise standards are based on the City's daytime and nighttime noise standards of 55 and 50 dBA L_{eq}, respectively, with a correction of 10 dBA for when noise occurs less than 90 minutes per day or less than 20 minutes per night. As the closest residences are located immediately adjacent to I-405, ambient noise levels would be higher than 46.8 dBA L_{eq}, and noise levels generated from on-site truck delivery and truck unloading activity would not be perceptible.

In addition, the closest on-site truck delivery and truck unloading activity would be located approximately 10 ft from the project's property line. At a distance of 10 ft, noise would increase by 14.0 dBA compared to the noise level measured at 50 ft from the source. Noise levels from on-site truck delivery and truck unloading activity at the closest project property line would reach noise levels of 79.0 dBA L_{eq} (65 dBA + 14.0 dBA = 79.0 dBA). Noise levels at the project's property line would exceed the City's daytime and nighttime noise standards of 70 and 65 dBA L_{eq}, respectively. However, the project site is bounded by roadways (I-405, I-405 southbound hook-ramps, Western Avenue, and 190th Street) on all sides and the area of the roadway is not considered to be noise sensitive. The next closest property line is located at least 125 ft from on-site truck delivery and unloading activities. At a distance of 125 ft, noise would be attenuated by 8.0 dBA compared to the noise level measured at 50 ft from the source. Noise levels from on-site truck delivery and unloading activities at the next closest property line would reach noise levels of 57.0 dBA L_{eq} (65 dBA – 8.0 dBA = 57.0 dBA). Noise levels at the next property line would not exceed the City's daytime and nighttime noise standards of 70 and 65 dBA L_{eq}, respectively. These noise standards are based on the City's daytime and nighttime noise standards of 60 and 65 dBA L_{eq}, respectively, with a correction of 10 dBA for when noise occurs less than 90 minutes per day or less than 20 minutes per night. Therefore, no impacts from truck delivery and unloading activities would occur, and no noise reduction measures are required.

Parking Lot Activity

The proposed project would include on-site surface parking. Noise generated from parking activities would include noise generated by vehicles traveling at slow speeds, engine start-up noise, car door slams, car horns, car alarms, and tire squeals. These activities would occur anytime during daytime or nighttime hours because the project would operate 24-hours per day. Representative parking activities would generate approximately 60 to 70 dBA L_{max} at 50 ft. Noise levels generated from parking activities are intermittent in nature.

The closest residential property line is located north of the project site, across I-405, and approximately 320 ft from the nearest parking area at the front of the building. At a distance of 320 ft, noise would be attenuated by 16.1 dBA compared to the noise level measured at 50 ft from the source. The building and the berm between the parking area at the front of the building to the closest residence would provide a noise reduction of 10 dBA. Noise levels from on-site parking activities at the closest residence would reach 43.9 dBA L_{max} (70 dBA – 16.1 dBA – 10 dBA = 43.9 dBA). Although noise levels generated from parking activities are intermittent maximum noise levels, these noise levels would not reach or exceed the City's daytime and nighttime noise standards of 75 and 70 dBA L_{eq}, respectively, at the residential property line. These noise standards are based on the City's daytime and nighttime noise standards of 55 and 50 dBA L_{eq}, respectively, with a correction of 15 dBA for when noise occurs less than 30 minutes per day or less than 6 minutes per night. Because the closest residences are located immediately adjacent to I-405, ambient noise levels would be higher than 43.9 dBA L_{max}, and the noise levels generated from on-site parking activities would not be perceptible.

In addition, the closest parking area is located approximately 5 ft from the project's property line. At a distance of 5 ft, noise would increase by 20.0 dBA compared to the noise level measured at 50 ft from the source. Noise levels from parking activities at the closest project property line would reach

noise levels of 90.0 dBA L_{max} (70 dBA – 20.0 dBA = 90.0 dBA). Noise levels at the project's property line have the potential to exceed the City's daytime and nighttime noise standards of 75 and 70 dBA L_{eq}, respectively, even though parking activities generate intermittent maximum noise levels based on a conservative perspective. However, the project site is bounded by roadways (I-405, I-405 southbound hook-ramps, Western Avenue, and 190th Street) on all sides and the area of the roadway is not considered to be noise sensitive. The next closest property line is located at least 150 ft from on-site parking activities. At a distance of 150 ft, noise would be attenuated by 9.5 dBA compared to the noise level measured at 50 ft from the source. Noise levels from on-site parking activities at the next closest property line would reach noise levels of 60.5 dBA L_{max} (70 dBA – 9.5 dBA = 60.5 dBA). Noise levels at the next property line would not exceed the City's daytime and nighttime noise standards of 75 and 70 dBA L_{eq}, respectively. Although noise levels generated from parking activities are intermittent maximum noise levels, this noise level would not reach or exceed the City's daytime and nighttime noise standards of 75 and 70 dBA L_{eq}, respectively, at the project's property line. These noise standards are based on the City's daytime and nighttime noise standards of 60 and 55 dBA L_{eq}, respectively, with a correction of 15 dBA for when noise occurs less than 30 minutes per day or less than 6 minutes per night. Therefore, no impacts from parking activities would occur, and no noise reduction measures are required.

HVAC Equipment

The proposed project would construct five commercial buildings on the project site that would include rooftop HVAC equipment. The HVAC on the rooftop of these buildings could operate 24 hours a day. Rooftop HVAC equipment would generate noise levels of 55.4 dBA L_{eq} at 50 ft.

The closest residential property line is located north of the project site, across I-405, and approximately 310 ft from the nearest on-site HVAC equipment. At a distance of 310 ft, noise would be attenuated by 15.8 dBA compared to the noise level measured at 50 ft from the source. The roof line and parapet would provide a noise reduction of 8 dBA. Noise levels from on-site HVAC equipment at the closest residence would reach noise levels of 31.6 dBA L_{eq} (55.4 dBA – 15.8 dBA – 8.0 dBA = 31.6 dBA). Because the closest residences are located immediately adjacent to I-405, ambient noise levels would be higher than 30.6 dBA L_{eq}, and noise levels generated from on-site HVAC equipment would not be perceptible.

The closest on-site rooftop HVAC equipment would be located approximately 25 ft from the project's property lines. At a distance of 25 ft, noise would increase by 6.0 dBA compared to the noise level measured at 50 ft from the source. The roof line and parapet would provide a noise reduction of 8 dBA. Noise levels from on-site HVAC equipment at the closest project property line would reach noise levels of 53.4 dBA L_{eq} (55.4 dBA + 6.0 dBA – 8.0 dBA = 53.4 dBA). Noise levels at the project's property line would not exceed the City's daytime and nighttime noise standards of 60 and 55 dBA L_{eq}, respectively. Therefore, no impacts from noise generated from on-site HVAC equipment would occur, and no noise reduction measures are required.

LONG-TERM GROUND-BORNE NOISE AND VIBRATION FROM VEHICULAR TRAFFIC

Once operational, the proposed project would not generate vibration. In addition, vibration levels generated from project-related traffic on the adjacent roadways (190th Street and Western Avenue)

would be unusual for on-road vehicles because the rubber tires and suspension systems of on-road vehicles provide vibration isolation. Therefore, no vibration impacts would occur from project-related traffic on the adjacent roadways, and no vibration reduction measures are required.

BEST CONSTRUCTION PRACTICES

The following measures would further minimize construction noise:

- The construction contractor shall limit construction activities to between the hours of 7:30 a.m. and 6:00 p.m. Monday through Friday and between the hours of 9:00 a.m. and 5:00 p.m. on Saturdays. Construction shall be prohibited on Sundays and holidays observed by City Hall.

- During all project site excavation and grading, the project contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers consistent with manufacturers' standards.

- The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and most noise-sensitive receptors nearest the project site during all project construction.

- The construction contractor shall place all stationary construction equipment so that the emitted noise is directed away from the sensitive receptors nearest the project site.

REDUCTION MEASURES

SHORT-TERM CONSTRUCTION NOISE IMPACTS

No noise reduction measures are required.

SHORT-TERM CONSTRUCTION VIBRATION IMPACTS

No vibration reduction measures are required.

LONG-TERM AIRCRAFT NOISE IMPACTS

No noise reduction measures are required.

LONG-TERM TRAFFIC NOISE IMPACTS

No noise reduction measures are required

LONG-TERM STATIONARY NOISE IMPACTS

No noise reduction measures are required.

LONG-TERM VIBRATION IMPACTS

No vibration reduction measures are required.

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APPENDIX A

CITY OF TORRANCE NOISE REGION MAP

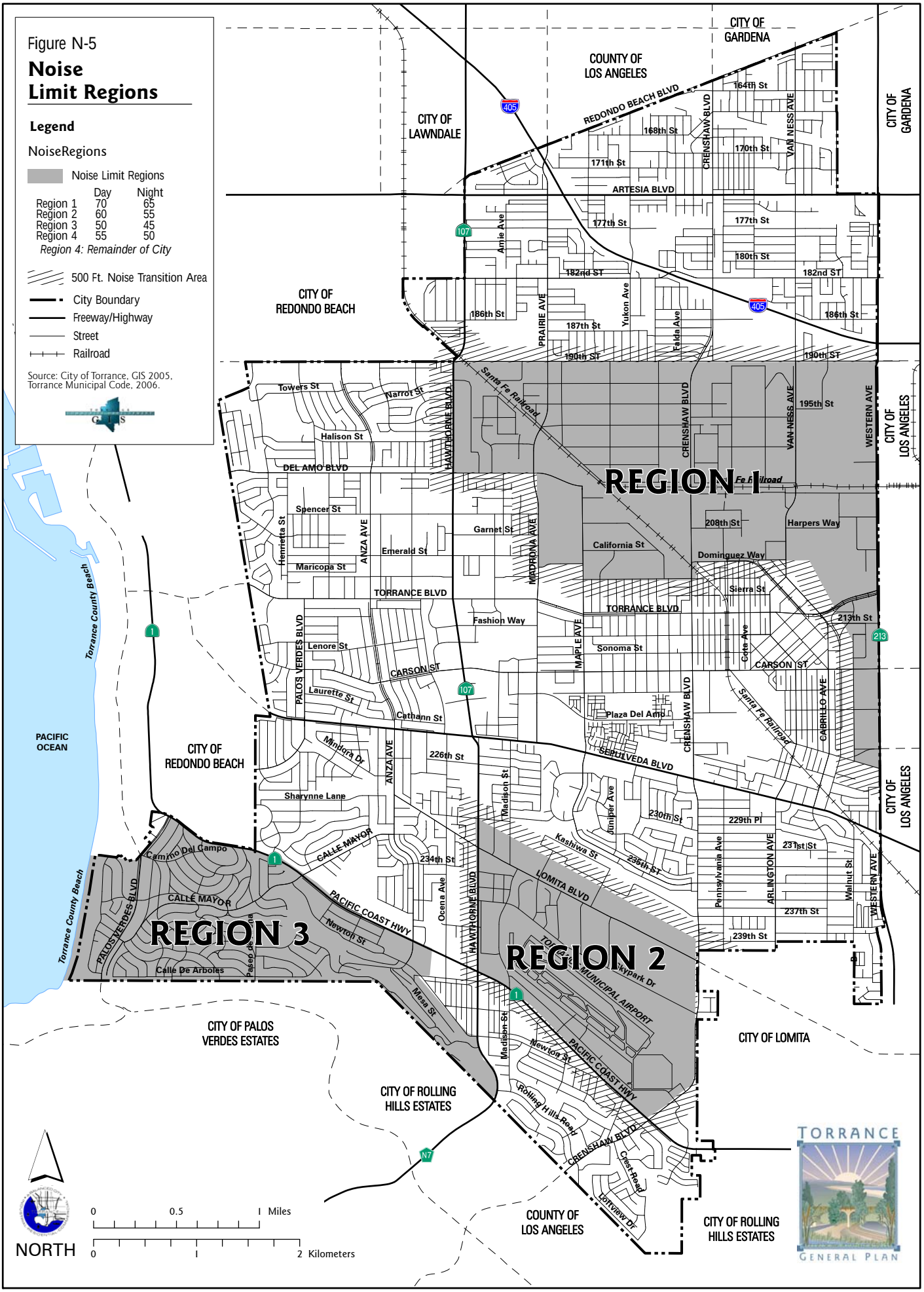
Figure N-5
Noise Limit Regions
Legend
NoiseRegions
Noise Limit Regions
Day Night
Region 1 70 65
Region 2 60 55
Region 3 50 45
Region 4 55 50
Region 4: Remainder of City
500 Ft. Noise Transition Area
City Boundary
Freeway/Highway
Street
Railroad
Source: City of Torrance, GIS 2005, Torrance Municipal Code, 2006.
REGION 1
REGION 2
REGION 3
CITY OF GARDENA
COUNTY OF LOS ANGELES
CITY OF LAWNDALE
CITY OF REDONDO BEACH
CITY OF LOS ANGELES
PACIFIC OCEAN
CITY OF PALOS VERDES ESTATES
CITY OF ROLLING HILLS ESTATES
CITY OF LOMITA
REDONDO BEACH BLVD
ARTESIA BLVD
TORRANCE BLVD
CARSON ST
SEPULVEDA BLVD
LOMITA BLVD
PACIFIC COAST HWY
CRENSHAW BLVD
HAWTHORNE BLVD
PALOS VERDES BLVD
ANZA AVE
MAPLE AVE
VAN NESS AVE
WESTERN AVE
ARLINGTON AVE
Santa Fe Railroad
Torrance County Beach
TORRANCE MUNICIPAL AIRPORT
0 0.5 1 Miles
0 1 2 Kilometers
NORTH
TORRANCE GENERAL PLAN

APPENDIX B

FHWA HIGHWAY TRAFFIC NOISE MODEL PRINTOUTS

TABLE Existing-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street West of I-405 EB Ramps
NOTES: 190th Street and Western Avenue - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 32500 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 30 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.98

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
139.9	295.9	634.9	1366.4

TABLE Existing-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street between I-405 EB Ramps and Project Driveway West
NOTES: 190th Street and Western Avenue - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 32845 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.69

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
142.2	298.5	639.3	1375.4

TABLE Existing-03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street between Project Driveway West and Project Driveway East
NOTES: 190th Street and Western Avenue - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 32845 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.69

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
142.2	298.5	639.3	1375.4

TABLE Existing-04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street between Project Driveway East and Western Avenue
NOTES: 190th Street and Western Avenue - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 32845 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.69

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
142.2	298.5	639.3	1375.4

TABLE Existing-05
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street East of Western Avenue
NOTES: 190th Street and Western Avenue - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 27350 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 34 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.00

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
126.4	264.5	566.1	1217.7

TABLE Existing-06
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: Western Avenue between I-405 WB Ramps and Project Driveway North
NOTES: 190th Street and Western Avenue - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 36750 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES	DAY	EVENING	NIGHT
AUTOS	72.95	12.15	9.02
M-TRUCKS	2.52	0.15	0.31
H-TRUCKS	2.51	0.08	0.31

ACTIVE HALF-WIDTH (FT): 32 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.49

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL	70 CNEL	65 CNEL	60 CNEL	55 CNEL
	100.2	206.9	441.6	949.2

TABLE Existing-07
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: Western Avenue between Project Driveway North and 190th Street
NOTES: 190th Street and Western Avenue - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 36750 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	72.95	12.15	9.02
M-TRUCKS	2.52	0.15	0.31
H-TRUCKS	2.51	0.08	0.31

ACTIVE HALF-WIDTH (FT): 32 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.49

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
100.2	206.9	441.6	949.2

TABLE Existing-08
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: Western Avenue South of 190th Street
NOTES: 190th Street and Western Avenue - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 34850 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	72.95	12.15	9.02
M-TRUCKS	2.52	0.15	0.31
H-TRUCKS	2.51	0.08	0.31

ACTIVE HALF-WIDTH (FT): 34 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.15

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
97.7	200.2	426.4	916.1

TABLE Existing with Project-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street West of I-405 EB Ramps
NOTES: 190th Street and Western Avenue - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 33210 SPEED (MPH): 45 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES		
	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 30 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 74.08

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
141.9	300.2	644.1	1386.2

TABLE Existing with Project-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street between I-405 EB Ramps and Project Driveway West
NOTES: 190th Street and Western Avenue - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 33830 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.82

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
144.9	304.4	652.0	1402.8

TABLE Existing with Project-03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street between Project Driveway West and Project Driveway East
NOTES: 190th Street and Western Avenue - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 33880 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.82

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
145.0	304.7	652.7	1404.2

TABLE Existing with Project-04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street between Project Driveway East and Western Avenue
NOTES: 190th Street and Western Avenue - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 34965 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.96

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
147.9	311.1	666.5	1434.0

TABLE Existing with Project-05
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street East of Western Avenue
NOTES: 190th Street and Western Avenue - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 28470 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 34 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.18

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
129.6	271.6	581.4	1250.7

TABLE Existing with Project-06
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: Western Avenue between I-405 WB Ramps and Project Driveway North
NOTES: 190th Street and Western Avenue - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 37670 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	72.95	12.15	9.02
M-TRUCKS	2.52	0.15	0.31
H-TRUCKS	2.51	0.08	0.31

ACTIVE HALF-WIDTH (FT): 32 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.60

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
101.7	210.3	448.9	964.9

TABLE Existing with Project-07
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: Western Avenue between Project Driveway North and 190th Street
NOTES: 190th Street and Western Avenue - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 38380 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	72.95	12.15	9.02
M-TRUCKS	2.52	0.15	0.31
H-TRUCKS	2.51	0.08	0.31

ACTIVE HALF-WIDTH (FT): 32 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.68

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
102.8	212.9	454.5	977.0

TABLE Existing with Project-08
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: Western Avenue South of 190th Street
NOTES: 190th Street and Western Avenue - Existing with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 36020 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	72.95	12.15	9.02
M-TRUCKS	2.52	0.15	0.31
H-TRUCKS	2.51	0.08	0.31

ACTIVE HALF-WIDTH (FT): 34 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.29

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
99.6	204.5	435.8	936.5

TABLE Opening Year (2023) -01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street West of I-405 EB Ramps
NOTES: 190th Street and Western Avenue - Opening Year (2023)

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 34380 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 30 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 74.23

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
145.0	307.1	659.1	1418.5

TABLE Opening Year (2023) -02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street between I-405 EB Ramps and Project Driveway West
NOTES: 190th Street and Western Avenue - Opening Year (2023)

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 35050 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.97

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
148.1	311.6	667.6	1436.3

TABLE Opening Year (2023) -03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street between Project Driveway West and Project Driveway East
NOTES: 190th Street and Western Avenue - Opening Year (2023)

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 35050 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.97

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
148.1	311.6	667.6	1436.3

TABLE Opening Year (2023) -04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street between Project Driveway East and Western Avenue
NOTES: 190th Street and Western Avenue - Opening Year (2023)

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 34420 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.89

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
146.4	307.9	659.6	1419.0

TABLE Opening Year (2023) -05
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street East of Western Avenue
NOTES: 190th Street and Western Avenue - Opening Year (2023)

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 28260 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 34 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.15

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL	70 CNEL	65 CNEL	60 CNEL	55 CNEL
	129.0	270.3	578.6	1244.5

TABLE Opening Year (2023) -06
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: Western Avenue between I-405 WB Ramps and Project Driveway North
NOTES: 190th Street and Western Avenue - Opening Year (2023)

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 38580 SPEED (MPH): 40 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES		
	DAY	EVENING	NIGHT
AUTOS	72.95	12.15	9.02
M-TRUCKS	2.52	0.15	0.31
H-TRUCKS	2.51	0.08	0.31

ACTIVE HALF-WIDTH (FT): 32 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.70

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
103.1	213.6	456.0	980.4

TABLE Opening Year (2023) -07
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: Western Avenue between Project Driveway North and 190th Street
NOTES: 190th Street and Western Avenue - Opening Year (2023)

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 38580 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	72.95	12.15	9.02
M-TRUCKS	2.52	0.15	0.31
H-TRUCKS	2.51	0.08	0.31

ACTIVE HALF-WIDTH (FT): 32 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.70

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
103.1	213.6	456.0	980.4

TABLE Opening Year (2023) -08
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: Western Avenue South of 190th Street
NOTES: 190th Street and Western Avenue - Opening Year (2023)

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 38565 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	72.95	12.15	9.02
M-TRUCKS	2.52	0.15	0.31
H-TRUCKS	2.51	0.08	0.31

ACTIVE HALF-WIDTH (FT): 34 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.59

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
103.7	213.8	456.0	980.0

TABLE Opening Year (2023) with Project-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street West of I-405 EB Ramps
NOTES: 190th Street and Western Avenue - Opening Year (2023) with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 35090 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 30 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 74.32

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
146.9	311.3	668.1	1438.0

TABLE Opening Year (2023) with Project-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street between I-405 EB Ramps and Project Driveway West
NOTES: 190th Street and Western Avenue - Opening Year (2023) with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 36000 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 74.09

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
150.6	317.1	679.5	1462.1

TABLE Opening Year (2023) with Project-03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street between Project Driveway West and Project Driveway East
NOTES: 190th Street and Western Avenue - Opening Year (2023) with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 35935 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 74.08

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
150.4	316.7	678.7	1460.3

TABLE Opening Year (2023) with Project-04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street between Project Driveway East and Western Avenue
NOTES: 190th Street and Western Avenue - Opening Year (2023) with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 36425 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 74.14

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
151.7	319.5	684.9	1473.6

TABLE Opening Year (2023) with Project-05
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: 190th Street East of Western Avenue
NOTES: 190th Street and Western Avenue - Opening Year (2023) with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 29380 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES			
	DAY	EVENING	NIGHT
AUTOS	71.21	11.86	8.81
M-TRUCKS	1.01	0.06	0.12
H-TRUCKS	5.99	0.19	0.75

ACTIVE HALF-WIDTH (FT): 34 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.32

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
132.2	277.3	593.7	1277.2

TABLE Opening Year (2023) with Project-06
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: Western Avenue between I-405 WB Ramps and Project Driveway North
NOTES: 190th Street and Western Avenue - Opening Year (2023) with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 39500 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	72.95	12.15	9.02
M-TRUCKS	2.52	0.15	0.31
H-TRUCKS	2.51	0.08	0.31

ACTIVE HALF-WIDTH (FT): 32 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.81

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
104.6	216.9	463.2	995.9

TABLE Opening Year (2023) with Project-07
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: Western Avenue between Project Driveway North and 190th Street
NOTES: 190th Street and Western Avenue - Opening Year (2023) with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 40225 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES			
	DAY	EVENING	NIGHT
AUTOS	72.95	12.15	9.02
M-TRUCKS	2.52	0.15	0.31
H-TRUCKS	2.51	0.08	0.31

ACTIVE HALF-WIDTH (FT): 32 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.89

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
105.8	219.5	468.8	1008.0

TABLE Opening Year (2023) with Project-08
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 01/18/2022
ROADWAY SEGMENT: Western Avenue South of 190th Street
NOTES: 190th Street and Western Avenue - Opening Year (2023) with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 39735 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	72.95	12.15	9.02
M-TRUCKS	2.52	0.15	0.31
H-TRUCKS	2.51	0.08	0.31

ACTIVE HALF-WIDTH (FT): 34 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.72

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
105.6	218.0	465.1	999.7
