Noise and Vibration Impact Analysis

Fletcher 15

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Prepared for
City of Orange

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TABLE OF CONTENTS

1 Introduction 1
1.1 Project Description 1
1.2 Purpose of the Report 4
1.3 Summary of Findings 4
2 Noise Scales and Definitions 5
2.1 Terminology 5
2.2 Sound Propagation 7
2.3 Stationary Noise 7
2.4 Mobile Noise 8
2.5 Noise From Multiple Sources 8
2.6 Vibration 8
3 Regulatory Setting 10
3.1 Federal 10
3.2 State 11
3.3 Local 12
3.4 Significance Criteria 15
4 Existing Conditions 19
4.1 Existing Noise Levels 19
4.2 Sensitive Receptors 21
4.3 Aircraft Noise 21
4.4 Stationary Sources 21
4.5 Existing Traffic Noise 21
5 Thresholds of Significance 22
5.1 CEQA Thresholds 22
5.2 Methodology 22
6 Project Impacts 25
6.1 Construction Noise 25
6.2 Operational Noise 27
6.3 Vibration 29
6.4 Airport Noise 30
7 Conclusion 31
8 References 32

Figures

Figure 1-1: Regional Map 2
Figure 1-2: Conceptual Site Plan 3
Figure 2-1: Common Noise Levels 6
Figure 4-1: Noise Measurement Locations 20

Tables

Table 1-1: Project Site and Surrounding Areas Existing Land Use and Zoning Designations 1
Table 1-2: Summary of Findings 4
Table 3-1: Construction Noise Criteria 10
Table 3-2: Guideline Vibration Damage Potential Threshold Criteria 11
Table 3-3: Maximum Allowable Noise Exposure – Transportation Sources 13
Table 3-4: Maximum Allowable Noise Exposure – Stationary Noise Sources 14
Table 3-5: Exterior Noise Standard 14
Table 3-6: Daytime Standards of Cities in California 16
Table 3-7: City of Orange Significance Criteria Summary 18
Table 4-1: Ambient Noise Measurements 19
Table 4-2: Existing Traffic Noise Levels 21
Table 5-1: Distances Used for Construction Noise Analysis 23
Table 6-1: Construction Equipment Noise Levels 26
Table 6-2: Construction Noise Level Increases at the Nearest Sensitive Receptors 27
Table 6-3: Existing Plus Project Traffic Noise Levels 28
Table 6-4: Construction Equipment Vibration Levels 30
Table 7-1: Summary of Noise Levels at the Nearest Sensitive Receptors 31

Appendices

Appendix A – Noise Measurement Data
Appendix B – Noise Modeling Data

1 INTRODUCTION

This Noise and Vibration Impact Analysis evaluates the potential noise impacts of the proposed Fletcher 15 Project ("Project" or "proposed Project"). The Project is located within the jurisdiction of the City of Orange (City).

1.1 Project Description

The Project site is situated in the western portion of the City of Orange within Orange County. The Project site is located northeast of North Batavia Street and West Fletcher Avenue at 715 West Fletcher Avenue. Regional access to the site is provided via State Route 57 (SR-57), SR-55, SR-91, and Interstate 5 (I-5). Local access to the Project site is provided via West Fletcher Avenue. The Project site and the surrounding area are shown in Figure 1-1, *Regional Map*. The Project site is vacant, undeveloped, and is heavily disturbed by previous development and grading activities. Vegetation on-site is limited to non-native grasses. An existing 12-foot-high Concrete-Mansory-Unit (CMU) wall is located along the northern and eastern perimeter of the site, and a 6-foot-tall chain link fence is located along the western perimeter.

The Project applicant proposes to develop the site for single-family residential development. The 0.72-acre parcel would be subdivided and developed with 15 single-family residential lots. The proposed Project would also include associated improvements such as landscaping, parking, a private roadway, common and private open space areas, and utility and stormwater infrastructure. The existing CMU walls along the northern and eastern perimeter of the site would remain, and a new 6-foot-high CMU wall would be installed along the western boundary of the site. Figure 1-2, C*onceptual Site Plan*, illustrates the Project as proposed. The Project site is designated as Low Medium Density Residential (LMDR) by the City of Orange General Plan and is zoned as Multiple-Family Residential District (R-3). Refer to Table 1-1, *Project Site and Surrounding Areas Existing Land Use and Zoning Designations*, for a description of the land use and zoning designations of the Project site and surrounding area.

Table 1-1: Project Site and Surrounding Areas Existing Land Use and Zoning Designations

Direction	General Plan Land Use	Zoning
Proposed Project Site	Low Medium Density Residential (LMDR)	Multiple-Family Residential District (R-3)
North	LMDR	R-3
East	LMDR	R-3
South	Light Industrial (LI)	Light Manufacturing (M-1)
West	LMDR	R-3 and Residential Duplex (R-2.6)

Source: City of Orange, General Plan Land Use Map (2010); City of Orange, Zoning Map (2023).

Figure 1-1: Regional Location

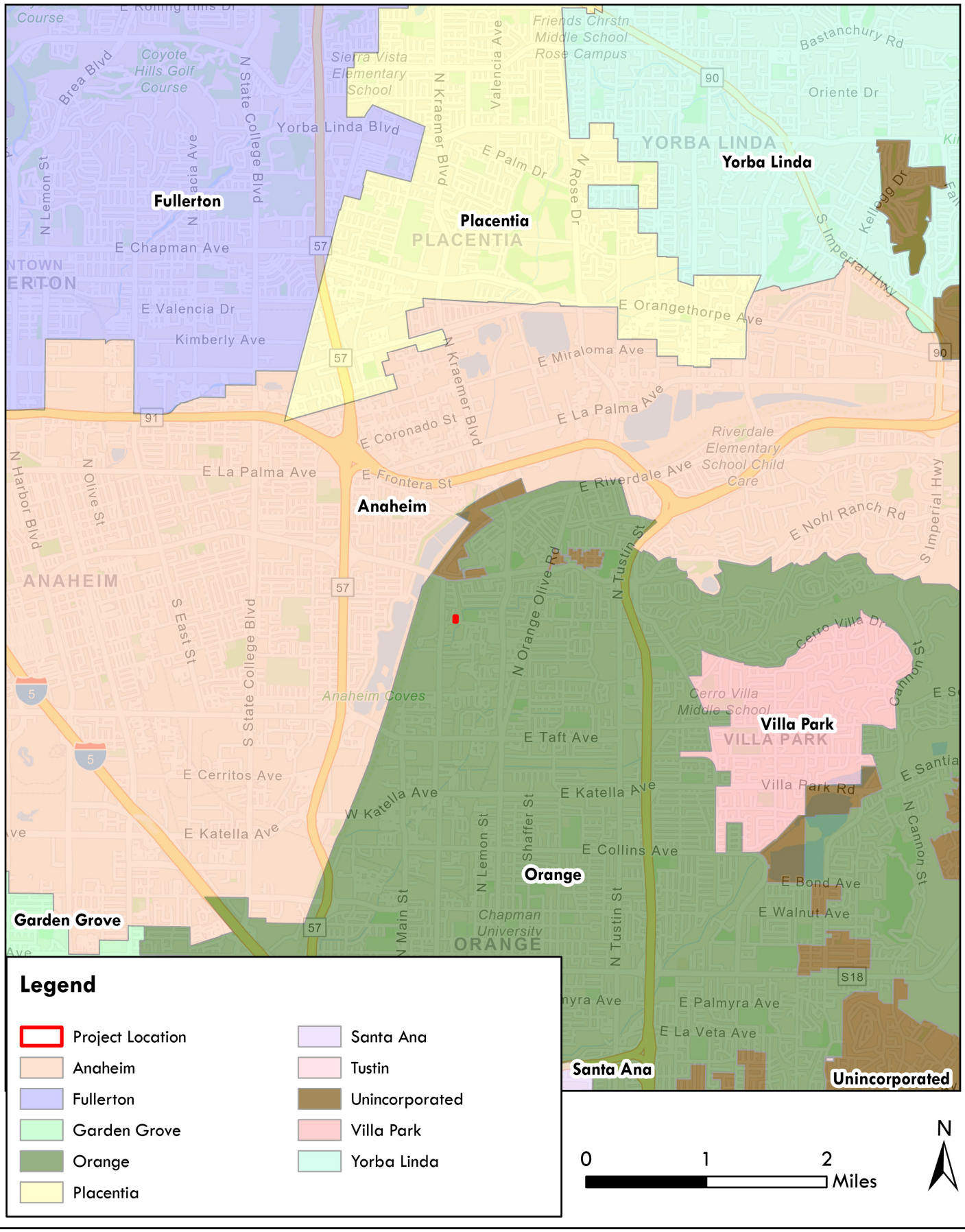
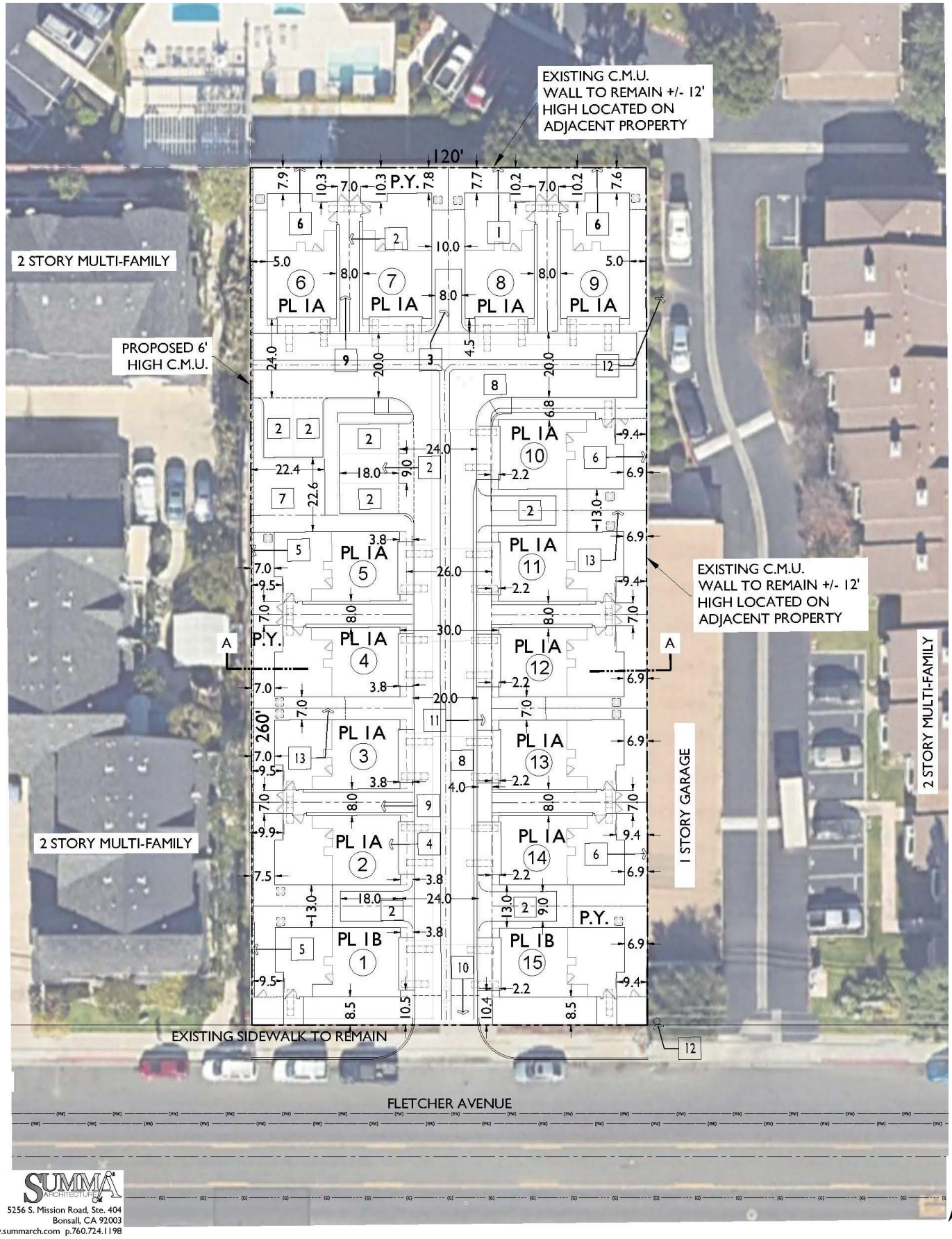


Figure 1-2: Conceptual Site Plan



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1.2 Purpose of the Report

To support the California Environmental Quality Act (CEQA) document for the proposed Project, this report evaluates potential noise-related impacts to surrounding land uses as a result of implementation of the Project. This report begins with an overview of the study area, the Project site, and the key components of the proposed development. It then provides a foundational explanation of noise and vibration concepts to help frame the analysis.

To ensure consistency with local requirements, this report outlines relevant noise guidelines and regulatory standards that apply to the Project. It also describes the existing noise environment in and around the Project site to establish a baseline for comparison. From there, the analysis addresses potential short-term noise and vibration impacts that could occur during construction activities. Finally, the report examines long-term operational impacts once the Project is built and active.

1.3 Summary of Findings

The conclusions of this analysis are shown in Table 1-2, *Summary of Findings*.

Table 1-2: Summary of Findings

Topics	Significance Findings	Mitigation Measures Proposed
Construction Noise	Less than significant	NA
Operation Noise	Less than significant	NA
Construction Vibration	Less than significant	NA
Operation Vibration	Less than significant	NA
Airport Noise	Less than significant	NA

Notes: NA = not applicable

2 NOISE SCALES AND DEFINITIONS

Sound is energy transferred through air that our ears detect as small changes in air pressures. Noise is defined as any sound that is unwanted or excessive. Noise is considered undesirable when it disrupts everyday activities, poses a risk of physical harm, or negatively impacts health. Its effects on people can include irritation, difficulty communicating, sleep disruption, and in severe cases, hearing loss. These impacts can stem from either the pitch or the loudness of the sound. Pitch refers to the frequency of a sound wave, how many vibrations occur per second, which determines whether a sound is high or low in tone. Humans generally perceive higher-pitched sounds as louder. Loudness, on the other hand, relates to the intensity or amplitude of the sound.

Typically, noise is measured or predicted by a sound pressure level, reported in decibels (dB). The dB is a logarithmic unit used to represent the ratio between a measured sound pressure level and a standard reference level. A sound level of 0 dB corresponds to the quietest sound that a healthy, unimpaired human ear can hear. The human ear does not hear all frequencies equally. To better approximate the sensitivity of human hearing, the A-weighted decibel scale (dBA) has been developed. On this scale, the human range of hearing extends from approximately 3 dBA to approximately 140 dBA. Figure 2-1, *Common Noise Levels*, shows typical sound levels and human response for everyday sounds and noises.

Sound and vibration are intimately related. Sound is produced by the vibration of sound pressure waves in the air. Vibrating surfaces and structures can radiate sound, so measures taken to reduce vibration will often lead to a reduction in noise level.

2.1 Terminology

Sound: Sound is a vibratory disturbance produced by a vibrating object that travels through a medium, such as air, in the form of pressure waves. It can be detected by a receiver, such as the human ear or a microphone.

Noise: Sound that is loud, unpleasant, unexpected, or otherwise undesirable.

Ambient noise: The combined noise from all nearby and distant sources present in a specific environment.

Decibel (dB): Unit used to measure the intensity of a sound.

A-weighted decibel (dBA): Unit of sound pressure level in decibels on the "A-weighted" scale.

Sound exposure level (SEL): Represents all the acoustic energy (sound pressure) of an individual noise event as if that event had occurred within a one-second time period.

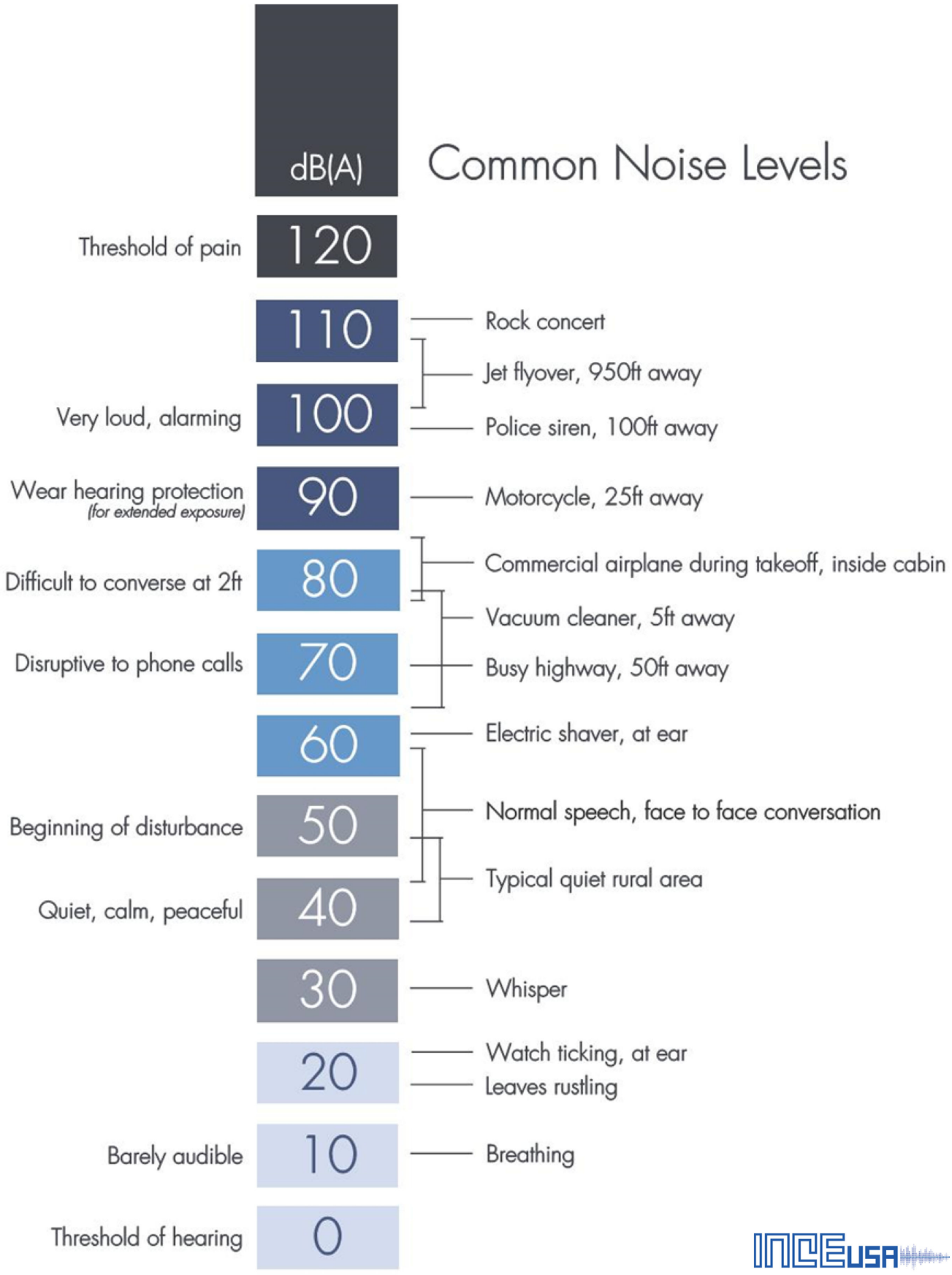
Equivalent sound level (L_{eq}): L_{eq} is the equivalent steady-state level which within a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period.

Maximum sound level (L_{max}): The highest values measured by the sound meter over a given time period.

Minimum sound level (L_{min}): The lowest values measured by the sound meter over a given time period.

Day-night average sound level (L_{dn}): A noise metric used to reflect a person's cumulative exposure to sound over a 24-hour period, expressed as the noise level for the average day of the year on the basis of annual operation.

Figure 2-1: Common Noise Levels



Community noise equivalent level (CNEL): CNEL represents a composite 24-hour noise level. The CNEL is the weighted average of the intensity of a sound, with corrections for time of day, and averaged over 24 hours. The time-of-day corrections require the addition of 5 decibels to dBA L_{eq} sound levels in the evening from 7:00 p.m. to 10:00 p.m., and the addition of 10 decibels to dBA L_{eq} sound levels at night between 10:00 p.m. and 7:00 a.m. These additions are to account for the noise-sensitive time periods during the evening and night hours when quiet is most desirable and sound appears louder. CNEL does not represent the actual sound level heard at any time, but rather represents the total sound exposure.

Root mean square (RMS): RMS is the average vibration amplitude. The RMS amplitude is defined as the average of the squared amplitude of the signal and is most frequently used to describe the effect of vibration on the human body (FTA, 2018).

Peak Particle Velocity (PPV): PPV is the maximum instantaneous peak of the vibration signal (FTA, 2018). The PPV is most frequently used to describe vibration impacts on buildings.

Vibration Decibel (VdB): VdB is a unit used to measure ground motion caused by vibrations, specifically particle velocity in inches per second.

2.2 Sound Propagation

Sound propagates uniformly outward in a spherical pattern. Sound can propagate through air, water, and solids. During propagation, waves can be reflected, refracted, or attenuated by the medium. The reduction of sound (acoustic) waves is known as attenuation. The sound level attenuates (or decreases) at a rate of 6 dB for each doubling of distance in air from a point source. Sound attenuation can occur in numerous ways, including:

- Dissipating through the air when absorbed by another medium.
- Reflected against a barrier.
- Via interference from ambient noise.

2.3 Stationary Noise

A stationary noise source refers to any fixed-location activity or equipment that generates noise. Examples include engines, machinery, energy generation systems, and other powered equipment, as well as activities such as loading and unloading and parking lot activity. Although noise from motor vehicles on public roads is generally exempt from local regulation, these vehicles are considered stationary noise sources when used on private property, such as at construction sites, truck terminals, or warehouse facilities.

The impact of stationary noise depends on several factors, including the type and operation of the equipment, the distance and path between the noise source and the receiver, and environmental conditions such as weather. Regulation of stationary noise can occur at the point of manufacture (for example, limits on engine noise), through restrictions on hours of operation, location of installation, or by requiring noise mitigation features such as barriers, structures, or other project features.

Construction activities are a frequent and often temporary source of stationary noise. Although construction-related noise is typically higher than existing background levels, it is limited to the duration of the work. Construction occurs in phases, each involving different equipment and operations, resulting in varied noise

levels and characteristics throughout the project. Despite differences in equipment type and size, the primary sources and patterns of noise during construction are consistent enough to categorize noise levels by construction phase.

2.4 Mobile Noise

Traffic noise levels are primarily influenced by three factors: the volume of traffic, the speed of vehicles, and the proportion of trucks within the traffic flow. In general, traffic noise becomes louder with increased vehicle volume, higher speeds, and a greater number of heavy trucks. Vehicle noise comes from a combination of sources, including the engine, exhaust system, and tires.

Because noise levels are measured on a logarithmic scale, doubling the volume of traffic (while speed and truck percentage remain the same) results in an increase of about 3 dBA. According to the Federal Highway Administration (FHWA), a change of 3 dBA is considered "barely perceptible" and a change of 5 dBA is considered readily perceptible. A 10 dBA increase is typically required to produce a doubling in perceived loudness. The mix of vehicles also affects noise levels; as the number of heavy trucks rises and makes up a larger share of the traffic, nearby noise levels increase (FTA, 2018).

2.5 Noise From Multiple Sources

Because sound pressure levels in decibels are measured on a logarithmic scale, they cannot be added or subtracted using standard arithmetic. Instead, these levels are combined using energy-based summation. This means that adding a new noise source with the same sound level as an existing one does not result in a doubling of the overall noise level.

When two noise sources differ by 10 dBA or more, the louder source determines the overall level, and the combined noise level will be equal to that louder source. If the difference is between 0 and 1 dBA, the resulting level will be 3 dBA higher than the louder source or both sources if they are equal. A difference of 2 to 3 dBA results in a combined level 2 dBA above the louder source. When the difference is between 4 and 10 dBA, the resulting level will be 1 dBA higher than the louder source (FTA, 2018).

2.6 Vibration

The FTA *Transit Noise and Vibration Impact Assessment Manual* describes that vibration is the periodic oscillation of a medium or object. Sources of ground-borne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment). Unlike airborne noise, ground-borne vibration is generally not perceptible outdoors and is primarily an indoor annoyance. Vibration effects should therefore be evaluated at the structure, considering building characteristics. Light structures such as wood-framed homes are more susceptible to vibration than heavy buildings with deep or spread foundations. In general, heavier buildings respond less to ground vibration due to soil-structure coupling.

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts on buildings. The root mean square (RMS) vibration is the average of the squared amplitude of the signal and is most frequently used to describe the effect of vibration on the human body.

Also, vibration decibel notation (VdB) is another vibration notation used by the FTA to describe vibration levels, provide a background of common vibration levels, and set vibration limits. Typical sources of perceptible ground-borne vibration are construction equipment, steel-wheeled trains, heavy trucks and traffic on rough roads. If a roadway is smooth, the ground-borne vibration is rarely perceptible. For construction-related activities, PPV-based threshold, such as those established by California Department of Transportation (Caltrans), are generally more appropriate for evaluating potential impacts on both structures and human receptors.

3 REGULATORY SETTING

3.1 Federal

Federal Transit Administration Noise and Vibration Guidance

The noise and vibration assessment in this report is based on criteria from the FTA's 2018 *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual) for a detailed construction noise assessment. Table 3-1, *Construction Noise Criteria*, lists the FTA's recommended noise thresholds for a detailed construction noise assessment based on adjacent land uses.

Table 3-1: Construction Noise Criteria

Land Use	$L_{eq.equip(8hr)}$, dBA	
	Day	Night
Residential	80	70
Commercial	85	85
Industrial	90	90

Source: Federal Transit Administration. (2018). *Federal Transit Administration Transit Noise and Vibration Guidance.*

Construction activity can result in varying degrees of ground vibration, depending on the equipment and method employed. Operation of the construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings founded on the soil near the construction site respond to these vibrations with varying results, ranging from no perceptible effects at the lowest levels, low rumbling sounds and perceptible vibration at moderate levels, and slight damage at the highest levels. While ground vibrations from construction activities do not often reach levels that can damage structures, fragile buildings must receive special consideration.

Federal Interagency Committee on Noise

The Federal Interagency Committee on Noise made the following recommendations when reviewing noise levels for land use planning. If screening analysis shows that noise sensitive areas will be at or above 65 dB and will have an increase of 1.5 dB L_{dn} or more, further analysis should be conducted of noise-sensitive areas between 60-65 dB L_{dn} having an increase of 3 dB L_{dn} or more due to the proposed project noise exposure. If the 65 dB L_{dn} screening test calls for further analysis between 60-65 dB L_{dn}, agency mitigation options may include noise sensitive areas between 60-65 dB L_{dn} that are projected to have an increase of 3 dB or more as a result of the proposed project noise exposure. When the ambient noise level is less than 60 dB L_{dn}, a margin of safety of 5 dB is applied to the identified outdoor level to account for other adverse effects on activity interference and annoyance as well as for the most sensitive fraction of the population.

3.2 State

Noise Element Requirements

California Government Code Section 65302(f) mandates that the legislative body of each county and city adopt a Noise Element within the General Plan. The Element must identify and evaluate noise problems within the community, focusing on noise sources such as transportation, industrial plants, and airports, and presenting noise contours using CNEL or Ldn.

The Governor's Office of Land Use and Climate Innovation (previously known as the Governor's Office of Planning and Research) Noise Element Guidelines include recommended exterior and interior noise level standards for local jurisdictions to identify and prevent creation of incompatible land uses due to noise. The Noise Element Guidelines contain a land use compatibility table that describes the compatibility of various land uses with a range of environmental noise levels in terms of community noise equivalent level (CNEL). A noise environment of 50 CNEL to 60 CNEL is considered to be "normally acceptable" for residential uses.

Title 24 – California Building Standards Code

The California Building Code (CBC) (California Code of Regulations Title 24, Part 2) contains general building design and construction requirements relating to fire and life safety, structural safety, and access compliance. Section 1206.4, *Allowable Interior Noise Levels*, of the CBC requires that interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room.

California Department of Transportation

Caltrans published updates to the *Traffic Noise Analysis Protocol* and *Transportation and Construction Vibration Guidance Manual* in April 2020. It contains the recommended thresholds to evaluate vibration impacts during construction. The construction vibration criteria include consideration of building conditions, as shown in Table 3-2, *Guideline Vibration Damage Potential Threshold Criteria*.

Table 3-2: Guideline Vibration Damage Potential Threshold Criteria

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

PPV=Peak Particle Velocity
Notes: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.
Source: Caltrans. (2020). *Transportation and Construction Vibration Guidance Manual.*

3.3 Local

City of Orange General Plan 2010

The goal of the City of Orange General Plan (General Plan) Noise Element is to provide direction regarding best practices and strategies to protect City residents and businesses from severe noise levels. The following are goals and policies from the City's General Plan Noise Element that are applicable to the proposed Project:

Goal 1.0 **Promote a pattern of land uses compatible with current and future noise levels.**

Policy 1.1 Consider potential excessive noise levels when making land use planning decisions.

Policy 1.2 Encourage new development projects to provide sufficient spatial buffers to separate excessive noise generating land uses and noise-sensitive land uses.

Policy 1.3 Incorporate design features into residential and mixed-use projects that can be used to shield residents from excessive noise.

Policy 1.4 Ensure that acceptable noise levels are maintained near noise-sensitive uses.

Policy 1.5 Reduce impacts of high-noise activities centers located near residential areas.

Policy 1.6 Require an acoustical study for proposed developments in areas where the existing and projected noise level exceeds or would exceed the maximum allowable levels identified in Table N-3. The acoustical study shall be performed in accordance with the requirements set forth within this Noise Element.

Goal 2.0 **Minimize vehicular traffic noise in residential areas and near noise-sensitive land uses.**

Policy 2.1 Encourage noise-compatible land uses along existing and future roadways, highways, and freeways.

Policy 2.2 Encourage coordinated site planning and traffic control measures that minimize traffic noise in noise-sensitive land use areas.

Policy 2.3 Encourage the use of alternative transportation modes such as walking, bicycling, mass transit, and alternative fuel vehicles to minimize traffic noise.

Policy 2.5 Work toward understanding and reducing traffic noise in residential neighborhoods with a focus on analyzing the effects of traffic noise exposure throughout the City.

Goal 7.0 **Minimize construction, maintenance vehicle, and nuisance noise in residential areas and near noise-sensitive land uses.**

Policy 7.2 Require developers and contractors to employ noise minimizing techniques during construction and maintenance operations.

Policy 7.3 Limit the hours of construction and maintenance operations located adjacent to noise-sensitive land uses.

Noise Standards and Land Use Compatibility

The City of Orange has developed its own land use compatibility standards based on recommended parameters from the California Governor's Office Planning and Research that rate compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable as shown in Table 3-3, *Maximum Allowable Noise Exposure – Transportation Sources* (from N-3 in the Noise Element).

Table 3-3: Maximum Allowable Noise Exposure – Transportation Sources

Land Use		CNEL (dBA)	
Designations (as shown on Figure LU-5)	**Uses**	**Interior[1,3]**	**Exterior[2]**
Estate Low Density Residential Low Density Residential Low Medium Density Residential	Single-family, duplex, and multiple-family	45	65
	Mobile home park	N/A	65
Medium Density Residential Neighborhood Mixed-use Neighborhood Office Professional Old Towne Mixed-use General Commercial Yorba Commercial Overlay Urban Mixed-use Urban Office Professional	Single-family	45	65
	Mobile home park	N/A	65
	Multiple-family, mixed-use	45	65
	Transit lodging-motels, hotels	45	N/A
	Sports arenas, outdoor spectator sports	N/A	N/A
	Auditoriums, concert halls, amphitheaters	45	N/A
	Office buildings, business, commercial and professional	50	N/A
Light Industrial Industrial	Manufacturing, utilities, agriculture	N/A	N/A
Public Facilities and Institutions	Schools, nursing homes, day care facilities, hospitals. Convalescent facilities, dormitories	45	65
	Government Facilities – Offices, fire stations, community buildings	45	N/A
	Places of Worship, Churches	45	N/A
	Libraires	45	N/A
	Utilities	N/A	N/A
	Cemeteries	N/A	N/A
Recreation Commercial Open Space Open Space – Park Open Space-- Ridgeline Resource Area	Playgrounds, neighborhood parks	N/A	70
	Golf courses, riding stables, water recreation, cemeteries	N/A	N/A

Land Use		CNEL (dBA)	
Designations (as shown on Figure LU-5)	Uses	Interior[1,3]	Exterior[2]

(1) Interior habitable environment excludes bathrooms, closets and corridors.
(2) Exterior noise level standard to be applied at outdoor activity area; such as private yards, private patio or balcony of a multi-family residence. Where the location of an outdoor activity area is unknown or not applicable, the noise standard shall be applied inside the property line of the receiving land use.
(3) Interior noise standards shall be satisfied with windows in the close position. Mechanical ventilation shall be provided per Uniform Building Code (UBC) requirements.
(4) With the Urban Mixed-Use, Neighborhood Mixed-Use, Old Towne Mixed-use, and Medium Density Residential land use designations, exterior space standards apply only to common outdoor recreational areas.
(5) Within Urban Mixed-Use and Medium Density Residential land use designations, exterior noise levels on private patios and balconies located within 250 feet of freeways (I-5, SR-57, SR-55, SR-22, or SR-241) and Smart Streets and Principal Arterials identified in the Circulation &Mobility Element that exceed 70 dB

Source: City of Orange. (2010). *City of Orange General Plan Noise Element.*

For City analysis of noise impacts and determining appropriate mitigation under CEQA, in addition to the maximum allowable noise level standards outlined in Table 3-3, above, and Table 3-4, *Maximum Allowable Noise Exposure – Stationary Noise Sources*, (Table N-4 in the Noise Element), an increase in ambient noise levels is assumed to be a significant noise impact if a project causes ambient noise levels to exceed the following:

- Where the existing ambient noise level is less than 65 dBA, a project related permanent increase in ambient noise levels of 5 dBA CNEL or greater.
- Where the existing ambient noise level is greater than 65 dBA, a project related permanent increase in ambient noise level of 3 dBA CNEL or greater.

Table 3-4: Maximum Allowable Noise Exposure – Stationary Noise Sources

	Noise Level	Time Period
Hourly Average (L_{eq})	55 dB (A)	7:00 a.m. – 10:00 p.m.
	45 dB (A)	10:00 p.m. – 7:00 a.m.
Maximum Level	70 dB (A)	7:00 a.m. – 10:00 p.m.
	65 dB (A)	10:00 p.m. – 7:00 a.m.

Source: City of Orange. (2010). *City of Orange General Plan Noise Element.*

City of Orange Municipal Code

The City of Orange Municipal Code (OMC) has several policies directed at controlling or mitigating environmental noise effects. OMC Chapter 8.24, *Noise Control*, provides all noise regulations to control and limit unnecessary and excessive noise and vibration in the city. The following sections are applicable to the proposed Project:

Section 8.24.040. Exterior Standards

A. The following noise standards for fixed noise sources, unless otherwise specifically indicated, shall apply to all residential property:

Table 3-5: Exterior Noise Standard

	Noise Level	Time Period
Hourly Average (L_{eq})	55 dB (A)	7:00 a.m. – 10:00 p.m.

	50 dB (A)	10:00 p.m. – 7:00 a.m.
Maximum Level	70 dB (A)	7:00 a.m. – 10:00 p.m.
	65 dB (A)	10:00 p.m. – 7:00 a.m.

Source: City of Orange. (2025). *City of Orange Municipal Code.*

B. It is unlawful for any person at any location within the City to create any noise, or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level when measured on any residential property to exceed the noise standards identified in Table 3-5 above. For multi-family residential or mixed-use developments located within the City's Urban Mixed Use, Neighborhood Mixed Use, Old Towne Mixed Use or Medium Density Residential General Plan land use districts, exterior noise standards shall apply to common recreation areas only and shall not apply to private exterior space (such as a private yard, patio, or balcony).
C. In the event the ambient noise level exceeds the noise standards identified in Table 3-5 of this section, the "adjusted ambient noise level" shall be applied as the noise standards. In cases where the noise standard is adjusted due to high ambient noise level, the noise standard shall not exceed the "adjusted ambient noise level", or 70 dB(A), whichever is less. In cases where the ambient noise level is already greater than 70 dB(A), the ambient noise level shall be applied as the noise standard.
D. Each of the noise limits specified in Table 3-5 shall be reduced by five dB(A) for impact or simple tone noises, recurring impulsive noises, or noises consisting of speech or music.

8.24.050. Exemptions from Chapter Provisions.

E. Noise sources associated with construction, repair, remodeling, or grading of any real property, provided said activities take place between the hours of 7:00 a.m. and 8:00 p.m. on any day except for Sunday or Federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or Federal holiday. Noise generated outside of the hours specified are subject to the noise standards identified in Table 8.24.0400.

3.4 Significance Criteria

The following significance criteria are based on the analysis identified within Appendix G of the CEQA Guidelines. The City's General Plan guidelines and Municipal Code regulations identify noise compatibility and establish noise standards that are implemented as thresholds. However, the existing City regulations do not identify levels of ambient noise increases that are considered substantial or vibration criteria during construction. Thus, information gathered from Municipal Codes from various jurisdictions and the Caltrans *Transportation and Construction Vibration Manual* were utilized.

Increase in Ambient Noise

Construction

Temporary noise level increases over the existing ambient conditions are required to be considered by CEQA Guidelines Appendix G. However, there are no specific thresholds set for increases in ambient noise from construction. Therefore, this analysis relies on a 20 dBA L_{eq} substantial noise increase threshold during the day, as explained below.

Noise ordinances vary across jurisdictions, and some cities and counties in California set construction noise limits at 75 dBA L_{eq} at residential properties and restrict construction activities to daytime hours. For cities and counties that haven't adopted standards, the FTA threshold of 80 dBA L_{eq} is widely used. In contrast, operational noise regulations are established by jurisdictions in their municipal codes and are generally more stringent because they apply to continuous, long-term noise sources that can significantly affect quality of life. As a result, many jurisdictions establish daytime residential noise limits around 50-60 dBA L_{eq}; refer to Table 3-6, *Daytime Standards of Cities and Counties in California*. The difference between exterior noise standards and construction noise levels listed in Table 3-6 suggest that a 15–35 dBA increase over the daytime noise limit can be reasonably tolerated during construction activities without significant adverse effects. The lowest midpoint of range in the examples shown is 20 dBA. This relationship is reflected in many CEQA documents statewide, which use the FTA construction noise threshold of 80 dBA L_{eq} for assessing temporary construction impacts, while applying local ordinance noise limits of 50-60 dBA for exterior noise standards when evaluating operational noise impacts.

Therefore, for this analysis, if construction would generate a temporary noise level increase of 20 dBA L_{eq} or more above the existing ambient noise level, it would be considered a potentially significant impact.

Table 3-6: Daytime Standards of Cities in California

Jurisdictions	Construction Noise Level	Exterior Noise Standards	Differences Range	Midpoint of the Range
City of Los Angeles[1]	75 dBA – 85 dBA	50 dBA	25 – 35 dBA	30
City of Solana Beach[2]	75 dBA	50 – 55 dBA	20 – 25 dBA	22.5
City of San Diego[3]	75 dBA	50 – 60 dBA	15 – 25 dBA	20

Source:
1. City of Los Angeles. 2025. City of Los Angeles Municipal Code Section 12.08.390, *Exterior noise standards—Citations for violations authorized when.*, and 12.08.440, *Construction Noise*.
2. City of Solana Beach. 2025. Solana Beach Municipal Code Section 7.34.040, *Sound Level Limits*, and Section 7.34.100, *Construction hours and noise levels limits*.
3. City of San Diego. 2019. San Diego Municipal Code. *Article 9.5 Noise Abatement and Control, Division 4: Limits*.

Operation

The City of Orange General Plan Noise Element provides an established source of criteria to assess the impacts of a substantial permanent increase in baseline ambient noise levels. Per the City of Orange General Plan Noise Element, if ambient noise is less than 65 dBA, a project-related permanent increase in ambient noise levels of 5 dBA CNEL or greater constitute a significant impact; if ambient noise is more than 65 dBA, a project related permanent increase in ambient noise levels of 3 dBA CNEL or greater is considered significant as it likely contributes to an existing noise exposure exceedance.

Vibration

Vibration-generating activities are evaluated using the Caltrans *Transportation and Construction Vibrational Manual* vibration damage thresholds to assess potential construction-related impacts at nearby buildings. Most buildings near the Project site are modern structures. However, to provide a conservative analysis, the

threshold for older residential structures was used, which provides a vibration threshold of 0.3 PPV (in/sec), as listed previously in Table 3-2, *Construction Vibration Damage Criteria*.

Summary

Table 3-7, *City of Orange Significance Criteria Summary*, provides a summary of thresholds established by the City of Orange and used in this report.

Table 3-7: City of Orange Significance Criteria Summary

Analysis	Conditions	Significant Criteria	
		Daytime	Nighttime
Off-Site Traffic[1]	If ambient is < 65 dBA CNEL	≥ 5 dBA CNEL Project Increase	
	If ambient is > 65 dBA CNEL	≥ 3 dBA CNEL Project Increase	
Operational	Stationary Noise Sources	55 dBA	45 dBA
	Exterior Noise Level Standards for Residential Properties[2]	55 dBA	50 dBA
	Land Use Compatibility[3]	Interior: 45 dBA Exterior: 65 dBA	
Construction	Noise sources associated with construction, repair, remodeling, or grading of any real property, provided said activities take place between the hours of 7:00 a.m. and 8:00 p.m. on any day except for Sunday or Federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or Federal holiday.[4]		
	Noise Level at Residential Property[5]	80 dBA	Not Allowed
	Noise Level Increase	20 dBA L_{eq}	
	Vibration Damage Criteria[6]	0.3 PPV (inches/second)	

1. City of Orange. *(2010). City of Orange Noise Element.*
2. City of Orange. (2025). *City of Orange Municipal Code, Section 8.24.040. Exterior Standards.*
3. City of Orange. (2010). *City of Orange Noise Element.*
4. *City of Orange. City of Orange Municipal Code. 8.24.050. Exemptions from Chapter Provisions.*
5. FTA. (2018). *Transit Noise and Vibration Impact Assessment Manual.*
6. Caltrans. (2020). *Transportation and Construction Vibration Guidance Manual.* For older residential structures.

4 EXISTING CONDITIONS

4.1 Existing Noise Levels

To assess existing ambient noise levels in the Project area, EPD conducted two short-term noise measurements on October 15, 2025, at locations in the vicinity of the proposed Project. These measurement locations are shown in Figure 4-1, *Noise Measurement Locations*, and are representative of typical noise exposure levels experienced at the nearest sensitive receptors. Each measurement consisted of a 15-minute recording taken between 10:30 a.m. and 11:30 a.m. These short-term L_{eq} measurements are considered indicative of general noise conditions throughout the day.

The measurements were conducted during "off-peak" traffic hours (9:00 a.m. to 3:00 p.m.) to establish a more conservative baseline. During traditional peak hours, traffic congestion often results in lower vehicle and heavy truck volumes. In contrast, free-flowing traffic conditions immediately before or after peak periods can produce higher noise levels. The recorded noise levels at the measurement sites and at the nearest sensitive receptors are summarized in Table 4-1, *Ambient Noise Measurements*.

Table 4-1: Ambient Noise Measurements

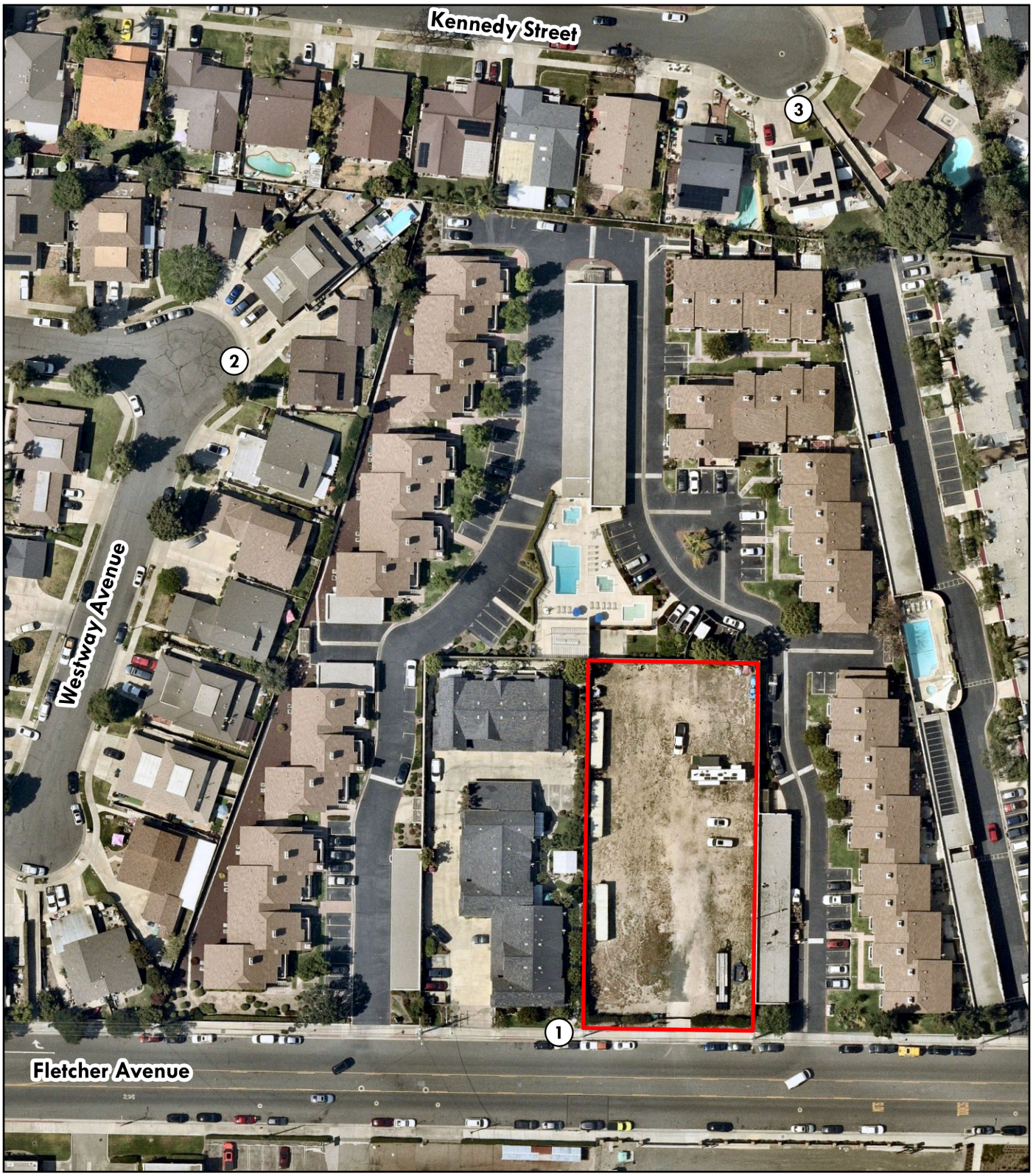
Location	Description	L_{eq} (dBA)	L_{max} (dBA)	L_{min} (dBA)
NM-1	Southwest corner of the site, next to the nearest sensitive receptor to the west	65.6	95.1	43.4
NM-2	In front of 2549 N Capri St	51.5	65.3	41.7
NM-3	In front of 706 W Brentwood Ave, Orange, CA 92865	47.1	61.9	41.0

Notes: dBA=A-weighted decibels; L_{eq}=Equivalent Sound Level; L_{min}=Minimum Sound Level; L_{max}=Maximum Sound Level
Source: EPD Solutions, Inc. 2025. Refer to Appendix A, *Noise Measurement Data*.

The background ambient noise levels in the Project area are dominated by transportation-related noise associated with surface streets, including the auto and heavy truck activities on study area roadway segments and industrial operational noise across the street near the noise level measurement locations.

The meteorological conditions during the measurement of ambient noise levels included clear conditions and warm temperatures with light windspeeds (5 miles per hour). Noise monitoring equipment used for the ambient noise survey consisted of a PCE-430, which is a Class 1 sound level meter with a half-inch measurement microphone. The monitoring equipment complies with applicable requirements of the American National Standards Institute (ANSI) for sound level meters. The results of the field measurements are included in Appendix A.

Figure 4-1: Noise Measurement Locations



Legend

Project Boundary

Noise Measurement Locations

0 0.01 0.03 Miles

N

E | P | D SOLUTIONS, INC

4.2 Sensitive Receptors

Noise-sensitive receptors are locations or individuals that may be adversely affected by elevated noise levels due to their nature, function, or occupancy. Land uses considered sensitive by the State of California includes schools, playgrounds, athletic facilities, hospitals, rest homes, rehabilitation centers, long-term care and mental care facilities. Generally, a sensitive receptor is identified as a location where human populations (especially children, senior citizens, and sick people) are present.

The nearest sensitive receptors to the Project site boundary are multi-family residences adjacent to the Project site to the west. Other noise sensitive land uses near the Project site are located at greater distances than those listed above and would experience lower noise levels than those detailed in this report due to the additional attenuation from distance and the shielding of intervening structures.

4.3 Aircraft Noise

Airport-related noise levels are primarily associated with aircraft engine noise made during takeoff, landing, or idling on the tarmac. The closest airport to the Project site is Fullerton Municipal Airport, approximately 7.2 miles southwest of the Project site.

4.4 Stationary Sources

Land uses in the Project area are mostly residential. The primary sources of stationary noise in the Project vicinity are urban-related activities (e.g., mechanical equipment and parking areas). The noise associated with these sources may represent a single-event noise occurrence, short-term noise, or long-term/continuous noise.

4.5 Existing Traffic Noise

The Federal Highway Administration (FHWA) Highway Traffic Prediction Model (FHWA-RD-77-108) was used to evaluate traffic-related noise conditions along local roadway segments in the Project vicinity. The details of traffic noise modeling are included in Appendix B, *Noise Modeling Data*. Table 4-2, *Existing Traffic Noise Levels*, provides the existing traffic noise levels in the Project vicinity. These traffic noise levels are representative of a worst-case scenario that assumes a flat terrain and no shielding between the traffic and the noise contour.

Table 4-2: Existing Traffic Noise Levels

Roadway Segment	ADT[1]	dBA @ 100 feet from Roadway Centerline[2]	Centerline to 65 dBA CNEL (feet)	Centerline to 60 dBA CNEL (feet)	Centerline to 55 dBA CNEL (feet)
Fletcher Avenue	1,695	51.2	-	-	56

Notes: ADT = average daily traffic; CNEL = community noise equivalent level; dBA=A-weighted decibels, - = contour is within the roadway.
1. Streetlight Data. (2025).
2. United States Department of Transportation and Federal Highway Administration. (2018). *Traffic Data Computation Method.* Refer to Appendix B, *Noise Modeling Data*.

5 THRESHOLDS OF SIGNIFICANCE

5.1 CEQA Thresholds

Appendix G, *Environmental Checklist Form*, of the CEQA Guidelines contains the following significance criteria. A project could have potential significant impacts regarding noise and vibration if it were to:

- Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of the other agencies;
- Generate excessive ground vibration or ground borne noise levels; or
- For a project located within the vicinity of a private airstrip or an airport land use plan, or where such a plan has not been adopted, within 2 miles of a public or public use airport, expose people residing or working in the project area to excessive noise levels.

Based on these standards/criteria, the effects of the Project have been categorized as having "no impact," a "less-than-significant impact," or a "potentially significant impact." Mitigation measures are recommended for potentially significant impacts. If a potentially significant impact cannot be reduced to a less-than-significant level through the application of existing regulations and mitigation, it is categorized as a significant and unavoidable impact.

5.2 Methodology

Construction Noise

Since the City's Municipal Code does not establish quantified thresholds for increases to noise volumes and vibration, the thresholds from the FTA *Transit Noise and Vibration Impact Assessment Manual* were used in this analysis. Construction noise levels were based on typical noise levels generated by construction equipment as published by the FTA and FHWA and using the FHWA's Roadway Construction Noise Model (RCNM), which includes a national database of construction equipment reference noise levels. The equipment list used in this analysis is based on land use and Project location using the California Emissions Estimator Model (CalEEMod). Since the exact specific equipment to be used on-site is unknown, the General Noise Assessment Methodology from the FTA's Transit Noise and Vibration Impact Assessment Manual is used to evaluate the noise level due to construction equipment on-site. Per the General Noise Assessment Methodology, noise from construction is typically modeled as originating from the center of the project site.

As a conservative analysis, this evaluation identifies the combined noise levels for the two loudest pieces of equipment operating simultaneously for each stage. Due to the size of the Project site, only two pieces of mobile equipment would be operating at the same time. Construction noise is assessed in dBA L_{eq}.

The General Noise Assessment Methodology sets a threshold of 90 dBA for residential land uses during the daytime; however, the Detailed Noise Assessment Methodology from the FTA's *Transit Noise and Vibration Impact Assessment Manual* sets a threshold of 80 dBA for residential land uses during the daytime, which is more conservative. As such, the more conservative threshold of 80 dBA is used to evaluate noise impacts.

Additionally, the construction noise increase criteria from Caltrans's *Traffic Noise Analysis Protocol* was used to evaluate the construction noise increase over ambient noise levels.

Operational Noise

Operational noise would include noise from off-site mobile sources and on-site noise source such as Heating, Ventilation, Air Conditioning (HVAC) units, parking lot activities, on-site vehicle moving including garbage and delivery trucks traveling on the internal roads due to implementation of the Project was compared to the exterior thresholds set in the City of Orange Municipal Code to evaluate the significance of impact.

The FHWA Highway Traffic Prediction Model (FHWA-RD-77-108) was used to evaluate traffic-related noise conditions along local roadway segments in the Project vicinity. The "Existing with Project" levels would be calculated based on existing trip generation plus the Project daily trips. According to the *Fletcher Avenue Single-Family Residential Project Revised Trip Generation & Vehicle Miles Traveled Screening Analysis* (VMT Analysis), dated September 18, 2025, prepared by RK Engineering Group Inc., the Project would generate an estimated net 127 daily trips. Since the ambient noise level is more than 65 dBA, the mobile noise increase due to implementation of the Project was compared to a threshold of 3 dBA (as listed in Table 3-6, *City of Orange Significance Criteria Summary*) to evaluate the significance.

Construction and Operation Vibration

Vibration levels were calculated based on the structure damage assessment method provided in the Caltrans' *Transportation and Construction Vibration Guidance Manual*. As the nearest sensitive receptor structures are residential uses, the construction damage criterion for vibrations at of 0.3 inch-per-second is applied (see Table 3-6, *City of Orange Significance Criteria Summary*).

Distance to the Surrounding Sensitive Receptors

As discussed above, there are sensitive receptors located in the Project vicinity. The nearest sensitive receptors are the residences located to the west of the Project site. Other noise sensitive land uses near the Project site are located at greater distances than those listed above and would experience lower noise levels than those detailed in this report due to the additional attenuation from distance and the shielding of intervening structures. The construction noise impacts are evaluated from the geographic center of the Project to the nearest sensitive receptors. The construction vibration impacts are evaluated from the construction activities to the nearest residential structures. Please refer to Table 5-1, *Distances Used for Construction Noise Analysis*, for details of distances.

Table 5-1: Distances Used for Construction Noise Analysis

Sensitive Receptor	Distance Between Project Boundary to Surrounding Land Uses (feet)	Distance From the Geographic Center of Project Site to the Nearest Sensitive Receptor (feet)	Distance from Construction Activities to the Nearest Structure (feet)
Residential to the West	Adjacent	75	15

Airport Noise

The distance between the Project site and the nearest airport was evaluated to determine whether the Project is located within an airport land use plan area or within the vicinity of a public or private airstrip. Aircraft flyovers may occasionally be audible at the project site due to air traffic in the surrounding area. The closest airport to the Project site is Fullerton Municipal Airport, approximately 7.2 miles southwest of the Project site. The Project site lies well outside the Fullerton Municipal Airport 60 dBA CNEL noise contour and airport influence area (Airport Land Use Commission, 2019). Because the site is not within this contour, no significant impact would occur and no further evaluation of aircraft-related noise impacts is warranted.

6 PROJECT IMPACTS

6.1 Construction Noise

On-Site Construction Noise

Construction is accomplished in different phases with a specific equipment mix, depending on the work to be performed during that phase. As a result of the different equipment mix for each phase, each phase has its own noise characteristics; some phases have higher continuous noise levels, while others have higher impact noise levels. The Project construction activities are expected to occur in the following phases:

1. Site preparation;
2. Grading;
3. Building construction;
4. Paving; and
5. Architectural coating.

Construction activities frequently shift from one location to another. For example, during site preparation and grading, noise-generating activities may concentrate in an area for a short period to remove existing structures, while the majority of the grading involves the equipment moving back and forth in a predictable pattern throughout the site. The building construction and foundation work generally concentrates near the building location, while paving involves a pattern of movement throughout the site over a short term. Therefore, the FTA recommends that construction activities are best evaluated as multiple moving point sources because equipment changes position in terms of its distance and direction relative to the receivers (FTA, 2018). Since this analysis assumed all equipment operating simultaneously, the distance used to evaluate construction noise would be from the geographic center of the Project site and nearest sensitive receptors. The construction noise would be attenuated by distance and existing objects (e.g., walls or buildings) to block line of sight. The noise levels of the potential construction equipment are listed in Table 6-1, *Construction Equipment Noise Levels*.

Table 6-1: Construction Equipment Noise Levels

Activity	Equipment[1]	Maximum Noise Level @ 50 Feet[2,3]	Noise Level @ 75 Feet[2,3]
		dBA L_{max}	dBA L_{eq}
Site Preparation	Rubber Tired Dozers	85	80.0
	Grader	85	
	Crawler Tractors	84	
Grading	Graders	85	80.0
	Rubber Tired Dozers	85	
	Crawler Tractors	84	
Building Construction	Cranes	81	79.5
	Forklift	75	
	Tractors/Loaders/Backhoe	84	
Paving	Pavers	85	77.3
	Paving Equipment	90	
	Rollers	85	
Architectural Coating	Air Compressors	80	70.2

Source:
1. The equipment list at each construction phase is based on the California Emissions Estimator Model and questionnaire filled by the applicant.
2. Federal Highway Administration. (2006). *Construction Noise Handbook*.
3. The noise levels are based on Table 9.1 of the Construction Noise Handbook. If the exact equipment listed is not available, a default noise level of 85 dBA, representative of typical construction equipment, is used. Specifically, the Forklift is modeled using this default value. Additionally, for the category of Tractors/Loaders/Backhoes, the noise level of a Tractor (84 dBA) is used, as it represents the loudest among the three.

The nearest noise sensitive receptors are multi-family residences adjacent to the Project site to the west and an existing 12-foot-high CMU wall is located along the northern and eastern boundaries of the site. The geographic center of the Project site is approximately 75 feet from the closest residential properties. The noise levels of the construction equipment are listed in Table 6-1, *Construction Equipment Noise Levels*, above. As discussed above, as a conservative analysis, this analysis assumes two loudest pieces of equipment are operating together and located at the geographic center of the Project site. The estimated temporary noise levels from Project construction activities at the nearest sensitive receptors would range from 70.2 dBA to 80.0 dBA; refer to Table 6-1, above. The existing 12-foot-wall CMU wall along the northern and eastern boundaries of the site would reduce noise levels by at least five dBA (FHWA, 2006). In addition, there is a 6-foot-tall chain fence with vegetation located along the western perimeter, which would screen noise during construction by approximately 1.5 dBA (FHWA 2006). Therefore, the noise level at the nearest sensitive receptor to the west would range from 68.7 to 78.5 dBA, which would not exceed the FTA threshold of 80 dBA for residential property. Further, Project construction would be restricted to between the hours of 7:00 a.m. and 8:00 p.m. on any day except for Sunday or Federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or federal holiday in compliance with the City's Municipal Code. As such, the Project construction would result in a less-than-significant impact.

Temporary Construction Increases in Ambient Noise

To identify the temporary Project construction noise level contributions to the existing ambient noise environment, the Project construction noise levels were combined with the existing ambient noise level measurements listed in Table 4-1, *Ambient Noise Measurements*. The difference between the combined Project-construction and ambient noise levels is used to describe the construction noise level contributions. As detailed in Table 3-6, *City of Orange Significance Criteria Summary*, a temporary noise level increase of 20 dBA is considered to have a potentially significant impact.

Table 6-2, *Construction Noise Level Increases at the Nearest Sensitive Receptors*, shows that the Project construction activities which would not exceed the ambient noise level (L_{eq}) at the nearest receptor over the construction noise increase threshold of 20 dBA L_{eq}. Thus, temporary construction noise level increases from Project construction would be less than significant.

Table 6-2: Construction Noise Level Increases at the Nearest Sensitive Receptors

Sensitive Receptors	Noise Level L_{eq} (dBA)				Exceed the Thresholds?
	Highest Noise Level	Ambient Noise Level	Construction Increase	Threshold	
Residential to West	78.5	65.5	13	20	No

Off-Site Construction Noise

Project construction would result in additional traffic on adjacent roadways over the period that construction occurs. According to the California Emissions Estimator Model (CalEEMod), which is used to predict the number of construction-related automotive trips, the maximum number of Project construction trips traveling to and from the Project site during a single construction phase would be expected to be 82 daily trips in total. According to the *Caltrans Traffic Noise Analysis Protocol*, a doubling of traffic on a roadway results in an increase of 3 dB (Caltrans, 2020a). A 3 dBA change is considered a just perceptible difference. The Project site would be accessible via Fletcher Avenue during construction. The existing trip counts along Fletcher Avenue currently accommodates 1,695 vehicle daily trips (Streetlight Data, 2025). Therefore, the Project's construction trips (82 trips) would not result in a doubling of traffic on the transportation network (currently 1,695 trips), and its contribution to existing traffic noise would be less than 0.1 dBA, which would not be perceptible. Additionally, construction is temporary, and construction trips would cease upon completion of the Project. As such, the impacts during off-site construction would be less than significant.

6.2 Operational Noise

Long-term operational noise would be generated from the day-to-day residential operational activities including:

- Off-site mobile sources: automobiles traveling to and from the Project site.
- On-site noise sources:
    - Stationary sources including HVAC units and parking activities.
    - Mobile sources including vehicles moving on-site and garbage trucks.

Off-Site Mobile Noise

Roadway segment noise levels for the "Existing" and "Existing with Project" scenarios were compared to evaluate Project-related operational noise impacts. As shown in Table 6-3, *Existing Plus Project Traffic Noise Levels*, the noise level under the "Existing" scenario at a distance of 100 feet from the roadway centerline is 51.2 dBA. With the addition of the Project, the noise level would be 51.5 dBA. The increase due to the Project would be 0.3 dBA, which would not exceed the 3 dB threshold along Fletcher Avenue. Furthermore, the traffic noise with the Project would be less than the standard of 65 dBA. As such, impacts would be less than significant.

Table 6-3: Existing Plus Project Traffic Noise Levels

Roadway Segment	Existing		Existing Plus Project				Increase over Existing Scenario (dBA)
	Existing ADT[1]	dBA @ 100 feet from Roadway Centerline	Existing Plus Project ADT[2]	dBA @ 100 feet from Roadway Centerline	Centerline to 60 dBA CNEL (feet)	Centerline to 55 dBA CNEL (feet)	
Fletcher Avenue	1,695	51.2	1,827	51.5	-	59	0.3

Notes: ADT= average daily traffic; CNEL=Community Noise Equivalent Level; dBA=A-weighted decibels.
1. The existing ADT along the roadway is 1,695, referring to Table 4-2, *Existing Traffic Noise Levels*, above.
2. ADT of the Existing with Project is the total of the existing ADT and Project's daily trips, which is 132 trips per day, based on the *Fletcher Avenue Single-Family Residential Project Revised Trip Generation & Vehicle Miles Traveled Screening Analysis*, dated September 18, 2025, prepared by RK Engineering Group Inc.

On-Site Noise

Heating, Ventilation, and Air Conditioning

Typically, mechanical equipment, such as heating, ventilation, and air conditioning (HVAC) units, would be located in the backyard of the proposed unit adjacent to the structure. The Project proposes a 15-unit single-family residential development. For this analysis, it was assumed that the residences would have the most common and currently available HVAC unit with standard sound performance (or similar), which is Air Conditioner Model 26TPA8-C from Carrier. This model would generate 67 dB at the source based on the specification sheet. Based on research online, residential AC could run from 12 to 16 hours per day during an extremely hot day (Craig Air Conditioning, 2025). As a conservative analysis, the HVAC units were analyzed assuming they would be located in the backyard and closer to the property boundary, and it was assumed that the HVAC units would operate for 585 minutes during the daytime and 250 minutes during the nighttime, resulting a total of 14 hours per day, which is the average running hours on a hot day.

Parking Activities

The Project includes two car garages for each residential unit and seven surface parking spaces on-site. As conservative analysis, it is assumed one parking activity at the surface parking spaces per hour. The noise generated by the proposed Project would be consistent with that of the surrounding residential properties.

Cumulative Noise due to On-site Stationary Source at the Nearest Sensitive Receptor

Based on the modeling results from CadnaA (refer to Appendix B, *Noise Modeling Data*), the noise generated from HVAC units and parking activities would be 45.4 dBA during the daytime and 44.5 dBA during the nighttime at the site boundary, which would not exceed the City's thresholds of 55 dBA and 45 dBA due to stationary sources, respectively.

On-Site Mobile Noise

There are two components of on-site mobile noise: vehicles traveling on internal roads, including regular automobile vehicles and occasional delivery trucks, and weekly garbage trucks. As a conservative analysis, it is assumed there would be 13 vehicles per hour during the day trips on-site, which is the highest peak hour trips based on the VMT Analysis prepared for the Project. It was assumed there would be one truck activity per hour on-site to account for occasional delivery trucks and weekly garbage trucks. Traffic associated with single-family residences is typically not o a sufficient volume to exceed community noise standards, which are based on a time-averaged scale such as the CNEL scale.

Cumulative Operational Increases in Ambient Noise

To identify Project operational ambient noise level increases, the Project operational noise levels are combined with the existing ambient noise levels measurements. The difference between the combined Project and ambient noise levels identifies the Project noise level increase. Based on the modeling results from CadnaA, the noise generated from HVAC units and parking activities would be 45.9 dBA during the daytime and 44.7 dBA during the nighttime at the site boundary, which would not exceed the City's exterior thresholds of 55 dBA and 50 dBA at a residential property, respectively. As shown in Table 4-1, *Ambient Noise Measurements*, the ambient noise level in the Project vicinity would range from 47.1 to 65.6 dBA L_{eq}. As such, the Project's daytime and nighttime noise levels during operation would be less than 47.1 dBA, which would thus not result in an increase in ambient noise level due to auditory masking. In human perception, auditory masking is that the louder sound covers the quieter one so that it is inaudible or less perceptible. Therefore, the incremental increase in ambient noise from operation of the proposed Project would be less than significant.

6.3 Vibration

Construction Vibration

Construction activities can generate varying levels of ground vibration depending on the equipment used and the methods employed. These vibrations propagate through the ground and decrease in intensity with distance. Table 6-4, *Construction Equipment Vibration Levels*, presents typical vibration levels associated with various types of construction equipment.

Table 6-4: Construction Equipment Vibration Levels

Equipment	Reference Vibration Level at 25 Feet (PPV [inches/second])[1]	Vibration Level at 15 Feet (PPV [inches/second])[2]
Large Bulldozer	0.089	0.191
Loaded Trucks	0.076	0.191
Small Bulldozer	0.003	0.012

Source:
1. FTA. (2018). *Transit Noise and Vibration Impact Assessment Manual*.
2. $PPV_{equip} = PPV_{ref} \times \left(\frac{25}{D}\right)^{1.1}$, D=distance between the equipment to the sensitive receptors.

Based on the equipment list in Table 6-1, *Construction Equipment Noise Levels*, the Project construction would use the following vibration-heavy equipment on-site, that include rubber tired dozers, loaded trucks, and graders (generates similar vibration as large bulldozer). The nearest residential structure would be located as close as 15 feet from the construction activities, which would generate a vibration level of 0.191 from a large bulldozer, which would be the most vibrating piece of equipment used by Project construction. As shown in Table 6-4, *Construction Equipment Vibration Levels*, the vibration level at the nearest residential structure would range from 0.012 to 0.191 PPV (inches per second), which would not exceed the threshold of 0.3 inches per second established by the FTA. As such, the vibration impacts during construction would be less than significant.

Operational Vibration

The Project proposes a 15-unit single-family residential development, which would not involve railroads or substantial heavy truck operations that are typically associated with significant operational vibration. Operation of the residences would include heavy trucks for residents moving in and out of the units and garbage trucks for solid waste disposal, which would not be frequent daily activities. Truck vibration levels are dependent on vehicle characteristics, load, speed, and pavement conditions. Garbage trucks and delivery trucks on-site would be travelling at very low speeds, so it is expected that garbage truck vibration at nearby sensitive receptors would not be noticeable. Therefore, operational vibration impacts would be less than significant.

6.4 Airport Noise

Aircraft flyovers may occasionally be audible at the Project site due to air traffic in the surrounding area. However, the closest airport to the Project site is Fullerton Municipal Airport, approximately 7.2 miles southwest of the Project site, and the Project site lies well outside of the Fullerton Municipal Airport 60 dBA CNEL noise contour (Airport Land Use Commission, 2019). Therefore, impacts related to airport noise would be less than significant.

7 CONCLUSION

During construction, the Project would be required to comply with the rules and regulations set in the City's Noise Element and Municipal Code. Construction noise of the Project would not exceed the 80 dBA threshold. In addition, construction vibration would not exceed the threshold of 0.3 inches per second. As such, the Project would not result in a significant impact related to noise and vibration from construction.

During operation, sources of noise would include those from mobile and stationary sources. The operation of the future residential uses on the parcels would result in a 0.3 dBA increase over the existing traffic conditions along Fletcher Avenue. On-site noise would include HVAC units and on-site vehicle activities from automobiles, delivery trucks, and garbage trucks. Overall, on-site noise from operation of the future residential uses would be 45.9 dBA during the daytime and 44.7 dBA during the nighttime, which would not exceed the City's exterior thresholds of 55 dBA and 50 dBA, respectively. In addition, the Project's daytime and nighttime noise levels during operation would be less than 47.1 dBA, which would not result in an increase in ambient noise level due to auditory masking. Finally, a residential development would only involve occasional delivery and garbage trucks on-site, which would not cause significant vibrations to the surrounding structures. As such, the Project would not result in a significant impact related to noise and vibration from operation.

Additionally, the Project is located outside of the noise contour and airport influence area of the nearest airport (Fullerton Municipal Airport) and would not expose people residing or working in the Project area to excessive airport noise levels. Impacts related to airport noise would therefore be less than significant.

Table 7-1, *Summary of Noise Levels at the Nearest Sensitive Receptors*, provides the summary of noise levels at the surrounding land uses due to the implementation of the Project. Overall, the proposed Project would not result in impacts related to noise or vibration.

Table 7-1: Summary of Noise Levels at the Nearest Sensitive Receptors

Receptors	Construction (Highest)			Operation (dBA)		
	Noise (dBA)	Noise Level Increase (dBA)	Maximum Vibration Level (PPV)	(Daytime)	(Nighttime)	Maximum Increase to the Ambient
Residences to the South	78.5	13	0.191	45.9	44.7	NA
Threshold	***80***	***20***	***0.3***	***55***	***45***	***3***
Exceed the Threshold?	**No**	**No**	**No**	**No**	**No**	**No**

NA= Not Applicable.

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Appendix A – Noise Measurement Data

Noise Measurement Field Data

Project Number:	25-116		
Site Number:	NM-1		
Investigator(s):	Tina Yuan, Maryam Javanmardi		
Date:	10/15/2025		
Time:	10:23-10:38		
Measurement Location:	Southwest corner of the site, next to the nearest sensitive receptor to the west		
Peak Noise:	Traffic, and industrial operation		
Noise Meter Model:	PCE-430	Microphone Model:	PCE 1/2''
Calibration Date:	3/3/2025		
Weather Conditions:	Sky	Temperature	Wind Speed
	Partly Cloudy	63	3 mph

Measurements Data		
L_{eq} (dB)	L_{max} (dB)	L_{min} (dB)
65.6	95.1	43.4

Site Photo

Project Number:	25-116		
Site Number:	NM-2		
Investigator(s):	Tina Yuan, Maryam Javanmardi		
Date:	10/15/2025		
Time:	10:45-11:00		
Measurement Location:	In front of 2549 N Capri St		
Peak Noise:	Traffic		
Noise Meter Model:	PCE-430	Microphone Model:	PCE 1/2''
Calibration Date:	3/3/2025		
Weather Conditions:	Sky	Temperature	Wind Speed
	Partly Cloudy	63	3 mph

Measurements Data		
L_{eq} (dB)	L_{max} (dB)	L_{min} (dB)
51.5	65.3	41.7

Site Photo

Project Number:	25-116		
Site Number:	NM-3		
Investigator(s):	Tina Yuan, Maryam Javanmardi		
Date:	10/15/2025		
Time:	11:10-11:25		
Measurement Location:	In front of 706 W Brentwood Ave, Orange, CA 92865		
Peak Noise:	Traffic		
Noise Meter Model:	PCE-430	Microphone Model:	PCE 1/2''
Calibration Date:	3/3/2025		
Weather Conditions:	Sky	Temperature	Wind Speed
	Partly Cloudy	63	3 mph

Measurements Data		
L_{eq} (dB)	L_{max} (dB)	L_{min} (dB)
47.1	61.9	41.0

Site Photo

Appendix B – Noise Modeling Data

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/12/2025
Case Description: Site Prep

		---- Receptor #1 ----		
		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential	Residential	1	1	1

			Equipment			
			Spec	Actual	Receptor	Estimated
	Impact		Lmax	Lmax	Distance	Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Tractor	No	40	84		75	0
Grader	No	40	85		75	0

				Results											
		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Tractor		80.5	76.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader		81.5	77.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	81.5	80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/12/2025
Case Description: Grading

		---- Receptor #1 ----		
		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential	Residential	1	1	1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40		85	75	0
Tractor	No	40		84	75	0

		Results													
		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Grader		81.5	77.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		80.5	76.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	81.5	80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/12/2025
Case Description: Building Construction

				---- Receptor #1 ----
		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential	Residential	1	1	1

			Equipment			
			Spec	Actual	Receptor	Estimated
		Impact	Lmax	Lmax	Distance	Shielding
Description		Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Tractor		No	40	84	75	0
Tractor		No	40	84	75	0

				Results											
		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Tractor		80.5	76.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		80.5	76.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	80.5	79.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/12/2025
Case Description: Paving

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential	Residential	1	1	1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Roller	No	20		80	75	0
Tractor	No	40	84		75	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Roller	76.5	69.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	80.5	76.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	80.5	77.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/12/2025
Case Description: Architectural Coating

		---- Receptor #1 ----		
		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential	Residential	1	1	1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	75	0

		Results													
		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)		74.1	70.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	74.1	70.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Traffic Noise levels and Noise Contours

Project Number 25116
Project Name Fletcher 15
Scenario Exsiting

Background Information
Model Description: FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise Emission Levels.
Source of Traffic Volumns: Streetlight Data
Coomunity Noise Descriptors: Ldn _____ CNEL x

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night	Total
Total ADT Volumns	77.50%	12.90%	9.60%	100.00%
Medium-Duty Trucks	84.80%	4.90%	10.30%	100.00%
Heavy-Duty Trucks	86.50%	2.70%	10.80%	100.00%

Analysis						Vehicle Mix			Distance from Centerline of Roadway to Contour			
Roadway Segment	Lanes	Median Width	ADT Volume	sign Speed (mp	Alpha Factor	Medium Trucks (MT)	Heavy Trucks (HT)	CNEL at 100 Feet	70 CNEL	65 CNEL	60 CNEL	55 CNEL
Fletcher Avenue												
Between Sierra Avenue and 7th Street	2	12	1,695	35	0.5	1.8%	0.7%	51.2	-	-	-	56

Traffic Noise levels and Noise Contours

Project Number 25-116
Project Name Fletcher 15
Scenario Exsiting + Project

Background Information
Model Description: FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise Emission Levels.
Source of Traffic Volumns:
Coomunity Noise Descriptors: Ldn ____ CNEL x

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night	Total
Total ADT Volumns	77.50%	12.90%	9.60%	100.00%
Medium-Duty Trucks	84.80%	4.90%	10.30%	100.00%
Heavy-Duty Trucks	86.50%	2.70%	10.80%	100.00%

Analysis						Vehicle Mix			Distance from Centerline of Roadway to Contour			
Roadway Segment	Lanes	Median Width	ADT Volume	sign Speed (mp	Alpha Factor	Medium Trucks (MT)	Heavy Trucks (HT)	CNEL at 100 Feet	70 CNEL	65 CNEL	60 CNEL	55 CNEL
Fletcher Avenue												
Between Sierra Avenue and 7th Street	2	12	1,827	35	0.5	1.8%	0.7%	51.5	-	-	-	59

Receiver		Land Use	Limiting Value		rel. Axis			Lr w/o Noise Control		dL req.		Lr w/ Noise Control		Exceeding		passive NC
Name	ID		Day	Night	Station	Distance	Height	Day	Night	Day	Night	Day	Night	Day	Night	
			dB(A)	dB(A)	m	m	m	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
SR_West			55	45				45.4	44.5	-	-	0.0	0.0	-	-	-

Receiver		Land Use	Limiting Value		rel. Axis			Lr w/o Noise Control		dL req.		Lr w/ Noise Control		Exceeding		passive NC
Name	ID		Day	Night	Station	Distance	Height	Day	Night	Day	Night	Day	Night	Day	Night	
			dB(A)	dB(A)	m	m	m	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
SR_West			55	50	23	20.54	4.00	45.9	44.7	-	-	0.0	0.0	-	-	-