

901 E. KATELLA AVENUE IN-FILL RESIDENTIAL DEVELOPMENT

NOISE IMPACT STUDY

City of Orange, California



901 E. KATELLA AVENUE IN-FILL RESIDENTIAL DEVELOPMENT NOISE IMPACT STUDY City of Orange, California

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1.0 Introduction

1.1 Purpose of Analysis and Study Objectives

The purpose of this report is to evaluate the potential noise impacts from the proposed 901 E. Katella Avenue In-Fill Residential Development (hereinafter referred to as "Project") and provide recommendations, if necessary, to minimize any project noise impacts.

The assessment was conducted within the context of the California Environmental Quality Act (CEQA, California Public Resources Code Sections 21000, et seq.) and the standards and methodology follow the City of Orange noise requirements.

The following is provided in this report:

- A description of the study area and the proposed project
- Information regarding the fundamentals of noise
- Identification of the regulatory setting and applicable noise standards
- Analysis of the existing noise environment
- Analysis of the project's operational noise impact on adjacent sensitive receptors
- Analysis of the project's construction noise and vibration impact on adjacent sensitive receptors
- Analysis of the project's noise/land use compatibility
- Summary of recommended mitigation measures and project design features to reduce noise level impacts.

1.2 Site Location

The proposed project is located at 901 E. Katella Ave., on the northeast corner of the intersection of Cambridge Street and Katella Avenue, in the City of Orange, California. The project site is currently developed with a vacant AT&T call center.

The project site is bounded by residential uses to the north, Katella Avenue to the south, commercial uses to the east, and Cambridge Street to the west. The project site is located within a General Commercial (GC) land use designation and is bordered along the northern property line by a Low Density Residential (LDR) land use designation.

The nearest noise-sensitive land uses surrounding the project site include:

- Existing adjacent residential land uses located directly north of the project site

- Existing adjacent residential land use to the northwest of the project site, approximately 125 feet from the centerline of Cambridge Street

The project site location map is provided in Exhibit A.

1.3 Project Description

The proposed project consists of razing the existing vacant AT&T call center and constructing forty-nine (49) residential units with a density of 18.1 DU/AC. The site plan used for this analysis, provided by BASSENIAN LAGONI ARCHITECTS, is illustrated in Exhibit B.

Table 1 summarizes the proposed project land uses.

Table 1
Land Use Summary

Project Land Use	Amount	Metric
Multifamily Residential	49	Dwelling Units
Parking Lot	128	Spaces

This report analyzes the short-term noise impacts associated with construction activities and long-term noise impacts associated with the day-to-day operation of the project. The primary source of operational noise includes residential HVAC mechanical equipment noise and on-site vehicle circulation noise.

The project is proposing to build a noise barrier wall (minimum six (6) feet high) along the eastern property line. An existing six (6) foot tall noise barrier wall is located along the northern property line.

It should be noted that this study was conducted in November 2022 based on the proposed project including 52 residential dwelling units and 117 parking spaces. The project site plan has since been revised to include 49 dwelling units and 128 parking spaces. No significant changes or new sources of noise have been added to the proposed project. Therefore, this report conservatively analyzes noise impacts based on the original site plan.

1.4 Summary of Analysis Results

Table 2 provides a summary of the noise analysis results, per the CEQA impact criteria checklist. The project is not expected to result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Table 2
CEQA Noise Impact Criteria

Noise Impact Criteria	Potentially Significant	Potentially Significant Unless Mitigated	Less Than Significant Impact	No Impact
<i>Would the project result in?</i>				
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			X	
b) Generation of excessive ground-borne vibration or ground-borne noise levels?			X	
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X

1.5 Recommended Project Design Features (DF)

The following recommended project design features include standard rules and requirements, best practices, and recognized design guidelines for reducing noise levels. Design features are assumed to be part of the conditions of the project and integrated into its design. All CEQA-related impacts are considered less than significant; hence the design features are not considered mitigation.

Operational Design Features

- DF-1** The project will need to comply with California Title 24 building insulation requirements for exterior walls, roofs, and common separating assemblies

(e.g., floor/ceiling assemblies and demising walls), which shall be reviewed by the City prior to issuance of a building permit.

- Interior noise levels due to exterior sources must not exceed a community noise equivalent level (CNEL) or a day-night level (LDN) of 45 dBA, in any habitable room.
- Party wall assembly designs must provide a minimum STC of 50, based on lab tests. Field tested assemblies must provide a minimum noise isolation class (NIC) of 45.

DF-2 A “windows closed” condition is expected to be required for all residential units within the project site to meet the interior noise standard. To accommodate windows closed conditions, all units shall be equipped with adequate fresh air ventilation, per the requirements of the California Building Standards.

DF-3 Upgraded windows and sliding glass doors with a minimum STC rating of 32 or greater are expected to be required for all units facing Cambridge Street and Katella Avenue.

DF-4 Deliveries, loading and unloading activities, and trash pick-up hours should be limited to daytime hours only (7 a.m. – 10 p.m.).

DF-5 Engine idling time for all delivery vehicles and moving trucks to 5 minutes or less.

Construction Design Features

DF-6 Construction-related noise shall take place only between the hours of 7:00 a.m. to 8:00 p.m. Monday through Saturday, and 9:00 a.m. to 8:00 p.m. on Sundays and Federal holidays.

DF-7 Provide public notifications and signage in readily visible locations along the perimeter of construction sites that indicate the dates and duration of construction activities, as well as provide a telephone number where neighbors can enquire about the construction process and register complaints to a designated construction noise disturbance coordinator.

- DF-8** All construction equipment shall be equipped with muffles and other suitable noise attenuation devices (e.g., engine shields).
- DF-9** Establish an electric connection to the site to avoid the use of diesel- and gas-powered generators, if feasible.
- DF-10** Locate staging area, generators, and stationary construction equipment as far from the adjacent residential homes as feasible.
- DF-11** Construction-related equipment, including heavy-duty equipment, motor vehicles, and portable equipment, shall be turned off when not in use for more than 5 minutes.

2.0 Fundamentals of Noise and Vibration

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

2.1 Sound, Noise, and Acoustics

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

2.2 Frequency and Hertz

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

2.3 Sound Pressure Levels and Decibels

The *amplitude* of a sound determines its loudness. The loudness of sound increases or decreases, as the amplitude increases or decreases. Sound pressure amplitude is measured in units of micro-Newton per square inch meter (N/m²), also called micro-Pascal (μ Pa). One μ Pa is approximately one hundred billionths (0.0000000001) of normal atmospheric pressure. Sound pressure level (SPL or L_p) is used to describe in logarithmic units the ratio of actual sound pressures to a reference pressure squared. These units are called decibels and abbreviated as dB.

2.4 Addition of Decibels

Because decibels are on a logarithmic scale, sound pressure levels cannot be added or subtracted by simple plus or minus addition. When two (2) sounds of equal SPL are combined, they will produce an SPL 3 dB greater than the original single SPL. In other words, sound energy must be doubled to produce a 3dB increase.

If two (2) sounds differ by approximately 10 dB the higher sound level is the predominant sound.

2.5 Human Response to Changes in Noise Levels¹

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

2.6 Noise Descriptors

Noise in our daily environment fluctuates over time. Some noise levels occur in regular patterns, others are random. Some noise levels are constant, while others are sporadic. Noise descriptors were created to describe the different time-varying noise levels. Following are the most commonly used noise descriptors along with brief definitions.

A-Weighted Sound Level

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

Ambient Noise Level

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

¹ Technical Noise Supplement to the Traffic Noise Analysis Protocol, September 2013.

Community Noise Equivalent Level (CNEL)

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

Decibel (dB)

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

dB(A)

A-weighted sound level (see definition above).

Equivalent Sound Level (LEQ)

The sound level corresponding to a steady noise level over a given sample period with the same amount of acoustic energy as the actual time-varying noise level. The energy average noise level during the sample period.

Habitable Room

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

L(n)

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

Noise

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

Percent Noise Levels

See L(n).

Sound Level (Noise Level)

The weighted sound pressure level obtained by use of a sound level meter having a standard frequency-filter for attenuating part of the sound spectrum.

Sound Level Meter

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

Single Event Noise Exposure Level (SENEL)

The dBA level which, if it lasted for one (1) second, would produce the same A-weighted sound energy as the actual event.

2.7 Sound Propagation

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

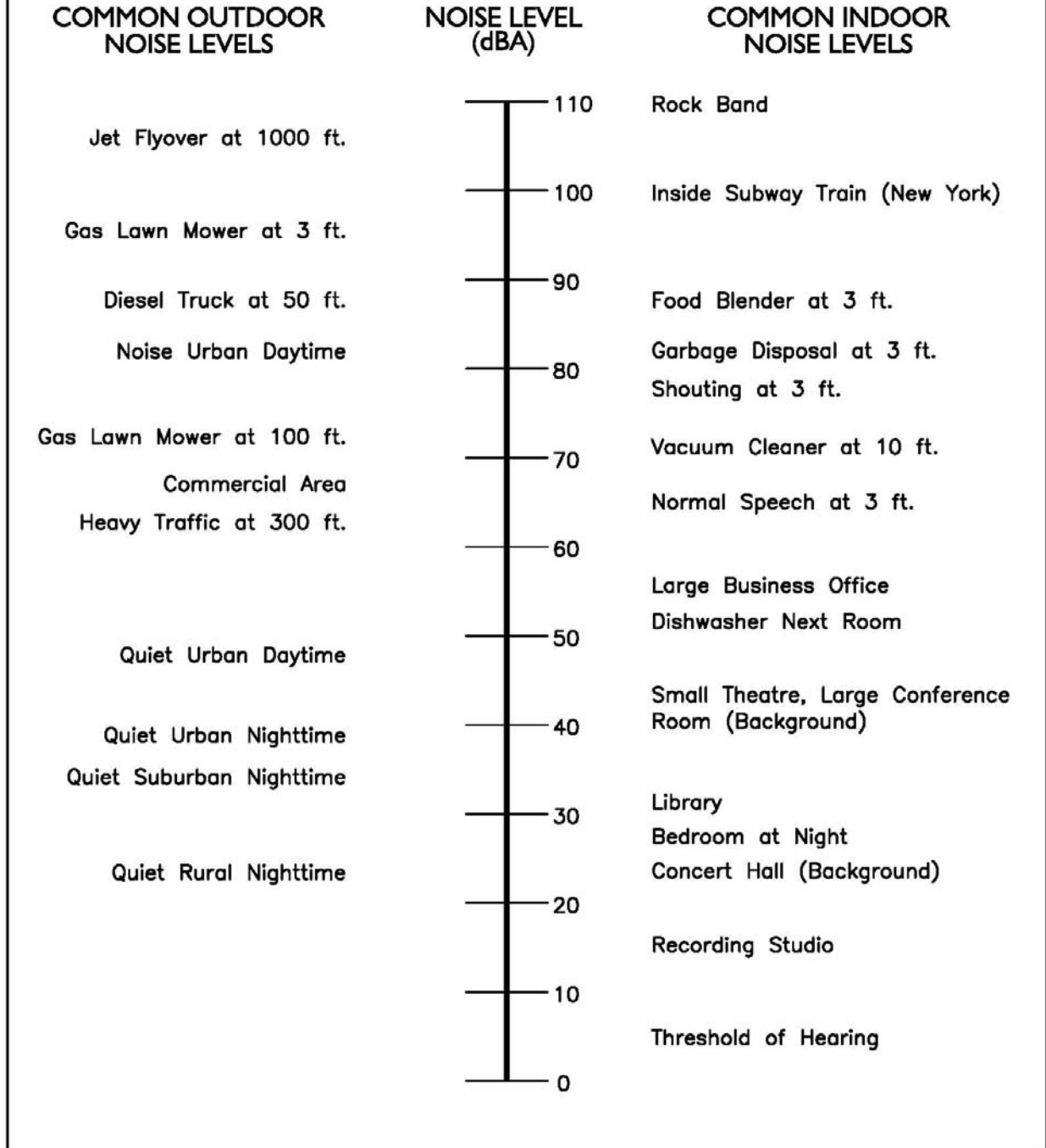
As noise propagates from the source, it is affected by the ground and atmosphere. Noise models use the hard site (reflective surfaces) and soft site (absorptive surfaces) to help calculate predicted noise levels. Hard site conditions assume no excessive ground

absorption between the noise source and the receiver. Soft site conditions such as grass, soft dirt or landscaping attenuate noise at an additional rate of 1.5 dB per doubling of distance. When added to the geometric spreading, the excess ground attenuation results in an overall noise attenuation of 4.5 dB per doubling of distance for a line source and 6.0 dB per doubling of distance for a point source.

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

Figure 1 shows typical sound levels from indoor and outdoor noise sources.

Figure 1²
TYPICAL SOUND LEVELS FROM
INDOOR AND OUTDOOR NOISE SOURCES



² Technical Noise Supplement to the Traffic Noise Analysis Protocol, September 2013.

2.8 Vibration Descriptors

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

Several different methods are used to quantify vibration amplitude.

PPV

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

RMS

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

VdB

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

2.9 Vibration Perception

Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. These continuous vibrations are not noticeable to humans whose threshold of perception is around 65 VdB. Outdoor sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible ground-borne noise or vibration. To counter the effects of ground-borne vibration, the Federal Transit Administration (FTA) has published guidance relative to vibration impacts.

2.10 Vibration Propagation

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

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil but has been shown to be effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests.

2.11 Construction Related Vibration Level Propagation³

Operational activities are separated into two different categories. The vibration can be transient or continuous in nature. Each category can result in varying degrees of ground vibration, depending on the equipment used on the site. Operation of equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings in the vicinity of the project area site respond to these vibrations with varying results ranging from no perceptible effects at the low levels to slight damage at the highest levels. The thresholds from Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, in the table below provide general guidelines as to the maximum vibration limits for when vibration becomes potentially annoying.

³ Caltrans Transportation and Construction Vibration Guidance Manual, April 2020

Table 3
Vibration Annoyance Potential Criteria

Human Response	PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.90	0.10
Severe	2.00	0.40

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

The Caltrans Transportation and Construction Vibration Guidance Manual, April 2020 provides general thresholds and guidelines as to the vibration damage potential from vibratory impacts. The table below provides general vibration damage potential thresholds:

Table 4
Vibration Damage Potential Threshold Criteria

Structure and Condition	PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings ruin ancient monuments	0.12	0.08
Fragile buildings	0.20	0.10
Historic and some old buildings	0.50	0.25
Older residential structures	0.50	0.30
New residential structures	1.00	0.50
Modern industrial/commercial buildings	2.00	0.50

Soil conditions have an impact on how vibration propagates through the ground. The Caltrans Transportation and Construction Vibration Guidance Manual, April 2020 provides suggested “n” values based on soil class. The table below outlines the manual’s suggested values and description.

Table 5
Suggested "n" Values Based on Soil Classes

Soil Class	Description of Soil Material	Suggested Value of "n"
I	Weak or soft soils: loose soils, dry or partially saturated peat and muck, mud, loose beach sand, and dune sand.	1.4
II	Most sands, sandy clays, silty clays, gravel, silts, and weathered rock.	1.3
III	Hard soils: densely compacted sand, dry consolidated clay, consolidated glacial till, and some exposed rock.	1.1
IV	Hard, component rock: bedrock, freshly exposed hard rock.	1.0

3.0 Regulatory Setting

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

3.1 Federal Regulations

The adverse impact of noise was officially recognized by the federal government in the Noise Control Act of 1972, which serves three (3) purposes:

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

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

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

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

3.2 State Regulations

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

Noise insulation design standards for residential dwellings are established in the 2019 California Building Code, Title 24, Part 2, Volume 1, Section 1206 Sound Transmission. The City is required by the State Housing Law to adopt these State codes as minimum performance standards. The City may enact stricter noise standards throughout the city or on a case-by-case basis if deemed necessary. In brief, the Title 24 noise standards require the following for allowable interior noise levels:

1. Interior noise levels due to exterior sources must not exceed a community noise equivalent level (CNEL) or a day-night level (LDN) of 45 dBA, in any habitable room.
2. Party wall and floor-ceiling assembly designs must provide a minimum STC of 50, based on lab tests. Field tested assemblies must provide a minimum noise isolation class (NIC) of 45.
3. Floor-ceiling assembly designs must provide for a minimum impact insulation class (IIC) of 50, based on lab tests. Field tested assemblies must provide a minimum FIIC of 45.
4. Penetrations or openings in sound rated assemblies must be treated to maintain required ratings.

3.3 City of Orange Noise Regulations

The City of Orange outlines its noise regulations and standards within Chapter 8.24 of the Orange Municipal Code and the City of Orange General Plan Noise Element. Noise impacts can be identified into two types based on their sources: mobile or stationary. The noise metrics used for mobile sources, such as transportation-related noise (e.g., freeways, airports, and railroads) are the Community Noise Equivalent Level (CNEL), which is a 24-hour time-weighted average noise level. Stationary noise sources, such as industrial or construction noise, that may be intrusive to a neighboring private property utilize the noise metrics that are defined as noise levels that cannot be exceeded for certain percentages of time.

The noise standards from the City's General Plan and Municipal Code are provided in Appendix A.

3.3.1 City of Orange Stationary Noise Standards

The City of Orange's daytime and nighttime noise standards for fixed noise sources are defined in the City's General Plan. Table 6 below states the City of Orange's maximum allowable noise exposure from stationary sources.

Table 6
City of Orange
Stationary Noise Standards

Noise Level Descriptor	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)
Hourly Equivalent Level	55	45
Maximum Level	70	65

Source: City of Orange General Plan Noise Element, Table N-4

Notes:

- ¹ These standards apply to new or existing noise sensitive land uses affected by new or existing non-transportation noise sources, as determined at the outdoor activity area of the receiving land use. However, these noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).
- ² Each of the noise levels specified above should be lowered by five dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. Such noises are generally considered by residents to be particularly annoying and are a primary source of noise complaints. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).
- ³ No standards have been included for interior noise levels. Standard construction practices that comply with the exterior noise levels identified in this table generally result in acceptable interior noise levels.
- ⁴ The City may impose noise level standards which are more or less restrictive than those specified above based upon determination of existing low or high ambient noise levels. If the existing ambient noise level exceeds the standards listed in Table N-4, then the noise level standards shall be increased at 3 dB increments to encompass the ambient environment. Noise level standards incorporating adjustments for existing ambient noise levels shall not exceed a maximum of 70 dB Leq.

3.3.2 Land Use Compatibility Standards

The City of Orange has developed land use compatibility standards to determine ambient noise levels that are considered “normally acceptable” for their respective land uses. These standards are applicable to transportation-related noise sources. Table 7 below states the noise standards applicable to the proposed project’s land use, as described in the City’s General Plan.

Table 7
City of Orange
Land Use Compatibility Standards

Land Use		CNEL (dBA)	
Designations	Uses	Interior ^{1, 3}	Exterior ²
Medium Density Residential Neighborhood ^{4, 5}	Multiple-family, mixed-use	45	65

Source: City of Orange General Plan Noise Element, Table N-3.

Notes:

- ¹. Interior habitable environment excludes bathrooms, closets and corridors.
- ². Exterior noise level standard to be applied at outdoor activity areas; 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 closed position. Mechanical ventilation shall be provided per California Building Standards Code requirements.
- ⁴. Within 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 or balconies located within 250 feet of freeways (I-5, SR-57, SR-22, or SR-241) and Smart Streets and Principal Arterials identified in the Circulation & Mobility Element that exceed 70 dB should provide additional common open space.

3.3.3 City of Orange Construction Noise Regulation

Section 8.24.050, Exemptions from Chapter Revisions, of the City's municipal code lists construction-related noise as exempt from exterior noise standards under the following conditions:

- Noise sources associated with construction, repair, remodeling, or grading of any real property . . . take place between the hours of 7:00 a.m. and 8:00 p.m. on any day except for Sunday or a Federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a Federal holiday. Noise generated outside of the hours specified are subject to the noise standards identified in Table 8.24.040.

3.3.4 City of Orange Noise Level Thresholds of Significance

The City of Orange General Plan Noise Element outlines the following additional thresholds of significance for examining noise impacts under CEQA:

For City analysis of noise impacts and determining appropriate mitigation under the California Environmental Quality Act (CEQA), in addition to the maximum allowable noise level standards outlined in Tables N-3 and N-4, 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 levels of 3 dBA CNEL or greater.

4.0 Study Method and Procedures

The following section describes the measurement procedures, measurement locations, and noise modeling procedures and assumptions used in the noise analysis.

4.1 Measurement Procedures and Criteria

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

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

RK conducted the sound level measurements in accordance with Caltrans technical noise specifications. All measurement equipment meets American National Standards Institute (ANSI) specifications for sound level meters (ANSI S1.4: Specification for Sound Level Meter, 1983)

Piccolo-II Type 2 integrating-averaging level meters were used to conduct long-term (24-hour) noise measurements at the project site.

The Leq, Lmin, Lmax, L2, L8, L25, and L50 statistical data were recorded over the measurement time period intervals and the information was utilized to define the noise characteristics for the project. The following gives a brief description of the Caltrans Technical Noise Supplement procedures for sound level measurements:

- Microphones for sound level meters were placed five (5) feet above the ground for long-term noise measurements
- Sound level meters were calibrated before and after each measurement
- Following the calibration of equipment, a windscreen was placed over the microphone
- Frequency weighting was set on "A" and slow response
- Temperature and sky conditions were observed and documented

Appendix B includes photos, field sheets, and measured noise data.

4.2 Stationary Noise Modeling

On-site stationary noise sources were analyzed using SoundPLAN™ noise modeling software. SoundPLAN™ is a standards-based program that incorporates more than twenty national and international noise modeling guidelines. This project consists of parking lot noise and stationary noise sources which are classified under industrial sources.

Projected noise levels from SoundPLAN™ are based on the following key parameters:

- Developing three-dimensional noise models of the project,
- Predicting the project noise levels at the selected community locations and
- Comparing the predicted noise with the existing community ambient noise levels at the receptor locations.

The sides of the buildings, walls, etc. were modeled as reflective surfaces and also as diffractive bodies. The noise sources are shown as red spheres (point sources) and red surfaces (area sources). A light blue line outlines the perimeter of each operation. The surrounding roads are displayed as grey surfaces.

Most of the ground within the project site and adjacent areas are covered with paved surfaces and lawns and will be run as a hard site to be conservative (Ground Factor=0). The Effective Flow Resistivity for field grass is SoundPLAN default. The elevation profile for the project site is derived from Google Earth and all the receptors are placed at 5 feet above ground level.

Sound Power and Sound Pressure Level

Sound power level is the acoustic energy emitted by a source that produces a sound pressure level at some distance. While the sound power level of a source is fixed, the sound pressure level depends upon the distance from the source and the acoustic characteristics of the area in which it is located.

SoundPLAN requires that the source noise level be input using sound power level and which must be back-calculated based on a measured sound pressure level. The sound power level is calculated using SoundPLAN software by calibrating the source noise level to equal the sound pressure level at an equal distance from the source in which the referenced measurement was taken.

4.2.1 HVAC Equipment Noise

This analysis assumes each dwelling unit will be equipped with residential HVAC equipment. Table 8 indicated the referenced noise levels for on-site stationary noise sources.

Table 8
HVAC Referenced Noise Levels¹

Source ¹	Noise Levels (dBA)
	L _{eq}
HVAC Equipment	73.2

¹Referenced noise levels are based on typical residential HVAC equipment observed by RK.

To estimate the future noise levels during typical operational conditions, referenced noise levels are input into SoundPLAN and projected to the nearest sensitive receptor locations. Adjusted noise levels are based on the distance of the receptor location relative to the noise source, local topography, and physical barriers including buildings and sound walls. The noise levels assume that the stationary sources are operating continuously during both daytime and nighttime hours, when in reality will likely operate only intermittently throughout daily operations.

4.2.2 Parking Lot Noise

Parking lot noise would occur from vehicles and trucks entering and exiting the site, idling, exhaust, loading and delivery activities, doors slamming, tires screeching, people talking, and the occasional horn honking. Parking lot noise would occur throughout the site and is assessed by using referenced noise levels in the SoundPLAN model. Parking lot noise is based on the type of vehicle and the number of movements per hour. Referenced noise levels for parking lot activities are based on the SoundPLAN™ standard *Parkplatzlärmstudie 2007*. Key inputs for parking lot noise include the size of the area source, number of movements per hour, type of vehicles, and number of parking spaces within each lot.

4.3 Construction Noise Modeling

The construction noise analysis utilizes the Federal Highway Administration (FHWA) Roadway Construction Noise Model, together with several key construction parameters. Key inputs include distance to the sensitive receiver, equipment usage, and baseline parameters for the project site. This study evaluates the potential exterior noise impacts during each phase of construction.

Noise levels were projected at an average distance of 50 feet for equipment operating over a 8-hour period from the nearest sensitive receptor property line. While some construction noise activity may occur closer than 50 feet from the property line, noise levels are averaged over a 8-hour period for purposes of assessing impacts. The methodology used for assessing construction noise impacts is consistent with the Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual, September 2018⁴.

4.4 Construction Vibration Modeling

The construction vibration assessment is based on the methodology set forth within the Caltrans Transportation and Construction Induced Vibration Guidance Manual. The vibration impacts from vibratory rollers and compactors, heavy truck loading, and bulldozer activity are analyzed. All vibratory activity is analyzed as a continuous and/or frequent event and is required to comply with the applicable guidance threshold criteria. It is expected that vibration levels will be highest during the paving phase. No impact pile driving is expected as part of this project.

Vibratory impacts were calculated from the site area property line to the closest sensitive receptors and structures using the reference vibration levels, soil conditions, and the reference equation $PPV = PPV_{ref} (25/D)^n$ (in/sec) (from Caltrans Manual) where:

PPV = reference measurement at 25 feet from vibration source

D = distance from equipment to property line

n = vibration attenuation rate through ground (n=1.0 was utilized for this study)

⁴ Federal Transit Administration. Transit Noise and Vibration Impact Assessment Manual. September 2018. Section 7.1. Construction Noise Assessment.

5.0 Existing Noise Environment

The existing noise environment for the project site and surrounding areas has been established based on noise measurement data collected by RK. Noise measurement data indicates that the ambient noise consists primarily of traffic noise propagating from the adjacent roadways, as well as activities from the surrounding properties.

5.1 24-Hour Noise Measurement Results

In order to establish the ambient noise environment, RK conducted three (3) 24-hour noise measurements at the project study area.

Noise levels were measured on September 14, 2022 using Piccolo-II Type 2 integrating-averaging sound level meters. The information was utilized to establish the noise characteristics of the existing ambient environment

The noise monitoring locations were selected based on the proximity and location of adjacent sensitive receptors. Exhibit C graphically illustrates the location of the long-term measurements.

- Noise monitoring location one (L-1) was taken approximately 100 feet north of the centerline of Katella Avenue and 115 feet east of the centerline of N. Cambridge Street.
- Noise monitoring location two (L-2) was taken approximately 70 feet east of the centerline of Cambridge Street and approximately 20 feet south of the project site's northern property line.
- Noise monitoring location three (L-3) was taken approximately 300 feet east of the centerline of Cambridge Street and 10 feet south of the project site's northern property line.

Noise monitoring locations represent the existing ambient noise levels near the adjacent noise-sensitive land uses and the project site.

Appendix B includes photographs, field sheets, and measured noise data.

Noise measurements are summarized in Table 9, Table 10, and Table 11 below.

Table 9
24 Noise Measurement Results, L-1¹

Time	Leq (dBA)	Time	Leq (dBA)
12:00 AM	59.1	12:00 PM	68.2
1:00 AM	56.0	1:00 PM	66.6
2:00 AM	57.1	2:00 PM	66.7
3:00 AM	60.7	3:00 PM	67.5
4:00 AM	63.7	4:00 PM	68.3
5:00 AM	65.6	5:00 PM	68.2
6:00 AM	68.2	6:00 PM	67.5
7:00 AM	68.9	7:00 PM	67.4
8:00 AM	69.3	8:00 PM	67.1
9:00 AM	68.0	9:00 PM	64.3
10:00 AM	66.4	10:00 PM	63.0
11:00 AM	66.2	11:00 PM	60.8
24-Hour CNEL			71.0

¹ L-1 was taken approximately 100 feet north of the centerline of E. Katella Ave. and 155 feet east of the centerline of N. Cambridge St.

Table 10
24 Noise Measurement Results, L-2¹

Time	Leq (dBA)	Time	Leq (dBA)
12:00 AM	53.0	12:00 PM	70.6
1:00 AM	52.5	1:00 PM	63.3
2:00 AM	52.5	2:00 PM	63.4
3:00 AM	52.7	3:00 PM	63.8
4:00 AM	56.9	4:00 PM	64.0
5:00 AM	58.7	5:00 PM	65.2
6:00 AM	61.6	6:00 PM	63.4
7:00 AM	62.9	7:00 PM	62.8
8:00 AM	63.7	8:00 PM	62.1
9:00 AM	62.6	9:00 PM	60.2
10:00 AM	63.3	10:00 PM	62.2
11:00 AM	62.7	11:00 PM	55.3
24-Hour CNEL			66.4

¹ L-2 was taken approximately 70 feet east of the centerline of N. Cambridge St. and 20 feet south of the project site's northern property line.

Table 11
24 Noise Measurement Results L-3¹

Time	Leq (dBA)	Time	Leq (dBA)
12:00 AM	54.8	12:00 PM	65.2
1:00 AM	54.4	1:00 PM	59.5
2:00 AM	54.5	2:00 PM	59.0
3:00 AM	54.8	3:00 PM	59.0
4:00 AM	55.5	4:00 PM	59.6
5:00 AM	56.1	5:00 PM	58.7
6:00 AM	57.5	6:00 PM	58.6
7:00 AM	58.2	7:00 PM	57.6
8:00 AM	58.7	8:00 PM	56.0
9:00 AM	58.8	9:00 PM	56.2
10:00 AM	59.0	10:00 PM	55.8
11:00 AM	58.7	11:00 PM	55.0
24-Hour CNEL			63.0

¹ L-3 was taken approximately 300 feet east of the centerline of N. Cambridge St. and 10 feet south of the project site's northern property line.

6.0 Operational Noise Impacts

This assessment analyzes the anticipated noise levels generated by the project and impacts caused by changes to the ambient environment. The main sources of noise generated by the project would include on-site operational activities from HVAC equipment and parking lot noise. Noise level impacts are compared to the City of Orange noise standards.

The project must demonstrate that noise levels generated by the project site would not be in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

6.1 Operational Noise Source Impacts

6.1.1 Stationary Noise Source Impacts

On-site stationary noise impacts are assessed at all adjacent sensitive receptor property lines surrounding the project site. Existing sensitive land uses surrounding the proposed project site include existing residential uses to the north and northwest.

Project operational activities are analyzed for long-term noise impacts associated with the day-to-day operation of the project; including mechanical HVAC equipment and on-site vehicular movements to the nearest adjacent property lines.

The project is proposing to build a noise barrier wall (minimum six (6) feet high) along the eastern property line. An existing six (6) foot tall noise barrier wall is located along the northern property line. The noise study has taken the proposed and existing wall locations into account for potential noise barrier shielding.

HVAC equipment will be located at ground level on the side yards of the homes.

On-site vehicular noise would occur from vehicle engine idling and exhaust, doors slamming, tires screeching, people talking, and the occasional horn honking. Vehicular noise is expected to occur throughout the project site.

SoundPLAN calculation worksheets are shown in Appendix C. Project daytime and nighttime noise level contours are graphically illustrated in Exhibits E and F, respectively.

Daytime Stationary Source Noise Impacts

The results of the daytime noise impact analysis are shown in Table 12 and are graphically illustrated in Exhibit D.

The noise analysis considers all project noise sources operating simultaneously during daytime (7:00 a.m. to 10:00 p.m.) hours at the nearest sensitive receptors.

Table 12
Typical Operation Noise Levels (dBA) - Daytime

Receptor	Location	Daytime Exterior Noise Level dBA						
		Existing Ambient Noise Level ¹	Project Noise Level	Existing + Project Noise Level	Change as a result of project	City of Orange Daytime Noise Level Standard (Leq)	Project Noise Level Exceeds Standard (?)	Significant Impact (?) ²
Receiver-1	Northwest	60.2	35.1	60.2	0.1	55.0	No	No
Receiver-2	North	56.0	44.5	56.3	0.3		No	No
Receiver-3	Northeast	56.0	36.3	56.0	0.4		No	No

¹ Existing ambient noise levels are the lowest average hourly Leq, and are representative of approximate noise levels at surrounding receptor locations.

² Source: City of Orange General Plan Noise Element, Table N-4.

³ A significant impact would occur where there is an existing ambient noise level of less than 65 dBA and a project related permanent increase in ambient noise levels of 5 dBA CNEL or greater.

Based on the results of this analysis, noise levels generated by the project are not expected to exceed the City of Orange's daytime noise standards at the adjacent property lines.

6.

Nighttime Stationary Source Noise Impacts

The results of the nighttime noise impact analysis are shown in Table 13 and are graphically illustrated in Exhibit D.

The nighttime noise analysis considers all project noise sources operating simultaneously during nighttime (10:00 p.m. to 7:00 a.m.) hours at the nearest sensitive receptors.

Table 13
Typical Operation Noise Levels (dBA) - Nighttime

Receptor	Location	Daytime Exterior Noise Level dBA (Leq)						
		Existing Ambient Noise Level ¹	Project Noise Level	Existing + Project Noise Level	Change as a result of project	City of Orange Nighttime Noise Level Standard (Leq) ²	Project Exceeds City Standard (yes/no)	Significant Impact (yes/no) ³
Receiver-1	Northwest	50.2	34.8	50.3	0.1	45.0	No	No
Receiver-2	North	46.0	44.5	48.3	2.3		No	No
Receiver-3	Northeast	46.0	36.2	46.4	0.4		No	No

¹ Existing ambient noise levels are the lowest average hourly Leq, and are representative of approximate noise levels at surrounding receptor locations.

² Source: City of Orange General Plan Noise Element, Table N-4.

³ A significant impact would occur where there is an existing ambient noise level of less than 65 dBA and a project related permanent increase in ambient noise levels of 5 dBA CNEL or greater.

Based on the results of this analysis, noise levels generated by the project are not expected to exceed the City of Orange's nighttime noise standards at the adjacent property lines.

6.1.2 Roadway Noise Source Impacts

The project is not expected to cause a substantial increase in ambient noise levels in the vicinity of the site as a result of increased traffic volume along adjacent roadways. Typically, it takes a doubling of traffic volume along a roadway to cause a significant increase in ambient noise levels of more than 3 dBA.

The project is expected to generate approximately 374 average daily trips (ADT)⁵. Hence, the amount of traffic generated by the project will not double the amount of traffic along Cambridge Street or Katella Avenue, either directly or cumulatively, and therefore the increase in roadway noise levels as a result of the project is less than significant.

The project's impact from operational noise sources will be less than significant.

⁵ ADT volumes are referenced from *901 E. Katella Avenue In-Fill Residential Project (TTM 19253) Trip Generation Analysis*, City of Orange, CA by RK Engineering Group, October 2022.

6.2 Noise/Land Use Compatibility

The project will site new residential homes and outdoor recreational space within approximately 25 feet of the edges of the nearest travel lanes of Katella Avenue and Cambridge Street. Traffic noise from these roadways will be the primary source of noise impacting the project site and may expose future residents to noise levels above the State of California and City of Orange recommended limits for residential uses.

The proposed project site is designated in the City's General Plan as "Medium Density Residential Neighborhood," and is listed as a "multiple-family" land use. The General Plan Noise Element states that for Medium Density Residential land uses, exterior noise standards apply only to common outdoor recreational areas, and do not apply to private patios or balconies. Therefore, this study only analyzes exterior noise levels for the project's common recreational area (pocket park) and does not consider noise levels at private outdoor patios.

The proposed on-site pocket park will be located near the northern boundary of the project site. This space will be considered a habitable outdoor area and will be required to comply with the City's exterior noise standards for multi-family residential uses. Due to its location, the pocket park will be shielded from the line of sight of the adjacent roadways and the noise they produce. Therefore, it is assumed that the ambient noise levels at the pocket park will be within the City's exterior noise standards.

6.3 Preliminary Interior Noise Analysis

Based on the measured existing and projected exterior noise levels, future residents of the proposed project may be exposed to noise levels that exceed the City's maximum allowable standards for interior noise exposure. Therefore, to ensure that interior noise levels fall within the "normally acceptable" range, the following preliminary interior noise analysis has been performed.

The preliminary interior noise analysis has been prepared for the project's on-site sensitive receptor locations (i.e., first rows of residential dwelling units) using a typical "windows open" and "windows closed" condition. A "windows open" condition assumes 12 dBA of noise attenuation from the exterior noise level. A "windows closed" condition assumes 20 dBA of noise attenuation from the exterior noise level.

Table 14 indicates the interior noise levels for the residential uses on the project site.

Table 14
Preliminary Interior Noise Impact Analysis

Receptor Location	Exterior Noise Level at Building Facade (CNEL)	Interior Noise Standard ¹ (CNEL)	Required Building Shell Noise Reduction (CNEL)	Interior Noise Level with Standard California Construction Windows (STC $\geq$ 25)		STC Rating for Windows Facing Subject Roadway
				"Windows Open" ²	"Windows Closed" ³	
1 st Row Buildings Facing Adjacent Roadways	74.0	45.0	29.0	62.0	54.0	32.0

¹Source: City of Orange General Plan Noise Element, Table N-3.

²A minimum of 12 dBA noise reduction is assumed with the "windows open" condition.

³A minimum of 20 dBA noise reduction is assumed with the "windows closed" condition.

The project is expected to require a "windows closed" condition, upgraded building construction, and upgraded STC-rated windows to meet the California Building Standards Code requirements for residential interior noise. To accommodate windows closed conditions, all units shall be equipped with adequate fresh air ventilation.

Exterior walls, designed per the latest California Building Standards are typically rated between STC 35-40. In order to ensure adequate noise attenuation is provided from the building shell, exterior walls should be designed to meet the required sound attenuation targets. Attic vents and other openings should be baffled and oriented away from facing the adjacent roadways.

Prior to issuance of building permits, the project proponent should demonstrate to the City Building Department that the proposed building shell and window assemblies will achieve exterior to interior noise reduction necessary to meet the State of California and City of Orange requirements.

Furthermore, the project shall comply with California Title 24 insulation building requirements for multi-family dwelling units for common separating assemblies (e.g., floor/ceiling assemblies and demising walls).

6.4 Operation Project Design Features (DF)

The following recommended project design features include standard rules and requirements, best practices, and recognized design guidelines for reducing noise levels. Design features are assumed to be part of the conditions of the project and integrated into its design. Design features are not typically considered mitigation under CEQA.

Operational Design Features

- DF-1** The project will need to comply with California Title 24 building insulation requirements for exterior walls, roofs, and common separating assemblies (e.g. floor/ceiling assemblies and demising walls), which shall be reviewed by the City prior to issuance of a building permit.
- Interior noise levels due to exterior sources must not exceed a community noise equivalent level (CNEL) or a day-night level (LDN) of 45 dBA, in any habitable room.
 - Party wall assembly designs must provide a minimum STC of 50, based on lab tests. Field tested assemblies must provide a minimum noise isolation class (NIC) of 45.
- DF-2** A “windows closed” condition is expected to be required for all residential units within the project site to meet the interior noise standard. To accommodate windows closed conditions, all units shall be equipped with adequate fresh air ventilation, per the requirements of the California Building Standards.
- DF-3** Upgraded windows and sliding glass doors with a minimum STC rating of 32 or greater is expected to be required for all units facing Cambridge Street and Katella Avenue.
- DF-4** Deliveries, loading and unloading activities, and trash pick-up hours should be limited to daytime hours only (7 a.m. – 10 p.m.).
- DF-5** Engine idling time for all delivery vehicles and moving trucks to 5 minutes or less.

7.0 Construction Noise and Vibration Impacts

Temporary construction noise and vibration impacts have been assessed from the project site to the surrounding existing noise-sensitive land uses. The degree of construction noise will vary depending on the type of construction activity taking place and the location of the activity relative to the surrounding properties.

Section 8.24.050, Exemptions from Chapter Revisions, of the City's municipal code lists construction-related noise as exempt from exterior noise standards under the following conditions:

- Noise sources associated with construction, repair, remodeling, or grading of any real property . . . take place between the hours of 7:00 a.m. and 8:00 p.m. on any day except for Sunday or a Federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a Federal holiday. Noise generated outside of the hours specified is subject to the noise standards identified in Table 8.24.040.

In compliance with the City's Municipal Code, it is assumed construction would not occur during the noise-sensitive nighttime hours.

7.1 Typical Construction Noise Levels

Table 15 shows typical construction noise levels compiled by the Environmental Protection Agency (EPA) for common-type construction equipment. Typical construction noise levels are used to estimate potential project construction noise levels at the adjacent sensitive receptors.

Table 15
Typical Construction Noise Levels¹

Type	Noise Levels (dBA) at 50 Feet
Earth Moving	
Compactors (Rollers)	73 - 76
Front Loaders	73 - 84
Backhoes	73 - 92
Tractors	75 - 95
Scrapers, Graders	78 - 92
Pavers	85 - 87
Trucks	81 - 94
Materials Handling	
Concrete Mixers	72 - 87
Concrete Pumps	81 - 83
Cranes (Movable)	72 - 86
Cranes (Derrick)	85 - 87
Stationary	
Pumps	68 - 71
Generators	71 - 83
Compressors	75 - 86
Impact Equipment	
Pneumatic Wrenches	82 - 87
Jack Hammers, Rock Drills	80 - 99
Pile Drivers (Peak)	95-105
Other	
Vibrators	68 - 82
Saws	71 - 82

¹ Referenced Noise Levels from the Environmental Protection Agency (EPA)

7.2 Construction Noise Impact Analysis

This assessment analyzes potential noise impacts during all expected phases of construction, including demolition, site preparation, grading, building construction, paving, and architectural coating. Noise levels are calculated based on an average distance of equipment over an 8-hour period to the nearest adjacent property.

The project's estimated construction noise levels have been calculated using the Federal Highway Administration Roadway Construction Noise Model Version 1.1. Table 16 shows the noise level impacts at 100 feet.

Although construction activity is exempt from the noise standards in the City's Municipal Code, the Federal Transit Administration (FTA) has provided guidelines for assessment of construction noise impacts in the *Transit Noise And Vibration Impact Assessment Manual*. For the purposes of this study, expected construction noise levels will be analyzed using the construction noise criteria provided by the FTA.

Construction noise calculation worksheets are provided in Appendix D.

Table 16
Project Construction Noise Levels – at 100 Feet

Phase	Equipment	Quantity	Equipment Noise Level at 100ft (dBA Leq)	Combined Noise Level (dBA Leq)
Demolition	Concrete Saw	1	83.6	85.2
	Rubber Tired Dozers	1	75.7	
	Tractors/Loaders/Backhoes	1	78.0	
Site Preparation	Graders	1	79.0	83.0
	Tractors/Loaders/Backhoes	1	78.0	
	Scraper	1	77.6	
Grading	Tractors/Loaders/Backhoes	2	78.0	83.8
	Graders	1	79.0	
	Rubber Tired Dozers	1	75.7	
Building Construction	Cranes	1	74.6	81.9
	Forklifts	2	69.0	
	Generator Sets	1	74.6	
	Tractors/Loaders/Backhoes	1	78.0	
	Welders	3	68.0	
Paving	Tractors/Loaders/Backhoes	1	78.0	82.0
	Concrete Mixers	1	72.8	
	Pavers	2	71.2	
	Rollers	2	74.0	
Architectural Coating	Air Compressors	1	71.7	71.7
Worst Case Construction Phase Noise Level - Leq (dBA)				85.2
FTA Daytime General Assessment Construction Noise Criteria – Leq (dBA)¹				90.0

¹Source: *Transit Noise and Vibration Impact Assessment Manual, Section 7 Noise and Vibration during Construction*, by the Federal Transit Administration.

The project is expected to generate a maximum noise level of 85.9 dBA. Based on the above table, the project's construction-related noise levels will not exceed the FTA General Assessment Construction Noise Criteria threshold.

7.3 Construction Vibration

To determine the vibratory impacts during construction, reference construction equipment vibration levels were utilized and then extrapolated to the façade of the nearest adjacent structures. The nearest sensitive receptors are the adjacent residential uses to the north of the project site. All structures surrounding the project site are “new structures”. No historical or fragile buildings are known to be located within the vicinity of the site.

The construction of the proposed project is not expected to require the use of substantial vibration-inducing equipment or activities, such as pile drivers or blasting. The main sources of vibration impacts during the construction of the project would be the operation of equipment such as bulldozer activity during site preparation, loading trucks during grading and excavation, and vibratory rollers during paving.

The construction vibration assessment utilizes the referenced vibration levels and methodology set forth within the Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, September 2018. Table 17 shows the FTA-referenced vibration levels.

Table 17
Typical Construction Vibration Levels¹

Equipment	Peak Particle Velocity (PPV) (inches/second) at 25 feet	Approximate Vibration Level (LV) at 25 feet
Piledriver (impact)	1.518 (upper range)	112
	0.644 (typical)	104
Piledriver (sonic)	0.734 upper range	105
	0.170 typical	93
Clam shovel drop (slurry wall)	0.202	94
Hydromill	0.008 in soil	66
(slurry wall)	0.017 in rock	75
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Large bulldozer	0.089	87
Caisson drill	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

¹ Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006.

Table 18 shows the project's construction-related vibration analysis at the nearest structures to the project construction area. Construction impacts are assessed at 60 feet from the nearest adjacent structure.

Table 18
Construction Vibration Impact Analysis

Construction Activity	Distance to Nearest Structure (ft)	Duration	Calculated Vibration Level - PPV (in/sec)	Damage Potential Level	Annoyance Criteria Level
Large Bulldozer	60	Continuous/Frequent	0.034	Extremely fragile historic buildings, ruins, ancient monuments	Barely Perceptible
Vibratory Roller	60	Continuous/Frequent	0.080	Extremely fragile historic buildings, ruins, ancient monuments	Distinctly Perceptible
Loaded Trucks	60	Continuous/Frequent	0.029	Extremely fragile historic buildings, ruins, ancient monuments	Barely Perceptible

Project-related construction activity is not expected to cause any potential damage to the nearest structures.

Construction vibration calculation worksheets are shown in Appendix D.

7.4 Construction Project Design Features

The following recommended project design features include standard rules and requirements, best practices, and recognized design guidelines for reducing noise levels. Design features are assumed to be part of the conditions of the project and integrated into the site design and construction management plan.

Construction Design Features

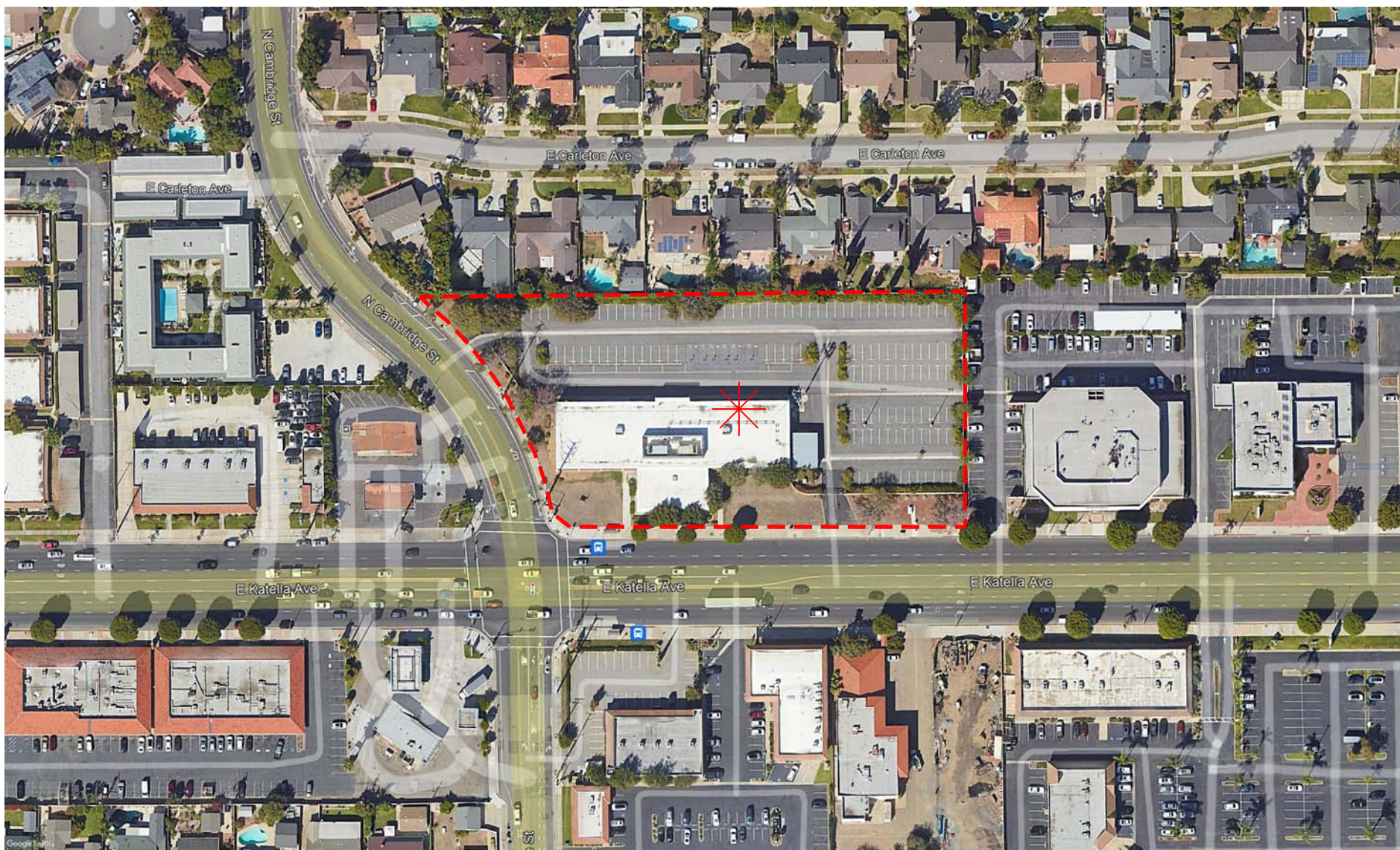
DF-6 Construction noise is prohibited between the hours of 8:00 p.m. to 7:00 a.m., Monday through Saturday, and 6:00 p.m. to 10:00 a.m. on Sundays and federal holidays.

DF-7 Provide public notifications and signage in readily visible locations along the perimeter of construction sites that indicate the dates and duration of

construction activities, as well as provide a telephone number where neighbors can enquire about the construction process and register complaints to a designated construction noise disturbance coordinator.

- DF-8** All construction equipment shall be equipped with muffles and other suitable noise attenuation devices (e.g., engine shields).
- DF-9** Establish an electric connection to the site to avoid the use of diesel- and gas-powered generators, if feasible.
- DF-10** Locate staging area, generators, and stationary construction equipment as far from the adjacent residential homes as feasible.
- DF-11** Construction-related equipment, including heavy-duty equipment, motor vehicles, and portable equipment, shall be turned off when not in use for more than 5 minutes.

Exhibits



Legend:

--- = Project Site Boundary

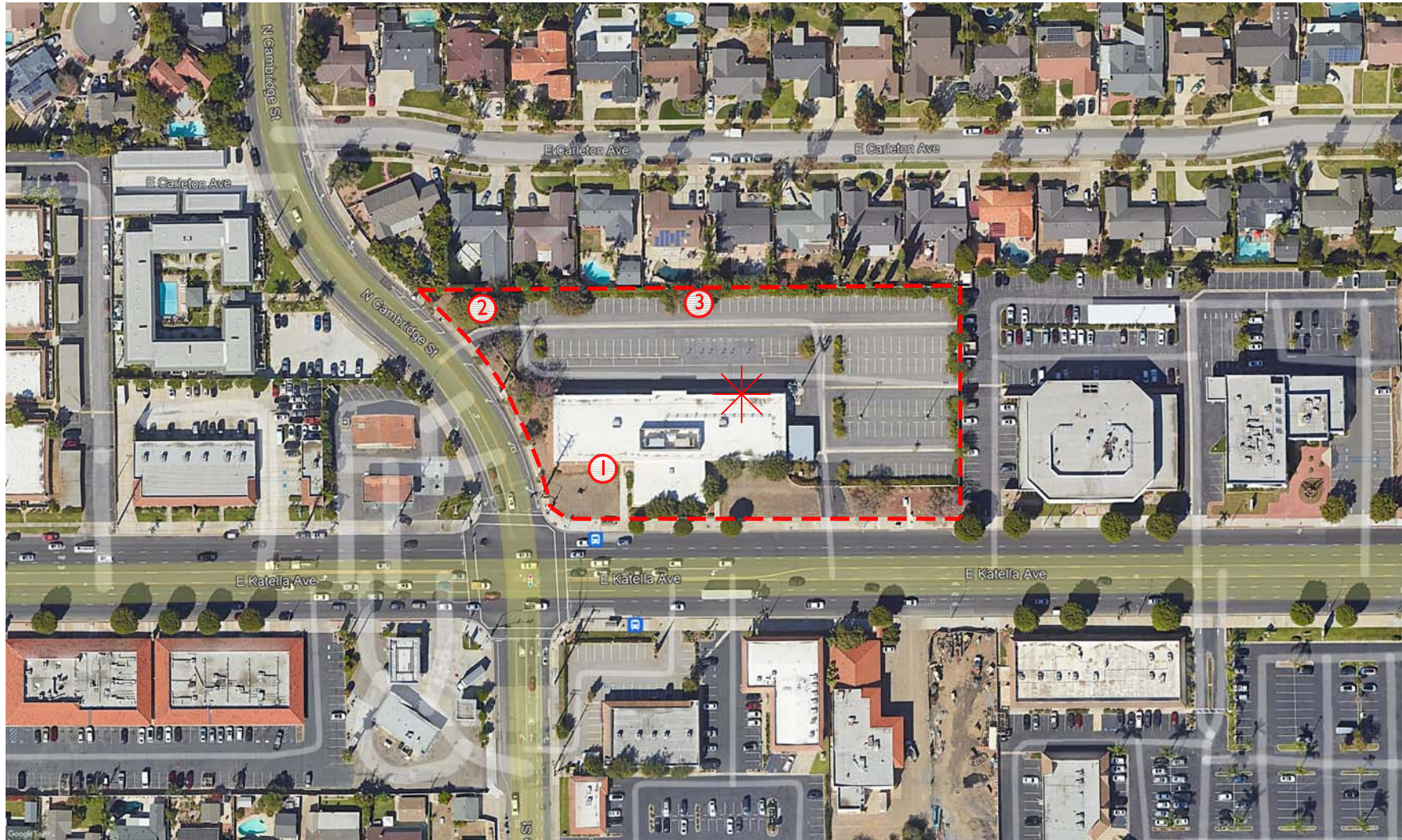
* = Project Site





Exhibit C

Noise Monitoring Locations



Legend:

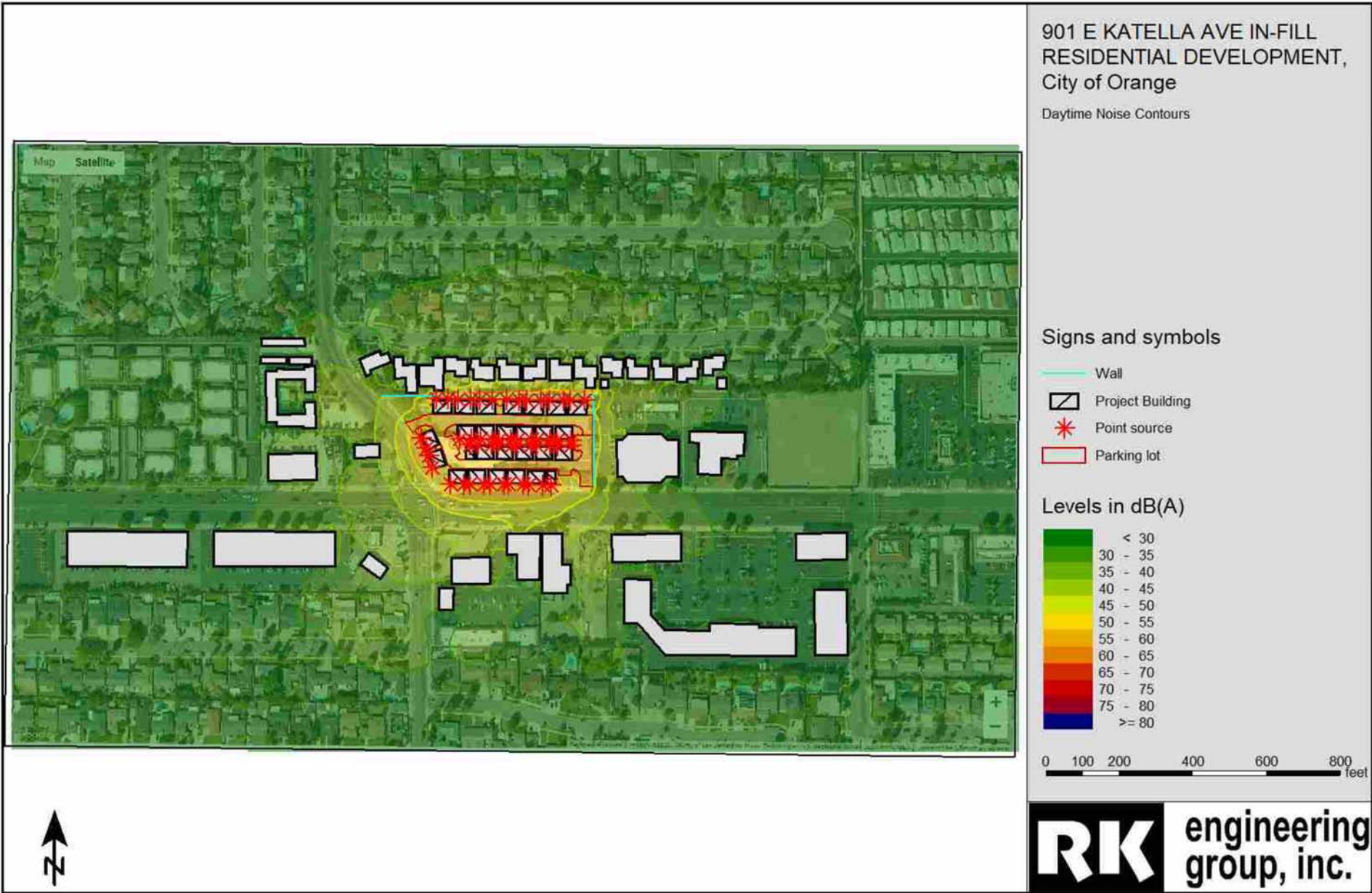
- = Project Site Boundary
- * = Project Site
- = Noise Monitoring Location



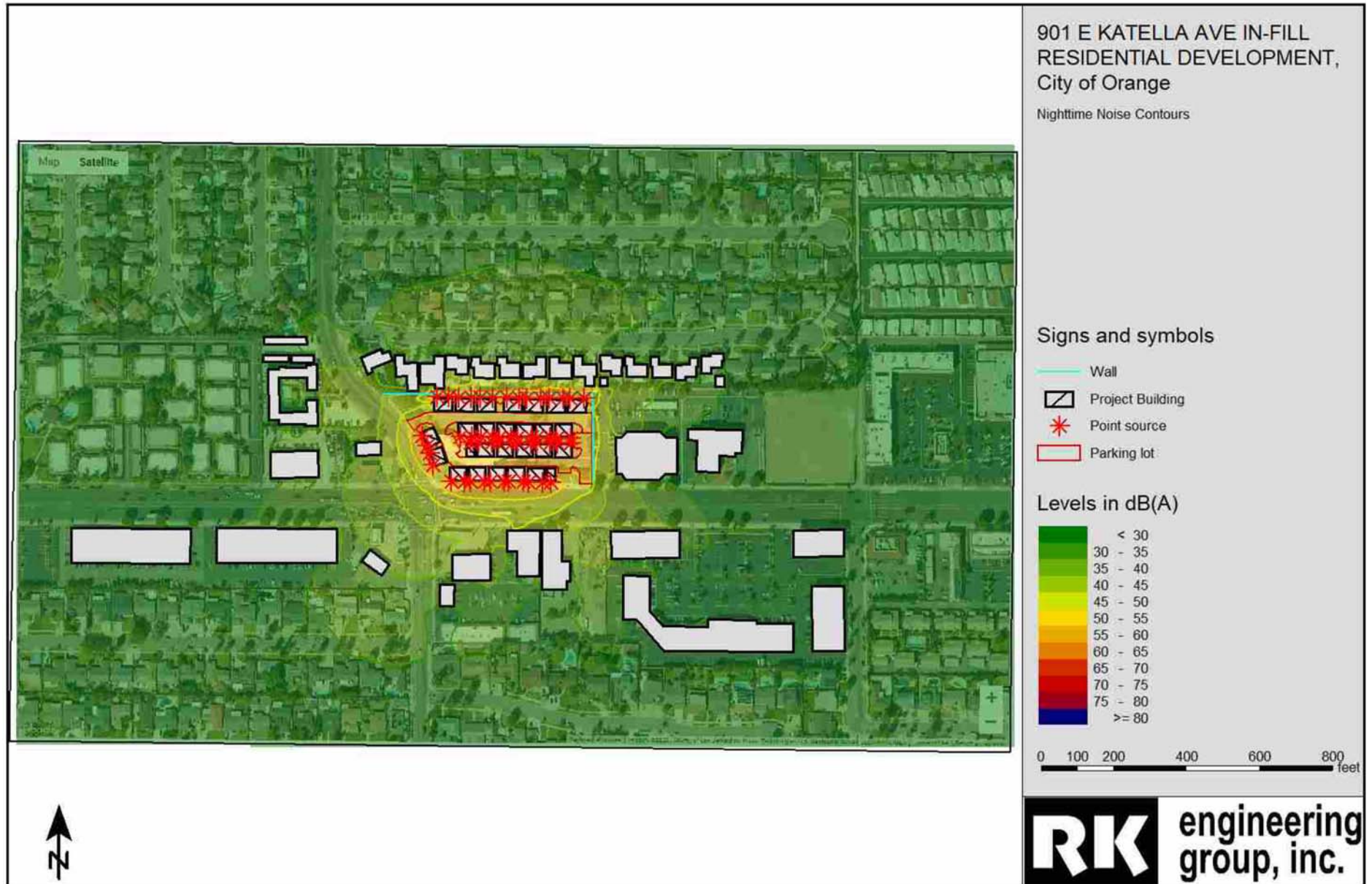
SoundPLAN Project Noise Level Results



Project Noise Level Contour - Daytime



Typical Operational Noise Contour - Nighttime



Appendices

Appendix A

City of Orange
General Plan Noise Element and
Municipal Code Noise Control



NOISE

INTRODUCTION AND VISION FOR THE FUTURE

The urban environment contains a variety of noise sources that can affect the way people live and work. Some types of noise are only short-term irritants, like the pounding of a jackhammer or the whine of a leaf blower. These noise sources can generally be controlled through City noise regulations, including noise ordinances. However, certain noises, such as freeway, road, aircraft, and train noise, may be permanent fixtures in the community, diminishing its quality of life. In Orange, because of its location, transportation corridors are the major source of noise.

Orange's *Vision for the Future*, presented in the General Plan introduction, includes the following objective related to the Noise Element:

- The City will work to improve the quality of life for all residents by providing residential, commercial, industrial, and public uses that exist in harmony with the surrounding urban and natural environments.

The Noise Element is a mandatory General Plan element, required by California's Health and Safety Code Section 46050.01. The goal of the Noise Element is to identify problems and noise sources threatening community safety and comfort and to establish policies and programs that will limit the community's exposure to excessive noise levels. It addresses both existing and foreseeable future noise abatement issues.

Purpose of the Noise Element

Recognizing that excessive or unusual noise can have significant adverse impacts on human health and welfare, the state has developed definitive guidelines for determining community noise levels and for establishing programs aimed at reducing community exposure to noise levels defined to be adverse. Policies, plans, and programs outlined within the Noise Element are designed to minimize the effects of human-caused noise in the community, and to improve residents' quality of life by regulating and reducing noise, particularly within residential areas and near such noise-sensitive land uses as residences, hospitals, convalescent and day care facilities, schools, and libraries. The Element provides direction regarding best practices and strategies to protect City residents and businesses from severe noise levels.

The Noise Element recognizes that multiple noise environments exist within the City, including rural, suburban, and urban environments. As Orange evolved from a rural agricultural town to a bustling suburban community in the middle to late 20th century, the noise environment similarly changed. Rural roads were replaced by the arterials and



freeways present in Orange today. Relatively quiet suburban residential noise levels became the norm for most City residents. At the outset of the 21st century, Orange still has semi-rural areas in the eastern portions of the City, in addition to the suburban noise environment found in most of its residential neighborhoods and commercial areas. However, a noisier, more urban environment is now emerging in Uptown, and Land Use Element policies promote reinvention of certain City commercial corridors into mixed-use activity centers. At these mixed-use activity centers, residents, shoppers, and businesspeople alike may be exposed to higher noise levels due to traffic and human activity.

Scope and Content of the Noise Element

The Noise Element consists of three sections:

- (1) Introduction;
- (2) Issues, Goals, and Policies; and
- (3) Noise Plan.

This Introduction summarizes the general purpose of the Noise Element. The Issues, Goals, and Policies section outlines the most relevant noise issues affecting the City. The goals are a statement of the general direction and broad ideals that capture the desire of the community. The policies provide potential solutions for decreasing noise. The Noise Plan defines noise standards, presents noise contour maps, and recommends strategies to achieve goals and implement policies. Implementation programs for the Noise Element are provided in an Appendix to the General Plan.

The Noise Element addresses noise concerns that influence the comfort and quality of life of Orange residents. Excessive noise may originate from many sources, including vehicle traffic on freeways and arterial roadways, construction activities and machinery in industrial areas, railroads, and aircraft. Beyond direct mitigation strategies to address these sources of noise, the City is also committed to establishing and upholding guidelines for noise levels compatible with various types of land use activity.

Mixed-use residential and commercial development presents unique noise reduction challenges. Although located in commercial environments, the residential portions of mixed-use projects are nonetheless subject to residential noise standards and guidelines established by the state. Strategies to address noise in these environments focus on incorporation of noise reducing measures in project design.

Relationship to Other General Plan Elements

Accomplishing the goals and policies of the Noise Element requires coordination with other related components of the City's General Plan. Other topics that are affected by the Noise Element include the Land Use, Circulation & Mobility, and Housing Elements.

Impacts of noise policies and programs on the Land Use Element arise during identification of noise sources and noise-sensitive uses. The noise contours and land use compatibility standards contained in the Noise Element should be used when making planning and development decisions.



The contents of the Noise Element are also related to the Circulation & Mobility and Housing Elements, because Orange's primary noise sources include freeways, arterial roadways, railways, and aircraft. In turn, Noise Element policies are intended to mitigate excessive noise along transportation routes and direct housing to appropriate sites away from sources of excessive noise.

ISSUES, GOALS AND POLICIES

Certain areas of Orange are subject to high levels of noise from one or more of the following sources: freeways and arterial roadways, construction activities and machinery in industrial areas, railroads, aircraft, and fireworks noise from nearby Disneyland and Angel Stadium. All of these noise sources reduce the quality of life within the City. Considering noise sources in the planning process, identifying the noise impacts of potential development projects, and planning accordingly are effective methods of minimizing the impacts of noise on residents. The goals, policies, and implementation programs of the Noise Element address seven issues: (1) noise and land use compatibility; (2) vehicular traffic noise; (3) train noise; (4) aircraft noise; (5) noise associated with mixed-use development; (6) industrial noise; and (7) construction, maintenance, and nuisance noise.

Noise and Land Use Compatibility

Land use directly affects noise compatibility, because higher noise levels often associated with industrial, commercial, and mixed commercial and residential development can encroach upon more noise-sensitive land uses. Noise-sensitive land uses include: residences, hospitals, convalescent and day care facilities, schools, and libraries. Noise producing and noise-sensitive land uses should be either sufficiently separated or sufficiently buffered from one another to ensure that sensitive uses are not exposed to unacceptable noise levels.

Proposed land uses should be compatible with existing and forecasted future noise levels. Incompatible land use noise exposures should incorporate noise attenuation and/or control measures within project design to reduce the noise to an acceptable interior level of 45 A-weighted decibels (dBA) community noise equivalent level (CNEL) or lower, as required by state regulations (CCR Title 24) for residential uses. (For an explanation of these terms and the relative noise levels of common noise-producing activities, see the discussion accompanying Table N-2 in the "Measuring Noise" section that follows.)

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 activity 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.

Vehicular Traffic Noise

Vehicular traffic is the most common source of noise experienced throughout the City. Primary sources of traffic noise include: the Interstate 5 and State Route (SR) -22, -55, -57, and -91 Freeways which surround and traverse the City; the SR-241/261 Foothill Transportation Corridor; and City arterial roadways. Arterials such as State College Boulevard/The City Drive, Chapman Avenue, La Veta Avenue, Batavia Street, Glassell Street, Tustin Street, Katella Avenue, and Jamboree Road are all high traffic volume roadways that generate traffic noise levels well above 65 dBA CNEL. Traffic noise is dependent on vehicle volume, speed, flow, and fleet mix, as well as distance from the roadway to the receptor.

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 2.4: Continue to work with the California Department of Transportation (Caltrans), the Orange County Transit Authority (OCTA), and Transportation Corridor Agencies (TCA) to install, maintain, and update freeway and highway rights-of-way buffers and soundwalls.
- 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.

Train Noise

Train noise currently experienced within the City results from the locomotive engines and warning horns associated with rail operations. These daily operations tend to produce high short-term noise levels that can be a source of annoyance to nearby sensitive uses. Depending on the number of daily movements, train operations also have the potential to generate noise levels that exceed 65 dBA CNEL along the rail corridors.

GOAL 3.0: Minimize train noise in residential areas and near noise-sensitive land uses.

- Policy 3.1: Encourage noise-compatible land uses and incorporate noise-reducing design features within transit oriented, mixed-use development near rail corridors.



Aircraft Noise

Although no airports or airfields are located in Orange, noise generated by aircraft overflights can be noticeable throughout the City. Aircraft operations associated with John Wayne Airport, Long Beach Airport, and even Los Alamitos Army Airfield use the airspace above the City in arrival and departure operations. The general noise environment in the City also includes helicopter noise from private, police, emergency medical, and news/traffic monitoring helicopters.

GOAL 4.0: Minimize aircraft related noise in residential areas and near noise-sensitive land uses.

- Policy 4.1: Continue to provide input to the Orange County Airport Land Use Commission as appropriate to minimize airport noise.
- Policy 4.2: Continue to work with regional, state, and federal agencies, including officials at John Wayne Airport and Long Beach Airport, to implement noise-reducing measures and to monitor and reduce noise associated with aircraft.
- Policy 4.3: Continue to coordinate with the Federal Aviation Administration, Caltrans Division of Aeronautics, and the Orange County Airport Land Use Commission regarding the siting and operation of heliports and helistops in order to minimize excessive helicopter noise.

Mixed-use Development

Mixed-use development projects often include both residential uses located above or in close proximity to commercial uses and stand-alone multi-family residential uses, especially in areas served by rail and bus transit, along major roadways and the railroad corridor. Noise generated by commercial uses can include mechanical equipment operations, maintenance activities, public address systems, vehicles, entertainment, parking lots, loading operations, and trash collection, as well as pedestrian and business patron noise. A unique challenge presented by mixed-use development is that on one hand, such uses desire locations along busy street corridors and within activity centers, and on the other hand, state-mandated interior noise requirements for residential uses must be met within the residential portions of such use.

GOAL 5.0: Minimize commercial activity noise in residential portions of mixed-use areas where residential units are located above commercial uses or within the same development.

- Policy 5.1: Encourage the design and construction of mixed-use structures to minimize commercial noise within the residential components of the development.
- Policy 5.2: Encourage new mixed-use development to locate the residential component of the development away from noise-generating sources such as mechanical equipment, entertainment facilities, gathering places, loading bays, parking lots, driveways, and trash enclosures.
- Policy 5.3: Encourage residential developments within mixed-use developments and located adjacent to commercial or retail and entertainment related uses to notify potential residents that they may be affected by noise from these uses.



Industrial Noise

Industrial land uses have the potential to generate noise that can be considered intrusive to sensitive land uses. Depending on the type of industrial operation, noise sources could involve mechanical equipment, loading and unloading of vehicles and trucks, as well as amplified or unamplified communications. The level and intrusiveness of the noise generated also vary depending on the size of the facility, type of business, hours of operation, and location relative to sensitive land uses.

GOAL 6.0: Minimize industrial activity noise in residential areas and near noise-sensitive land uses.

Policy 6.1: Encourage the design and construction of industrial uses to minimize excessive noise through project design features that include noise control.

Policy 6.2: Encourage industrial uses to locate vehicular traffic and operations away from abutting residential zones as much as possible.

Construction, Maintenance, and Nuisance Noise

Construction operations and maintenance vehicles such as refuse trucks and parking lot sweepers generate noise throughout the City. Although these types of noise sources tend to be short term, temporary, and limited, they can be a source of annoyance, especially during the late night or early morning hours.

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

Policy 7.1: Schedule City maintenance and construction projects so that they generate noise during less sensitive hours.

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.

Policy 7.4: Encourage limitations on the hours of operations and deliveries for commercial, mixed-use, and industrial uses abutting residential zones.

NOISE PLAN

Noise is most often defined as unwanted sound. Potential noise problem areas are considered to be those areas where ambient noise levels exceed established noise standards, and areas where sensitive land uses are exposed to excessive ambient noise levels. Excessive noise is viewed as a disturbance, especially to residential communities and other noise-sensitive uses. Noise sources in Orange fall into two categories: transportation oriented and non-transportation oriented. Examples of transportation oriented noise include noise generated by vehicles, airplanes, and rail cars operating within the City. Examples of non-transportation noise include noise generated from mechanical or industrial processes and lawn equipment.



The most prevalent noise source within the City is vehicular traffic on highways, freeways, toll roads, and arterials—specifically, the I-5, SR-55, SR-57, SR-91 and SR-22 freeways that surround and pass through the City; the SR-241 toll road that crosses the eastern portion of the City; and the many arterial roadways that traverse almost all areas of the community.

Other noise sources include passenger and freight rail operations, industrial facilities, loading docks and mechanical equipment at retail centers. Periodic sources of noise include train traffic (Amtrak, Metrolink, and freight trains); aircraft overflights into and out of John Wayne Airport, Long Beach Airport, and Los Alamitos Army Air Station; helicopter traffic along the Main Street and Katella Avenue corridors and over residential neighborhoods; sporting and exhibition events and fireworks shows in the City of Anaheim; and operation of trucks and machinery throughout Orange’s industrial areas.

Measuring Noise

Although sound can be easily measured, the perception of noise levels is subjective and the physical response to sound complicates the analysis of its effects on people. People judge the relative magnitude of sound sensation in subjective terms such as noisiness or loudness. Sound pressure magnitude is measured and quantified using a logarithmic ratio of pressures, the scale of which gives the level of sound in decibels (dB). Table N-1 presents the subjective effect of changes in sound pressure levels.

Table N-1 Changes in Sound Pressure Levels, dB	
dB Change	Change in Apparent Loudness
+/- 3 dB	Threshold of human perceptibility
+/- 5 dB	Clearly noticeable change in noise level
+/-10 dB	Half or twice as loud
+/-20 dB	Much quieter or louder
Source: Engineering Noise Control, Bies and Hansen (1988).	

To account for the pitch of sounds and an average human ear’s response to such sounds, a unit of measure called an A-weighted sound pressure level (dBA) is used. To provide some perspective on the relative loudness of various types of noise, Table N-2 lists common sources of noise and their approximate noise levels.

Many metrics have been developed to account for the way humans perceive sound. The most common of these descriptors are the average “equivalent” noise level (Leq), the Day Night noise level (Ldn), and the Community Noise Equivalent Level (CNEL). Leq represents a measure of the average noise level at a given location over a specified period of time. Ldn and CNEL are based on a 24-hour Leq which applies offsets to evening and nighttime noise levels to account for the increased sensitivity of people to noise occurring at night. The Ldn is a 24-hour average sound level (similar to a 24-hour Leq) in which a 10 dB penalty is added to any sound occurring between the hours of 10:00 p.m. and 7:00 a.m. CNEL is similar to Ldn, except that a five dB penalty is also added for noise occurring during evening hours from



7:00 p.m. to 10:00 p.m. Therefore, both the Ldn and CNEL noise metrics provide 24-hour averages of noise level exposure at a particular location, with temporal adjustments that reflect the increased sensitivity to noise during the evening and nighttime hours¹. CNEL is the noise level descriptor, consistent with state guidelines, applied by the City throughout this Noise Element to describe the current and future noise environment affected by transportation-generated noise.

Table N-2 Typical Noise Levels of Common Outdoor and Indoor Activities		
Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock Band
Jet Fly-over at 1,000 feet	100	
	90	
Diesel Truck at 50 feet, at 50 mph	80	Food Blender at three feet Garbage Disposal at three feet
Noisy Urban Area, Daytime	70	Vacuum Cleaner at 10 feet Normal speech at three feet
Gas Lawn Mower at three feet	60	
Commercial Area	50	Large Business Office
Heavy Traffic at 300 feet	40	Dishwasher Next Room
Quiet Urban Daytime	30	Theater, Large Conference Room (background)
Quiet Urban Nighttime	20	Library
Quiet Suburban Nighttime	10	Bedroom at Night, Concert Hall (background)
Quiet Rural Nighttime	0	Broadcast/Recording Studio
Lowest Threshold of Human Hearing		Lowest Threshold of Human Hearing
Source: Table N-2136.2 of California Department of Transportation's Technical Noise Supplement to the Traffic Noise Analysis Protocol (October 1998).		

Noise Standards and Land Use Compatibility

Orange has developed its own land use compatibility standards, based on recommended parameters from the California Governor's Office of Planning and Research, that rate compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable. Using these land use compatibility guidelines, the City has established interior and exterior noise standards.

¹ In practical implementation CNEL and L_{dn} could be used interchangeably for traffic generated noise as the difference between these two descriptors for urban / suburban noise levels is less than one dB.

The City's compatibility standards provide only for normally acceptable conditions, based on state recommendations and City land use designations. The City's Land Use Compatibility standards are presented in Table N-3. These standards, which use the CNEL noise descriptor, are intended to be applicable for land use designations exposed to noise levels generated by transportation related sources. Land use compatibility noise exposure limits are generally established as 65 dBA CNEL for a majority of land use designations throughout the City. Higher exterior noise levels are permitted for multiple-family housing and housing in mixed-use contexts than for single-family houses. This is because multiple-family complexes are generally located in transitional areas between single-family and commercial districts or in proximity to major arterials served by transit, and a more integrated mix of residential and commercial activity (accompanied by higher noise levels) is often desired in mixed-use areas close to transit routes. These standards establish maximum interior noise levels for new residential development, requiring that sufficient insulation be provided to reduce interior ambient noise levels to 45 dBA CNEL.

The City's land use compatibility standards are based first on the General Plan land use designation of the property, and secondly on the use of the property. For example, within the Urban Mixed-use designation, a multiple-family use exposed to transportation related noise would have an exterior noise standard of 65 dBA CNEL, and an interior noise standard of 45 dBA CNEL. Noise standards for multiple-family and mixed-use land use designations shown in Table N-3 are higher than those for rural or single-family residential areas, reflecting the gradually changing character of Orange and a more urban environment planned for certain areas of the City. The standards shown in Table N-3 are purposefully general in nature, and not every specific land use which could be accommodated within each General Plan designation is identified. Application of the standards will vary on a case-by-case basis according to location, development type, and associated noise sources.

When non-transportation (stationary) noise is the primary noise source, and to ensure that noise producers do not adversely affect noise-sensitive land uses, the City applies a second set of standards when planning and making development decisions. These hourly and maximum performance standards (expressed in Leq) for non-transportation or stationary noise sources are designed to protect noise sensitive land uses adjacent to stationary sources from excessive noise. Table N-4 summarizes City stationary source noise standards for various land use types. These standards represent the acceptable exterior noise levels at the sensitive receptor.

For City analysis of noise impacts and determining appropriate mitigation under the California Environmental Quality Act (CEQA), in addition to the maximum allowable noise level standards outlined in Tables N-3 and N-4, 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 levels of 3 dBA CNEL or greater.



**Table N-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 ^{4,5}
	Transient lodging—motels, hotels	45	65
	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
	Libraries	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

Notes:

- (1) Interior habitable environment excludes bathrooms, closets and corridors.
- (2) Exterior noise level standard to be applied at outdoor activity areas; 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 closed position. Mechanical ventilation shall be provided per Uniform Building Code (UBC) requirements.
- (4) Within 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 or 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 should provide additional common open space.

N/A=Not Applicable to specified land use category or designation

Source: Alliance Acoustical Consultants, modified by EDAW, 2008

**Table N-4
Maximum Allowable Noise Exposure—Stationary Noise Sources**

Noise Level Descriptor	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Hourly Equivalent Level (L_{eq}), dBA	55	45
Maximum Level (L_{max}), dBA	70	65
Notes: (1) These standards apply to new or existing noise sensitive land uses affected by new or existing non-transportation noise sources, as determined at the outdoor activity area of the receiving land use. However, these noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings). (2) Each of the noise levels specified above should be lowered by five dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. Such noises are generally considered by residents to be particularly annoying and are a primary source of noise complaints. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g. caretaker dwellings). (3) No standards have been included for interior noise levels. Standard construction practices that comply with the exterior noise levels identified in this table generally result in acceptable interior noise levels. (4) The City may impose noise level standards which are more or less restrictive than those specified above based upon determination of existing low or high ambient noise levels. If the existing ambient noise level exceeds the standards listed in Table N-4, then the noise level standards shall be increased at 3 dB increments to encompass the ambient environment. Noise level standards incorporating adjustments for existing ambient noise levels shall not exceed a maximum of 70 dB Leq.		

Noise Contours and Impact Areas

The community noise environment can be described using contours derived from monitoring major sources of noise. Noise contours define areas of equal noise exposure. Future noise contours have been estimated using information about both current and projected future land use development and traffic volumes. The contours assist in setting policies for distribution of land uses and establishing development standards.

A study of baseline noise sources and levels was completed by Alliance Acoustical Consultants in November 2004. Noise level measurements were collected during a typical weekday at 28 locations throughout Orange. Criteria for site selection included geographical distribution, land uses suspected of noisy activities, proximity to transportation facilities, and noise-sensitive land uses. The primary purpose of noise monitoring was to establish a noise profile for the planning area that could be used to estimate levels of current and future noise.

Measurements represent motor vehicle noise emanating from freeways, the local roadway network, and industrial land uses. Typical noise sources measured during the short-term survey included vehicular traffic, aircraft, trains, emergency sirens, industry, mechanical equipment, sporting events, firework shows, children playing, motorcycles, car alarms, and car audio systems. Of all these sources, traffic noise was determined to be the predominant noise source.

Figure N-1 identifies noise contours for baseline year 2004. Major arterials and the railroad and freeway network represent the major sources of noise. A number of areas are exposed to traffic noise from arterials in excess of 65 dBA CNEL, including areas near State College Boulevard/The City Drive, Chapman Avenue, La Veta Avenue, Batavia Street, Glassell Street, Tustin Street, Katella Avenue, and Jamboree Road.



The Land Use Element indicates that the planning area will accommodate additional future growth, accompanied by an increase in citywide traffic volumes. Traffic volume increases represent the major anticipated measurable new noise sources in the community over the long term. Potential future ambient noise levels can be estimated by modeling. Figure N-2 displays projected year 2030 noise contours based upon future traffic levels.

Figure N-2 indicates that noise levels may be expected to rise in areas where roadways will experience the greatest increase in traffic volumes over time. Specifically, these areas include Tustin Street, State College Boulevard/The City Drive, Chapman Avenue, Jamboree Road, Santiago Canyon Road, Glassell Street, Main Street, I-5, SR-57, SR-22, SR-55, SR-241, SR-261, the Burlington Northern/Santa Fe Railroad, and throughout the City's industrial area,

Identification of Noise Problem Areas

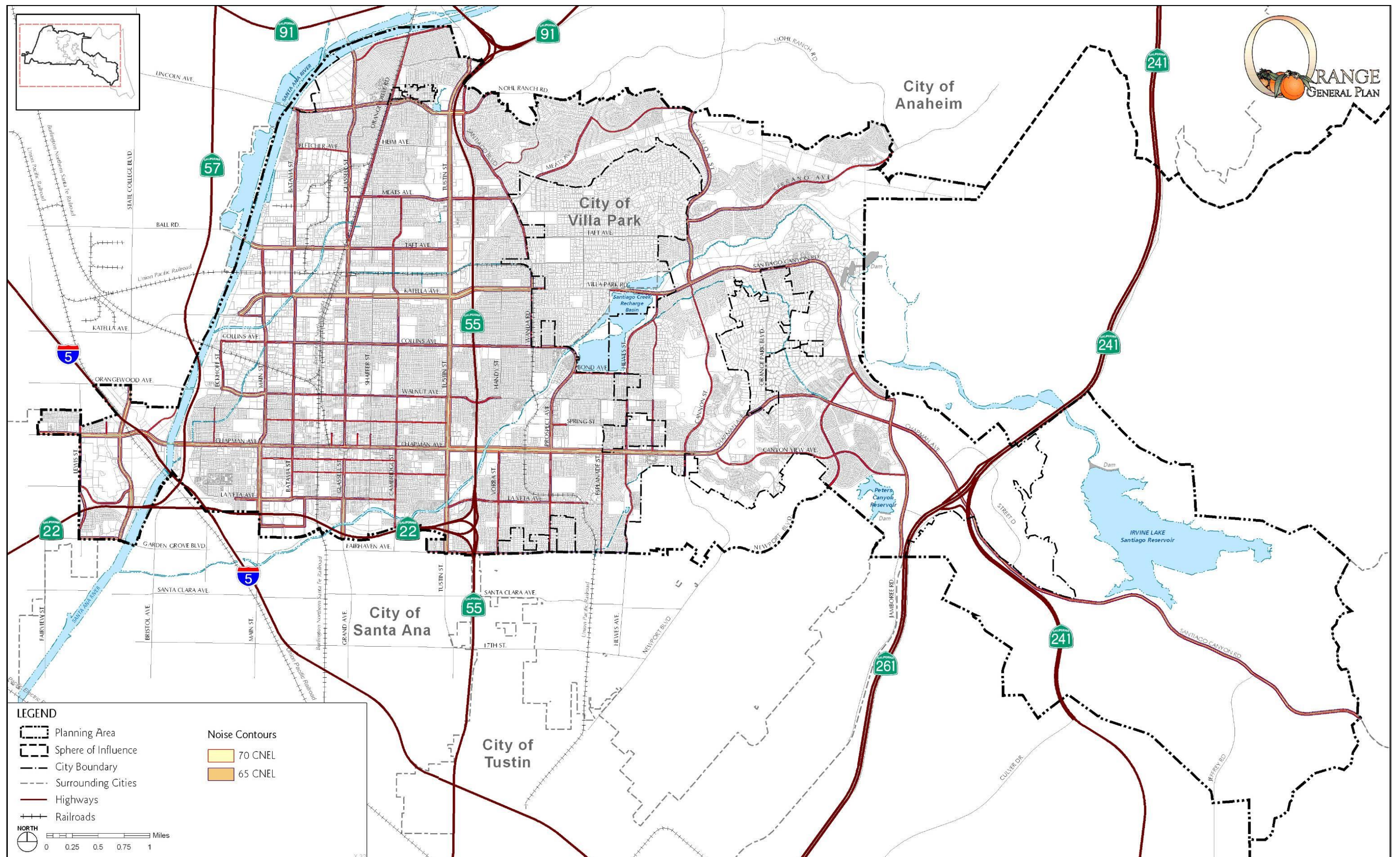
Potential noise problem areas are considered to be those areas where ambient noise levels exceed established noise standards and areas where sensitive land uses are exposed to ambient noise levels in excess of standards identified in Tables N-3 and N-4. For the most part, these problem areas lie along freeways, toll roads, and arterial and secondary roadways where noise barriers have not been installed.

Beneath the landing pattern for aircraft approaching John Wayne Airport in Santa Ana, Long Beach Airport, and Los Alamitos Army Air Station, some residents in the area find the aircraft noise disturbing. The aircraft noise may be considered an intermittent, recurring noise problem. Helicopter noise from private, police, emergency medical, and news and traffic monitoring helicopters also contributes to the general noise environment in the City, particularly approaching University of California Irvine (UCI) Medical Center and Children's Hospital of Orange County (CHOC).

An additional noise problem cited by residents citywide is noise associated with the operation of hand-held, motorized leaf blowers. Gasoline powered blowers, which are generally used to clear debris from driveways, sidewalks, and landscaped areas generate noise levels in the range of 60 to 85 dBA L_{eq} (measured 50 feet from the source). This noise level may exceed the standard established for stationary noise sources during both daytime and nighttime hours.

Noise Control Techniques

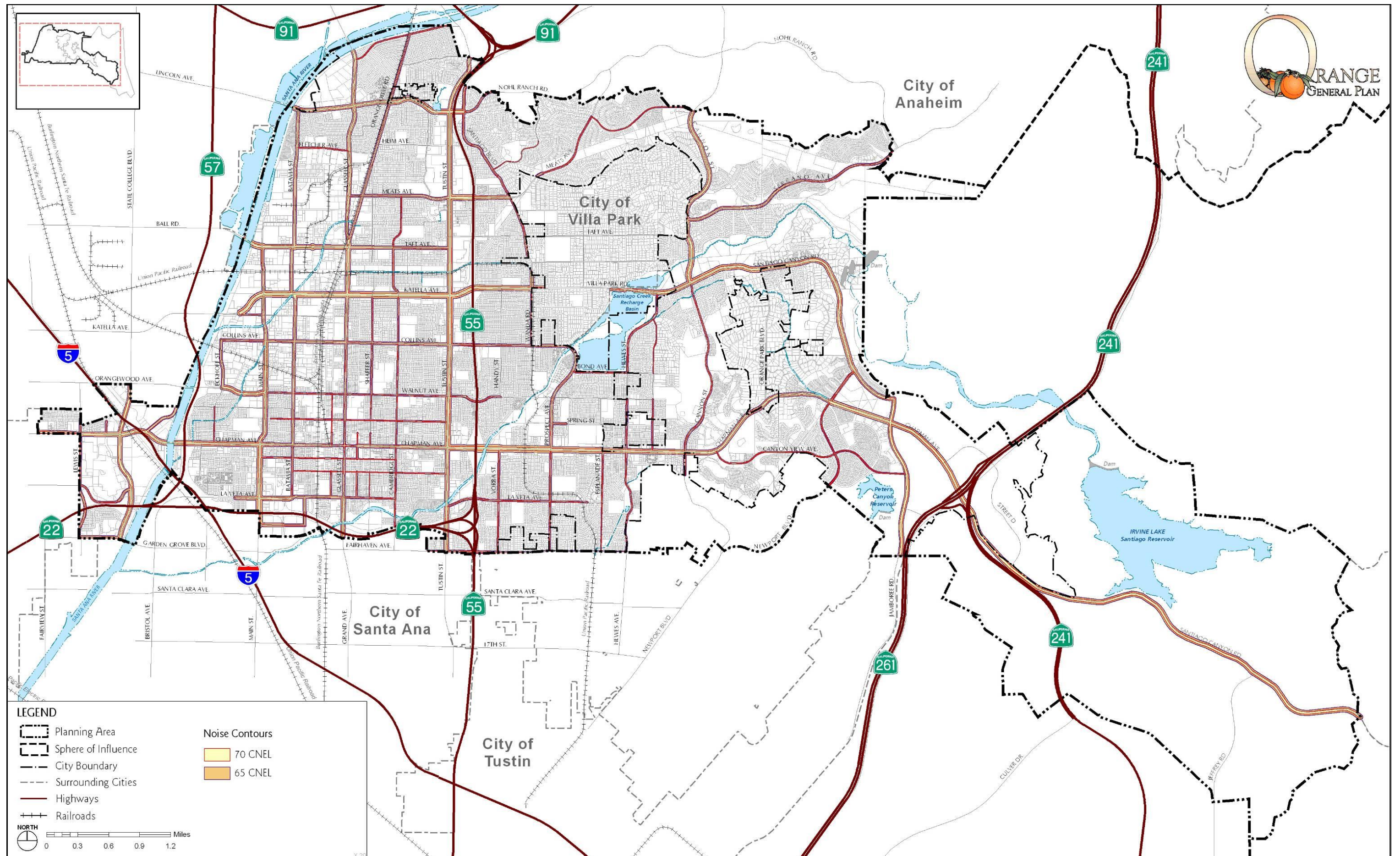
The most efficient and effective means of controlling noise is to reduce noise at the source. However, regarding noise generated from transportation systems, the City has no direct control over noise produced by trucks, cars, and trains, because state and federal noise regulations preempt local laws. Given that the City cannot control transportation noise at the source, City noise programs and standards focus on reducing transportation noise along freeways, arterial roadways, and rail corridors, through noise reduction methods that interrupt the path of the noise or directly shield the receiver. The emphasis of such noise reduction methods should be placed on site planning and design. Such reduction measures may include building orientation, spatial buffers, landscaping, and noise barriers. The use of noise barriers, such as sound walls, should be considered as a means of achieving the noise



Note: Large format map available at the Community Development Department

Figure N-1. 2004 Noise Contours

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Note: Large format map available at the Community Development Department

Figure N-2. 2030 Noise Contours

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standards only after all other practical design-related noise reduction measures have been integrated into the project.

Sound walls may not be desirable in some cases, such as intersections in commercial areas where visibility and access are important. Additionally, effective acoustical design features in new development can provide additional interior noise reduction. Regarding stationary and non-transportation generated noise, noise levels are to be addressed at the source as a primary focus. For mixed-use development in particular, acoustical design should be applied that isolates residential portions of mixed-use development from both commercial portions and external noise sources. When it is not feasible to address stationary noise at the source, the aforementioned noise reduction methods will be employed to reduce noise exposure to the levels presented in Table N-5.

Table N-5 Sample Interior Noise Control Measures		
Noise Exposure Level	Exterior to Interior Noise Level Reduction (NLR) Required to Achieve 45 dBA CNEL	Noise Control Measures and Façade Upgrades
➤ ≤60 dBA CNEL	15 dBA	Normal construction practices consistent with the Uniform Building Code are typically sufficient.
60 dBA to 65 dBA CNEL	20 dBA	Normal construction practices consistent with the Uniform Building Code are sufficient with the addition of the following specifications: • Air conditioning or mechanical ventilation systems are installed so that windows and doors may remain closed. • Windows and sliding glass doors are mounted in low air infiltration rated frames (0.5 cfm or less). • Exterior doors are solid core with perimeter weather-stripping and threshold seals.
65 dBA to 70 dBA CNEL	25 dBA	Normal construction practices consistent with the Uniform Building Code are sufficient with the addition of the following specifications: • Air conditioning or mechanical ventilation systems are installed so that windows and doors may remain closed. • Windows and sliding glass doors are mounted in low air infiltration rated frames (0.5 cfm or less). • Exterior doors are solid core with perimeter weather-stripping and threshold seals. • Glass in both windows and exterior doors should have a Sound Transmission Classification (STC) rating of at least 30. • Roof or attic vents facing the noise source of concern should be boxed, or provided with baffling.
Notes: (1) The information listed in this table is sample guidance for interior noise control recommendations and is not intended for application to individual development projects, renovations, or retrofits. Noise-sensitive land uses located in areas with noise level exposures exceeding 60 dBA CNEL should have a detailed acoustical analysis performed on a case by case basis.		

The most common and feasible method to control exterior-to-interior noise levels is achieved through improvements to the building structure and use of wall/façade treatments that reduce noise levels. Buildings constructed consistent with the Uniform Building Code (UBC) typically provide approximately 15 dBA of exterior-to-interior noise level reduction (NLR) with



windows open, and 25 dBA of NLR with windows closed. Therefore, special consideration must be given to reducing interior noise levels to the required 45 dBA CNEL at noise-sensitive land uses exposed to noise levels in excess of 60 dBA. The NLR of a wall element or building façade can be calculated by first assuming a generalized A-weighted noise frequency spectrum for roadway traffic noise. Then, the composite transmission loss of the various wall materials and the wall's structural design is considered in determining the resulting noise level in the receiving room. After correcting for room absorption, the overall noise level in the room is calculated. The ability to perform these calculations requires detailed floor plans and façade construction details. Calculation of required NLR and resultant interior noise levels should be conducted by a qualified acoustical consultant. Table N-5 provides an example of varying levels of building façade improvements that may be required to achieve compliance with the interior noise level standard of 45 dBA CNEL for land uses exposed to three different noise levels: 60 dBA CNEL, 65 dBA CNEL, and 70 dBA CNEL.

City Noise Control Ordinance

The primary tool used to implement noise policy will be the City's noise control ordinance (Title 8 Health and Safety, Chapter 8.24, Orange Municipal Code). The ordinance gives the City authority to regulate noise at its source and thereby protect noise-sensitive land uses. It also establishes exterior and interior noise standards for all residential properties. The ordinance specifies permitted days and times for construction, repair, remodeling, or grading of real property, and exemptions to the ordinance.

The City will continue to apply provisions of the noise control ordinance, and will modify the noise ordinance as needed to respond to policy direction within this Element, including the noise standards specified in Table N-4, and policies addressing noise in mixed-use land use districts.

State Noise Standards

The City will continue to enforce state laws which set forth requirements for the insulation of residential dwelling units from excessive and potentially harmful noise. Title 25, Section 1092 of the California Administrative Code establishes exterior and interior noise standards for multi-family residential development. Units established in areas where ambient noise levels exceed 65 dBA CNEL must incorporate noise reduction features into project design and construction. To reduce exterior noise levels, open space and other outdoor private areas should be shielded from the primary noise source (e.g., a freeway or railroad track). Insulation must be provided to reduce interior ambient noise levels to 45 dBA CNEL or lower, pursuant to Title 24 requirements. The City will continue to enforce these regulations.

Particular challenges arise in the application of standards to mixed-use areas. Residential portions of mixed-use projects must meet the 45 dBA CNEL Title 24 interior noise requirements while located on busy commercial corridors. This obligation can be met by incorporating design features that insulate residential uses from commercial portions of the project.



Sound Walls Along Toll Roads, Arterials, and Secondary Roadways

The City will encourage Caltrans and the TCA to abide by Section 215.5 of the State Streets and Highway Code, which establishes a priority system for constructing noise barriers in the form of sound walls along freeways, to minimize exposure of residential or other noise-sensitive land uses to excessive freeway noise. Furthermore, all new residential development proposed adjacent to toll roads, arterials, and secondary roadways will be required to buffer itself by providing sound walls or a combination of berms and walls designed to achieve the noise and land use compatibility standards indicated in Table N-3 within common open spaces. In the event that sound walls are used, the analysis should include evaluation of multiple reflections between parallel noise barriers (e.g., large structures, noise barriers on each side of the highway) which could reduce the acoustical performance of individual barriers or result in unintended impacts to other parts of the community.

Land Use Policy and Design of Residential Projects

To mitigate non-transportation-related noise, the City will require site plan adjustments, higher insulation performance, spatial buffers, and other mitigation measures to absorb and block sound as needed. Design features incorporated into residential projects can be used to shield residents from excessive noise. For example, bedrooms, balconies and open space areas can be located away from streets and focused toward the interior of a project. The City will develop guidelines to assist developers to design structures that respond to noise concerns.

Acoustical Studies

Under certain conditions, the City may require acoustical studies to be prepared as part of the development review process to ensure adequate analysis of proposed development projects. Acoustical studies will be required for all discretionary projects where any of the following apply:

- The project includes a noise-sensitive land use that is located within the existing or future 65 dBA CNEL contour for transportation noise sources.
- The project will cause future traffic volumes to increase by 25 percent or more on any roadway that fronts a sensitive land use.
- The project will expose a noise-sensitive land use to a stationary noise source or vibration source exceeding the standards outlined in Table N-4. Such stationary sources may include mechanical equipment operations, entertainment venues, and industrial facilities.
- The project includes a noise-sensitive land use in the vicinity of existing or proposed commercial and industrial areas.
- The project is a mixed-use development that includes a residential component. The focus of this type of acoustical study is to determine likely interior and exterior noise levels and to recommend appropriate design features to reduce noise.



An acoustical analysis prepared in accordance with this Noise Element shall:

- be the financial responsibility of the applicant seeking City approval of a project;
- be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics;
- include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions and predominant noise sources;
- estimate existing and projected cumulative noise in terms of CNEL or L_{eq} , and compare those noise levels to the adopted standards and policies of the Noise Element;
- recommend appropriate mitigation to achieve compliance with the adopted policies and standards of the Noise Element. Where the noise source in question consists of intermittent single events, the report must address the effects of maximum noise levels in sleeping rooms in terms of possible sleep disturbance; and
- estimate noise exposure after the prescribed mitigation measures have been implemented.

Truck Routes

Truck traffic generates noise that can disturb people in residential and other noise-sensitive land uses. Heavy trucks will not be permitted to drive through residential neighborhoods. Truck routes in Orange are located mostly in the general industrial area in the western part of the City, as well as on the higher capacity roadways that traverse the planning area. Truck routes are identified for such purposes as noise reduction, safety, roadway maintenance, and traffic operations. The Orange Municipal Code identifies trucks as motor vehicles designed, used, or maintained primarily for the transportation of property and having an unladen weight of six thousand pounds or more.

Air Traffic Noise

To lessen the impacts of noise associated with air traffic into and out of John Wayne Airport, Long Beach Airport, and Los Alamitos Army Air Station, the City will participate in regional efforts to require airlines to use quieter aircraft. Also, the City will work with airport officials and surrounding jurisdictions to restore instrument approach patterns (as opposed to visual approach) at John Wayne Airport. Finally, the City will continue to register noise complaints with the airport's Noise Abatement Office to ensure airport officials are made aware of any noise problems.

A limited number of heliports and helistops are located throughout the City, with the most active locations being UCI Medical Center and Childrens' Hospital of Orange County. Helicopter operations at these facilities are regulated by the Federal Aviation Administration, Caltrans Division of Aeronautics, and the Orange County Airport Land Use Commission. The City will work with these parties to ensure compliance with all state and federal laws pertaining to helicopter operations.



Rail Traffic Noise

The City has established a “quiet zone” along portions of the Burlington Northern/Santa Fe Railroad corridor. Federal Railroad Administration regulations allow cities to delineate zones where trains are not allowed to blow warning horns. Without a formally established “quiet zone”, trains approaching all railroad crossings that intersect public streets are required to blow a warning horn at the intersection to warn motorists and pedestrians. “Quiet zones” may reduce noise impacts at these crossings, and will continue to be supported so long as they do not increase traffic and pedestrian hazards.

NOISE IMPLEMENTATION

The goals, policies, and plans identified in this Element are implemented through a variety of City plans, ordinances, development requirements, capital improvements, and ongoing collaboration with regional agencies and neighboring jurisdictions. Specific implementation measures for this Element are contained in the General Plan Appendix.

Orange, California Municipal Code

Title 8 HEALTH AND SAFETY

Chapter 8.24 NOISE CONTROL

Note

8.24.010 Policy.

8.24.020 Definitions.

8.24.030 Noise Level Measurement Criteria.

8.24.040 Exterior Standards.

8.24.050 Exemptions from Chapter Provisions.

8.24.060 Special Provisions for Schools, Hospitals and Churches.

8.24.070 Measurement of Noise Levels.

8.24.080 Enforcement Authority.

8.24.090 Violation—Public Nuisance.

8.24.100 Alternative Noise Prohibition.

8.24.110 Violation—Misdemeanor.

Note

* Editor's note(s)—Ord. No. 1-14, § I, adopted August 12, 2014, repealed the former Ch. 8.24, §§ 8.24.010—8.24.110 and enacted a new Ch. 8.24 as set out herein. The former Ch. 8.24 pertained to similar subject matter and derived from Prior Code 9500.1—9500.16; Ord. Nos. 49-74, 17-74, 1-80, and 26-96.

8.24.010 Policy.

A. In order to control unnecessary, excessive and annoying sounds emanating from the City, it is the policy of the City to regulate such sounds generated from all sources as specified in this chapter. The intent of this chapter is to protect residential land uses from unnecessary, excessive and annoying sounds.

B. It is determined that certain sound levels are detrimental to the public health, welfare and safety, and contrary to public interest.

(Ord. No. 1-14, § I, 8-12-14)

8.24.020 Definitions.

The following words, phrases and terms as used in this chapter shall have the meaning as indicated below:

A. "Ambient noise level" means the all-encompassing noise level associated with a given environment, being a composite of sounds from all sources, excluding the alleged offensive noise, at the location and approximate time at which a comparison with the alleged offensive noise is to be made.

B. "Adjusted ambient noise level" means the measured ambient noise level plus 3 dB (A). Three (3) dB (A) is the industry-accepted threshold of human perceptibility for a change in the noise environment.

C. "Decibel (dB)" means a unit which denotes the ratio between two quantities which are proportional to power: the number of decibels corresponding to the ratio of two amounts of power is ten times the logarithm to the base ten of this ratio.

D. "Emergency machinery, vehicle or work" means any machinery, vehicle or work used, employed or performed in an effort to protect, provide or restore safe conditions in the community or for the citizenry, or work by private or public utilities when restoring utility service.

E. "Fixed noise source" means a stationary noise source which creates sounds while fixed or motionless, including but not limited to construction equipment, industrial and commercial machinery and equipment, pumps, fans, compressors, generators, air conditioners and refrigeration equipment.

F. "Grading" means any excavating or filling of earth material or any combination thereof conducted to prepare a site for construction or other improvements thereon.

G. "Hourly Average" (L_{eq}) means the energy mean or average sound level over a one (1) hour period of time.

H. "Impact noise" means the noise produced by the collision of one mass in motion with a second mass which may be either in motion or at rest.

I. "Mobile noise source" means any noise source other than a fixed noise source.

J. "Noise level" means the "A" weighted sound pressure level in decibels obtained by using a sound level meter at slow response with a reference pressure of twenty (20) micronewtons per square meter. The unit of measurement shall be designated as dB(A).

K. "Person" means a person, firm, association, co-partnership, joint venture, corporation or any entity, public or private in nature.

L. “Recurring impulsive noise” means a noise of short duration, usually less than one (1) second, with an abrupt onset and rapid decay, which occurs repeatedly or in a cyclical manner. Examples include jack hammering, pile driving, or operational noise from a generator or other mechanical equipment that is cyclical in nature.

M. “Residential property” means a parcel of real property which is developed and used either in part or in whole for residential purposes, other than transient uses such as hotels and motels.

N. “Simple tone noise” means a noise characterized by a predominant frequency or frequencies so that other frequencies cannot be readily distinguished.

O. “Sound level meter” means an instrument meeting American National Standard Institute’s Standard SI.4- 1983 for Type 1 sound level meters or an instrument and the associated recording and analyzing equipment which will provide equivalent data.

P. “Sound pressure level” of a sound, in decibels, means twenty times the logarithm to the base ten of the ratio of the pressure of the sound to a reference pressure, which reference pressure shall be explicitly stated.

(Ord. No. 1-14, § I, 8-12-14)

8.24.030 Noise Level Measurement Criteria.

Any noise level measurements made pursuant to the provisions of this chapter shall be performed using a sound level meter as defined in Section 8.24.020P.

(Ord. No. 1-14, § I, 8-12-14)

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 8.24.040 Exterior Noise Standards

	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.

- 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 other residential property to exceed the noise standards identified in Table 8.24.040. 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 8.24.040 of this section, the "adjusted ambient noise level" shall be applied as the noise standard. In cases where the noise standard is adjusted due to a 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 8.24.040 shall be reduced by 5 dB(A) for impact or simple tone noises, recurring impulsive noises, or for noises consisting of speech or music.

(Ord. No. 1-14, § I, 8-12-14)

8.24.050 Exemptions from Chapter Provisions.

The following activities shall be exempted from the provisions of this chapter:

- A. School bands, school athletic and school entertainment events;
- B. Outdoor gatherings, public dances, shows, and sporting and entertainment events provided such events are conducted pursuant to any permit requirements established by the City;
- C. Activities conducted on public parks, public playgrounds, and public or private school grounds;
- D. Any mechanical device, apparatus or equipment used, related to or connected with emergency machinery, vehicle or work;
- 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 a Federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a Federal holiday. Noise generated outside of the hours specified are subject to the noise standards identified in Table 8.24.040;
- F. All mechanical devices, apparatus or equipment which are utilized for the protection or salvage of agricultural crops during periods of potential or actual frost damage or other adverse weather conditions;
- G. Noise sources associated with agricultural operations provided such operations take place between the hours of 7:00 a.m. and 8:00 p.m. on any day except Sunday or a Federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a Federal holiday;

H. Noise sources associated with agricultural pest control through pesticide application, provided that the application is made in accordance with restricted material permits issued by or regulations enforced by the Agricultural Commissioner;

I. Noise sources associated with the maintenance of real property, provided such activities take place between the hours of 7:00 a.m. and 8:00 p.m. on any day except Sunday or a Federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a Federal holiday. Operation of leaf blowers are regulated under OMC Chapter [8.26](#);

J. Industrial or commercial noise affecting residential units, when the residential unit is associated with said industrial or commercial use (e.g. caretaker's dwellings);

K. Any maintenance or construction activity undertaken by a public agency or utility within street right of way;

L. Mobile noise sources including but not limited to operational noise from trains, or automobiles or trucks traveling on roadways. Transportation noise as related to noise/land use compatibility is subject to the City's General Plan Noise Element;

M. Any activity to the extent regulation thereof has been preempted by State or Federal Law.

(Ord. No. 1-14, § I, 8-12-14)

8.24.060 Special Provisions for Schools, Hospitals and Churches.

It is unlawful for any person to create any noise which causes the noise level at any school, hospital or church, while the same is in use, to exceed the noise limits as specified in Section [8.24.040](#), or which noise level unreasonably interferes with the use of such institutions.

(Ord. No. 1-14, § I, 8-12-14)

8.24.070 Measurement of Noise Levels.

The location selected for measuring exterior noise levels shall be the point closest to the noise source along the perimeter of the outdoor activity area (such as a private yard, patio, balcony, or common recreation area, as applicable pursuant to Section 8.24.040B. of this chapter) of the affected residential receiving property. If the location of the outdoor activity area is unknown or unclear, the noise standard shall be applied at the point closest to the noise source along the property line of the affected residential receiving property.

(Ord. No. 1-14, § I, 8-12-14)

8.24.080 Enforcement Authority.

A. The Chief Building Official or his/her designee are directed to enforce the provisions of this chapter. The Chief Building Official or his/her designee are authorized, pursuant to [Penal Code](#) Section 836.5, to arrest any person without a warrant when they have reasonable cause to believe that such person has committed a misdemeanor in their presence.

B. No person shall interfere with, oppose or resist any authorized person charged with the enforcement of this chapter while such person is engaged in the performance of his duty.

(Ord. No. 1-14, § I, 8-12-14)

8.24.090 Violation—Public Nuisance.

Any violation of this chapter is a public nuisance and may be abated in accordance with law. The expense of such abatement may, by resolution of the City Council, be declared to be a lien against the property on which such nuisance is maintained, and such lien shall be made a personal obligation of the property owner.

(Ord. No. 1-14, § I, 8-12-14)

8.24.100 Alternative Noise Prohibition.

Notwithstanding any other provisions of this chapter and in addition thereto, it is unlawful for any person to willfully make, continue, maintain, permit or cause to be made, continued, maintained, or permitted, any loud, unnecessary and unusual noise which disturbs the peace or quiet of any residential property or which causes discomfort or annoyance to any reasonable person of normal sensitivity residing in the area. It shall be a prima facie violation of this section if any power tool, radio, receiving set, television, music amplifier, tape player, record player, compact disc player, musical instrument or similar device is played, used or permitted to be played or used between the hours of 10:00 p.m. and 7:00 a.m. when audible from a distance of one hundred (100) feet from the property line of the noise source or from a distance of one hundred fifty (150) feet from any non-stationary noise source. For the purpose of this chapter, these prohibitions shall also be applied to stationary vehicles parked on the street or on private property. The determination may be made by a peace officer or may be proven by the testimony of any other person. Furthermore, and in addition to the provisions of this chapter, noise prohibitions pursuant to [Penal Code](#) Section 415 and Orange Municipal Code Chapter [9.39](#) may also be applied.

(Ord. No. 1-14, § I, 8-12-14)

8.24.110 Violation—Misdemeanor.

Any person violating any of the provisions of this chapter shall be deemed guilty of a misdemeanor. Each day such violation is committed or permitted to continue shall constitute a separate offense and shall be punishable as such. The provisions of this chapter shall not be construed as permitting conduct not prescribed herein and shall not affect the enforceability of any other applicable provisions of law.

(Ord. No. 1-14, § I, 8-12-14)

Contact:

City Clerk: 714-744-5500

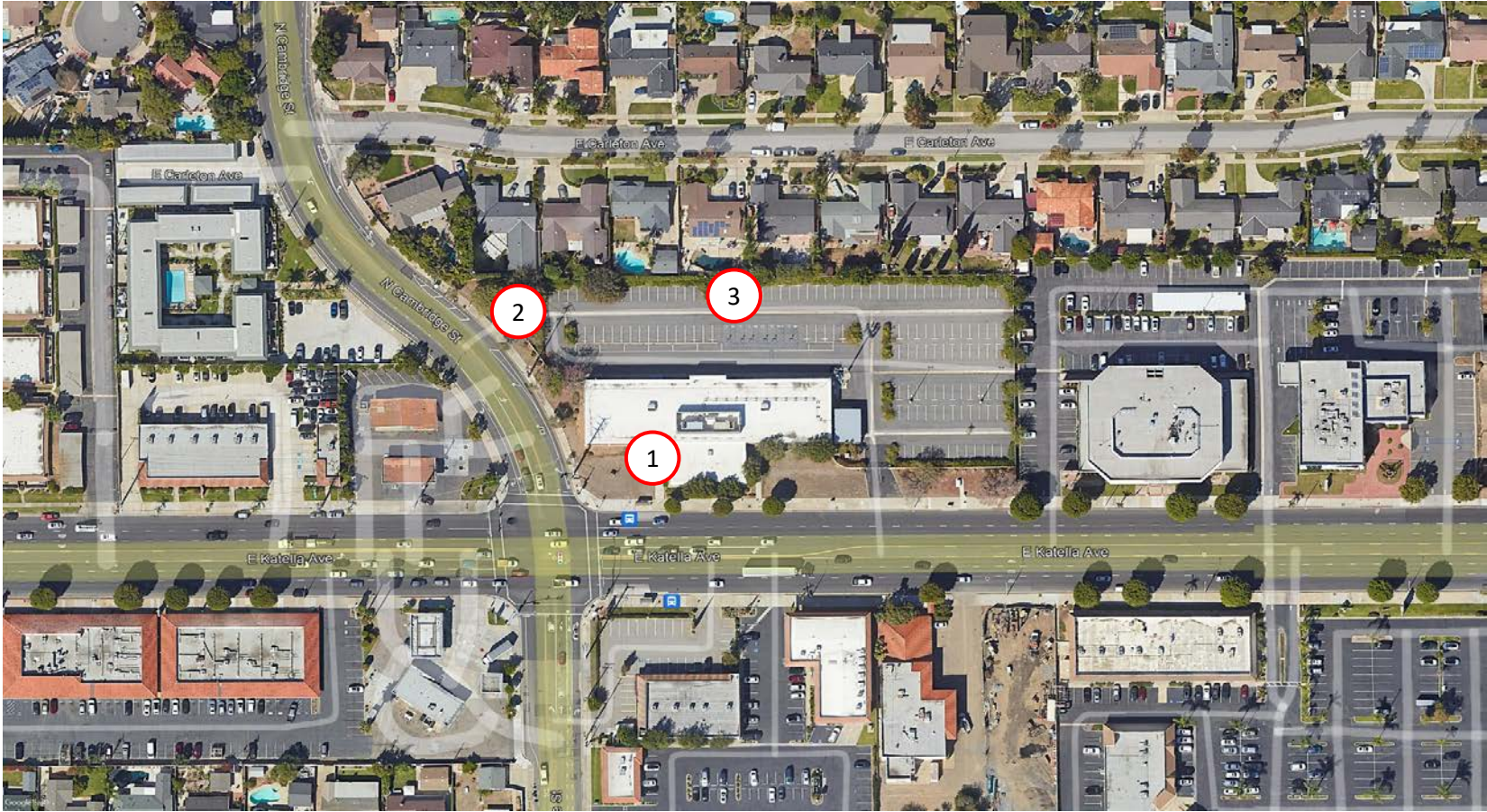
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Appendix B

Field Data and Photos

Field Sheet																													
Project: 901 E. Katella In-Fill Residential Development		Engineer: B. Estrada		Date: 9/13/2022																									
				JN: 2827-2022-08																									
Measurement Address: 901 E. Katella Avenue		City: Orange, CA		Site No.: 1																									
Sound Level Meter: Piccolo II Serial # P0221010801 P0221010802 P0218092808		Calibration Record: <table><thead><tr><th></th><th>Input, dB/</th><th>Time</th><th>Date</th></tr></thead><tbody><tr><td>1</td><td>94.0</td><td>1:40:00 PM</td><td>9/13/2022</td></tr><tr><td>2</td><td>94.0</td><td>1:40:00 PM</td><td>9/13/2022</td></tr><tr><td>3</td><td>94.0</td><td>1:40:00 PM</td><td>9/13/2022</td></tr><tr><td>4</td><td>/</td><td>/</td><td>/</td></tr><tr><td>5</td><td>/</td><td>/</td><td>/</td></tr></tbody></table>			Input, dB/	Time	Date	1	94.0	1:40:00 PM	9/13/2022	2	94.0	1:40:00 PM	9/13/2022	3	94.0	1:40:00 PM	9/13/2022	4	/	/	/	5	/	/	/	Conditions: Temp (F): 83 Deg. F Windspeed: 11 mph Direction: South Skies: Clear	
	Input, dB/	Time	Date																										
1	94.0	1:40:00 PM	9/13/2022																										
2	94.0	1:40:00 PM	9/13/2022																										
3	94.0	1:40:00 PM	9/13/2022																										
4	/	/	/																										
5	/	/	/																										
Calibrator: BSWA Serial # 500732																													
Meter Settings: <table><tr><td>☒ A-WTD</td><td>☐ LINEAR</td><td>☒ SLOW</td><td>☐ 1/1 OCT</td><td>☒ _60_ MINUTE INTERVALS</td></tr><tr><td>☐ C-WTD</td><td>☐ IMPULSE</td><td>☐ FAST</td><td>☐ 1/3 OCT</td><td>☒ L(N) PERCENTILE VALUES</td></tr></table>					☒ A-WTD	☐ LINEAR	☒ SLOW	☐ 1/1 OCT	☒ _60_ MINUTE INTERVALS	☐ C-WTD	☐ IMPULSE	☐ FAST	☐ 1/3 OCT	☒ L(N) PERCENTILE VALUES															
☒ A-WTD	☐ LINEAR	☒ SLOW	☐ 1/1 OCT	☒ _60_ MINUTE INTERVALS																									
☐ C-WTD	☐ IMPULSE	☐ FAST	☐ 1/3 OCT	☒ L(N) PERCENTILE VALUES																									

Notes:	Measurement Type: ☒ Long-term ☐ Short-term
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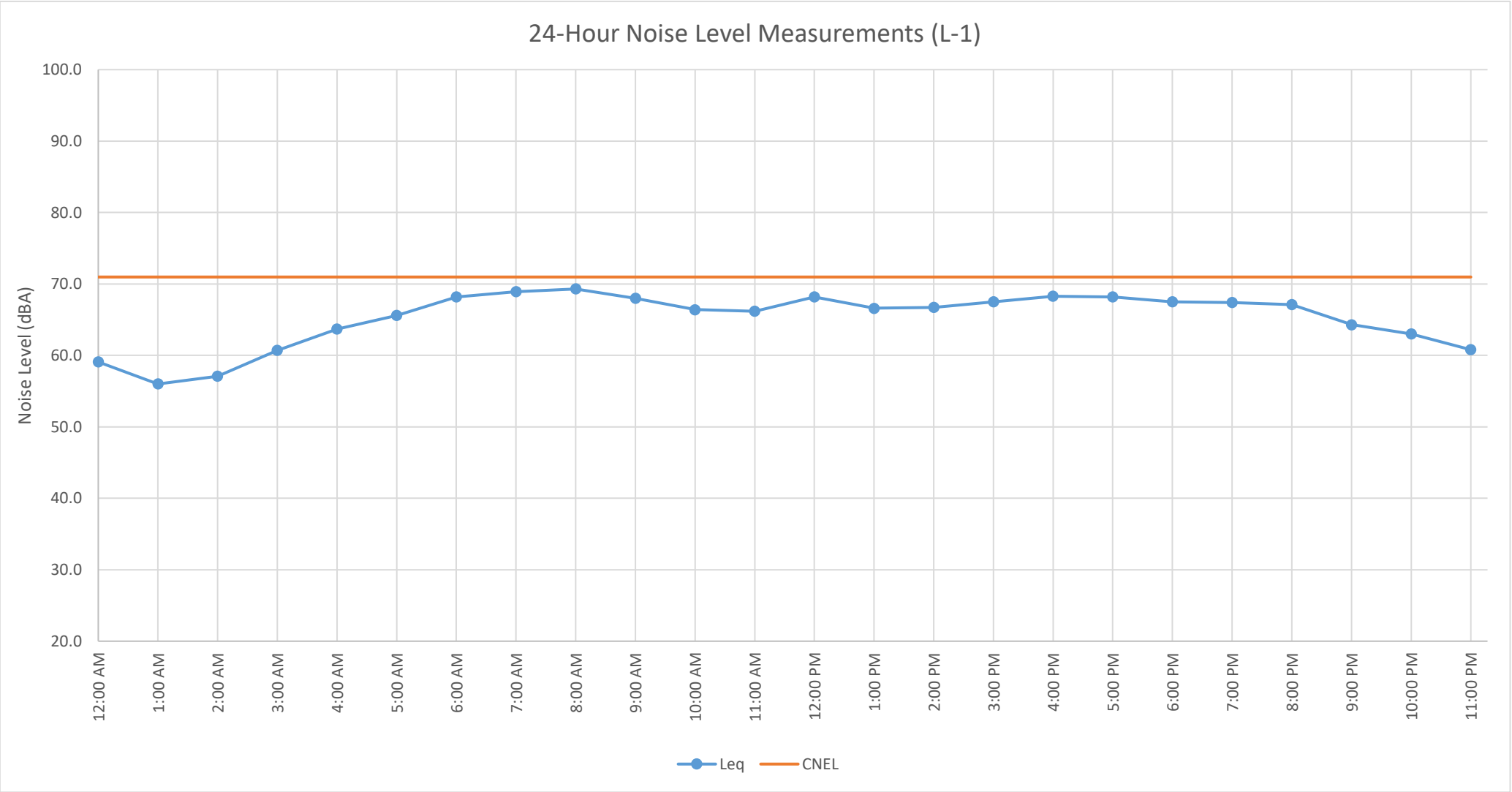
1 = Noise Monitoring Location

Field Sheet - Noise Monitoring Location 1 Photo			
Project: 901 E. Katella Ave. In-Fill Residential Development		Engineer: B. Estrada	Date: 9/13/2022
		JN: 2827-2022-08	
Measurement Address: 901 E. Katella Ave.		City: Orange, CA	Site No.: 1
Notes: Measurement was taken approximately 100 ft. north of the centerline of E. Katella Ave. and 115 ft. east of the centerline of N. Cambridge St.			

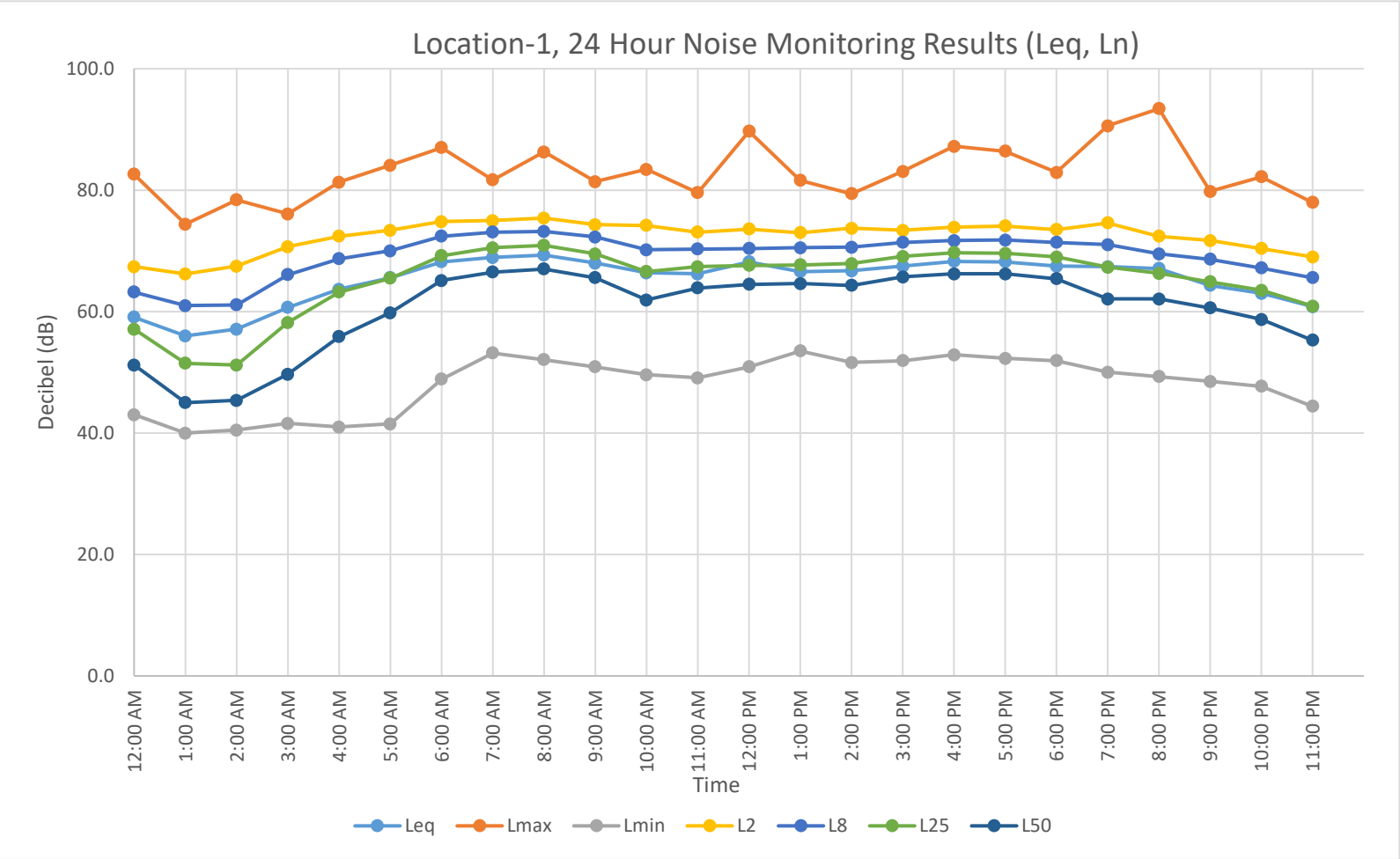


Time	Leq	CNEL
12:00 AM	59.1	71.0
1:00 AM	56.0	71.0
2:00 AM	57.1	71.0
3:00 AM	60.7	71.0
4:00 AM	63.7	71.0
5:00 AM	65.6	71.0
6:00 AM	68.2	71.0
7:00 AM	68.9	71.0
8:00 AM	69.3	71.0
9:00 AM	68.0	71.0
10:00 AM	66.4	71.0
11:00 AM	66.2	71.0
12:00 PM	68.2	71.0
1:00 PM	66.6	71.0
2:00 PM	66.7	71.0
3:00 PM	67.5	71.0
4:00 PM	68.3	71.0
5:00 PM	68.2	71.0
6:00 PM	67.5	71.0
7:00 PM	67.4	71.0
8:00 PM	67.1	71.0
9:00 PM	64.3	71.0
10:00 PM	63.0	71.0
11:00 PM	60.8	71.0

Day Min: 64.3
Night Min 56.0



PROJECT:	901 E. Katella Ave. In-Fill Residential Development					JOB #:	2827-2022-18
NOISE METER	Piccolo II SLM, 24-Hour Measurement					DATE:	14-Sep-22
LOCATION:	L-1					BY:	B. Estrada
Time	Leq	Lmax	Lmin	L2	L8	L25	L50
12:00 AM	59.1	82.6	43.0	67.4	63.2	57.1	51.2
1:00 AM	56.0	74.4	40.0	66.2	61.0	51.5	45.0
2:00 AM	57.1	78.4	40.5	67.5	61.1	51.2	45.4
3:00 AM	60.7	76.1	41.6	70.7	66.1	58.2	49.7
4:00 AM	63.7	81.3	41.0	72.4	68.7	63.2	55.9
5:00 AM	65.6	84.1	41.5	73.4	70.0	65.5	59.8
6:00 AM	68.2	87.0	48.9	74.8	72.4	69.2	65.1
7:00 AM	68.9	81.7	53.2	75.0	73.1	70.5	66.5
8:00 AM	69.3	86.3	52.1	75.4	73.2	70.9	67.0
9:00 AM	68.0	81.4	50.9	74.3	72.3	69.5	65.6
10:00 AM	66.4	83.4	49.6	74.2	70.2	66.6	61.9
11:00 AM	66.2	79.6	49.1	73.1	70.3	67.4	63.9
12:00 PM	68.2	89.7	50.9	73.6	70.4	67.6	64.5
1:00 PM	66.6	81.6	53.5	73.0	70.5	67.7	64.6
2:00 PM	66.7	79.4	51.6	73.7	70.6	67.9	64.3
3:00 PM	67.5	83.1	51.9	73.4	71.4	69.1	65.7
4:00 PM	68.3	87.2	52.9	73.9	71.7	69.7	66.2
5:00 PM	68.2	86.4	52.3	74.1	71.8	69.6	66.2
6:00 PM	67.5	82.9	51.9	73.5	71.4	69.0	65.4
7:00 PM	67.4	90.6	50.0	74.6	71.0	67.3	62.1
8:00 PM	67.1	93.4	49.3	72.4	69.5	66.3	62.1
9:00 PM	64.3	79.8	48.5	71.7	68.6	64.9	60.6
10:00 PM	63.0	82.2	47.7	70.4	67.2	63.5	58.7
11:00 PM	60.8	78.0	44.4	69.0	65.6	60.9	55.3
Daytime	66.9	93.4	47.7	73.7	71.1	68.4	64.6
Nighttime	64.9	87.0	40.0	71.2	67.7	63.2	58.1



Field Sheet - Noise Monitoring Location 2 Photo

Project: 901 E. Katella Ave. In-Fill Residential Development
Engineer: B. Estrada

Date: 9/13/2022

JN: 2827-2022-08

Measurement Address: 901 E. Katella Ave. **City:** Orange, CA

Site No.:

1

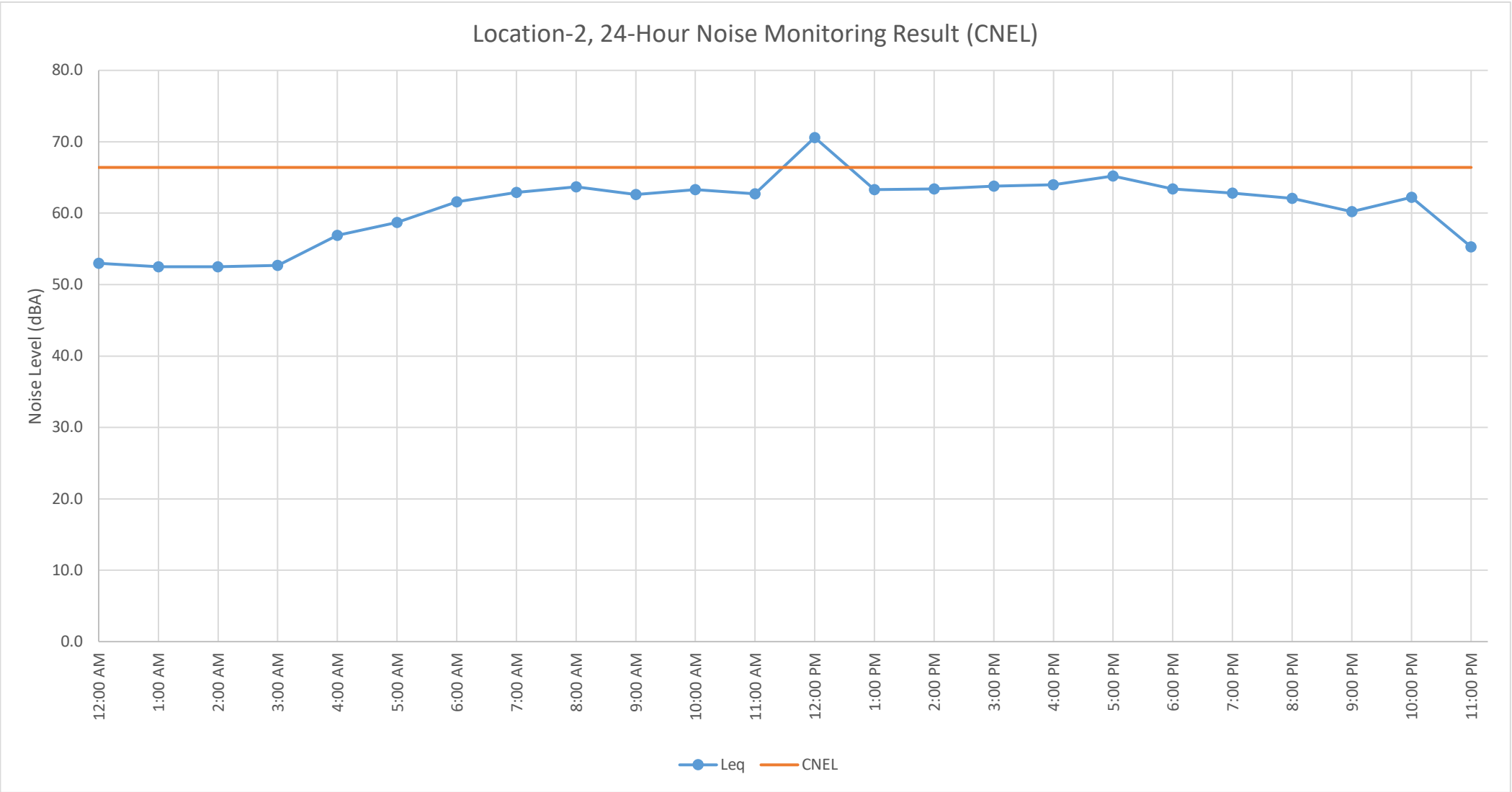
Notes: Measurement was taken approximately 70 ft east of the centerline of N. Cambridge St. and 20 ft. south of the project site's northern property line.



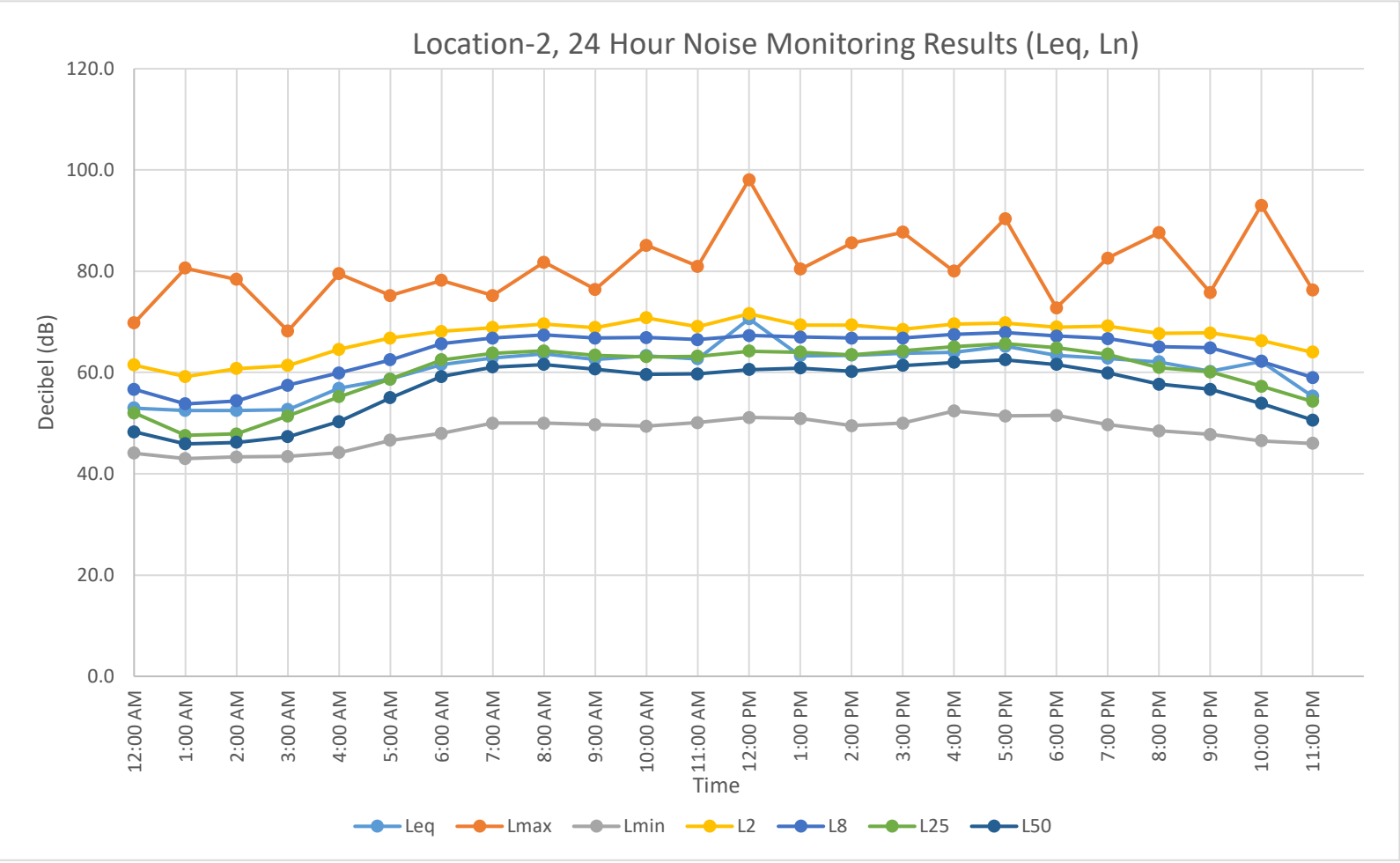
Time	Leq	CNEL
12:00 AM	53.0	66.4
1:00 AM	52.5	66.4
2:00 AM	52.5	66.4
3:00 AM	52.7	66.4
4:00 AM	56.9	66.4
5:00 AM	58.7	66.4
6:00 AM	61.6	66.4
7:00 AM	62.9	66.4
8:00 AM	63.7	66.4
9:00 AM	62.6	66.4
10:00 AM	63.3	66.4
11:00 AM	62.7	66.4
12:00 PM	70.6	66.4
1:00 PM	63.3	66.4
2:00 PM	63.4	66.4
3:00 PM	63.8	66.4
4:00 PM	64.0	66.4
5:00 PM	65.2	66.4
6:00 PM	63.4	66.4
7:00 PM	62.8	66.4
8:00 PM	62.1	66.4
9:00 PM	60.2	66.4
10:00 PM	62.2	66.4
11:00 PM	55.3	66.4

Day Min: 60.2

Night Min 52.5



PROJECT:	901 E. Katella Ave. In-Fill Residential Development					JOB #:	2827-2022-08
NOISE METER	Piccolo II SLM, 24-Hour Measurement					DATE:	14-Sep-22
LOCATION:	L-2					BY:	B. Estrada
Time	Leq	Lmax	Lmin	L2	L8	L25	L50
12:00 AM	53.0	69.8	44.1	61.5	56.7	52.0	48.3
1:00 AM	52.5	80.6	43.0	59.2	53.8	47.6	45.9
2:00 AM	52.5	78.4	43.3	60.8	54.4	47.9	46.2
3:00 AM	52.7	68.2	43.4	61.4	57.5	51.4	47.3
4:00 AM	56.9	79.5	44.2	64.6	59.9	55.2	50.3
5:00 AM	58.7	75.2	46.6	66.8	62.5	58.7	55.0
6:00 AM	61.6	78.2	48.0	68.1	65.7	62.5	59.2
7:00 AM	62.9	75.2	50.0	68.9	66.8	63.8	61.1
8:00 AM	63.7	81.8	50.0	69.6	67.4	64.3	61.6
9:00 AM	62.6	76.4	49.7	68.9	66.8	63.4	60.7
10:00 AM	63.3	85.1	49.4	70.8	66.9	63.1	59.6
11:00 AM	62.7	81.0	50.1	69.1	66.5	63.2	59.7
12:00 PM	70.6	98.1	51.1	71.6	67.3	64.2	60.6
1:00 PM	63.3	80.4	50.9	69.4	67.0	64.0	60.9
2:00 PM	63.4	85.6	49.5	69.4	66.8	63.5	60.2
3:00 PM	63.8	87.7	50.0	68.5	66.8	64.3	61.4
4:00 PM	64.0	80.0	52.4	69.6	67.5	65.1	62.0
5:00 PM	65.2	90.4	51.4	69.8	67.9	65.7	62.5
6:00 PM	63.4	72.8	51.5	69.0	67.2	64.9	61.6
7:00 PM	62.8	82.6	49.7	69.2	66.7	63.6	59.9
8:00 PM	62.1	87.6	48.5	67.7	65.1	61.0	57.7
9:00 PM	60.2	75.8	47.8	67.8	64.9	60.1	56.7
10:00 PM	62.2	93.0	46.5	66.3	62.2	57.3	53.9
11:00 PM	55.3	76.3	46.0	64.0	59.0	54.3	50.6
Daytime	64.2	98.1	46.5	69.3	66.7	63.6	60.4
Nighttime	56.7	80.6	43.0	64.3	60.4	56.5	52.9

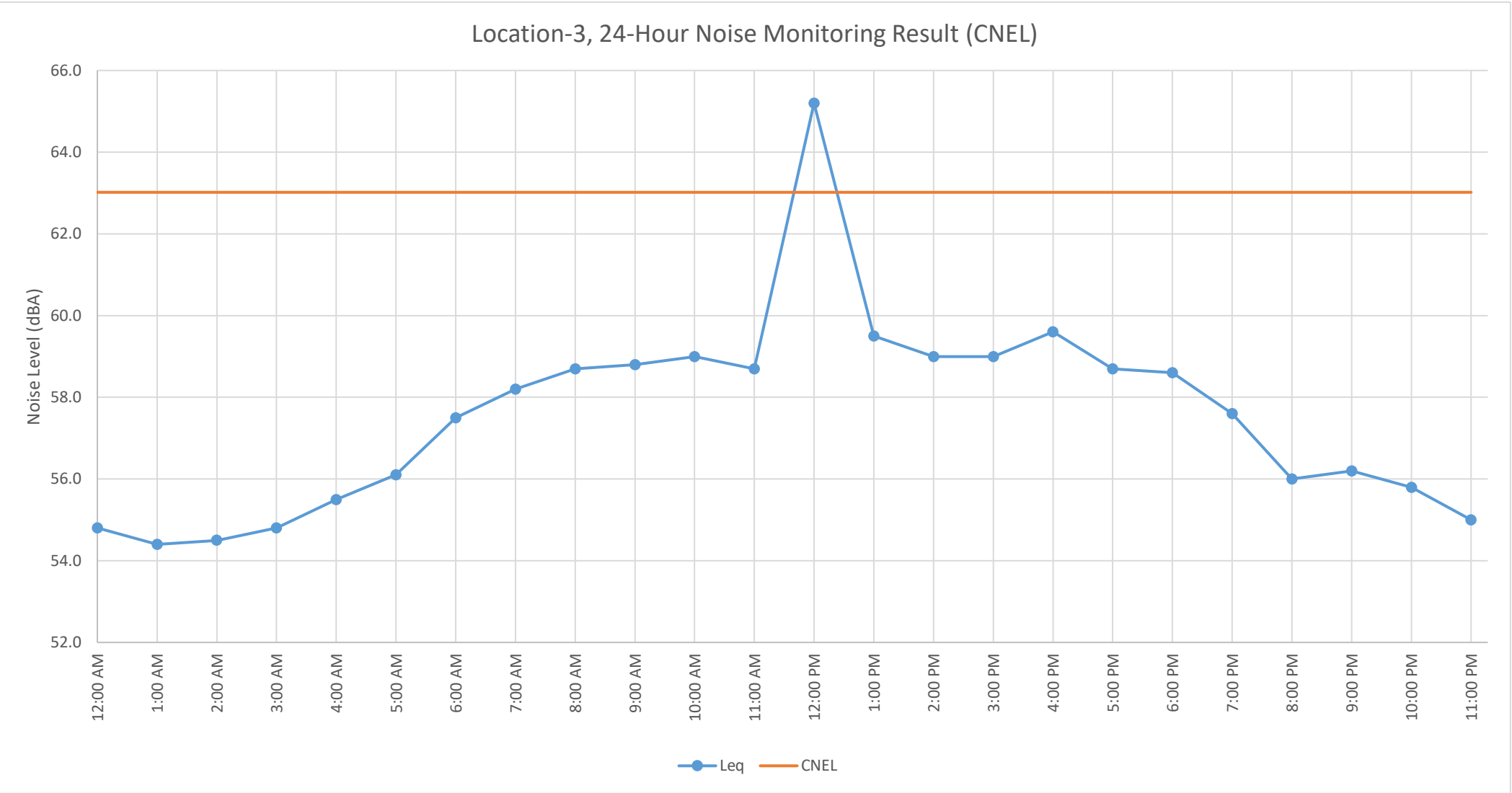


Field Sheet - Noise Monitoring Location 3 Photo			
Project: 901 E. Katella Ave. In-Fill Residential Development		Engineer: B. Estrada	Date: 9/14/2022
		JN: 2827-2022-08	
Measurement Address: 901 E. Katella Ave.		City: Orange, CA	Site No.: 1
Notes: Measurement was taken approximately 300 ft. east of the centerline of N. Cambridge St. and 10 ft. south of the project site's northern property line.			

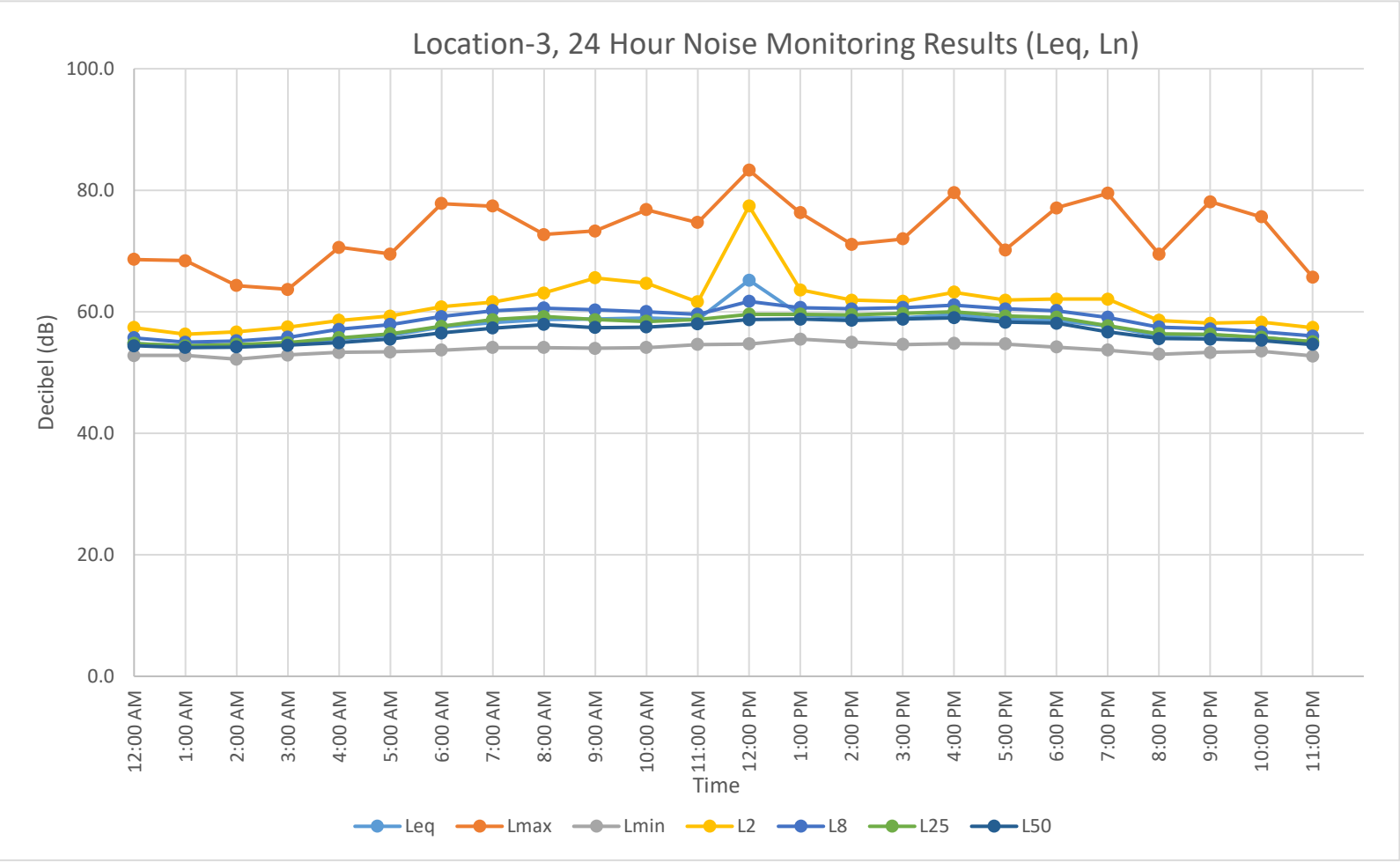


Time	Leq	CNEL
12:00 AM	54.8	63.0
1:00 AM	54.4	63.0
2:00 AM	54.5	63.0
3:00 AM	54.8	63.0
4:00 AM	55.5	63.0
5:00 AM	56.1	63.0
6:00 AM	57.5	63.0
7:00 AM	58.2	63.0
8:00 AM	58.7	63.0
9:00 AM	58.8	63.0
10:00 AM	59.0	63.0
11:00 AM	58.7	63.0
12:00 PM	65.2	63.0
1:00 PM	59.5	63.0
2:00 PM	59.0	63.0
3:00 PM	59.0	63.0
4:00 PM	59.6	63.0
5:00 PM	58.7	63.0
6:00 PM	58.6	63.0
7:00 PM	57.6	63.0
8:00 PM	56.0	63.0
9:00 PM	56.2	63.0
10:00 PM	55.8	63.0
11:00 PM	55.0	63.0

Day Min: 56.0
Night Min 54.4



PROJECT:	901 E. Katella Ave. In-Fill Residential Development					JOB #:	2827-2022-08
NOISE METER	Piccolo II SLM, 24-Hour Measurement					DATE:	14-Sep-22
LOCATION:	L-3					BY:	B. Estrada
Time	Leq	Lmax	Lmin	L2	L8	L25	L50
12:00 AM	54.8	68.6	52.8	57.4	55.7	54.8	54.4
1:00 AM	54.4	68.4	52.8	56.3	55.0	54.4	54.1
2:00 AM	54.5	64.3	52.2	56.7	55.2	54.6	54.2
3:00 AM	54.8	63.7	52.9	57.5	55.8	54.9	54.5
4:00 AM	55.5	70.6	53.3	58.6	57.1	55.7	54.9
5:00 AM	56.1	69.5	53.4	59.3	57.9	56.4	55.5
6:00 AM	57.5	77.8	53.7	60.8	59.2	57.6	56.5
7:00 AM	58.2	77.4	54.1	61.6	60.2	58.7	57.3
8:00 AM	58.7	72.7	54.1	63.1	60.6	59.2	57.9
9:00 AM	58.8	73.3	54.0	65.6	60.3	58.7	57.4
10:00 AM	59.0	76.8	54.1	64.7	60.0	58.4	57.5
11:00 AM	58.7	74.7	54.6	61.6	59.6	58.7	58.0
12:00 PM	65.2	83.3	54.7	77.4	61.7	59.6	58.7
1:00 PM	59.5	76.3	55.5	63.6	60.7	59.6	58.8
2:00 PM	59.0	71.1	55.0	61.9	60.5	59.5	58.6
3:00 PM	59.0	72.0	54.6	61.7	60.7	59.7	58.8
4:00 PM	59.6	79.6	54.8	63.2	61.1	60.0	59.0
5:00 PM	58.7	70.2	54.7	61.9	60.5	59.3	58.3
6:00 PM	58.6	77.1	54.2	62.1	60.2	59.1	58.1
7:00 PM	57.6	79.5	53.7	62.1	59.1	57.7	56.7
8:00 PM	56.0	69.5	53.0	58.6	57.5	56.4	55.6
9:00 PM	56.2	78.1	53.3	58.1	57.2	56.3	55.5
10:00 PM	55.8	75.6	53.5	58.3	56.7	55.8	55.3
11:00 PM	55.0	65.7	52.7	57.4	56.0	55.1	54.6
Daytime	59.3	83.3	53.0	67.0	60.0	58.7	57.7
Nighttime	55.4	77.8	52.2	58.2	56.7	55.6	54.9



Appendix C

Noise Analysis Results
(SoundPLAN Results Sheets)

Contribution levels of the receivers

Source name	Traffic lane	Level	
		Day	Night
		dB(A)	
1	1.FI	35.1	34.8
1	-	31.4	30.7
HVAC2	-	20.4	20.4
HVAC2	-	21.3	21.3
HVAC3	-	19.6	19.6
HVAC4	-	18.8	18.8
HVAC5	-	18.3	18.3
HVAC6	-	17.6	17.6
HVAC7	-	16.8	16.8
HVAC8	-	16.2	16.2
HVAC9	-	15.8	15.8
HVAC10	-	15.2	15.2
HVAC11	-	14.9	14.9
HVAC12	-	14.3	14.3
HVAC13	-	14.0	14.0
HVAC14	-	13.5	13.5
HVAC15	-	24.5	24.5
HVAC16	-	23.7	23.7
HVAC17	-	23.2	23.2
HVAC18	-	22.5	22.5
HVAC19	-	2.2	2.2
HVAC20	-	8.0	8.0
HVAC21	-	3.1	3.1
HVAC22	-	4.1	4.1
HVAC23	-	2.2	2.2
HVAC24	-	0.7	0.7
HVAC25	-	12.4	12.4
HVAC26	-	8.1	8.1
HVAC27	-	5.6	5.6
HVAC28	-	5.0	5.0
HVAC29	-	7.0	7.0
HVAC30	-	0.5	0.5
HVAC31	-	0.9	0.9
HVAC32	-	6.5	6.5
HVAC33	-	5.2	5.2
HVAC34	-	-0.5	-0.5
HVAC35	-	3.9	3.9
HVAC36	-	-2.4	-2.4
HVAC37	-	2.3	2.3
HVAC38	-	-4.5	-4.5
HVAC39	-	-6.4	-6.4
HVAC40	-	4.2	4.2
HVAC41	-	1.3	1.3
HVAC42	-	18.4	18.4
HVAC43	-	5.2	5.2
HVAC44	-	3.5	3.5
HVAC45	-	2.7	2.7
HVAC46	-	1.7	1.7
HVAC47	-	0.4	0.4
HVAC48	-	-0.9	-0.9
HVAC49	-	-0.7	-0.7
HVAC50	-	-2.0	-2.0
HVAC51	-	-1.5	-1.5
HVAC52	-	-4.7	-4.7
1	2.FI	35.0	34.7
1	-	30.1	29.4
HVAC2	-	20.9	20.9
HVAC2	-	21.9	21.9
HVAC3	-	20.1	20.1
HVAC4	-	19.2	19.2
HVAC5	-	18.7	18.7
HVAC6	-	18.0	18.0
HVAC7	-	17.2	17.2

Contribution levels of the receivers

Source name	Traffic lane	Level	
		Day	Night
		dB(A)	
HVAC8	-	16.5	16.5
HVAC9	-	16.2	16.2
HVAC10	-	15.5	15.5
HVAC11	-	15.2	15.2
HVAC12	-	14.6	14.6
HVAC13	-	14.3	14.3
HVAC14	-	13.7	13.7
HVAC15	-	25.2	25.2
HVAC16	-	24.3	24.3
HVAC17	-	23.8	23.8
HVAC18	-	23.0	23.0
HVAC19	-	2.3	2.3
HVAC20	-	8.9	8.9
HVAC21	-	3.1	3.1
HVAC22	-	4.3	4.3
HVAC23	-	2.4	2.4
HVAC24	-	0.8	0.8
HVAC25	-	13.1	13.1
HVAC26	-	9.1	9.1
HVAC27	-	6.2	6.2
HVAC28	-	5.6	5.6
HVAC29	-	7.7	7.7
HVAC30	-	0.6	0.6
HVAC31	-	1.0	1.0
HVAC32	-	7.3	7.3
HVAC33	-	6.1	6.1
HVAC34	-	-0.4	-0.4
HVAC35	-	4.7	4.7
HVAC36	-	-2.2	-2.2
HVAC37	-	3.1	3.1
HVAC38	-	-4.4	-4.4
HVAC39	-	-6.4	-6.4
HVAC40	-	5.0	5.0
HVAC41	-	2.0	2.0
HVAC42	-	18.8	18.8
HVAC43	-	5.5	5.5
HVAC44	-	3.7	3.7
HVAC45	-	2.9	2.9
HVAC46	-	1.9	1.9
HVAC47	-	0.6	0.6
HVAC48	-	-0.7	-0.7
HVAC49	-	-0.5	-0.5
HVAC50	-	-1.8	-1.8
HVAC51	-	-1.3	-1.3
HVAC52	-	-4.6	-4.6
2	1.FI	44.5	44.5
1	-	27.4	26.7
HVAC2	-	30.5	30.5
HVAC2	-	29.3	29.3
HVAC3	-	31.8	31.8
HVAC4	-	31.8	31.8
HVAC5	-	33.8	33.8
HVAC6	-	36.6	36.6
HVAC7	-	36.3	36.3
HVAC8	-	34.4	34.4
HVAC9	-	35.5	35.5
HVAC10	-	33.2	33.2
HVAC11	-	30.7	30.7
HVAC12	-	28.9	28.9
HVAC13	-	24.4	24.4
HVAC14	-	25.4	25.4
HVAC15	-	2.8	2.8
HVAC16	-	5.2	5.2
HVAC17	-	3.1	3.1

Contribution levels of the receivers

Source name	Traffic lane	Level	
		Day	Night
		dB(A)	
HVAC18	-	5.2	5.2
HVAC19	-	10.9	10.9
HVAC20	-	12.3	12.3
HVAC21	-	15.2	15.2
HVAC22	-	20.4	20.4
HVAC23	-	13.5	13.5
HVAC24	-	14.2	14.2
HVAC25	-	12.9	12.9
HVAC26	-	14.4	14.4
HVAC27	-	13.7	13.7
HVAC28	-	12.1	12.1
HVAC29	-	13.9	13.9
HVAC30	-	8.9	8.9
HVAC31	-	11.8	11.8
HVAC32	-	12.1	12.1
HVAC33	-	12.2	12.2
HVAC34	-	10.1	10.1
HVAC35	-	11.5	11.5
HVAC36	-	11.4	11.4
HVAC37	-	10.6	10.6
HVAC38	-	8.6	8.6
HVAC39	-	9.8	9.8
HVAC40	-	8.7	8.7
HVAC41	-	8.3	8.3
HVAC42	-	2.4	2.4
HVAC43	-	1.1	1.1
HVAC44	-	1.2	1.2
HVAC45	-	1.9	1.9
HVAC46	-	3.7	3.7
HVAC47	-	1.9	1.9
HVAC48	-	1.9	1.9
HVAC49	-	1.2	1.2
HVAC50	-	2.9	2.9
HVAC51	-	0.7	0.7
HVAC52	-	3.6	3.6
3	1.FI	36.3	36.2
1	-	28.5	27.7
HVAC2	-	13.4	13.4
HVAC2	-	13.1	13.1
HVAC3	-	13.8	13.8
HVAC4	-	14.3	14.3
HVAC5	-	14.9	14.9
HVAC6	-	16.6	16.6
HVAC7	-	17.6	17.6
HVAC8	-	21.2	21.2
HVAC9	-	22.7	22.7
HVAC10	-	21.0	21.0
HVAC11	-	26.5	26.5
HVAC12	-	25.6	25.6
HVAC13	-	28.8	28.8
HVAC14	-	27.9	27.9
HVAC15	-	-3.4	-3.4
HVAC16	-	-3.3	-3.3
HVAC17	-	-3.4	-3.4
HVAC18	-	-3.4	-3.4
HVAC19	-	5.4	5.4
HVAC20	-	6.8	6.8
HVAC21	-	7.9	7.9
HVAC22	-	7.8	7.8
HVAC23	-	5.0	5.0
HVAC24	-	7.6	7.6
HVAC25	-	6.4	6.4
HVAC26	-	7.6	7.6
HVAC27	-	6.2	6.2

Contribution levels of the receivers

Source name	Traffic lane	Level	
		Day	Night
		dB(A)	
HVAC28	-	8.5	8.5
HVAC29	-	6.1	6.1
HVAC30	-	8.7	8.7
HVAC31	-	10.0	10.0
HVAC32	-	9.1	9.1
HVAC33	-	7.8	7.8
HVAC34	-	9.2	9.2
HVAC35	-	9.5	9.5
HVAC36	-	9.9	9.9
HVAC37	-	20.5	20.5
HVAC38	-	22.1	22.1
HVAC39	-	6.7	6.7
HVAC40	-	24.2	24.2
HVAC41	-	6.5	6.5
HVAC42	-	-3.0	-3.0
HVAC43	-	1.1	1.1
HVAC44	-	2.8	2.8
HVAC45	-	0.7	0.7
HVAC46	-	1.1	1.1
HVAC47	-	1.2	1.2
HVAC48	-	2.2	2.2
HVAC49	-	-0.1	-0.1
HVAC50	-	1.7	1.7
HVAC51	-	2.0	2.0
HVAC52	-	-0.9	-0.9

Appendix D

Construction and Vibration Analysis Results

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/14/2022

Case Description: 901 E. Katella Avenue In-Fill Residential Development

---- Receptor #1 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Demolition	Residential	56	56	54.4

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	100		81.7	100	0
Tractor	No	100		84	100	0
Concrete Saw	No	100		89.6	100	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Dozer	75.7	75.7
Tractor	78	78
Concrete Saw	83.6	83.6
Total	83.6	85.2

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/14/2022

Case Description: 901 E. Katella Avenue In-Fill Residential Development

---- Receptor #1 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Site Preparation	Residential	56	56	54.4

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	100		84	100	0
Grader	No	100		85	100	0
Scraper	No	100		83.6	100	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Tractor	78	78
Grader	79	79
Scraper	77.6	77.6
Total	79	83

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/14/2022

Case Description: 901 E. Katella Avenue In-Fill Residential Development

---- Receptor #1 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Grading	Residential	56	56	54.4

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	100		81.7	100	0
Tractor	No	100	84		100	0
Tractor	No	100	84		100	0
Grader	No	100	85		100	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Dozer	75.7	75.7
Tractor	78	78
Tractor	78	78
Grader	79	79
Total	79	83.8

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/14/2022

Case Description: 901 E. Katella Avenue In-Fill Residential Development

---- Receptor #1 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Building Construction	Residential	56	56	54.4

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	100		84	100	0
Crane	No	100		80.6	100	0
Pickup Truck	No	100		75	100	0
Pickup Truck	No	100		75	100	0
Generator	No	100		80.6	100	0
Welder / Torch	No	100		74	100	0
Welder / Torch	No	100		74	100	0
Welder / Torch	No	100		74	100	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Tractor	78	78
Crane	74.6	74.6
Pickup Truck	69	69
Pickup Truck	69	69
Generator	74.6	74.6
Welder / Torch	68	68
Welder / Torch	68	68
Welder / Torch	68	68
Total	78	81.9

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/14/2022
Case Description: 901 E. Katella Avenue In-Fill Residential Development

---- Receptor #1 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Paving	Residential	56	56	54.4

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	100		84	100	0
Concrete Mixer Truck	No	100		78.8	100	0
Paver	No	100		77.2	100	0
Paver	No	100		77.2	100	0
Roller	No	100		80	100	0
Roller	No	100		80	100	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Tractor	78	78
Concrete Mixer Truck	72.8	72.8
Paver	71.2	71.2
Paver	71.2	71.2
Roller	74	74
Roller	74	74
Total	78	82

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/14/2022

Case Description: 901 E. Katella Avenue In-Fill Residential Development

---- Receptor #1 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Architectural Coating	Residential	56	56	54.4

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	100		77.7	100	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Compressor (air)	71.7	71.7
Total	71.7	71.7

*Calculated Lmax is the Loudest value.

VIBRATION IMPACTS FROM CONSTRUCTION AND OPERATIONS

PROJECT:	901 E KATELLA AVE IN-FILL	JOB #:	2827-2022-08
ACTIVITY:	Construction Vibration	DATE:	10-Nov-22
LOCATION:	Receptors at 60 Feet	ENGINEER:	B. Morrison

VIBRATION INPUT/OUTPUT DATA

OTHER CONSTRUCTION EQUIPMENT

$$PPV = PPV_{ref}(25/D)^n \text{ (in/sec)}$$

PPV =	0.034 in/sec
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Equipment Type =	2 Large Bulldozer
PPV _{ref} =	0.089 Reference PPV at 25 ft.
D =	60.00 Distance from Equipment to receiver in ft.
n =	1.10 Vibration attenuation rate through the ground

EQUIPMENT PPV REFERENCE LEVELS		
Type	Equipment	Reference PPV
1	Vibratory Roller	0.210
2	Large Bulldozer	0.089
3	Caisson Drilling	0.089
4	Loaded Trucks	0.076
5	Jackhammer	0.035
6	Small Bulldozer	0.003
7	Crack and Seat	2.400

VIBRATION IMPACTS FROM CONSTRUCTION AND OPERATIONS

PROJECT:	901 E KATELLA AVE IN-FILL	JOB #:	2827-2022-08
ACTIVITY:	Construction Vibration	DATE:	10-Nov-22
LOCATION:	Receptors at 60 Feet	ENGINEER:	B. Morrison

VIBRATION INPUT/OUTPUT DATA

OTHER CONSTRUCTION EQUIPMENT

$$PPV = PPV_{ref}(25/D)^n \text{ (in/sec)}$$

PPV =	0.080 in/sec
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Equipment Type =	1 Vibratory Roller
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PPV _{ref} =	0.210 Reference PPV at 25 ft.
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D =	60.00 Distance from Equipment to receiver in ft.
-----	--

n =	1.10 Vibration attenuation rate through the ground
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EQUIPMENT PPV REFERENCE LEVELS

Type	Equipment	Reference PPV
1	Vibratory Roller	0.210
2	Large Bulldozer	0.089
3	Caisson Drilling	0.089
4	Loaded Trucks	0.076
5	Jackhammer	0.035
6	Small Bulldozer	0.003
7	Crack and Seat	2.400

VIBRATION IMPACTS FROM CONSTRUCTION AND OPERATIONS

PROJECT:	901 E KATELLA AVE IN-FILL	JOB #:	2827-2022-08
ACTIVITY:	Construction Vibration	DATE:	10-Nov-22
LOCATION:	Receptors at 60 Feet	ENGINEER:	B. Morrison

VIBRATION INPUT/OUTPUT DATA

OTHER CONSTRUCTION EQUIPMENT

$$PPV = PPV_{ref}(25/D)^n \text{ (in/sec)}$$

PPV = **0.029 in/sec**

Equipment Type =	4 Loaded Trucks
PPV _{ref} =	0.076 Reference PPV at 25 ft.
D =	60.00 Distance from Equipment to receiver in ft.
n =	1.10 Vibration attenuation rate through the ground

EQUIPMENT PPV REFERENCE LEVELS

Type	Equipment	Reference PPV
1	Vibratory Roller	0.210
2	Large Bulldozer	0.089
3	Caisson Drilling	0.089
4	Loaded Trucks	0.076
5	Jackhammer	0.035
6	Small Bulldozer	0.003
7	Crack and Seat	2.400