Appendix D

Noise Impact Assessment

NOISE IMPACT ASSESSMENT

FOR THE PROPOSED

365 PRADO ROAD PROJECT
SAN LUIS OBISPO, CA

MARCH 2025

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INTRODUCTION

This report provides an analysis of noise and groundborne vibration impacts associated with the proposed 365 Prado Road Project (Project). This report also provides a summary of existing conditions in the project area and the applicable regulatory framework.

PROPOSED PROJECT SUMMARY

The existing Project site is located at 365 Prado Road in the City of San Luis Obispo (City). The proposed Project includes the development of a mix of land uses, including residential, commercial retail, self-storage, and neighborhood park land uses. The proposed project's site plan is depicted in Figure 1.

ACOUSTIC FUNDAMENTALS

Noise is generally defined as sound that is loud, disagreeable, or unexpected. Sound, as described in more detail below, is mechanical energy transmitted in the form of a wave because of a disturbance or vibration.

Amplitude

Amplitude is the difference between ambient air pressure and the peak pressure of the sound wave. Amplitude is measured in decibels (dB) on a logarithmic scale. For example, a 65-dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). Amplitude is interpreted by the ear as corresponding to different degrees of loudness. Laboratory measurements correlate a 10 dB increase in amplitude with a perceived doubling of loudness and establish a 3-dB change in amplitude as the minimum audible difference perceptible to the average person.

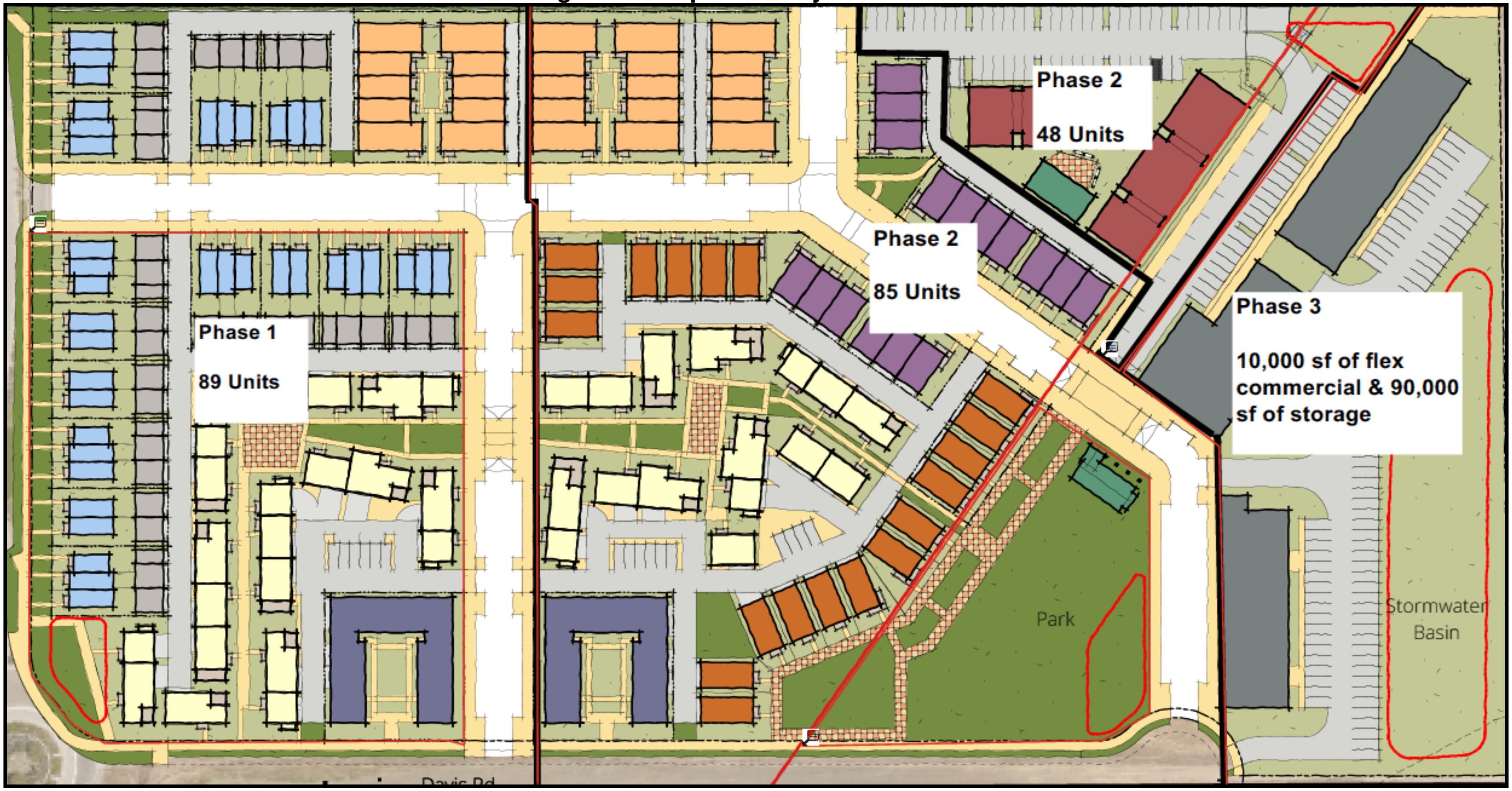
Frequency

Frequency is the number of fluctuations in the pressure wave per second. The unit of frequency is Hertz (Hz). One Hz equals one cycle per second. The human ear is not equally sensitive to sound of different frequencies. Sound waves below 16 Hz or above 20,000 Hz cannot be heard at all, and the ear is more sensitive to sound in the higher portion of this range than in the lower. To approximate this sensitivity, the environmental sound is usually measured in A-weighted decibels (dBA). On this scale, the normal range of human hearing extends from about 10 dBA to about 140 dBA. Common community noise sources and noise levels are depicted in Figure 2.

Addition of Decibels

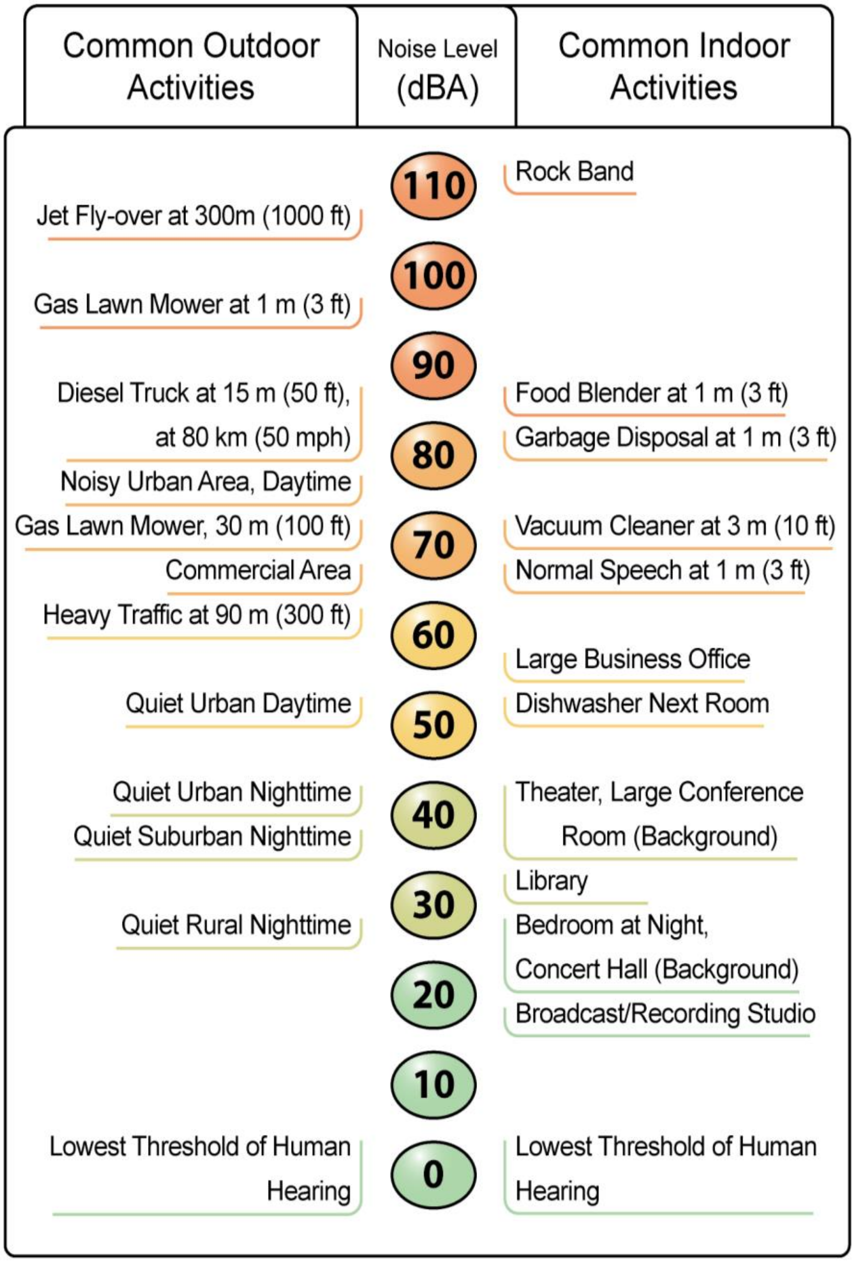
Because decibels are logarithmic units, sound levels cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dB higher than one source under the same conditions. For example, if one automobile produces a sound level of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB; rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together would produce an increase of 5 dB.

Figure 1. Proposed Project Site Plan



Not to Scale. Locations are approximate.

Figure 2. Typical Community Noise Levels



Source: Caltrans 2018

Sound Propagation & Attenuation

Geometric Spreading

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level decreases (attenuates) at a rate of approximately 6 dB for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path, and hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of approximately 3 dB for each doubling of distance from a line source, depending on ground surface characteristics. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, such as a parking lot or body of water,), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between a line source and the receiver, such as soft dirt, grass, or scattered bushes and trees), an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation for soft surfaces results in an overall attenuation rate of 4.5 dB per doubling of distance from a line source.

Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in an approximate 5 dB of noise reduction. Taller barriers provide increased noise reduction.

Noise Descriptors

The decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the sound-pressure level in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hz, and perceive sounds within that range better than sounds of the same amplitude in higher or lower frequencies. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies, which is referred to as the "A-weighted" sound level (expressed in units of dBA). The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-weighted noise scale. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-, C-, and D-scales), but these scales are rarely used in conjunction with environmental noise.

The intensity of environmental noise fluctuates over time, and several descriptors of time-averaged noise levels are typically used. For the evaluation of environmental noise, the most commonly used descriptors are L_{eq}, L_{dn}, and CNEL. The energy-equivalent noise level, L_{eq}, is a measure of the average energy content (intensity) of noise over any given period. Many communities use 24-hour descriptors of noise levels to regulate noise. The day-night average noise level, L_{dn}, is the 24-hour average of the noise intensity, with a 10-dBA "penalty" added for nighttime noise (10 p.m. to 7 a.m.) to account for the greater sensitivity to noise during this period. CNEL, the community equivalent noise level, is similar to L_{dn} but adds an additional 5-dBA penalty for evening noise (7 p.m. to 10 p.m.) Common noise descriptors are summarized in Table 1.

Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise intensity levels. When community noise interferes with human activities or contributes to stress, public annoyance with the noise source increases. The acceptability of noise and the threat to public well-being are the basis for land use planning policies preventing exposure to excessive community noise levels.

Table 1. Common Acoustical Terms and Descriptors

Descriptor	Definition
Decibel (dB)	A unit-less measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to referenced sound pressure amplitude. The reference pressure is 20 micro-pascals.
A-Weighted Decibel (dBA)	An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
Energy Equivalent Noise Level (L_{eq})	The energy mean (average) noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value (in dBA) is calculated.
Minimum Noise Level (Lmin)	The minimum instantaneous noise level during a specific period of time.
Maximum Noise Level (L_{max})	The maximum instantaneous noise level during a specific period of time.
Day-Night Average Noise Level (DNL or L_{dn})	The 24-hour L_{eq} with a 10 dBA "penalty" for noise events that occur during the noise-sensitive hours between 10:00 p.m. and 7:00 a.m. In other words, 10 dBA is "added" to noise events that occur in the nighttime hours to account for increased sensitivity to noise during these hours.
Community Noise Equivalent Level (CNEL)	The CNEL is similar to the L_{dn} described above, but with an additional 5 dBA "penalty" added to noise events that occur between the hours of 7:00 p.m. to 10:00 p.m. The calculated CNEL is typically approximately 0.5 dBA higher than the calculated L_{dn}.

Unfortunately, there is no completely satisfactory way to measure the subjective effects of noise or of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise over differing individual experiences with noise. Thus, an important way of determining a person's subjective reaction to a new noise is the comparison of it to the existing environment to which one has adapted: the so-called "ambient" environment. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged. Regarding increases in A-weighted noise levels, knowledge of the following relationships will be helpful in understanding this analysis:

- Except in carefully controlled laboratory experiments, a change of 1 dB cannot be perceived by humans;
- Outside of the laboratory, a 3-dB change is considered a just-perceivable difference;
- A change in a level of at least 5 dB is required before any noticeable change in community response would be expected. An increase of 5 dB is typically considered substantial;
- A 10-dB change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

Effects of Noise on Human Activities

The extent to which environmental noise is deemed to result in increased levels of annoyance, activity interference, and sleep disruption varies greatly from individual to individual depending on various factors, including the loudness or suddenness of the noise, the information value of the noise (e.g., aircraft overflights, child crying, fire alarm), and an individual's sleep state and sleep habits. Over time, adaptation to noise events and increased levels of noise may also occur. In terms of land use compatibility, environmental noise is often evaluated in terms of the potential for noise events to result in increased levels of annoyance, sleep disruption, or interference with speech communication, activities, and learning.

Speech Communication

For most noise-sensitive land uses, an interior noise level of 45 dB L_{eq} is typically identified for the protection of speech communication in order to provide for 100-percent intelligibility of speech sounds. Assuming an average 20-dB reduction in sound level between outdoors and indoors (which is an average amount of sound attenuation that assumes windows are closed), this interior noise level would equate to an exterior noise level of 65 dBA L_{eq}. For outdoor voice communication, an exterior noise level of 60 dBA L_{eq} allows normal conversation at distances up to 2 meters with 95 percent sentence intelligibility (U.S. EPA 1974.) Based on this information, speech interference begins to become a problem when steady noise levels reach approximately 60 to 65 dBA.

Annoyance & Sleep Disruption

With regard to potential increases in annoyance, activity interference, and sleep disruption, land use compatibility determinations are typically based on the use of the cumulative noise exposure metrics (i.e., CNEL or L_{dn}). Perhaps the most comprehensive and widely accepted evaluation of the relationship between noise exposure and the extent of annoyance was one originally developed by Theodore J. Schultz in 1978. In 1978 the research findings of Theodore J. Schultz provided support for L_{dn} as the descriptor for environmental noise. Research conducted by Schultz identified a correlation between the cumulative noise exposure metric and individuals who were highly annoyed by transportation noise. The Schultz curve, expressing this correlation, became a basis for noise standards. When expressed graphically, this relationship is typically referred to as the Schultz curve. The Schultz curve indicates that approximately 13 percent of the population is highly annoyed at a noise level of 65 dBA L_{dn}. It also indicates that the percent of people describing themselves as being highly annoyed accelerates smoothly between 55 and 70 dBA L_{dn}. A noise level of 65 dBA L_{dn} is a commonly referenced dividing point between lower and higher rates of people describing themselves as being highly annoyed.

The Schultz curve and associated research became the basis for many of the noise criteria subsequently established for federal, state, and local entities. Most federal and state of California regulations and policies related to transportation noise sources establish a noise level of 65 dBA CNEL/L_{dn} as the basic limit of acceptable noise exposure for residential and other noise-sensitive land uses. For instance, with respect to aircraft noise, both the Federal Aviation Administration (FAA) and the State of California have identified a noise level of 65 dBA L_{dn} as the dividing point between normally compatible and normally incompatible residential land use generally applied for the determination of land use compatibility. For noise-sensitive land uses exposed to aircraft noise, noise levels in excess of 65 dBA CNEL/L_{dn} are typically considered to result in a potentially significant increase in levels of annoyance.

Allowing for an average exterior-to-interior noise reduction of 20 dB, an exterior noise level of 65 dBA CNEL/L_{dn} would equate to an interior noise level of 45 dBA CNEL/L_{dn}. An interior noise level of 45 dB CNEL/L_{dn} is generally considered sufficient to protect against activity interference at most noise-sensitive land uses, including residential dwellings, and would also be sufficient to protect against sleep interference (U.S. EPA, 1974.) Within California, the California Building Code establishes a noise level of 45 dBA CNEL as the maximum acceptable interior noise level for residential uses (other than detached single-family dwellings). Use of the 45 dBA CNEL/L_{dn} threshold is further supported by recommendations provided in the State of California Office of Planning and Research's *General Plan Guidelines* (2017), which recommend an interior noise level of 45 dB CNEL/L_{dn} as the maximum allowable interior noise level sufficient to permit "normal residential activity".

The cumulative noise exposure metric is currently the only noise metric for which there is a substantial body of research data and regulatory guidance defining the relationship between noise exposure, people's reactions, and land use compatibility. However, when evaluating environmental noise impacts involving intermittent noise events, such as aircraft overflights and train passbys, the use of cumulative noise metrics may not provide a thorough understanding of the resultant impact. The general public often finds it difficult to understand the relationship between intermittent noise events and cumulative noise exposure metrics. In such instances, supplemental use of single-event noise metrics, such as the sound exposure level (SEL) descriptor, may be helpful as a means of increasing public understanding regarding the relationship between these metrics and the extent of the resultant noise impact.

Although the use of supplemental noise descriptors can provide increased understanding of intermittent noise events and relationship to the cumulative noise metrics, current environmental regulations do not identify quantitative criteria, metrics, or computation methods pertaining to single-event noise exposure for determination of land use compatibility. However, with regard to aircraft noise exposure, Federal Interagency Committee on Aviation Noise (FICAN) has provided non-regulatory guidance for estimating the expected percent of awakenings that may result from single aircraft noise events. For example, at an indoor SEL of 80 dBA, the FICAN data indicates that approximately 10 percent of exposed individuals would be awakened. Although some estimates of the percentage of people expected to be awakened when exposed to specific single-event noise levels inside a home have been provided, no quantitative determination as to what frequency of awakening would be acceptable has been made by Federal, State or local entities. Although no quantitative thresholds have yet been identified with regard to single-event noise exposure, the indication from several studies is that the noise threshold for significant occurrence of sleep disruption is higher than for speech interference.

EXISTING SETTING

Noise-Sensitive Receptors

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additional land uses such as parks, historic sites, cemeteries, and recreation areas are also considered sensitive to increases in exterior noise levels. Schools, churches, hotels, libraries, and other places where low interior noise levels are essential are also considered noise-sensitive land uses.

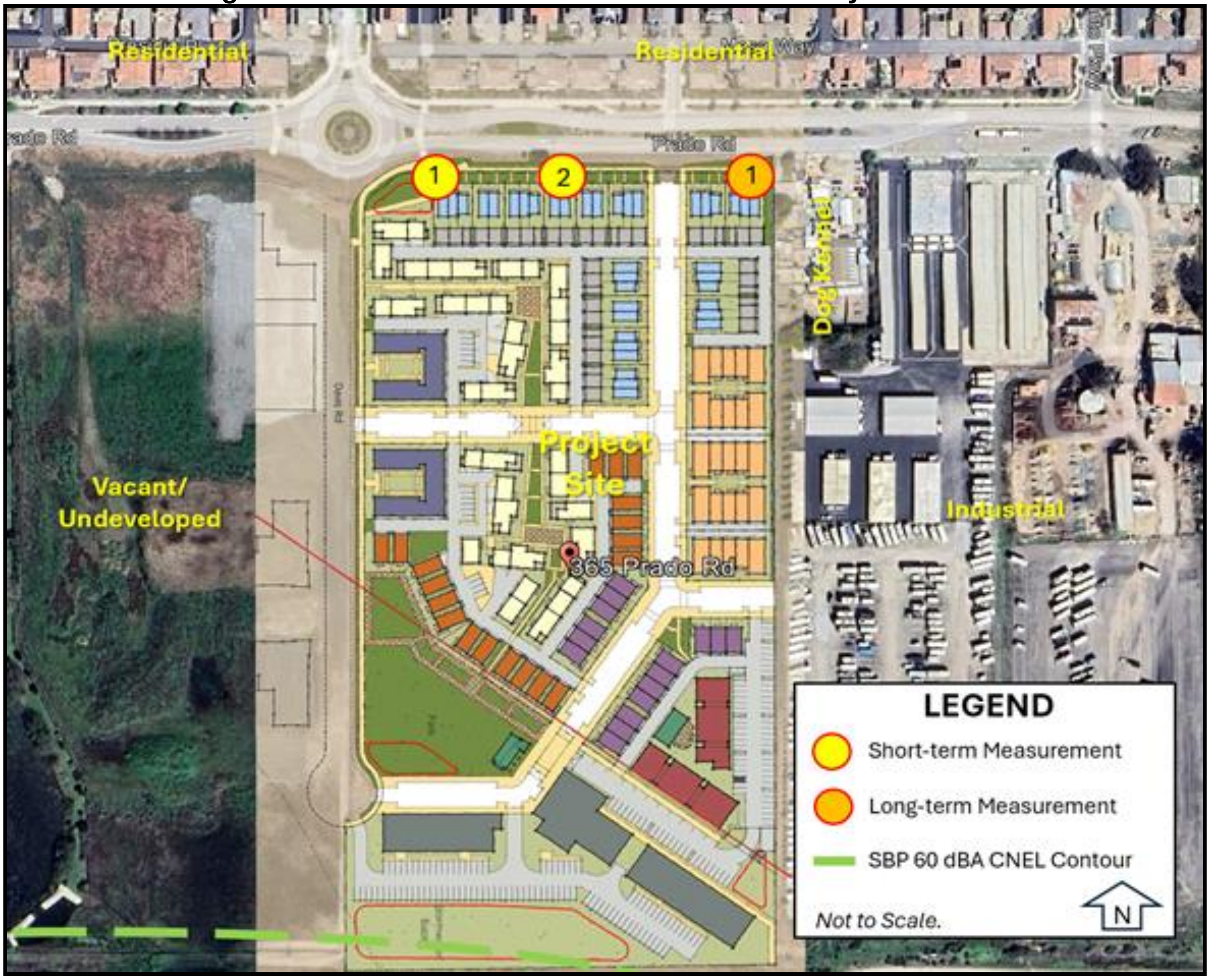
Noise-sensitive land uses in the project vicinity consist predominantly of residential land uses. The nearest residential land uses are located approximately 115 feet north of the project site, across Prado Road.

Ambient Noise Environment

To document the existing noise environment in the project vicinity, two short-term (ST) measurements and one continuous long-term (LT) (i.e., 24 hour) noise measurements were conducted January 29th through January 30th, 2025. The short-term measurements were conducted using a Larson Davis LxT Type 1 sound level meter placed at a height of approximately five feet above ground level and located along the northern boundary of the project site. The long-term measurement was conducted using a SoftdB Piccolo Type 2 sound level meter placed at a height of approximately five feet above ground level near the northeastern boundary of the project site. All measurements were calibrated prior to and upon completion of the noise measurements. Noise measurement locations are depicted in Figure 3. Short-term measurements are summarized in Table 2. Measured long-term noise levels are depicted in Figure 4.

As noted in Table 2, measured average-hourly noise levels ranged from approximately 58 dBA L_{eq} to 59 dBA L_{eq} and measured max noise levels range from approximately 68 dBA L_{max} to 69 dBA L_{max}. Noise levels are predominantly influenced by vehicle traffic on Prado Road. Ambient noise levels along the eastern boundary of the project site (LT-1, refer to Figure 4) are also influenced by dogs barking at the nearby kennel, which is located adjacent to the project site's eastern boundary, south of Prado Road. As noted in Figure 4, average hourly noise levels at the project site's northeastern boundary ranged from approximately 40 dBA L_{eq} during the nighttime hours to approximately 68 dBA L_{eq} during the daytime hours. To a lesser extent, distant industrial (e.g., material handling activities) and occasional aircraft overflights also contributed to the ambient noise environment at the project site on an intermittent basis. The San Luis Obispo County Airport (SBP) 60 dBA CNEL noise contour extends to the southern boundary of the project site.

Figure 3. Noise Measurement Locations & Nearby Land Uses

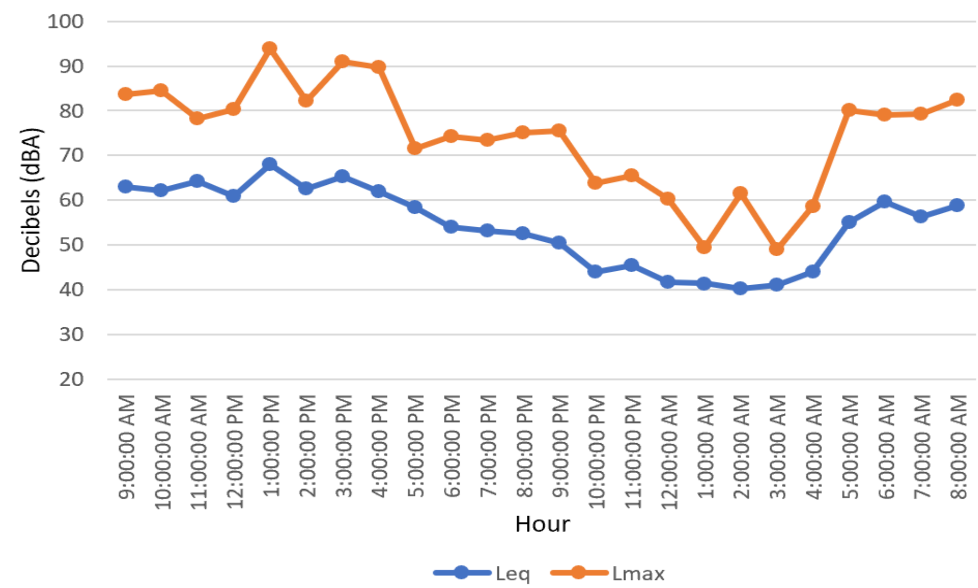


SBP=San Luis Obispo County Airport
Not to scale. Locations are approximate.

Table 2. Short-Term Noise Measurement Data

Measurement	Time Period	Measurement Location	Noise Level (dBA)	
			L_{eq}	L_{max}
ST-1	10:10-10:25	Northwestern Boundary of the Project Site Near Prado Road	58.1	68.7
ST-2	09:45-10:00	Northern Boundary of the Project Site Near Prado Road	59.4	69.3
Noise measurements were conducted January 29, 2025 using a Larson Davis LxT Type 1 sound level meter placed at a height of approximately five feet above ground level.				

Figure 4. Long-term Noise Measurement Data



Measured Hour	Average-Hourly Noise Level (dBA L_{eq})	Instantaneous Noise Level (dBA L_{max})
09:00	62.9	83.7
10:00	62.1	84.5
11:00	64.3	78.2
12:00	61.0	80.3
13:00	68.1	93.8
14:00	62.5	82.1
15:00	65.3	91.0
16:00	61.9	89.7
17:00	58.5	71.5
18:00	54.0	74.3
19:00	53.1	73.5
20:00	52.6	75.1
21:00	50.4	75.6
22:00	44.0	63.8
23:00	45.5	65.5
24:00	41.8	60.2
01:00	41.4	494
02:00	40.3	61.6
03:00	41.0	49.0
04:00	44.1	58.7
05:00	55.1	80.1
06:00	59.7	79.0
07:00	56.3	79.2
08:00	58.9	82.4
Average-Daily Noise Level (dBA CNEL/L_{dn}):		62

Noise measurements conducted on January 29-30, 2025. Refer to Figure 3 for noise measurement location. Measured noise levels were predominantly influenced by dogs barking at the nearby kennel and vehicle traffic on Prado Road. To a lesser extent, occasional aircraft overflights and distant industrial activities (e.g., material handling activities) also contributed to measured ambient noise levels on an intermittent basis.

Groundborne Vibration

No major existing sources of groundborne vibration were identified in the project area. Vehicle traffic on area roadways, particularly heavy-duty trucks, can result in increased groundborne vibration. However, groundborne vibration levels associated with vehicle traffic are typically considered minor and would not exceed applicable criteria at the project site boundaries.

REGULATORY FRAMEWORK

Noise

City of San Luis Obispo General Plan

The City's General Plan Noise Element sets noise exposure standards for the determination of land use compatibility for new noise-sensitive land uses and establishes performance standards for new transportation and non-transportation noise sources. The City's noise standards for transportation noise sources are summarized in Table 3. As depicted in Table 3, the noise standard for transportation noise sources ranges from an exterior level of 60 to 70 dBA CNEL/L_{dn}, depending on the land use. Interior noise standards for new transportation noise sources range from 35 to 45 dBA CNEL/L_{dn}. Noise generated by new transportation sources shall not exceed the noise levels presented in Table 3 for both outdoor areas and indoor spaces.

The City's General Plan noise standards for non-transportation noise sources are summarized in Table 4. With regard to new non-transportation noise sources, the City's average-hourly noise standards are 50 dBA L_{eq} during the daytime hours (7 a.m. to 10 p.m.) and 45 dBA L_{eq} during the nighttime hours (10 p.m. to 7 a.m.) Instantaneous noise level standards are 70 dBA L_{max} during the daytime hours and 65 dBA L_{max} during the nighttime hours. Impulsive noise sources, such as hammering, are limited to 65 dBA L_{max} during the daytime hours and 60 dBA L_{max} during the nighttime hours. (City of San Luis Obispo 1996).

Table 3. City of San Luis Obispo General Plan
Maximum Noise Exposure for Noise-Sensitive Uses Due to Transportation Noise Sources

Land Use	Outdoor Activity Areas (CNEL/L_{dn})[1,2]	Interior Spaces		
		CNEL/L_{dn}[2]	L_{eq}[3]	L_{max}[4]
Residences, hotels, motels, hospitals, nursing homes	60	45	--	60
Theaters, auditoriums, music halls	--	--	35	60
Churches, meeting halls, office building, mortuaries	60	--	45	-
Schools, libraries, museums	--	--	45	60
Neighborhood parks	65	--	--	-
Playgrounds	70	--	--	-

1. If the location of outdoor activity areas is not shown, the outdoor noise standard shall apply at the property line of the receiving land use.
2. L_{dn} (day-night average level) is the energy-averaged sound level measured over a 24-hour period, with a 10-dB penalty assigned to noise events occurring between 10:00 PM and 7:00 AM and a 5-dB penalty assigned to noise events occurring between 7:00 PM and 10 PM.
3. L_{eq} (equivalent sound level) is the constant or single sound level containing the same total energy as a time-varying sound, over a certain time. If the location of outdoor activity areas is not shown, the outdoor noise standard shall apply at the property line of the receiving land use.
4. L_{max} indoor standard applies only to railroad noise at locations south of Orcutt Road.
Source: City of San Luis Obispo 1996

Table 4. City of San Luis Obispo General Plan
Maximum Noise Exposure for Noise-Sensitive Uses Due to Stationary Noise Sources

Duration	Day (7 a.m. to 10 p.m.)	Night (10 p.m. to 7 a.m.)
Hourly (dBA L_{eq}) [1,2]	50	45
Maximum (dBA L_{max}) [1,2]	70	65
Impulsive (dBA L_{max}) [1,3]	65	60

1. *As determined at the property line of the receiver. When determining the effectiveness of noise mitigation measures, the standards may; be applied on the receptor side of noise barriers or other property-line noise mitigation measures.*
2. *Sound level measurements shall be made with slow meter response.*
3. *Sound level measurements shall be made with fast meter response.*

Source: City of San Luis Obispo 1996

City of San Luis Obispo Municipal Code

The City's Noise Control Ordinance is contained in Municipal Code, Chapter 9.12. Section 9.12.050 and specifies noise standards for various categories of land use. The City's municipal code standards apply to existing noise sources, as well as, construction activities.

The City's maximum allowable noise levels for short-term operation of mobile equipment and long-term operation of stationary equipment at residential properties are summarized in Tables 5 and 6. These standards applied at the property line of the receiving residential land uses for construction activities that utilize noise-generating mobile or stationary equipment. Accordingly, maximum sound levels from mobile equipment are limited to 75 dBA at single-family residential, 80 dBA at multi-family residential, and 85 dBA for mixed residential/commercial land uses. Except for emergency repair of public service utilities, or where an exception is issued by the City, construction activities are typically limited to between the hours of 7:00 a.m. and 7:00 p.m. and prohibited on Sundays and holidays. For instantaneous noise events, the City also limits interior noise levels at noise-sensitive land uses to 60 dBA L_{max}.

Table 5. City of San Luis Obispo Municipal Code
Maximum Noise Levels for Nonscheduled, Intermittent, Short-Term Operation (Less than 10 Days) of Mobile Equipment at Residential Properties

Zoning Category	Time Period	Noise Level (dBA)
Single-Family Residential	Daily 7:00 AM to 7:00 PM, except Sundays and legal holidays	75
Multi-Family Residential		80
Mixed Residential/Commercial		85
Single-Family Residential	7:00 PM to 7:00 AM, all day Sunday and legal holidays	60
Multi-Family Residential		65
Mixed Residential/Commercial		70

Source: City of San Luis Obispo 2021

Table 6. City of San Luis Obispo Municipal Code
Maximum Noise Levels for Repetitively Scheduled, Relatively Long-Term Operation (10 Days or More) of Stationary Equipment at Residential Properties

Zoning Category	Time Period	Noise Level (dBA)
Single-Family Residential	Daily 7:00 AM to 7:00 PM, except Sundays and legal holidays	60
Multi-Family Residential		65
Mixed Residential/Commercial		70
Single-Family Residential	7:00 PM to 7:00 AM, all day Sunday and legal holidays	50
Multi-Family Residential		55
Mixed Residential/Commercial		60

Source: City of San Luis Obispo 2021

Groundborne Vibration

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that noise is generally considered to be pressure waves transmitted through air, whereas vibration usually consists of the excitation of a structure or surface. As with noise, vibration consists of amplitude and frequency. A person's perception of the vibration will depend on their individual sensitivity to vibration, as well as the amplitude and frequency of the source and the response of the system which is vibrating. Vibration can be measured in terms of acceleration, velocity, or displacement. Measurements in terms of velocity are expressed as peak particle velocity (PPV) with units of inches per second (in/sec).

There are no federal, state, or local regulatory standards for groundborne vibration. However, the California Department of Transportation (Caltrans) has developed vibration criteria based on potential structural damage risks and human annoyance. Caltrans-recommended criteria for the evaluation of groundborne vibration levels, with regard to structural damage and human annoyance, are summarized in Table 7. The criteria apply to continuous vibration sources, which include vehicle traffic and most construction activities. All damage criteria for buildings are in terms of ground motion at the buildings' foundations. No allowance is included for the amplifying effects of structural components (Caltrans 2020).

As indicated in Table 7, the threshold at which there is a risk to normal structures from continuous events is 0.3 in/sec PPV for older residential structures and 0.5 in/sec PPV for newer building construction. With regard to human perception, vibration levels would begin to become distinctly perceptible at levels of 0.04 in/sec PPV for continuous events. Continuous vibration levels are considered potentially annoying for people in buildings at levels of 0.2 in/sec PPV.

Table 7. Summary of Groundborne Vibration Levels and Potential Effects

Vibration Level (in/sec ppv)	Human Reaction	Effect on Buildings
0.006 - 0.019	Threshold of perception; possibility of intrusion.	Vibrations unlikely to cause damage of any type.
0.08	Vibrations readily perceptible.	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected.
0.10	Level at which continuous vibrations begin to annoy people.	Virtually no risk of "architectural" damage to normal buildings.
0.20	Vibrations annoying to people in buildings (this agrees with the levels established for people standing on bridges and subjected to relatively short periods of vibrations).	Threshold at which there is a risk of "architectural" damage to fragile buildings.
0.3 - 0.6	Vibrations become distinctly perceptible at 0.04 in/sec ppv and considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges.	Potential risk of "architectural" damage may occur at levels above 0.3 in/sec ppv for older residential structures and above 0.5 in/sec ppv for newer structures.

The vibration levels are based on peak particle velocity in the vertical direction for continuous vibration sources, which includes most construction activities.
Source: Caltrans 2020

IMPACT ANALYSIS

Standards of Significance

Criteria for determining the significance of noise impacts were developed based on information contained in the California Environmental Quality Act (CEQA) Guidelines (Appendix G). According to those guidelines, a project may have a significant effect on the environment if it would result in the following conditions:

a) Generation of a substantial temporary or permanent increase in ambient noise levels in the project vicinity in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies; or

b) Generation of excessive groundborne vibration or groundborne noise levels; or

c) 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 private-use airport, that exposes people residing or working in the project area to excessive noise levels.

Significance thresholds used in this analysis are discussed in greater detail, as follows:

- Short-term Exposure to Construction-Generated Stationary Noise — According to the City's Municipal Code, areas consisting of single-family residential uses should be limited to a maximum construction-generated noise level of 60 dBA during the daytime hours (7:00 a.m. to 7:00 p.m.) and 50 dBA during the nighttime hours (7:00 p.m. to 7:00 a.m.) Project-generated construction stationary equipment noise levels that would exceed these limits at nearby residential land uses would be considered to have a potentially significant impact.
- Short-term Exposure to Construction-Generated Mobile Equipment Noise — According to the City's Municipal Code, areas consisting of single-family residential uses should be limited to a maximum construction-generated noise level of 75 dBA during the daytime hours (7:00 a.m. to 7:00 p.m.) and 60 dBA during the nighttime hours (7:00 p.m. to 7:00 a.m.) Project-generated construction mobile equipment noise levels that would exceed these limits at nearby noise-sensitive land uses would be considered to have a potentially significant impact.
- Long-term Exposure to Project-Generated Noise — Long-term operational noise impacts would be considered significant if the proposed project would result in a significant increase in ambient noise levels that would exceed applicable City's noise standards for transportation and stationary sources (refer to Tables 3 and 4, respectively). Significant increases in noise levels are defined as an increase of 5 dBA or more.
- Groundborne Vibration — Groundborne vibration levels would be considered significant if predicted short-term construction or long-term operational groundborne vibration levels attributable to the proposed project would exceed the commonly recommended criteria for structural damage and human annoyance of 0.2 in/sec ppv (Tables 7) at nearby existing or proposed onsite structures.

Methodology

The specific construction equipment anticipated to be required for this project has not yet been identified. As a result, short-term construction noise levels were analyzed based on typical construction equipment noise levels associated with various construction phases (e.g., ground clearing, excavation, foundations, building construction, finishing) and assuming that the two loudest pieces of equipment associated with each phase would be operating simultaneously (U.S. EPA 1971). Predicted construction noise levels at the nearest noise-sensitive land uses were calculated assuming a noise-attenuation rate of 6 dB per doubling of distance from the source. Predicted construction noise levels and assumptions are included in Appendix A).

Long-term noise impacts associated with stationary sources, such as building mechanical equipment, were predicted based on representative noise levels for similar equipment. Residential use air conditioning equipment noise levels were calculated assuming an average operational noise level of 65 dBA L_{eq} at 5 feet. To be conservative, operational AC noise levels were calculated assuming all AC units would be operating simultaneously. Commercial-use mechanical equipment noise levels were calculated based on the highest anticipated operational noise levels of 79 dBA at 50 feet associated with the potential operation of emergency backup generators and assuming one generator for each of the three proposed commercial structures. Parking lot noise levels were calculated using the Federal Transit Administration's *Noise Impact Assessment Spreadsheet* (version 1292019) based on the estimated number of parking spaces and assuming that all proposed on-site parking spaces would be accessed within a one-hour period. Noise levels were predicted based on the estimated distance from source center to the nearest off-site residential land uses located north of the project site, across Prado Road and an average noise-attenuation rate of 6 dB per doubling of distance from the source. Traffic noise levels were calculated using the Federal Highway Administration (FHWA) roadway noise prediction model (FHWA-RD-77-108) based on California vehicle reference noise levels and traffic data obtained from the traffic analysis prepared for this project (CCTC 2025). The project's contribution to traffic noise levels along area roadways was determined by comparing the predicted noise levels with and without project-generated traffic. Refer to Appendix A for noise modeling assumptions and results.

The nearest off-site structures are located approximately 25 feet from the nearest onsite construction activity areas. Ground-borne vibration levels were assessed based on representative vibration levels commonly associated with construction equipment at a distance of 25 feet (refer to Table 7).

Impacts and Mitigation Measures

Impact Noise-A:	***Generation of a substantial temporary or permanent increase in ambient noise levels in the project vicinity in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.***

Exposure to Construction Noise

Construction noise typically occurs intermittently and varies depending upon the nature or phase (e.g., demolition/land clearing, grading and excavation, erection) of construction. Noise generated by construction equipment, including earth movers, material handlers, and portable generators, can reach high levels. Although noise ranges were found to be similar for all construction phases, the initial site preparation phase tends to involve the most equipment. As noted in Table 8, noise levels generated by individual pieces of construction equipment typically range from approximately 77 to 90 dBA L_{max} at 50 feet. Typical operating cycles may involve 2 minutes of full power, followed by 3 or 4 minutes at lower settings.

Construction-generated noise levels representative of various construction phases commonly associated with typical residential and commercial development are summarized in Table 9. As depicted, construction noise levels can range from approximately 81 to 89 dBA L_{eq} at distance of 50 feet. The noise levels depicted in Table 9 are based on the two loudest pieces of non-stationary equipment commonly associated with the activities noted. Noise levels associated with stationary construction equipment (e.g., compressors, generators, pumps) are typically less averaging approximately 78 dBA L_{eq} at 50 feet.

As previously noted, the nearest residential land uses are located approximately 115 feet north of the project site, across Prado Road. Depending on the construction activities conducted, equipment used and hours of use, predicted construction mobile-equipment noise levels at the nearest residential land uses could reach a high of approximately 82 dBA L_{eq}. Predicted construction stationary-equipment noise levels would be approximately 71 dBA L_{eq}, or less, at the nearest residential land use. Construction-generated mobile-equipment noise levels could exceed applicable City noise standards of 75 dBA L_{eq} during the daytime hours (7:00 a.m. to 7:00 p.m.) and 60 dBA L_{eq} during the nighttime hours (7:00 p.m. to 7:00 a.m.).

Table 8. Typical Construction Equipment Noise Levels

Equipment	Noise Level (dBA at 50 feet)	
	L_{max}	L_{eq}
Backhoes	78	74
Bulldozers	82	78
Compressors	78	74
Cranes	81	73
Concrete Pump Truck	81	74
Drill Rigs	79	72
Dump Trucks	77	73
Excavator	81	77
Generator	81	78
Gradall	83	79
Grader	85	81
Hydraulic Break Rams	90	80
Front End Loaders	79	75
Pneumatic Tools	85	82
Pumps	81	78
Rollers	80	73
Scrapers	84	80
Tractor	84	80

Based on measured instantaneous noise levels (L_{max}), average equipment usage rates, and calculated average-hourly (L_{eq}) noise levels derived from the FHWA Road Construction Noise Model (FHWA 2008)

Table 9. Typical Noise Levels by Construction Phase

Construction Phase	Noise Level (dBA L_{eq})
Ground Clearing	83-84
Excavation	88-89
Foundations	78-81
Building Construction	81-87
Paving & Finishing	84-89

Based on the two loudest non-stationary pieces of equipment commonly used. Assumes a distance of 50 feet from the nearest source to the receiver.
Source: EPA 1974, FTA 2018

Stationary equipment used during construction could exceed the City's daytime and nighttime noise standards of 60 and 50 dBA L_{eq}, respectively. As a result, the impact of construction activities on nearby residential dwellings would be considered **potentially significant**.

Mitigation Measure

Noise-1: The following measures shall be implemented to reduce short-term construction noise impacts:

a. Construction activities (excluding activities that would result in a safety concern to the public or construction workers) shall be limited to between the hours of 7:00 a.m. and 7:00 p.m., Monday through Saturday. Construction activities shall be prohibited on Sundays and legal holidays.

b. Mobile and stationary construction equipment shall be properly maintained and equipped with exhaust mufflers and engine shrouds in accordance with manufacturers' recommendations.

c. Construction equipment staging areas shall be located at the furthest distance possible from nearby noise-sensitive land uses.

d. Stationary noise sources such as generators or pumps shall be located at the furthest distance possible from noise sensitive uses.

e. Stationary equipment located within 425 feet of nearby noise-sensitive land uses (e.g., residential dwellings) shall be shielded by use of temporary construction barriers and/or the use of equipment enclosures so as not to exceed the City's noise standard of 60 dBA L_{eq} at the property line of the nearest existing residential land use. Equipment barriers shall be constructed so that there are no visible air gaps between barrier material components or at the base of the barrier. Use of three-quarter inch plywood or sound blankets having a minimum STC rating of 21 would typically be considered sufficient. Refer to Appendix B for example construction equipment barriers and equipment enclosures.

Significance after Mitigation

Mitigation Measure Noise-1 would limit the periods during which construction activities would occur when in the vicinity of nearby noise-sensitive land uses. Additional measures would also be required to further reduce the potential for noise exposure, including the use of alternatively powered equipment, exhaust mufflers, engine shrouds, and equipment enclosures for stationary sources located in the vicinity of noise-sensitive uses. The use of equipment mufflers would reduce construction noise levels by approximately 10 dBA, or more. The use of construction equipment barriers/enclosures would reduce construction equipment noise levels by a minimum of 5 dBA. With mitigation, predicted construction noise levels would not exceed the City's daytime noise standard of 75 dBA L_{eq} for mobile sources or 60 dBA L_{eq} for stationary sources at nearby existing noise-sensitive land uses. With mitigation, this impact would be considered **less than significant.**

Exposure to Increased Stationary Source Noise

Noise sources commonly associated with proposed future land uses would include occasional parking lot activities (e.g., opening and closing of vehicle doors, people talking), and use of onsite building equipment, such as HVAC systems. Noise levels associated with these noise sources are discussed separately, as follows:

<u>Residential Building Mechanical Equipment</u>

Proposed residential dwelling units would be anticipated to include the use of building mechanical equipment, such as air conditioning (AC) units and exhaust fans. The specific building mechanical equipment to be installed and the locations of such equipment have not yet been identified. Building mechanical equipment (e.g., air conditioning units, exhaust fans) would typically be located within the structures, enclosed, or placed on rooftop areas away from direct public exposure. Exterior air conditioning units for residential land uses can generate noise levels of approximately 55-65 dBA L_{eq} at 5 feet.

Based on the preliminary site plans, the nearest residential land uses are located approximately 115 feet north of the project site. Based on a maximum operational noise level of 65 dBA L_{eq}, and an average noise attenuation rate of 6 dB/doubling of distance from the source, predicted noise levels at this nearest existing residential land use would be approximately 43 dBA L_{eq}. This predicted noise level assumes a total of 21 exterior AC units associated with the nearest proposed dwellings would be operating simultaneously, all AC units would be located at ground level, an estimated 8 AC units could be located within direct line-of-sight at any given location along the nearest property line of existing residential land uses, and a minimum noise reduction of 5 dB for intervening structures at the remaining 13 AC units. It is important to note that AC units for multi-family structures are typically located on roof-top areas and shielded from direct public exposure, which would further reduce operational noise levels. For this reason and given that other onsite structures would be largely shielded from direct line-of-sight to the nearest existing residential land uses and at increased distances from the nearest existing residences, the contribution of operational AC unit noise levels associated with other onsite structures at the nearest existing residential land uses would be negligible (i.e., 1 dB, or less). In total, assuming all AC units at proposed onsite structures were to be operating simultaneously, predicted noise levels at the nearest off-site residential land uses located north of Prado Road would be approximately 44 dBA L_{eq}, or less. Predicted operational noise levels would not exceed the City of San Luis Obispo's daytime or nighttime noise standards of 50 and 45 dBA L_{eq}, respectively. As a result, this impact would be considered **less than significant.**

<u>Commercial-Use Mechanical Equipment</u>

Noise sources commonly associated with commercial and retail uses may include mechanical equipment such as back-up power generators, trash compactors, and refrigeration condensing units. Noise levels associated with these types of equipment can vary depending on various factors, including equipment size, location, and hours of operation. Based on measurement data obtained from representative equipment, operational noise levels associated with back-up power generators can reach levels of approximately 78 dBA L_{eq} at 50 feet (FTA 2018. FHWA 2008). Refrigeration condensers and trash compactors can generate noise levels of up to approximately 60 dBA L_{eq} at 50 feet (Lennox 2022).

The nearest existing residential land uses are located in excess of approximately 1,000 feet to the north, across Prado Road, and would be largely shielded from direct line-of-sight by intervening on-site structures. Based on distances from the proposed commercial building to the nearest existing residential land use and assuming a maximum operational noise levels of 78 dBA L_{eq} at 50 feet, predicted operational noise levels at these nearest existing residential land uses would be approximately 40 dBA L_{eq}, or less. It is important to note that this predicted operational noise level assumes one exterior generator located at each of the three proposed commercial-use buildings, all generators operating simultaneously within a one-hour period, and a minimum noise reduction of 10 dB for intervening structures. The use of other commercial equipment (e.g., compactors, condensing units) would be less. In addition, estimated shielding provided by intervening on-site structures and distances to onsite sources would likely be greater. As a result, predicted operational noise levels at the nearest existing off-site residential land uses located north of Prado Road would likely be less than 44 dBA L_{eq}. Predicted operational noise levels at nearby existing residential land uses would not exceed the City's daytime or nighttime noise standards of 50 and 45 dBA L_{eq}, respectively. As a result, this impact would be considered **less than significant.**

Vehicle Parking Lot

The proposed project includes the construction of various on-site parking areas. The largest parking areas having the largest hourly turn-over rate would be located within the southern portion of the project site, associated with the proposed commercial uses and would be largely shielded from direct line-of-sight to nearby existing residential land uses by intervening on-site structures . Based on noise levels associated with large commercial land uses, predicted hourly noise levels would not be projected to exceed 45 dBA L_{eq} at the nearest property lines. Assuming all major parking areas were to be accessed simultaneously within a one-hour period and a minimum noise reduction of 10 dB due to shielding provided by intervening structures, predicted noise levels at the property line of the nearest off-site residential land uses would be negligible (i.e., 2 dB, or less) and would be largely masked by existing ambient/traffic noise levels. Predicted noise levels associated with on-site parking lot activities would not exceed the City of San Luis Obispo's daytime or nighttime noise standards of 50 and 45 dBA L_{eq}, respectively, at the nearest existing residential land uses. As a result, this impact would be considered **less than significant.**

Exposure to Increased Roadway Traffic Noise

Implementation of the proposed project would result in increased traffic volumes on some area roadways. The increase in traffic volume resulting from implementation of the proposed project would, therefore, contribute to predicted increases in traffic noise levels. Predicted changes in traffic noise levels in comparison to no-project conditions for existing and future cumulative conditions are discussed, as follows:

Predicted increases in existing and future cumulative traffic noise levels along area roadways are summarized in Table 10 and Table 11, respectively. As depicted in Table 10, implementation of the proposed project would result in predicted increases in existing traffic noise levels of approximately 1.14 dBA, or less, along primarily affected area roadway segments (refer to Table 10). As noted earlier in this report, perceptible changes in ambient noise levels do not typically occur at levels below 3 dBA. Based on the modeling conducted, implementation of the proposed project would not result in a significant increase in existing traffic noise levels at nearby noise-sensitive land uses. Under future cumulative conditions, taking into account proposed changes in planned vs. proposed onsite development, the proposed project would result in slight reductions in traffic noise levels along most area roadways, with only a negligible increase in traffic noise levels of 0.1 dBA CNEL occurring along a portion of Tank Farm Road (refer to Table 11). As a result, predicted increases in traffic noise levels associated with implementation of the proposed project would be considered **less than significant**.

Table 10. Predicted Increases in Traffic Noise Levels - Existing Conditions

Roadway	ADT	Predicted CNEL, 50 Feet from Near-Travel Lane Centerline	Predicted Change	Significant Increase?

	Without Project	With Project	Without Project	With Project		
Higuera St., Madonna Rd. to Margarita Ave.	14,900	15,420	65.46	65.61	0.15	No
Higuera St., Margarita Ave. to Prado Rd.	12,870	13,390	64.83	65.00	0.17	No
Higuera St., Prado Rd. to Tank Farm Rd.	16,200	16,660	65.83	65.95	0.12	No
Higuera St., Tank Farm Rd. to Suburban Rd.	21,100	21,430	66.97	67.04	0.07	No
Higuera St., Suburban Rd. to LOVR	24,300	24,560	67.59	67.63	0.04	No
Prado Rd., U.S.-101 Ramps to S. Higuera St.	7,200	7,450	62.77	62.91	0.14	No
Prado Rd., S. Higuera St. to Serra Meadows Rd.	4,270	5,560	59.92	61.06	1.14	No
Tank Farm Rd., Higuera St. to Innovation Wy.	17,950	18,090	68.51	68.54	0.03	No
Tank Farm Rd., Innovation Wy. To Santa Fe Rd.	14,440	14,510	68.48	68.50	0.02	No
Tank Farm Rd., Santa Fe Rd. to Broad St.	19,010	19,080	68.76	68.77	0.01	No

ADT = Average Daily Traffic
Traffic noise levels were calculated using the FHWA roadway noise prediction model (FHWA-RD-77-108) based on data obtained from the traffic analysis prepared for this project. Totals may not sum due to rounding.
ADT Source: CCTC 2025

Table 11. Predicted Increases in Traffic Noise Levels – Future Cumulative Conditions

Roadway	ADT		Predicted CNEL, 50 Feet from Near-Travel Lane Centerline		Predicted Change	Significant Increase?
	Without Project	With Project	Without Project	With Project		
Higuera St., Madonna Rd. to Margarita Ave.	15,400	15,270	65.61	65.57	-0.04	No
Higuera St., Margarita Ave. to Prado Rd.	17,090	16,960	66.06	66.02	-0.04	No
Higuera St., Prado Rd. to Tank Farm Rd.	17,750	17,680	66.22	66.20	-0.02	No
Higuera St., Tank Farm Rd. to Suburban Rd.	21,130	21,060	66.98	66.96	-0.02	No
Higuera St., Suburban Rd. to LOVR	24,300	24,230	67.59	67.57	-0.02	No
Prado Rd., U.S.-101 Ramps to S. Higuera St.	31,140	30,760	68.66	68.61	-0.05	No
Prado Rd., S. Higuera St. to Serra Meadows Rd.	30,070	29,900	68.39	68.37	-0.02	No
Tank Farm Rd., Higuera St. to Innovation Wy.	20,400	20,450	69.06	69.07	0.01	No
Tank Farm Rd., Innovation Wy. To Santa Fe Rd.	14,440	14,440	68.48	68.48	0.00	No
Tank Farm Rd., Santa Fe Rd. to Broad St.	27,230	27,180	70.32	70.31	-0.01	No

ADT = Average Daily Traffic
Traffic noise levels were calculated using the FHWA roadway noise prediction model (FHWA-RD-77-108) based on data obtained from the traffic analysis prepared for this project. Totals may not sum due to rounding.
ADT Source: CCTC 2025

<u>Compatibility with City of San Luis Obispo General Plan Noise Standards</u>

The City's General Plan Noise Element sets noise exposure standards for the determination of land use compatibility for new noise-sensitive land uses. The City's noise standards for new residential land uses that are exposed to transportation noise is an exterior level of 60 dBA CNEL/L_{dn} within outdoor activity areas and an interior noise standard of 45 dBA CNEL/L_{dn}. Exterior noise levels up to 70 dBA CNEL may be allowed if noise-reduction measures have been incorporated. Refer to Figure 5 for projected future cumulative noise contours.

Based on the traffic noise modeling conducted for this project, the 60 dBA CNEL/L_{dn} future cumulative traffic noise contour would extend to approximately 220 feet from the centerline of Prado Road (refer to Figure 5). As depicted in Figure 5, proposed residential land uses would be located within the projected 60 dBA CNEL/L_{dn} future cumulative noise contour of Prado Road. Based on preliminary site plans, predicted future cumulative traffic noise levels at the façade of the nearest proposed residential dwellings would be approximately 66 dBA CNEL/L_{dn}. Based on this exterior noise level and assuming an average exterior-to-interior noise reduction of 25 dBA, which is typical for new building construction, predicted interior noise levels at onsite residential land uses located nearest Prado Road would be approximately 36 dBA CNEL/L_{dn}, or less, and would not exceed the City's interior noise standard of 45 dBA CNEL/L_{dn}. Outdoor activity areas of these nearest residential dwellings would be largely shielded from traffic noise emanating from Prado Road by intervening residential structures. However, depending on final site design, predicted exterior noise levels at rear-yard outdoor activity areas could potentially exceed the City's noise standard of 60 dBA CNEL/L_{dn}.

Recommended Measure

- Residential land uses located within 220 feet of Prado Road shall be designed so that the rear-yards of these dwellings are shielded from direct line-of-sight of Prado Road. Shielding may include the use of intervening structures or barriers, or a combination thereof. The emphasis of such measures shall be placed upon site planning and project design. Where barriers are required to provide shielding (e.g., side yards), barriers shall be constructed to a minimum height of 6 feet and of materials having a minimum surface weight of 2 pounds per square foot, or greater. Barrier components shall be constructed so that there are no visible air gaps between barrier material components or at the base of the barrier. Overlapping or connecting panels (e.g., board-and-batten or tongue-groove) of three-quarter inch redwood would typically be considered sufficient (refer to Appendix B for example barrier design).

  With implementation of the above recommended measure, outdoor activity areas of residential dwellings located nearest Prado Road would be shielded by intervening structures and/or the installation of noise barriers. With implementation of this measure, predicted exterior noise levels within rear-yard outdoor activity areas would be reduced to less than 60 dBA CNEL/L_{dn}, in compliance with the City's noise standards for land use compatibility.

Figure 5. Predicted Future Cumulative Traffic Noise Contours

Depicts predicted average-daily traffic noise contours for Prado Road. Based on future cumulative traffic volume data for Prado Road, S. Higuera Street to Serra Meadows Road.

Impact Noise-B: Generation of excessive groundborne vibration or groundborne noise levels.

No major stationary sources of groundborne vibration were identified in the project area that would result in the long-term exposure of proposed onsite land uses to unacceptable levels of ground vibration. In addition, the proposed project would not involve the use of any major equipment or processes that would result in potentially significant levels of ground vibration that would exceed these standards at nearby existing land uses. However, construction activities associated with the proposed project would require the use of various tractors, trucks, and jackhammers that could result in intermittent increases in groundborne vibration levels. The use of major groundborne vibration-generating construction equipment/processes (i.e., blasting, pile driving) is not anticipated to be required for construction of future onsite land uses.

Groundborne vibration levels commonly associated with construction equipment are summarized in Table 12. As identified, groundborne vibration levels generated by construction equipment would be approximately 0.09 in/sec ppv, or less, at 25 feet.

The nearest off-site structures are located approximately 25 feet east of the project site. The nearest occupied sensitive structures are residential dwellings located in excess of 115 feet north of the project site. Assuming a maximum vibration level of 0.09 in/sec ppv at 25 feet, predicted vibration levels at the nearest off-site structures would not be anticipated to exceed the minimum recommended criteria for structural damage or human annoyance (0.2 in/sec ppv). As a result, short-term groundborne vibration impacts would be considered **less than significant**.

Table 12. Representative Vibration Source Levels for Construction Equipment

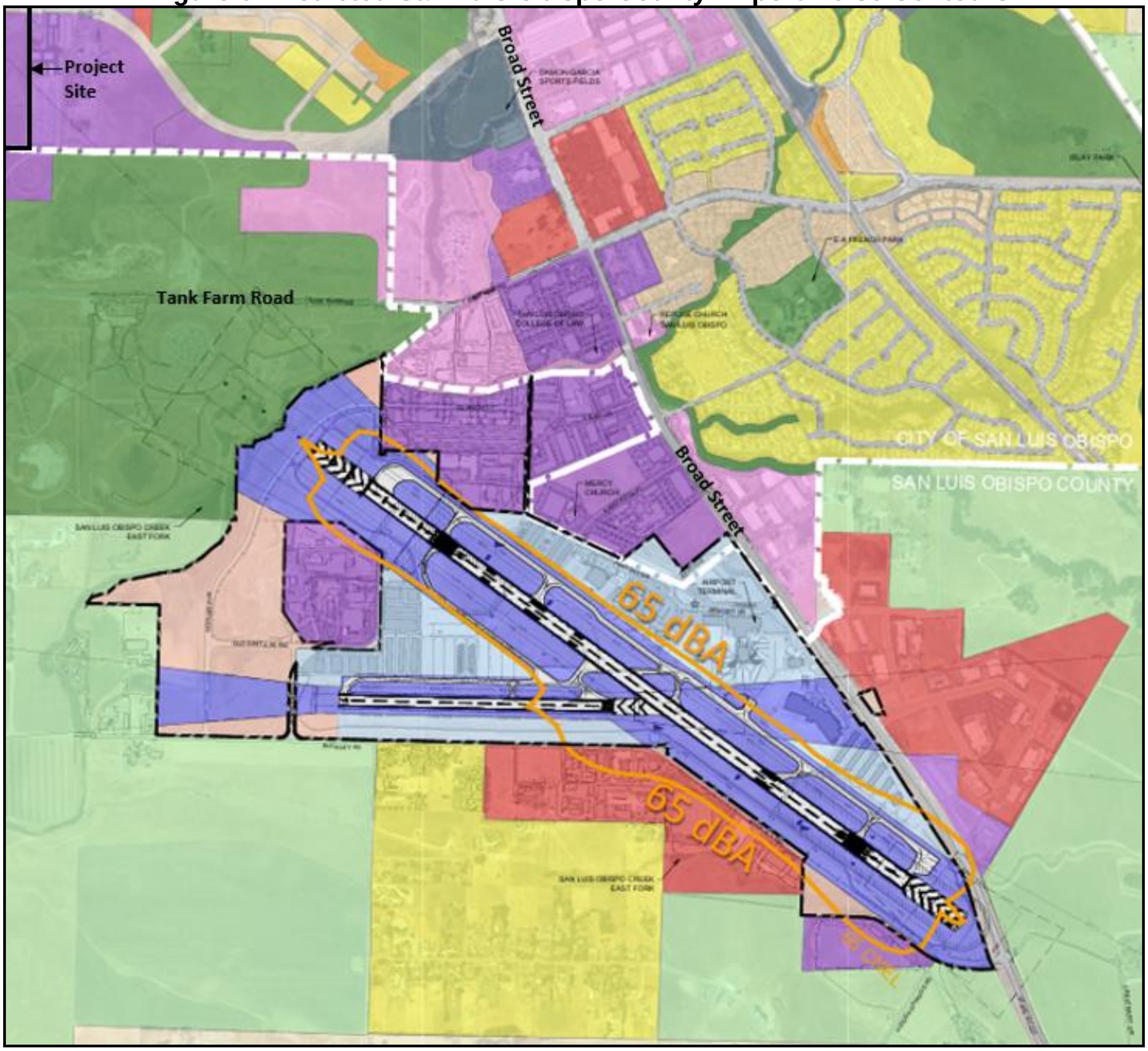
Equipment	Peak Particle Velocity at 25 Feet (In/Sec)
Large Bulldozers	0.089
Loaded Trucks	0.076
Jackhammer	0.035
Small Bulldozers	0.003
Source: FTA 2006, Caltrans 2013	

Impact Noise-C: 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 private-use airport, that exposes people residing or working in the project area to excessive noise levels.

The nearest public-use airport is San Luis Obispo County Airport (SBP), which is located approximately 0.7 miles southeast of the project site. No private airstrips were identified within two miles of the project site.

According to the San Luis Obispo County Airport Master Plan, all residential land uses are considered compatible with cumulative aircraft noise levels below 65 dBA CNEL (San Luis Obispo County 2023). Projected noise contours for SBP for are depicted in Figure 6. As shown, the projected 65 dBA CNEL noise contour for SBP is confined largely to the airport property (refer to Figure 6). Proposed residential land uses would not be located within the projected SBP 65 dBA CNEL noise contour (refer to Figure 3). As a result, this impact would be considered **less than significant**.

Figure 6. Predicted San Luis Obispo County Airport Noise Contours



Source: San Luis Obispo County 2023.

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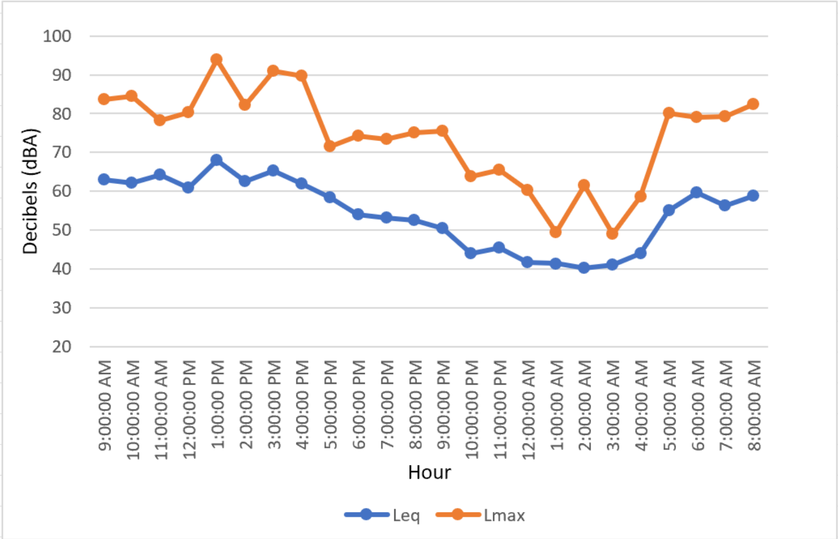
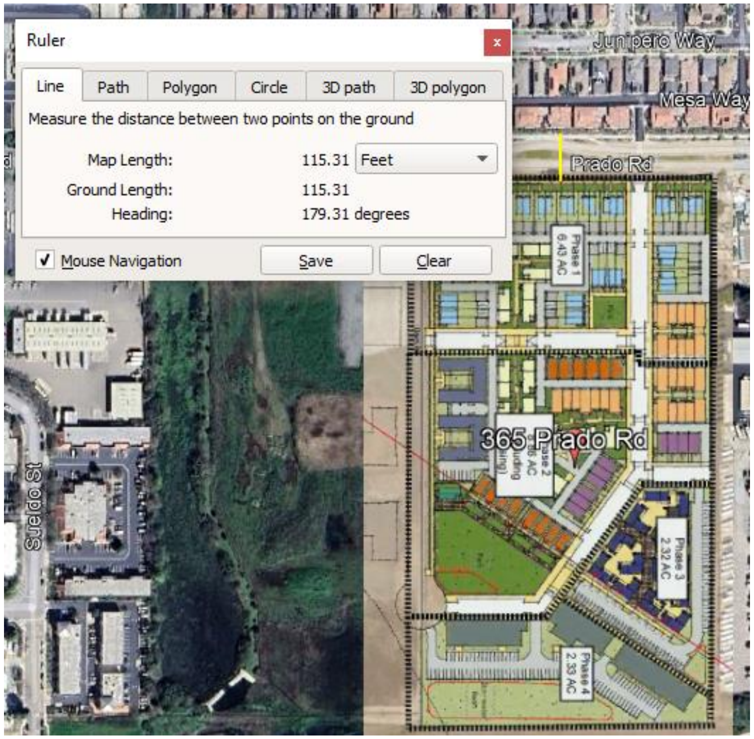
APPENDIX A
NOISE MODELING & SUPPORTIVE DOCUMENTATION

MEASURED AMBIENT NOISE LEVELS

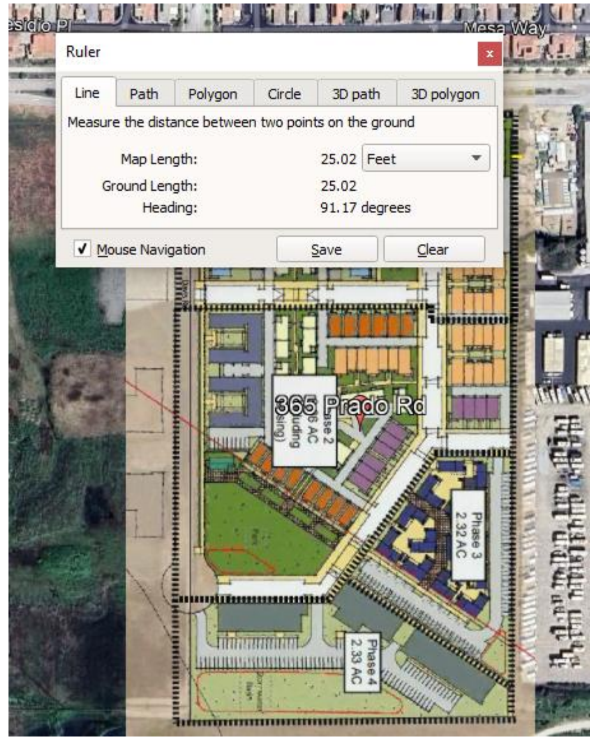
Start Date	Start Time	Leq	Lmax
1/29/2025	9:00:00 AM	62.9	83.7
1/29/2025	10:00:00 AM	62.1	84.5
1/29/2025	11:00:00 AM	64.3	78.2
1/29/2025	12:00:00 PM	61	80.3
1/29/2025	1:00:00 PM	68.1	93.8
1/29/2025	2:00:00 PM	62.5	82.1
1/29/2025	3:00:00 PM	65.3	91
1/29/2025	4:00:00 PM	61.9	89.7
1/29/2025	5:00:00 PM	58.5	71.5
1/29/2025	6:00:00 PM	54	74.3
1/29/2025	7:00:00 PM	53.1	73.5
1/29/2025	8:00:00 PM	52.6	75.1
1/29/2025	9:00:00 PM	50.4	75.6
1/29/2025	10:00:00 PM	44	63.8
1/29/2025	11:00:00 PM	45.5	65.5
1/30/2025	12:00:00 AM	41.8	60.2
1/30/2025	1:00:00 AM	41.4	49.4
1/30/2025	2:00:00 AM	40.3	61.6
1/30/2025	3:00:00 AM	41	49
1/30/2025	4:00:00 AM	44.1	58.7
1/30/2025	5:00:00 AM	55.1	80.1
1/30/2025	6:00:00 AM	59.7	79
1/30/2025	7:00:00 AM	56.3	79.2
1/30/2025	8:00:00 AM	58.9	82.4



DISTANCES TO NEARBY LAND USES



RESIDENTIAL LAND USES: 115 FEET



NON-RESIDENTIAL LAND USES: 25 FEET

PREDICTED CONSTRUCTION NOISE LEVELS

Construction Phase	Reference Noise Levels (dBA L_{eq}) at 50 feet	Predicted Noise Level at 115 feet
Ground Clearing	83-84	76-77
Excavation	88-89	81-82
Foundations	78-81	71-74
Building Construction	81-87	74-80
Paving & Finishing	84-89	77-82

Assumes construction activities would occur at the nearest property line. Based on a distance of 115 feet from the northern site boundary to the nearest residential land uses located north of the project site across Prado Road. Assumes a noise-attenuation rate of 6 dB/doubling of distance. Does not include shielding.

Source: U.S. EPA 1971

PREDICTED CONSTRUCTION STATIONARY EQUIPMENT NOISE LEVELS

Reference Noise Level (dBA Leq):	78
Reference Distance (feet):	50
Receptor Distance (feet):	115
Shielding:	0
Predicted Noise Level (dBA Leq):	71
Distance to <60 dBA Leq (feet):	425

TRAFFIC NOISE MODELING

PRIMARILY AFFECTED ROADWAYS		EXISTING ADT			SPEED (MPH)	NUMBER OF LANES	CENTER LANE (FEET)	CNEL/LDN AT 50 FT FROM NEAR TRAVEL LANE CENTER LINE			DISTANCE TO CNEL CONTOURS (FEET)		
		NO PROJECT	WITH PROJECT	CHANGE				NO PROJECT	WITH PROJECT	CHANGE	70	65	60
HIGUERA ST	MADONNA RD TO MARGARITA AVE	14900	15420	520	40	4	12	65.46	65.61	0.15			
HIGUERA ST	MARGARITA AVE TO PRADO RD	12870	13390	520	40	4	12	64.83	65	0.17			
HIGUERA ST	PRADO RD TO TANK FARM RD	16200	16660	460	40	4	12	65.83	65.95	0.12			
HIGUERA ST	TANK FARM RD TO SUBURBAN RD	21100	21430	330	40	4	12	66.97	67.04	0.07			
HIGUERA ST	SUBURBAN RD TO LOVR	24300	24560	260	40	4	12	67.59	67.63	0.04			
PRADO RD	US-101 RAMPS TO S HIGUERA ST	7200	7450	250	35	2	0	62.77	62.91	0.14			
PRADO RD	S HIGUERA ST TO SERRA MEADOWS RD	4270	5560	1290	35	2	12	59.92	61.06	1.14	WROW	WROW	72.6
TANK FARM RD	HIGUERA ST TO INNOVATION WAY	17950	18090	140	45	1EB / 2WB	12	68.51	68.54	0.03			
TANK FARM RD	INNOVATION WY TO SANTA FE RD	14440	14510	70	45	2	0	68.48	68.5	0.02			
TANK FARM RD	SANTA FE RD TO BROAD ST	19010	19080	70	45	2EB / 1WB	12	68.76	68.77	0.01			

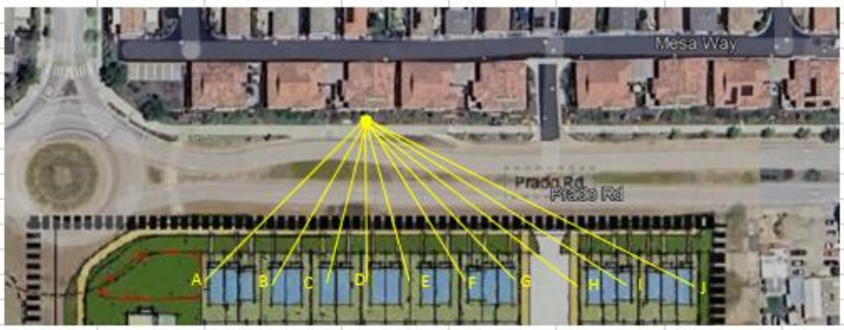
PRIMARILY AFFECTED ROADWAYS		FUTURE CUMULATIVE ADT			SPEED (MPH)	NUMBER OF LANES	CENTER LANE (FEET)	CNEL/LDN AT 50 FT FROM NEAR TRAVEL LANE CENTER LINE			DISTANCE TO CNEL CONTOURS (FEET)		
		NO PROJECT	WITH PROJECT	CHANGE				NO PROJECT	WITH PROJECT	CHANGE	70	65	60
HIGUERA ST	MADONNA RD TO MARGARITA AVE	15400	15270	-130	40	4	12	65.61	65.57	-0.04			
HIGUERA ST	MARGARITA AVE TO PRADO RD	17090	16960	-130	40	4	12	66.06	66.02	-0.04			
HIGUERA ST	PRADO RD TO TANK FARM RD	17750	17680	-70	40	4	12	66.22	66.2	-0.02			
HIGUERA ST	TANK FARM RD TO SUBURBAN RD	21130	21060	-70	40	4	12	66.98	66.96	-0.02			
HIGUERA ST	SUBURBAN RD TO LOVR	24300	24230	-70	40	4	12	67.59	67.57	-0.02			
PRADO RD	US-101 RAMPS TO S HIGUERA ST	31140	30760	-380	40	4	12	68.66	68.61	-0.05			
PRADO RD	S HIGUERA ST TO SERRA MEADOWS RD	30070	29900	-170	35	2	12	68.39	68.37	-0.02	WROW	102.7	220
TANK FARM RD	HIGUERA ST TO INNOVATION WAY	20400	20450	50	45	1EB / 2WB	12	69.06	69.07	0.01			
TANK FARM RD	INNOVATION WY TO SANTA FE RD	14440	14440	0	45	2	0	68.48	68.48	0			
TANK FARM RD	SANTA FE RD TO BROAD ST	27230	27180	-50	45	2EB / 1WB	12	70.32	70.31	-0.01			

RESIDENTIAL AC UNITS – FIRST ROW SOURCES

RESIDENTIAL AC UNITS - 1ST ROW

LOCATION	DISTANCE (FEET)	REFERENCE NOISE LEVEL (dBA Leq) AT 5 FEET	NUMBER OF UNITS	SHIELDED	MINIMUM SHIELDING	PREDICTED NOISE LEVELS
A	240	65	2	YES	5	29
B	200	65	2	YES	5	31
C	180	65	3	NO	0	38
D	170	65	2	NO	0	37
E	180	65	2	NO	0	37
F	200	65	2	YES	5	31
G	230	65	2	YES	5	30
H	290	65	1	NO	0	30
I	330	65	2	YES	5	26
J	385	65	3	YES	5	27
			21		COMBINED:	43

Assumes 20 units within the first row of dwelling units operating simultaneously. 10 AC units unshielded. Minimum noise reduction of 5 dB due to structural shielding. All units at ground level.



RESIDENTIAL AC UNITS - NON-1ST ROW

LOCATION	DISTANCE (FEET)	REFERENCE NOISE LEVEL (dBA Leq) AT 5 FEET	NUMBER OF UNITS	BLDGS/ROWS	SHIELDING	PREDICTED NOISE LEVELS
A	280	65	2	1	5	28
B	245	65	7	2	7	33
C	255	65	3	2	7	29
D	370	65	3	2	7	26
E	345	65	5	3	8	27
F	315	65	2	3	8	24
G	405	65	3	3	8	24
H	370	65	7	3	8	28
I	430	65	19	4	10	30
J	405	65	7	3	8	27
K	455	65	5	2	7	26
L	565	65	5	3	8	23
M	555	65	6	4	10	22
N	595	65	5	5	10	20
O	625	65	19	5	10	26
P	600	65	6	4	10	22
Q	690	65	5	5	10	18
R	690	65	2	5	10	14
S	585	65	6	4	10	22
T	715	65	5	5	10	18
U	750	65	4	5	10	16
V	760	65	5	4	10	19
W	780	65	6	4	10	19
X	885	65	3	4	10	15
Y	845	65	6	5	10	17
Z	960	65	7	5	10	17
AA	1025	65	48	5	10	25
			201		COMBINED:	38
				COMBINED ALL RES AC:		44

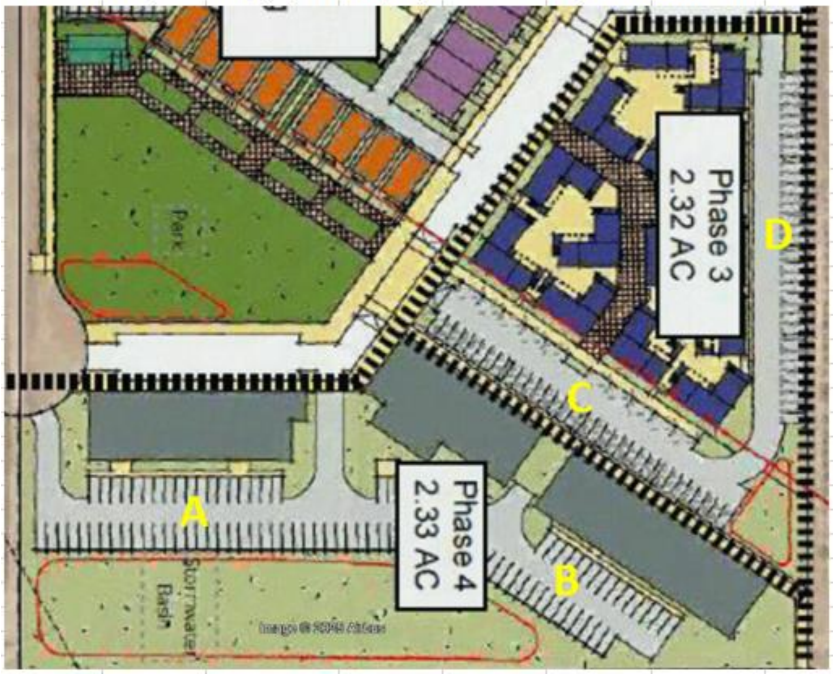
COMMERCIAL-USE MECHANICAL EQUIPMENT

NOISE PREDICTION CALCULATION				
Distance from Source Center (feet)	(dB)			
50	78	Reference Distance and Noise Level (All Sources)		
	(dB)	Shielding	(dB)	Receiver Description
1035	52	12	40	Building A
1100	51	12	39	Building B
1155	51	12	39	Building C
		COMBINED	44	

PARKING LOTS

					PREDICTED NOISE LEVEL AT RESIDENTIAL PL (dBA LEQ)		
	~NUMBER OF SPACES	DISTANCE FROM SOURCE CENTER TO RESIDENTIAL PL (FEET)	NUMBER OF ACTIVE SPACES	SHIELDING	WITH 5 dB SHIELDING	WITH 10dB SHIELDING	PREDICTED REF NOISE LEVEL AT 50 FT (UNSHIELDED)
LOT A	60	1245	60	YES	4.8		44
LOT B	35	1305	35	YES	1.9		42
LOT C	35	1135	35	YES	3.4		42
LOT D	35	1015	35	YES	4.7		42
FTA Noise Impact Assessment Spreadsheet v1292019				COMBINED	12	2	

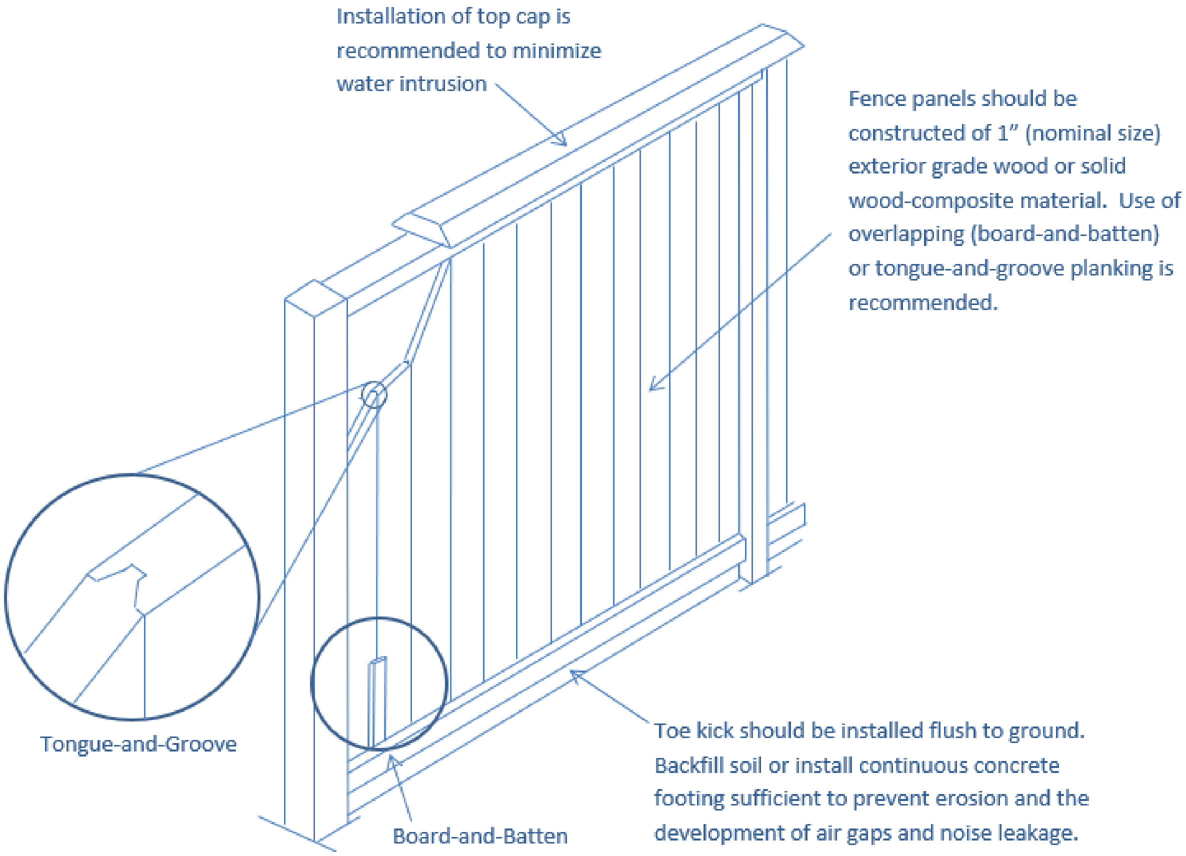
Assumes minimum of 5 dB shielding for first building row/structure and 1.5 dB for each additional structure.



APPENDIX B
EXAMPLE NOISE-REDUCTION BARRIERS

EXAMPLE CONSTRUCTION STATIONARY EQUIPMENT ENCLOSURES/BARRIERS

EXAMPLE TRAFFIC NOISE BARRIER DESIGN (WOOD)



Fencing should be constructed of exterior grade 1" (nominal size) materials having a minimum surface weight of 2 lbs/square foot and installed sufficient to ensure a tight fit with no air gaps. Use of overlapping (board-and-batten) or tongue-and-groove planking is recommended. Where necessary, joints between materials should be caulked to minimize water intrusion and the development of air gaps due to material shrinkage or warping.