# 12 NOISE

## INTRODUCTION

This chapter includes a description of ambient noise conditions, a summary of applicable regulations related to noise and vibration, and an analysis of the potential impacts resulting from the implementation of the proposed project. Mitigation measures are recommended, as necessary, to reduce potentially significant impacts.

## ENVIRONMENTAL SETTING

### ACOUSTIC FUNDAMENTALS

Noise is generally defined as sound that is loud, disagreeable, unexpected, or unwanted. Sound, as described in more detail below, is mechanical energy transmitted in the form of a wave because of a disturbance or vibration, and as any pressure variation in the air that the human ear can detect.

#### *SOUND PROPERTIES*

A sound wave is introduced into a medium (air) by a vibrating object. The vibrating object (e.g., vocal cords, the string and soundboard of a guitar, the diaphragm of a radio speaker) is the source of the disturbance that moves through the medium. Regardless of the type of source that creates the sound wave, the particles of the medium through which the sound moves are vibrating in a back-and-forth motion at a given frequency (pitch).[1] A commonly used unit for frequency is cycles per second, called hertz (Hz).[2]

A wave transports energy along a medium. The amount of energy carried by a wave is related to the amplitude (loudness) of the wave. A high-energy wave is characterized by high amplitude; a low-energy wave is characterized by low amplitude. The amplitude of a wave refers to the maximum amount of displacement of a particle from its rest position. The energy transported by a wave is directly proportional to the square of the amplitude of the wave. This means that a doubling of the amplitude of a wave is indicative of a quadrupling of the energy transported by the wave.

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[1] The frequency of a wave refers to how often the particles vibrate when a wave passes through the medium. The frequency of a wave is measured as the number of complete back-and-forth vibrations of a particle per unit of time. If a particle of air undergoes 1,000 longitudinal vibrations in 2 seconds, then the frequency of the wave would be 500 vibrations per second.

[2] Hertz (abbreviated: Hz) is the standard unit of measurement used for measuring frequency. Since frequency is measured in cycles per second, one hertz equals one cycle per second. Hertz is commonly used to measure wave frequencies, such as sound waves, light waves, and radio waves. For example, the average human ear can detect sound waves between 20 and 20,000 Hz. Sound waves close to 20 Hz have a low pitch and are called "bass" frequencies. Sound waves above 5,000 Hz have a high pitch and are called “treble” frequencies.

## SOUND AND THE HUMAN EAR

Because of the ability of the human ear to detect a wide range of sound-pressure fluctuations, sound-pressure levels are expressed in logarithmic units called decibels (dB) to avoid a very large and awkward range in numbers. The sound pressure level in decibels is calculated by taking the log of the ratio between the actual sound pressure and the reference sound pressure squared. The reference sound pressure is considered the absolute hearing threshold (Caltrans 2013). Use of this logarithmic scale reveals that the total sound from two individual sources, each measured at 65 A-weighted decibels (dBA), is 68 dBA, not 130 dBA; that is, doubling the source strength increases the sound pressure by 3 dBA. Typical noise levels associated with various sources are shown on Plate NOI-1.

Because the human ear is not equally sensitive to all sound frequencies, a specific frequency-dependent rating scale was devised to relate noise to human sensitivity. A dBA scale performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear. The basis for compensation is the faintest sound audible to the average ear at the frequency of maximum sensitivity. This dBA scale has been chosen by most authorities to regulate environmental noise. With respect to how humans perceive and react to changes in noise levels, a 1-dBA increase is imperceptible, a 3-dBA increase is barely perceptible, a 6-dBA increase is clearly noticeable, and a 10-dBA increase is subjectively perceived as approximately twice as loud (Egan 1988), as presented in Table NOI-1.[3]

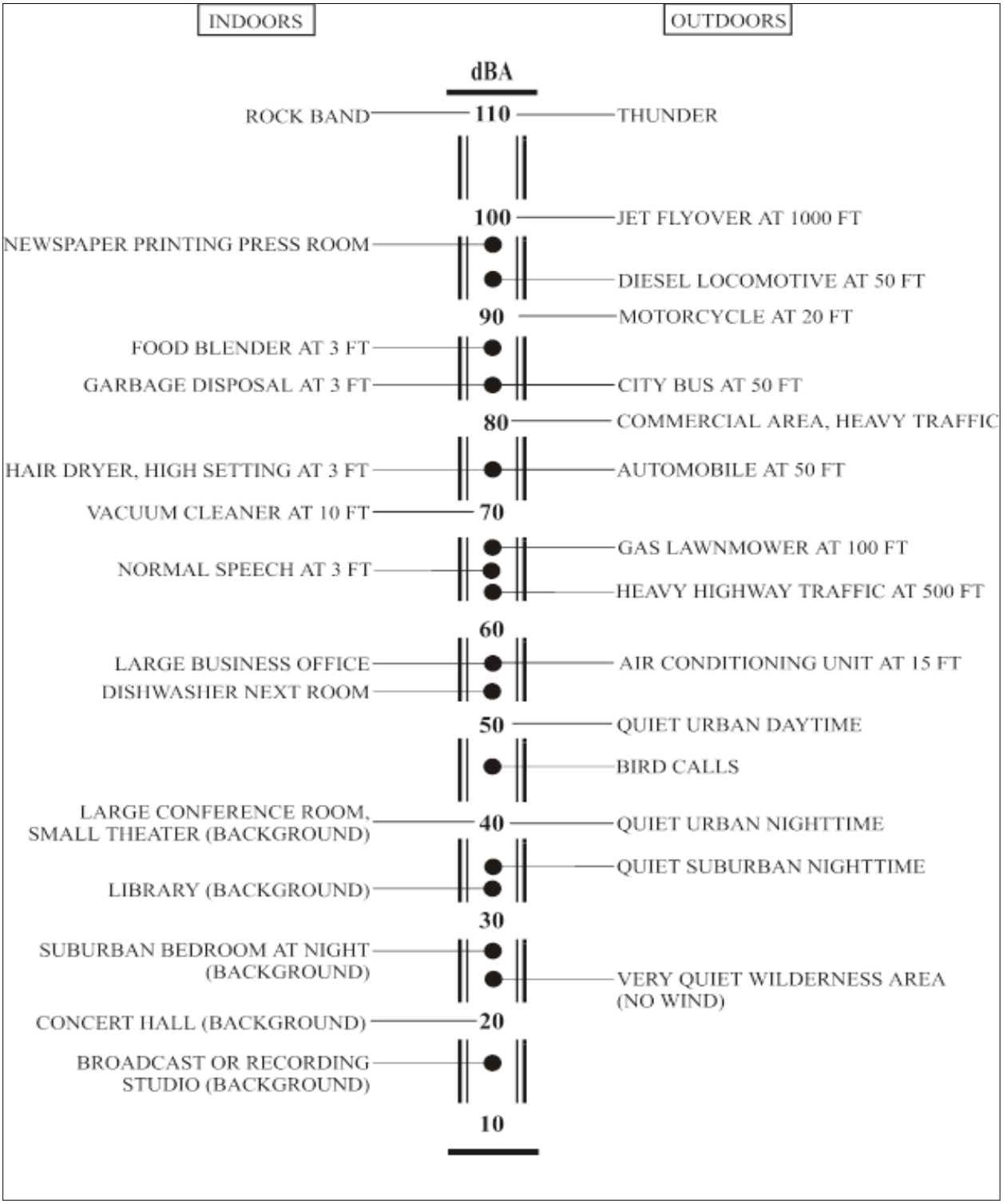
**Table NOI-1. Subjective Reaction to Changes in Noise Levels of Similar Sources**

| Change in Level, dBA | Subjective Reaction | Factor Change in Acoustical Energy |
|---|---|---|
| 1 | Imperceptible (except for tones) | 1.3 |
| 3 | Just barely perceptible | 2.0 |
| 6 | Clearly noticeable | 4.0 |
| 10 | About twice (or half) as loud | 10.0 |

Source: Egan 1988
Note: dBA = A-weighted decibels

[3] Table NOI-1 was developed on the basis of the reactions of test subjects to changes in the levels of steady-state pure tones or broadband noise and changes in levels of a given noise source. It is probably most applicable to noise levels in the range of 50–70 dBA, as this is the usual range of voice and interior noise levels.

## Plate NOI-1: Typical Noise Levels




Source: Caltrans 2013
Notes:
dBA = A-weighted decibels

## SOUND PROPAGATION AND ATTENUATION

As sound (noise) propagates from the source to the receptor, the attenuation, or manner of noise reduction in relation to distance, is dependent on surface characteristics, atmospheric conditions, and the presence of physical barriers. The inverse-square law describes the attenuation caused by the pattern in which sound travels from the source to the receptor. Sound travels uniformly outward from a point source in a spherical pattern with an attenuation rate of 6 dBA per doubling of distance (dBA/DD). However, from a line source (e.g., a road), sound travels uniformly outward in a cylindrical pattern with an attenuation rate of 3 dBA/DD. The characteristics of the surface between the source and the receptor may result in additional sound absorption and/or reflection. Atmospheric conditions such as wind speed, temperature, and humidity may affect noise levels. The presence of a barrier between the source and the receptor may also attenuate noise levels. The actual amount of attenuation depends on the size of the barrier and the frequency of the noise. A noise barrier may be any natural or human-made feature such as a hill, tree, building, wall, or berm (Caltrans 2013).

## NOISE DESCRIPTORS

The selection of a proper noise descriptor for a specific source depends on the spatial and temporal distribution, duration, and fluctuation of the noise. The noise descriptors most often encountered when dealing with traffic, community, and environmental noise are defined below (Caltrans 2013).

- **$L_{max}$ (Maximum Noise Level):** The maximum instantaneous noise level during a specific period of time. The $L_{max}$ may also be referred to as the "peak (noise) level."
- **$L_{min}$ (Minimum Noise Level):** The minimum instantaneous noise level during a specific period of time.
- **$L_{eq}$ (Equivalent Noise Level):** 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 is calculated, which is then converted back to dBA to determine the $L_{eq}$. In noise environments that are determined by major noise events, such as aircraft overflights, the $L_{eq}$ value is heavily influenced by the magnitude and number of single events that produce the high noise levels.
- **$L_{dn}$ (Day-Night Noise Level):** The 24-hour $L_{eq}$ with a 10-dBA "penalty" for noise events that occur during the noise-sensitive hours between 10 p.m. and 7 a.m. In other words, 10 dBA is "added" to noise events that occur in the nighttime hours, and this generates a higher reported noise level when determining compliance with noise standards. The $L_{dn}$ attempts to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to normal sleeping hours.
- **$L_n$ (statistical descriptor):** The noise level exceeded "n" percent of a specific period of time. The $L_{10}(t)$ is a statistical descriptor of the sound level exceeded for 10 percent of the time of the measurement period (t). It can be obtained using short-term measurements; however, it cannot be accurately added to or subtracted

from other L10 measures or other descriptors. Typically, the $L_{10}$ is about 3 dB(A) above the $L_{eq}$ (t). The $L_{50}$(t) is a statistical descriptor of the sound level exceeding 50 percent of the time of the measurement period (t). The $L_{90}$(t) is a statistical descriptor of the sound level exceeding 90 percent of the time of the measurement period (t). This is considered to represent the background noise without the source in question. Where the noise emissions from a source of interest are constant (such as noise from a fan, air conditioner, or pool pump) and the ambient noise level has a degree of variability (for example, due to traffic noise), the $L_{90}$ descriptor may adequately describe the noise source.

- **CNEL (Community Noise Equivalent Level):** Similar to the $L_{dn}$ described above, but with an additional 5-dBA, "penalty" added to noise events that occur during the noise-sensitive hours between 7 p.m. and 10 p.m., which are typically reserved for evening activities that require quiet. When the same 24-hour noise data are used, the reported CNEL is typically approximately 0.5 dBA higher than the $L_{dn}$.
- **SENL (Single-Event [Impulsive] Noise Level):** A receiver's cumulative noise exposure from a single impulsive noise event, which is defined as an acoustical event of short duration and involves a change in sound pressure above some reference value. SENLs typically represent the noise events used to calculate the $L_{eq}$, $L_{dn}$, and CNEL.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level $L_{eq}$, which corresponds to a steady-state, A-weighted sound level containing the same total energy as a time-varying signal over a given time period (usually one hour). The $L_{eq}$ is the foundation of the composite noise descriptors such as $L_{dn}$ and CNEL, as defined above, and correlates well with community response to noise.

## NEGATIVE EFFECTS OF NOISE ON HUMANS

Negative effects of noise exposure include physical damage to the human auditory system, interference, and disease. Exposure to noise may result in physical damage to the auditory system, which may lead to gradual or traumatic hearing loss. Gradual hearing loss is caused by sustained exposure to moderately high noise levels over a period of time; traumatic hearing loss is caused by sudden exposure to extremely high noise levels over a short period. Gradual and traumatic hearing loss both may result in permanent hearing damage. In addition, noise may interfere with or interrupt sleep, relaxation, recreation, and communication. Although most interference may be classified as annoying, the inability to hear a warning signal may be considered dangerous. Noise may also be a contributor to diseases associated with stress, such as hypertension, anxiety, and heart disease. The degree to which noise contributes to such diseases depends on the frequency, bandwidth, the level of the noise, and the exposure time (Caltrans 2013).

## FUNDAMENTAL NOISE CONTROL OPTIONS

Any noise problem is generally composed of three basic elements: the noise source, a transmission path, and a receiver. The appropriate acoustical treatment for a given project should consider the nature of the noise source and the sensitivity of the receiver. The

problem should be defined in terms of appropriate criteria ($L_{dn}$, $L_{eq}$, or $L_{max}$); the location of the sensitive receiver (inside or outside); and the time that the problem occurs (daytime or nighttime). Noise control techniques should then be selected to provide an acceptable noise environment for the receiving property while remaining consistent with local accessibility, safety, and aesthetic standards, as well as practical structural and economic limits. Example noise control options are listed below.

- **Setbacks** - Noise exposure may be reduced by increasing the distance between the noise source and the receiving use.
- **Barriers** - Shielding by barriers can be obtained by placing walls, berms, or other structures (such as buildings) between the noise source and the receiver. The effectiveness of a barrier depends on blocking the line of sight between the source and receiver; effectiveness is improved when the sound must travel a longer distance to pass over the barrier than if it were traveling in a straight line from source to receiver.
- **Site Design** - Buildings can be placed on a project site to shield other structures or areas from areas affected by noise, and to prevent an increase in noise level caused by reflections. The use of one building to shield another can significantly reduce a project's overall noise control costs, particularly if the shielding structure is insensitive to noise.
- **Building Façades** - When interior noise levels are of concern in a noisy environment, noise reduction may be obtained through acoustical design of building façades. Standard construction practices provide a noise reduction of 10–15 dBA for building façades with open windows and a noise reduction of approximately 25 dBA when windows are closed (USEPA 1974). Thus, an exterior-to-interior noise reduction of 25 dBA can be obtained by requiring that building design include adequate ventilation systems, which allows windows on a noise-affected façade to remain closed under any weather condition.
- **Vegetation** - Trees and other vegetation are often thought to provide significant noise attenuation. However, approximately 100 feet of dense foliage (so that no visual path extends through the foliage) is required to achieve a 5-dBA attenuation of traffic noise (Caltrans 2020). Thus, the use of vegetation as a noise barrier should not be considered a practical method of noise control unless large tracts of dense foliage are part of the existing landscape. Vegetation can be used to acoustically "soften" intervening ground between a noise source and a receiver, increasing ground absorption of sound and thus increasing the attenuation of sound with distance.

## Vibration

Vibration is the periodic oscillation of a medium or object. The rumbling sound caused by the vibration of room surfaces is called structure-borne noise. Sources of groundborne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, such as operating factory

machinery, or transient, such as explosions. As is the case with airborne sound, groundborne vibrations may be described by amplitude and frequency.

Vibration amplitudes are usually expressed in peak particle velocity (PPV) or root mean square (RMS), as in RMS vibration velocity. PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is often used in monitoring of blasting vibration because it is related to the stresses that are experienced by buildings (FTA 2018). PPV and RMS are normally described in inches per second (in/sec).

Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. Table NOI-2, which was developed by the California Department of Transportation (Caltrans), shows the vibration levels which would normally be required to result in damage to structures. The vibration levels are presented in terms of PPV in in/sec.

Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a period of one second. Like airborne sound, the RMS velocity is often expressed in decibel notation, as vibration decibels (VdB), which serves to compress the range of numbers required to describe vibration (FTA 2018). This is based on a reference value of one microinch per second (µin/sec).

The background vibration-velocity level in residential areas is usually approximately 50 VdB. Groundborne vibration is normally perceptible to humans at approximately 65 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels (FTA 2018).

Typical outdoor sources of perceptible groundborne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the groundborne vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings. Construction activities can generate groundborne vibrations, which can pose a risk to nearby structures. Constant or transient vibrations can weaken structures, crack facades, and disturb occupants (FTA 2018).

**Table NOI-2. Effects of Various Vibration Levels on People and Buildings**

| Velocity Level, PPV (in/sec) | Vibration Level, VdB | Human Reaction | Effect on Buildings |
|---|---|---|---|
| 0.01 | 68 | Barely perceptible | No effect |
| 0.04 | 80 | Distinctly perceptible | Vibration unlikely to cause damage of any type to any structures |
| 0.08 | 86 | Distinctly perceptible to strongly perceptible | Recommended upper level of the vibration to which ruins and ancient monuments should be subjected |
| 0.1 | 88 | Strongly perceptible | Virtually no risk of damage to normal buildings |
| 0.3 | 98 | Strongly perceptible to Severe | Threshold at which there is a risk of damage to older residential structures |
| 0.5 | 102 | Severe – Vibration considered unpleasant | Threshold at which there is a risk of damage to newer residential structures |

Source: Caltrans 2020
Notes:
In/sec=inches per second; PPV=peak particle velocity; VdB = Vibration Decibel

Construction vibrations can be transient, random, or continuous. Transient construction vibrations are generated by blasting, impact pile driving, and wrecking balls. Continuous vibrations result from vibratory pile drivers, large pumps, horizontal directional drilling, and compressors. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment. “Architectural” damage can be classified as cosmetic only, such as minor cracking of building elements, while “structural” damage may threaten the integrity of a building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to a building. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is in a high state of disrepair and the construction activity occurs immediately adjacent to the structure. Table NOI-3 shows the criteria established by the Federal Transit Administration (FTA) for the likelihood of structural damage due to vibration.

**Table NOI-3. Groundborne Vibration Criteria: Architectural Damage**

| Building Category | PPV (in/sec) | Lv (VdB)[a] |
|---|---|---|
| I. Reinforced concrete, steel, or timber (no plaster) | 0.5 | 102 |
| II. Engineered concrete masonry (no plaster) | 0.3 | 98 |
| III. Non-engineered timber and masonry buildings | 0.2 | 94 |
| IV. Buildings extremely and susceptible to vibration damage | 0.12 | 90 |

Source: FTA 2018.
Notes:
in/sec = inches per second; Lv = Vibration Level; PPV = peak particle velocity; VdB = Vibration Decibel.
[a] Root mean square (RMS) velocity calculated from vibration level (VdB) using the reference of one micro-inch/second.

## EXISTING CONDITIONS

### *EXISTING NOISE-SENSITIVE RECEPTORS*

Noise-sensitive receptors generally consist of receptors where noise exposure would result in adverse effects on uses for which 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. Other examples of noise-sensitive receptors include occupants of nursing homes, schools, hospitals, libraries, childcare facilities, and places of worship.

The proposed project site is located in Sacramento County, east and west of Scott Road southeast of the Prairie City State Vehicle Recreation Area (SVRA). The nearest noise-sensitive receptor in the vicinity of the project site includes the occupants of the residential property at 3850 Scott Road in the central part of the project site. The Sacramento County Boys Ranch to the south of the project site closed in 2010 and is not currently in use, therefore it is not considered a potential noise-sensitive receptor for the purposes of this analysis.

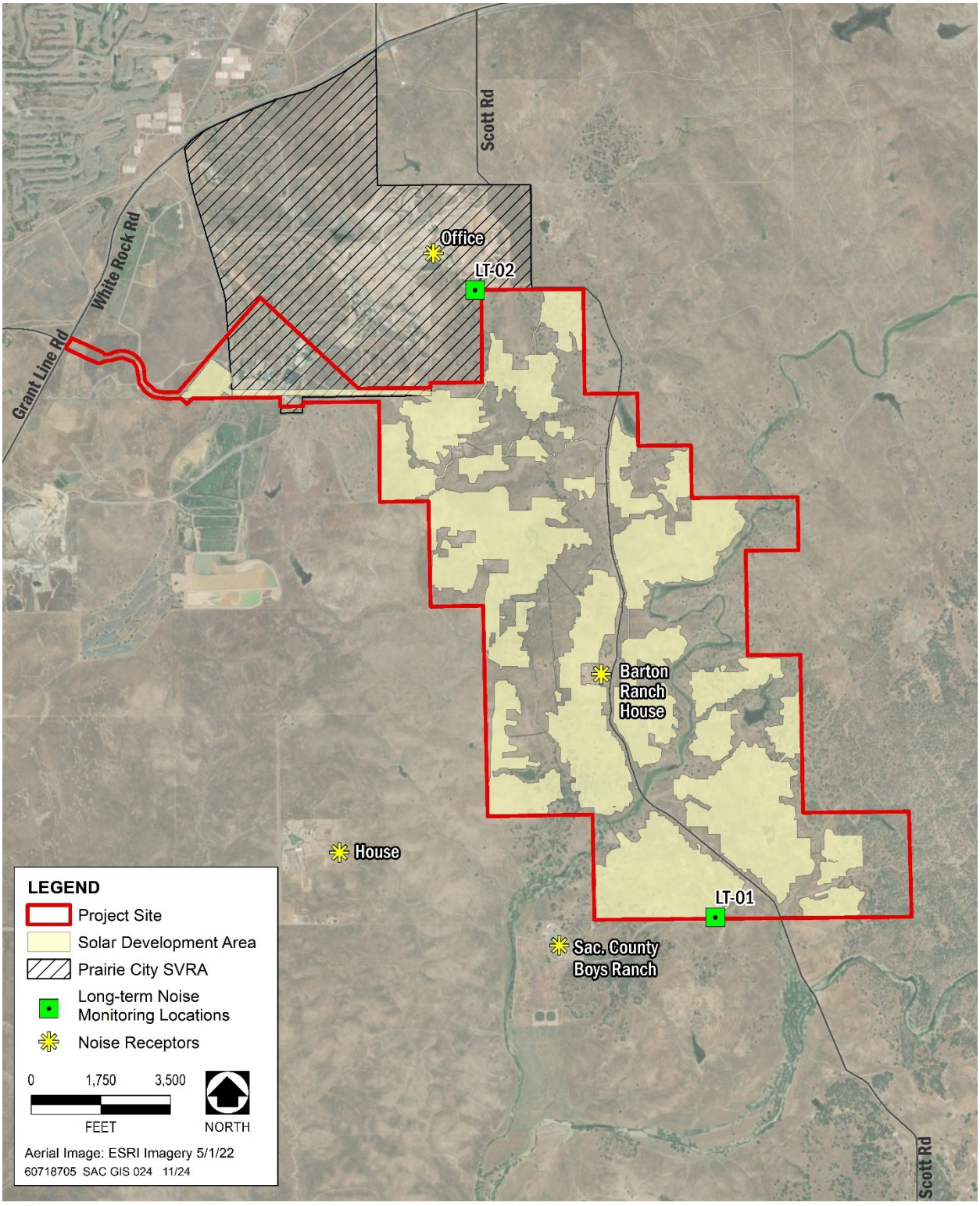
### *COMMUNITY NOISE SURVEY*

A community noise survey was conducted on March 6th through March 7th, 2024, to document the existing noise environment at various locations within the vicinity of the proposed project site. The dominant noise source identified during the ambient noise survey was vehicular traffic on Scott Road and the activities at Prairie City SVRA.[4]

Community noise survey locations are shown in Plate NOI-2.

[4] Measurements of noise levels were taken in accordance with American National Standards Institute (ANSI) standards. Continuous 24-hour, long-term (LT) monitoring of noise levels was conducted at two locations, using Larson Davis Laboratories (LDL) Model 820 sound-level meters. The sound-level meters were calibrated before and after use with an LDL Model CAL200 acoustical calibrator to ensure that the measurements would be accurate. The equipment used meets all pertinent specifications of the ANSI for Type 1 sound-level meters (ANSI S1.4-1983[R2006]).

**Plate NOI-2: Noise Monitoring Locations and Sensitive Receptors**




Source: AECOM 2024

**Table NOI-4. Summary of Measured Ambient Noise Levels, dBA**

| Site | Location | Date | Duration | $L_{dn}$ | Daytime (7 a.m.–10 p.m.) $L_{eq}$ \ $L_{max}$ | Nighttime (10 p.m.–7 a.m.) $L_{eq}$ \ $L_{max}$ |
|---|---|---|---|---|---|---|
| LT-01 | Southern Boundary | 3/6/2024 – 3/7/2024 | 24 Hour | 43 | 40 \ 59 | 36 \ 50 |
| LT-02 | Northern Boundary | 3/6/2024 – 3/7/2024 | 24 Hour | 52 | 53 \ 68 | 41 \ 52 |

Source: Data collected by AECOM, 2024.
Notes: dBA = A-weighted decibels; $L_{dn}$ = day-night average noise level; $L_{eq}$ = the equivalent hourly average noise level; $L_{max}$ = maximum noise level.
Monitoring locations correspond to those depicted in Plate NOI-2.

### *Existing Noise Sources*

The principal noise source near the project site is vehicular traffic on nearby roadways. Noise from the operation and maintenance of the Prairie City SVRA (represented by monitoring location LT-02) and noise from overhead aircraft also contribute to a lesser extent to the existing noise environment.

Existing vehicle traffic noise levels near the project site were modeled using the Federal Highway Administration (FHWA)[5] Highway Traffic Noise Prediction Model (FHWA-RD-77-108) and traffic data was used from the County Traffic Count data[6] and Caltrans Traffic Counts.[7]

Table NOI-5 summarizes the modeled traffic noise levels, provides noise levels from the centerline of roadways within the project area, and lists distances from the modeled roadway centerlines and the distances to the 60 dB, 65 dB, and 70 dB $L_{dn}$ traffic noise contours. The extent to which noise-sensitive receptors in the area are affected by existing traffic noise depends on their respective proximity to the roadways and their sensitivity to noise.

**Table NOI-5: Summary of Modeled Levels of Existing Traffic Noise**

| Roadway | Segment From | Segment To | Distance | Noise Level, dB | Distance (feet) from Roadway Centerline to $L_{dn}$ Contour | | |
|---|---|---|---|---|---|---|---|
| | | | | | 70 dB | 65 dB | 60 dB |
| Scott Road | White Rock Road | Latrobe Road | 100 feet | 66.1 | 41 | 129 | 408 |

Source: Data modeled by AECOM in 2024
Notes: dB = A-weighted decibels; $L_{dn}$ = day-night average noise level.

[5] The FHWA model is based on California Vehicle Noise (CALVENO) reference noise factors for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receptor, and ground attenuation factors.
[6] https://data.saccounty.gov/datasets/traffic-count-data/explore?showTable=true
[7] https://dot.ca.gov/programs/traffic-operations/census

# REGULATORY SETTING

## FEDERAL

The research that supported the development of federal community noise standards is broadly applicable in understanding human response to different noise levels and is summarized below for the reader's edification.

### *U.S. ENVIRONMENTAL PROTECTION AGENCY NOISE CONTROL ACT*

The Federal Noise Control Act of 1972 (Public Law 92-574) established a requirement that all federal agencies administer their programs to promote an environment free of noise that would jeopardize public health or welfare.[8] Although the U.S. Environmental Protection Agency (USEPA) was given a major role in disseminating information to the public and coordinating federal agencies, each federal agency retains authority to adopt noise regulations pertaining to agency programs.[9]

In 1974, in response to the requirements of the federal Noise Control Act, the USEPA identified indoor and outdoor noise level limits to protect public health and welfare (communication disruption, sleep disturbance, and hearing damage). Outdoor and indoor noise exposure limits of 55 dB $L_{dn}$ and 45 dB $L_{dn}$, respectively, are identified as desirable to protect against speech interference and sleep disturbance for residential, educational, and healthcare areas. The sound-level criterion identified to protect against hearing damage in commercial and industrial areas is 70 dB 24-hour $L_{eq}$ (both outdoors and indoors).

The USEPA's Office of Noise Abatement and Control was established to coordinate federal noise control activities. In 1981, USEPA administrators determined that subjective issues such as noise would be better addressed at lower levels of government. Consequently, in 1982 responsibilities for regulating noise control policies were transferred to state and local governments.

### *U.S. DEPARTMENT OF TRANSPORTATION AND USEPA VIBRATION GUIDELINES*

To address the human response to groundborne vibration, the FTA of the U.S. Department of Transportation has set forth guidelines for maximum-acceptable vibration criteria for different types of land uses. These include 65 VdB for land uses where low ambient vibration is essential for interior operations (e.g., hospitals, high-tech manufacturing, laboratory facilities); 80 VdB for residential uses and buildings where

[8] The USEPA was given the responsibility for providing information to the public regarding identifiable effects of noise on public health and welfare, publishing information on the levels of environmental noise that will protect the public health and welfare with an adequate margin of safety, coordinating federal research and activities related to noise control, and establishing federal noise emission standards for selected products distributed in interstate commerce. The Noise Control Act also directed that all federal agencies comply with applicable federal, State, interstate, and local noise control regulations.

[9] The USEPA can, however, require other federal agencies to justify their noise regulations in terms of the Noise Control Act policy requirements.

people normally sleep; and 83 VdB for institutional land uses with primarily daytime operations (e.g., schools, churches, clinics, offices) (FTA 2018).

Standards have also been established to address the potential for groundborne vibration to cause structural damage to buildings. These standards were developed by the Committee of Hearing, Bio Acoustics, and Bio Mechanics at the request of the U.S. Environmental Protection Agency (FTA 2018). For fragile structures, the Committee of Hearing, Bio Acoustics, and Bio Mechanics recommends a maximum limit of 0.25 in/sec PPV (FTA 2018).

## State

In 1971, the State required cities and counties to include noise elements in their general plans (Government Code Section 65302 et seq.). The State of California General Plan Guidelines (Office of Planning and Research 2017) identify guidelines for the noise elements of local general plans, including a sound level/land-use compatibility chart. The noise element guidelines identify the "normally acceptable" range of noise exposure for low-density residential uses as less than 60 dB $L_{dn}$, and the "conditionally acceptable" range as 55 to 70 dB $L_{dn}$. Overlapping noise level ranges are intended to indicate that local conditions (existing sound levels and community attitudes toward dominant sound sources) should be considered in evaluating land use compatibility at specific locations. The State's guidance for land use/noise compatibility is summarized in Table NOI-6.

**Table NOI-6. Land Use Noise Compatibility Guidelines**

| | Community Noise Exposure (CNEL/$L_{dn}$, dBA) | | | |
|---|---|---|---|---|
| Land Use Category | Normally Acceptable[1] | Conditionally Acceptable[2] | Normally Unacceptable[3] | Clearly Unacceptable[4] |
| Residential-Low Density Single Family, Duplex, Mobile Home | <60 | 55–70 | 70–75 | 75+ |
| Residential-Multiple Family | <65 | 60–70 | 70–75 | 75+ |
| Transient Lodging, Motel, Hotel | <65 | 60–70 | 70–80 | 80+ |
| School, Library, Church, Hospital, Nursing Home | <70 | 60–70 | 70–80 | 80+ |
| Auditorium, Concert Hall, Amphitheater | | <70 | 65+ | |
| Sports Arenas, Outdoor Spectator Sports | | <75 | 70+ | |
| Playground, Neighborhood Park | <70 | | 67.5–75 | 72.5+ |
| Golf Courses, Stable, Water Recreation, Cemetery | <75 | | 70–80 | 80+ |
| Office Building, Business Commercial and Professional | <70 | 67.5–77.5 | 75+ | |
| Industrial, Manufacturing, Utilities, Agriculture | <75 | 70–80 | 75+ | |

Source: OPR 2017

Notes: CNEL = Community Noise Equivalent Level; dBA = A-weighted decibels; $L_{dn}$ = day-night average noise level.

1 Specified land use is satisfactory, based on the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

2 New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

3 New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. Outdoor areas must be shielded.

4 New construction or development should generally not be undertaken.

### *California Department of Transportation*

For the protection of fragile, historic, and residential structures, Caltrans recommends a threshold of 0.3 in/sec PPV for older residential buildings and 0.08 in/sec PPV for extremely fragile or historically significant structures (Caltrans 2013). These standards are more stringent than the recommended guidelines established by the FTA, presented above. Table NOI-7 shows the general thresholds for structural responses to vibration levels.

**Table NOI-7. Structural Responses to Vibration Levels, Peak Vibration Threshold (in/sec PPV)**

| Structure and Condition | Peak Vibration Threshold (in/sec PPV) Transient Sources | Peak Vibration Threshold (in/sec PPV) Continuous/Frequent Intermittent Sources |
|---|---|---|
| Extremely fragile historic buildings, ruins, ancient monuments | 0.12 | 0.08 |
| Fragile buildings | 0.2 | 0.1 |
| Historic and some old buildings | 0.5 | 0.25 |
| Older residential structures | 0.5 | 0.3 |
| New residential structures | 1.0 | 0.5 |
| Modern industrial/commercial buildings | 2.0 | 0.5 |

Source: Caltrans 2020
Notes: in/sec = inches per second; PPV = peak particle velocity

## Local

### *County of Sacramento General Plan*

The County of Sacramento General Plan Noise Element contains policies related to land use and noise compatibility. Relevant County policies are presented for context.

**Policy NO-6.** Where a project would consist of or include non-transportation noise sources, the noise generation of those sources shall be mitigated so as not exceed the interior and exterior noise level standards of Table NOI-8 at existing noise-sensitive areas in the project vicinity.

**Policy NO-8.** Noise associated with construction activities shall adhere to the County Code requirements. Specifically, Section 6.68.090(e) addresses construction noise within the County.

**Policy NO-12.** All noise analyses prepared to determine compliance with the noise level standards contained within this Noise Element shall be prepared in accordance with Table NOI-9.

**Policy NO-13.** Where noise mitigation measures are required to satisfy the noise level standards of this Noise Element, emphasis shall be placed on the use

of setbacks and site design to the extent feasible, prior to consideration of the use of noise barriers.

### Table NOI-8. Non-Transportation Noise Standards Sacramento County Noise Element Median ($L_{50}$) / Maximum ($L_{max}$)[1]

### [Table 2 of the Sacramento County General Plan Noise Element]

| Receiving Land Use | Outdoor Area[2] | | Interior[3] | |
|---|---|---|---|---|
| | Daytime | Nighttime | Day & Night | Notes |
| All Residential | 55 / 75 | 50 / 70 | 35 / 55 | |
| Transient Lodging | 55 / 75 | --- | 35 / 55 | 4 |
| Hospitals & Nursing Homes | 55 / 75 | --- | 35 / 55 | 5, 6 |
| Theaters & Auditoriums | --- | --- | 30 / 50 | 6 |
| Churches, Meeting Halls, Schools, Libraries, etc. | 55 / 75 | --- | 35 / 60 | 6 |
| Office Buildings | 60 / 75 | --- | 45 / 65 | 6 |
| Commercial Buildings | --- | --- | 45 / 65 | 6 |
| Playgrounds, Parks, etc. | 65 / 75 | --- | --- | 6 |
| Industry | 60 / 80 | --- | 50 / 70 | 6 |

Source: County of Sacramento General Plan Noise Element 2017. Table 2.

Notes:

1 The Table NOI-8 standards shall be reduced by 5 dB for sounds consisting primarily of speech or music, and for recurring impulsive sounds. If the existing ambient noise level exceeds the standards of Table NOI-8 then the noise level standards shall be increased at 5 dB increments to encompass the ambient.

2 Sensitive areas are defined acoustic terminology section.

3 Interior noise level standards are applied within noise-sensitive areas of the various land uses, with windows and doors in closed positions.

4 Outdoor activity areas of transient lodging facilities are not commonly used during nighttime hours.

5 Hospitals are often noise-generating uses. The exterior noise level standards for hospitals are applicable only at clearly identified areas designated for outdoor relaxation by either hospital staff or patients.

6 The outdoor activity areas of these uses (if any), are not typically utilized during nighttime hours.

7 Where median ($L_{50}$) noise level data is not available for a particular noise source, average ($L_{eq}$) values may be substituted for the standards of this table provided the noise source in question operates for at least 30 minutes of an hour. If the source in question operates less than 30 minutes per hour, then the maximum noise level standards shown would apply.

### Table NOI-9. Requirements for Acoustical Analyses Prepared in Sacramento County

### [Table 3 of the Sacramento County General Plan Noise Element]

| **An acoustical analysis prepared pursuant to the Noise Element shall:** |
|---|
| A. Be the responsibility of the applicant. |
| B. Be prepared by qualified persons experienced in the fields of environmental noise assessment and architectural acoustics. |
| C. Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions. |
| D. Estimate projected future (20-year) noise levels in terms of the Standards of Table 2, and compare those levels to the adopted policies of the Noise Element. |
| E. Recommend appropriate mitigation to achieve compliance with the adopted policies and standards of the Noise Element. |
| F. Estimate interior and exterior noise exposure after the prescribed mitigation measures have been implemented. |

### *Sacramento County Noise Control Ordinance*

Noise control regulations in Sacramento County are specified under Chapter 6.68 of the County Code. The ordinance contains performance standards for the purpose of preventing unnecessary, excessive and offensive noise levels at sensitive receptors within the County. Table NOI-10 includes excerpts from the Noise Control Ordinance.

**Table NOI-10. Excerpts from the County of Sacramento Noise Control Ordinance**

| Noise Area | County Zoning Districts | Time Period | Exterior Noise Standard |
|---|---|---|---|
| 1 | RE-1, RD-1, RE-2, RD-2, RE-3, RD-3, RD-4, R-1-A, RD-5, R-2, RD-10, R-2A, RD-20, R-3, R-D-30, RD-40, RM-1, RM-2, A-1-B, AR-1, A-2, AR-2, A-5, AR-5 | 7 a.m.–10 p.m. | 55 dB |
| 1 | RE-1, RD-1, RE-2, RD-2, RE-3, RD-3, RD-4, R-1-A, RD-5, R-2, RD-10, R-2A, RD-20, R-3, R-D-30, RD-40, RM-1, RM-2, A-1-B, AR-1, A-2, AR-2, A-5, AR-5 | 10 p.m.–7 a.m. | 50 dB |

a Noise standards, unless otherwise specifically indicated in this chapter, shall apply to all properties within a designated noise area.

b It is unlawful for any person at any location within the County to create any noise which causes the noise levels on an affected property, when measured in the designated noise area, to exceed for the duration of time set forth following, the specified exterior noise standards in any one hour by:

| Cumulative Duration of the Intrusive Sound | Allowance Decibels (dB) |
|---|---|
| 1. Cumulative period of 30 minutes per hour | 0 |
| 2. Cumulative period of 15 minutes per hour | + 5 |
| 3. Cumulative period of 5 minutes per hour | +10 |
| 4. Cumulative period of 1 minute per hour | +15 |
| 5. Level not to be exceeded for any time per hour | +20 |

c. Each of the noise limits specified in subdivision (b) of this section shall be reduced by five dB for impulsive or simple tone noises, or for noises consisting of speech or music.

d. If the ambient noise level exceeds that permitted by any of the first four noise-limit categories specified in subdivision (b), the allowable noise limit shall be increased in five dB increments in each category to encompass the ambient noise level. If the ambient noise level exceeds the fifth noise level category, the maximum ambient noise level shall be the noise limit for that category.

Source: County of Sacramento Code, Noise Control 1976
Notes: dB = decibels

Section 6.68.090(e) of the County of Sacramento Code establishes conditions that are considered exempt from the associated provisions, as described below:

> Noise sources associated with construction, repair, remodeling, demolition, paving or grading of any real property, provided said activities do not take place between the hours of eight p.m. and six a.m. on weekdays and Friday commencing at eight p.m. through and including seven a.m. on Saturday; Saturdays commencing at eight p.m. through and including seven a.m. on the next following Sunday and on each Sunday after the hour of eight p.m. Provided, however, when an unforeseen or unavoidable condition occurs during a construction project and the nature of the project necessitates that work in process be continued until a specific phase is completed, the contractor or owner shall be allowed to continue work after eight

p.m. and to operate machinery and equipment necessary until completion of the specific work in progress can be brought to conclusion under conditions which will not jeopardize inspection acceptance or create undue financial hardships for the contractor or owner.

## IMPACTS AND ANALYSIS

### SIGNIFICANCE CRITERIA

Based on Appendix G of the State CEQA Guidelines, general standards for community ambient noise degradation, and the local standards identified above, the project would have a significant noise impact if it would result in:

- 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;
- generation of excessive groundborne vibration or groundborne noise levels; or
- for a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, exposure of people residing or working in the project area to excessive noise levels.

In addition to the guidelines and standards presented above, another consideration in determining whether a project noise effect may be significant is the degradation of the existing ambient noise environment due to an increase in the ambient noise levels. With respect to noise levels, a 1-dBA increase is imperceptible, a 3-dBA increase is barely perceptible, a 6-dBA increase is clearly perceptible, and a 10-dBA increase is subjectively perceived as approximately twice as loud. As a result, for operation of the proposed project, a minimally perceptible increase of 3 dBA shall represent a significant increase in ambient noise levels.

For evening and nighttime construction activity, the analysis applies the County noise limits provided on Table NOI-8.

Summary of permitted hours of construction for the Sacramento County are shown in Table NOI-11.

Caltrans vibration standards for large construction equipment are used by the County in evaluating the significance of groundborne vibration.

**Table NOI-11. Permitted Hours of Construction and Applicable Thresholds in Sacramento County**

| Noise Parameter | Noise Limit |
|---|---|
| Monday through Friday | between the hours of 8 p.m. and 6 a.m. |
| Saturdays | between the hours of 8 a.m. and 7 a.m. |
| Sundays and holidays | between the hours of 8 a.m. and 6 a.m. |
| Applicable Thresholds (Construction) | The County controls construction noise through limitations on construction hours. |
| Applicable Thresholds (Operation) | Residential land uses - 55 dBA $L_{dn}$ or less in exterior noise environment, and 35 dBA $L_{dn}$ interior noise levels attributable to exterior noise sources. |

Source: County of Sacramento.
dBA = A-weighted decibels
$L_{dn}$ = day-night average noise level.

## Issues Not Discussed Further

**Excessive Noise from an Airport**—Future development would not expose people to excessive noise levels from an airport or private airstrip. Mather Airport is approximately seven miles west of the project site, and therefore the project site is not within the boundaries of the Mather Airport Land Use Compatibility Plan or associated noise contours. There is also one smaller local airport in the project vicinity: Rancho Murieta Airport (approximately three miles to the south). Because the project site is not located in an area exposed to excessive aircraft-generated noise levels (e.g., not within the 60 dB $L_{dn}$/CNEL contour of any airport), there would be **no impact** related to aircraft noise, and therefore this issue is not discussed further in this EIR.

## Methodology

To assess potential short-term, temporary (i.e., construction-related) noise impacts, sensitive receptors (shown in Plate NOI-2, above) and their relative exposure were identified. Noise levels of specific construction equipment were determined and resultant noise levels at those receptors (at given distances from the source) were calculated. Potential long-term (i.e., operational) noise was assessed based on reconnaissance data and documented noise levels. Predicted noise levels during construction and decommissioning are shown in Table NOI-12 which were compared with applicable County standards shown in Table NOI-11 for determination of significance.

## Table NOI-12. Construction and Decommissioning Noise Levels, dBA

| Phase | Anticipated Type of Equipment that May Be Utilized by the Contractor | Est Noise Level at 50 ft ($L_{max}$, dBA) | Est Noise Level at 50 ft ($L_{eq}$, dBA) |
|---|---|---|---|
| **Construction** | | | |
| Perimeter Fence Installation | Front End Loader | 79 | 75 |
| | Pickup Truck | 75 | 71 |
| | Man Lift | 75 | 68 |
| Site Preparation | Grader | 85 | 81 |
| | Dozer | 82 | 78 |
| | Scraper | 84 | 80 |
| | Roller | 80 | 73 |
| | Dump Truck | 76 | 72 |
| | Dump Truck | 76 | 72 |
| | Tractor | 84 | 80 |
| | Blasting | 94 | 84 |
| Tree Removal | Hydra Break Ram | 90 | 80 |
| | Excavator | 81 | 77 |
| | Flat Bed Truck | 74 | 70 |
| | Front End Loader | 79 | 75 |
| Underground Work (Trenching) | Excavator | 81 | 77 |
| | Roller | 80 | 73 |
| | Pneumatic Tools | 85 | 82 |
| | Dump Truck | 76 | 72 |
| | Man Lift | 75 | 68 |
| | Blasting | 94 | 84 |
| PV System Installation | Crane | 81 | 73 |
| | Man Lift | 75 | 68 |
| | Dump Truck | 76 | 72 |
| | Generator | 81 | 78 |
| | Impact Pile Driver | 101 | 94 |
| | Pickup Truck | 75 | 71 |
| Energy Storage System | Crane | 81 | 73 |
| | Tractor | 84 | 80 |
| | Pickup Truck | 75 | 71 |
| | Man Lift | 75 | 68 |

| Phase | Anticipated Type of Equipment that May Be Utilized by the Contractor | Est Noise Level at 50 ft ($L_{max}$, dBA) | Est Noise Level at 50 ft ($L_{eq}$, dBA) |
|---|---|---|---|
| Gen-Tie Construction | Dump Truck | 76 | 72 |
| Testing, Commissioning, Site Clean Up | Front End Loader<br>Pickup Truck<br>Man Lift | 79<br>75<br>75 | 75<br>71<br>68 |
| **Decommissioning** | | | |
| Perimeter Fence Removal | Crane<br>Grader<br>Man Lift | 81<br>85<br>75 | 73<br>81<br>68 |
| PV System Removal | Crane<br>Man Lift<br>Dump Truck<br>Pickup Truck | 81<br>75<br>76<br>75 | 73<br>68<br>72<br>71 |
| Energy Storage System Removal | Crane<br>Grader<br>Man Lift | 81<br>85<br>75 | 73<br>81<br>68 |
| Site Cleanup and Restoration | Pickup Truck<br>Grader<br>Front End Loader | 75<br>85<br>79 | 71<br>81<br>75 |

Sources: FHWA 2006, Dudek 2025, Data Compiled by AECOM, 2025.
Notes: CNEL = Community Noise Equivalent Level; dBA = A-weighted decibels; $L_{eq}$ = the equivalent hourly average noise level.

## IMPACT NOI-1. TEMPORARY, SHORT-TERM EXPOSURE OF SENSITIVE RECEPTORS TO CONSTRUCTION NOISE

Short-term construction source noise levels could exceed the applicable County standards at a noise-sensitive receptor – the occupied residential property at 3850 Scott Road in the central part of the project site. As discussed below, this impact is potentially significant but can be reduced to less than significant with the implementation of required mitigation measures.

### *CONSTRUCTION EQUIPMENT NOISE*

While the majority of construction activities would conform to the County Noise Ordinance, if construction activities were to occur during more noise-sensitive hours

outside of those prescribed by the ordinance, construction source noise levels could result in annoyance and/or sleep disruption to the noise-sensitive receptors and create a substantial temporary increase in ambient noise levels. The project applicant proposes to perform all construction activities during the permitted work hours; however, deliveries may need to occur outside of permitted construction hours as may be required by traffic control permits issued for large equipment deliveries. Work may also need to occur during evening hours to meet weather restriction parameters (i.e., excessive heat).

Major noise-generating construction activities could include site grading and excavation, installation of infrastructure, blasting, paving, and landscaping. The highest construction noise levels, as shown in Table NOI-12 range between 81 to 94 dBA, $L_{eq}$, and are typically generated during blasting, grading, pile driving, and excavation, and lower noise levels range between 68 to 81 dBA, $L_{eq}$, typically occur during fence installation. These noise levels were calculated using FHWA reference levels (FHWA 2006).

Residences could be exposed to construction noise from on-site construction activity and off-site construction truck trips, such as movement of construction equipment on trucks along area roadways.

Section 6.68.090(e) of the County of Sacramento Code establishes conditions that are considered exempt from the associated provisions of the County Noise Ordinance, as described below:

> Noise sources associated with construction, repair, remodeling, demolition, paving or grading of any real property, provided said activities do not take place between the hours of eight p.m. and six a.m. on weekdays and Friday commencing at eight p.m. through and including seven a.m. on Saturday; Saturdays commencing at eight p.m. through and including seven a.m. on the next following Sunday and on each Sunday after the hour of eight p.m.

### *Construction Traffic Noise*

In addition, daily trip generation would occur for the delivery of equipment and supplies and the commuting of the construction workforce. The number of workers expected on-site during the construction of the project would vary over the 18-month construction period and would likely average 476 construction workers (952 total trips per day) during the peak construction phase, Photovoltaic (PV) System Installation. Deliveries of equipment and supplies to the site would also vary over the construction period but have the potential to range from 4 to 954 trips during the 10-month site preparation phase, averaging approximately 20 daily trips including the 16 daily vendor truck trips. As shown in Table NOI-13, these number of trips added to existing traffic volumes along the existing nearby roadways would result in a noise increase of up to 2 dB at the nearest noise-sensitive receptors from Scott Road centerlines.

**Table NOI-13: Summary of Modeled Levels of Existing Plus Construction Traffic Noise**

| Roadway | Segment From | Segment To | Distance | Existing Traffic Noise Level, dB | Construction Traffic Noise Level, dB | Combined Noise Level, dB | Increase Over Existing, dB |
|---|---|---|---|---|---|---|---|
| Scott Road | White Rock Road | Latrobe Road | 100 feet | 66.1 | 64.3 | 68.3 | 2.2 |

Source: Data modeled by AECOM in 2024
Notes: dB = decibels; $L_{dn}$ = day-night average noise level.

Construction activities that occur within the permitted hours (Section 6.68.090[e] of the County of Sacramento Code [refer to Table NOI-11]) are exempt from the County noise standards, and as a result would not violate County standards. Construction traffic noise would temporarily increase existing noise levels by approximately 2 dB and a 3-dBA increase is barely perceptible. Therefore, this impact is considered **less than significant**.

### *Blasting Noise*

Blasting would occur during the site preparation and trenching construction phases. Construction of the project would include up to one blast per day for a total of 35 blasts. Potential blasting locations are included in Plate PD-6, Potential Blasting Areas. As shown in this figure, blasting would occur in specific areas of the site and not throughout the entire site. The project applicant has committed to avoiding blasting activities within 340 feet of the Barton Ranch structures (see Mitigation Measure NOI-2b). Blasing would only occur within areas subject to grading. The applicant provided a worksheet that estimates project-specific blasting noise levels, which considered the detonation charge and blasting characteristics of the project. This estimate concluded that the blasting would result in noise levels of up to 91.0 dB $L_{eq}$ at 340 feet (Dudek 2024). These results are reported below in Table NOI-14.

**Table NOI-14: Blasting Noise**

| Noise Level (dBA, $L_{eq}$) | Distance |
|---|---|
| 98.1 | 150 feet |
| 93.7 | 250 feet |
| 91.0 | 340 feet |
| 87.6 | 500 feet |
| 66 | 1.1 miles |
| 53 | 5.1 miles |
| 40 | 22.8 miles |

Source: Data modeled by AECOM in 2024
Notes: dBA = A-weighted decibels; $L_{eq}$ = the equivalent hourly average noise level.

### Ambient Noise Increase

With respect to increase in ambient noise levels, noise levels associated with the various equipment types and operations, construction equipment can be considered to operate in two modes: mobile and stationary. Mobile equipment sources move around a construction site performing tasks in a recurring manner (e.g., loaders, graders, dozers). Stationary equipment operates in a given location for an extended period of time to perform continuous or periodic operations. Thus, determining the location of stationary sources during specific phases, or the effective acoustical center of operations for mobile equipment during various phases of the construction process is necessary. Operational characteristics of heavy construction equipment are additionally typified by short periods of full-power operation followed by extended periods of operation at lower power, idling, or powered-off conditions.

Predicted construction and decommissioning noise levels are shown in Table NOI-12 above. As shown, project construction noise levels would range from 68 dB, $L_{eq}$ to 94 dB $L_{eq}$, at 50 feet. Noise from localized point sources (such as construction sites) typically decreases by 6 dB with each doubling of distance from source to receptor. Project construction noise levels would range from 68 dB, $L_{eq}$ to 94 dB $L_{eq}$ at the nearest noise-sensitive receptor. The nearest sensitive receptor is the occupied residential property at 3850 Scott Road in the central part of the project site. The property line of this residential use is approximately 50 feet from the project site on Scott Road (the residential structure is approximately 100 feet from the project site, but the property line is approximately 50 feet from the project site). The construction noise level experienced at the property line of this residential use was calculated using FHWA reference levels (FHWA 2006).

Blasting noise is estimated to be 98.1 dB $L_{eq}$ at 150 feet. The project applicant has committed to avoiding blasting activities within 340 feet of the Barton Ranch structures (see Mitigation Measure NOI-2b). As shown in Table NOI-14, blasting noise level of 91.0 dB $L_{eq}$ at 340 feet and would exceed the existing ambient noise levels of 40 to 53 dB $L_{eq}$, and the estimated existing noise level of 66 dB, $L_{eq}$ at 100 feet from Scott Road.

Although noise would attenuate with distance, most project construction activities would still exceed the ambient levels and the County's exterior nighttime noise standard. While the majority of construction activities would conform to the County Noise Ordinance, if construction activities were to occur during more noise-sensitive hours outside of those prescribed by the Ordinance, construction source noise levels could result in annoyance and/or sleep disruption to existing noise-sensitive receptors and create a substantial temporary increase in ambient noise levels. As a result, this impact is considered **potentially significant**. However, portions of the project site are sufficiently distant from adjacent receptors to attenuate construction noise to levels below the County's standards, as reflected in the recommended mitigation measure that follows.

### Mitigation Measures

*NOI-1a. For Evening and Nighttime Construction (i.e., Outside of Permitted Construction Hours (Section 6.68.090[e] of the County of Sacramento Code), Implement Noise-*

*Reducing Construction Practices and Monitor and Record Construction Noise near Sensitive Receptors.*

The project applicant(s) and their primary contractors for engineering design and construction shall ensure that the following requirements are implemented at each worksite during project construction to avoid and minimize construction noise effects on sensitive receptors. The project applicant(s) and primary construction contractor(s) shall employ noise-reducing construction practices. Measures that shall be used to limit noise shall include the measures listed below:

- Pile driving shall be limited to the hours between 7 a.m. and 8 p.m. Monday through Friday, and between 8 a.m. and 6 p.m. on Saturdays and Sundays.
- Blasting activities shall be prohibited within 0.5 miles of off-site noise sensitive receptors, and shall be limited to the hours between 7 a.m. and 8 p.m. Monday through Friday.
- Construction equipment and equipment staging areas for equipment that generates noise levels of 70 dB or more at 50 feet shall be located as far as possible from nearby noise-sensitive receptors, shown in Plate NOI-2.
- All construction equipment shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations. Equipment engine shrouds shall be closed during equipment operation.
- All motorized construction equipment shall be shut down when not in use to prevent idling.
- Individual operations and techniques shall be replaced with quieter procedures (e.g., using welding instead of riveting, mixing concrete off-site instead of on-site).
- Noise-reducing enclosures shall be used around stationary noise-generating equipment (e.g., compressors and generators).
- Written notification of construction activities shall be provided to all noise-sensitive receptors located within 500 feet of the project site. Notification shall include anticipated dates and hours during which construction activities are anticipated to occur and contact information, including a daytime telephone number, for the project representative to be contacted in the event that noise levels are deemed excessive. Recommendations to assist noise-sensitive receptors in reducing interior noise levels (e.g., closing windows and doors) shall also be included in the notification.
- Provide real-time noise monitoring at the boundary of the nearest sensitive receptor(s) during evening and nighttime construction activity occurring outside the hours exempted by the County Noise Ordinance. Any activity resulting in a measured exterior noise level that exceeds 50 dB at the property boundary of an occupied residence shall immediately cease.

*NOI-1b. Prepare and Implement a Blasting Plan.*

To minimize the noise and vibration impacts related to blasting activities, the applicant shall prepare a Blasting Plan for the proposed project for County review and approval that shall include the following information:

- Public Communication: Notify all sensitive receptors within 0.5 miles of blast locations of the timing of planned blasting at least two weeks in advance by mail, and include contact information with a daytime telephone number for the project representative to be contacted in the event that noise levels are deemed excessive. Recommendations to reduce interior noise levels (e.g., closing windows and doors) shall also be included in the notification.
- If blasting activities occur within 0.5 miles of the occupied residential property at 3850 Scott Road within the project site, the notification provided as part of this measure shall include the option to receive temporary relocation for the residents of this residential property for the duration of blasting activities within 0.5 miles of this receptor.
- Blast Timing: Blasting shall be limited to the hours between 7 a.m. and 8 p.m. Monday through Friday.
- Blast Design: Optimize blast design parameters, such as charge size, delay intervals, rock preconditioning, and stemming, to reduce peak noise levels.
- Equipment Maintenance: Ensure all blasting equipment is well-maintained to prevent excessive noise from malfunctioning or inefficient machinery.
- Blast Mats: Use blast mats to cover the blast area, reducing airborne noise and debris.
- Noise Monitoring: Implement a noise monitoring program during blasting activities to ensure compliance with Chapter 6.68 of the County Code and apply additional sound-attenuating measures in real-time, if necessary. There are several real-time sound-attenuating measures that can be implemented, if noise monitoring during blasting activities indicates that noise levels exceed 55 dB at the property boundary of any noise-sensitive receptors. Some examples include:

  1. Adjust Blast Timing:

     - Modify the Blasting Schedule: Adjust the timing of blasts to avoid sensitive times of the day (e.g., early morning, late evening, or during periods when wind direction favors noise propagation towards sensitive receptors).
     - Avoid Adverse Weather Conditions: Postpone blasts during temperature inversions and when wind speeds and directions could enhance noise propagation.

2. Use Additional Blast Mats or Heavy Tarps:

    - Cover the blast site with additional Blast Mats or Heavy Tarps to reduce airborne noise and control fly-rock. The mats act as a physical barrier, absorbing some of the noise energy produced during blasting.
    - Increase Matting Coverage: If monitoring shows high noise levels, add mats or reposition for better coverage.

3. Modify Blasting Techniques:

    - Reduce Charge Size: By reducing the charge size per delay, noise levels can be lowered. This may require splitting the blast into smaller, sequential blasts (using decked charges or micro-sequencing).
    - Stemming Optimization: Increasing the amount or using different types of stemming materials can help reduce noise from blast holes. High-density materials like gravel can be more effective at noise attenuation.

4. Install Temporary Noise Barriers:

    - Mobile Noise Barriers: Erect temporary noise barriers or screens (e.g., noise curtains, portable barriers) close to the blast area to block direct line-of-sight noise transmission to noise-sensitive receptors.
    - Use Acoustical Blankets: Wrap acoustical blankets around machinery or hang along barriers to further reduce noise transmission.

5. Real-time Monitoring, Communication, and Alerts:

    - Set up automated systems that send alerts if noise levels exceed thresholds, allowing the blast crew to make adjustments immediately. This may include delaying the blast or making on-site adjustments.

6. Modify Blast Design:

    - Change the Blast Geometry: Altering the angle, depth, or configuration of the blast holes can influence the direction of the energy release, potentially reducing noise.
    - Use Delayed Detonation Patterns: Using precise, millisecond delays between charges can help control the release of energy, reducing the peak noise levels.

- Alternative Methods: Where feasible, explore the use of alternative rock excavation methods that generate less noise and vibration, such as hydraulic splitting or chemical expansion.
- Post-Blast Reporting: Provide post-blast reports to the County, detailing the noise and vibration levels recorded, any exceedances of thresholds, and actions taken to mitigate impacts.

### *Significance after Mitigation*

With the implementation of Mitigation Measures NOI-1a and NOI-1b, impacts from temporary exposure of sensitive receptors to nighttime noise and blasting noise would be reduced to less than significant. This would entail eliminating certain construction activities at night (i.e., pile driving and blasting), using noise enclosures, and locating construction equipment away from sensitive receptors – e.g., given a minimum noise reduction of 6 dB for each doubling of distance, attenuated noise levels of 82 dB at 50 feet would be reduced to 50 dB exterior at 2,000 feet. These mitigation measures would preclude nighttime construction for certain construction activities within the project site (e.g., pile driving and blasting). Areas further interior to the perimeter of project site are sufficiently distant from sensitive receptors to comply with the County's interior nighttime noise standards. To help ensure nighttime construction activity does not exceed County noise standards or result in sleep disturbance, construction noise levels would be monitored at or near proximate residences, with activities ceased if measurements exceed the nighttime noise limit of 50 dB.

Additionally, by preparing and implementing a Blasting Plan, noise and vibration impacts would be reduced. As described above and in Chapter 2, "Project Description", blasting would be limited to specific blasting locations and would not occur throughout the entire site. Potential blast sites are included in Plate PD-6, Potential Blasting Areas. The unmitigated noise level from blasting is estimated to reach 98.1 dB $L_{eq}$ at a distance of 150 feet. The applicant has committed to avoiding blasting activities within 340 feet of the Barton Ranch structures. The unmitigated noise level from blasting is estimated to reach 91.0 dB $L_{eq}$ at a distance of 340 feet. The noise reduction values for blast mats and temporary noise barriers can vary depending on factors such as the type of material used, the specific blast conditions, and the configuration of the barriers. According to the *Blasting and Explosives Quick Reference Guide* by the International Society of Explosives Engineers, blast mats can reduce noise levels by 10 to 20 dB, depending on the material and installation technique (Dyno Nobel Inc. 2010). The *Noise Barrier Design Handbook* by the FHWA indicates that temporary noise barriers can typically reduce noise levels by 5 to 15 dB, depending on the height, material, and proximity to the noise source. Combined use of blast mats and temporary barriers can achieve 15 to 35 dB reduction when both measures are optimally applied. Conservatively assuming a 20 dB-reduction from these measures, blasting noise is estimated to be at the County's daytime threshold of 55 dB, at 0.5 miles. Additionally, by including the option to offer temporary relocation for the residents 3850 Scott Road within the project site for the duration of blasting activities within 0.5 miles of this noise sensitive receptor, short-term exposure of sensitive receptors to construction noise would be reduced. As a result, with implementation of

Mitigation Measures *NOI-1*a and NOI-1b, the impact would be **less than significant with mitigation.**

### IMPACT NOI-2. TEMPORARY, SHORT-TERM EXPOSURE OF SENSITIVE RECEPTORS TO POTENTIAL GROUNDBORNE NOISE AND VIBRATION FROM PROJECT CONSTRUCTION

Short-term construction and decommissioning activities have the potential to expose noise-sensitive receptors to groundborne noise and vibration levels that would exceed applicable standards that indicate human disturbance and damage to structures could result during blasting activities on-site, as detailed in the discussion that follows.

The movement and operation of the project's construction equipment may generate temporary groundborne vibration and have the potential to result in varying degrees of temporary groundborne vibration, depending on the specific construction equipment used, the location of construction activities relative to sensitive receptors, the operations/activities involved, and the construction material of the vibration-sensitive receptors (the buildings and houses) affected. Vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance (approximately 9 VdB per doubling of distance from the source). The type and density of soil can also affect the transmission of energy. Table NOI-15 provides vibration levels for typical construction equipment.

**Table NOI-15. Typical Vibration Levels for Construction Equipment**

| Equipment | PPV at 25 Feet (in/sec) | Approximate Lv (VdB) at 25 Feet |
|---|---|---|
| Pile Driver (Impact) – Upper Range | 1.518 | 112 |
| Pile Driver (Impact) – Typical | 0.644 | 104 |
| Pile Driver (Sonic) – Upper Range | 0.734 | 105 |
| Pile Driver (Sonic) – Typical | 0.170 | 93 |
| Blasting | 1.127 | 109 |
| Vibratory Roller | 0.210 | 94 |
| Large Bulldozer | 0.089 | 87 |
| Caisson Drilling | 0.089 | 87 |
| Truck | 0.076 | 86 |
| Jackhammer | 0.035 | 79 |
| Small Bulldozer | 0.003 | 58 |

Sources: Caltrans 2020, FTA 2018.

Notes: in/sec = inches per second; Lv = the velocity level in decibels referenced to 1 microinch per second and based on the root mean square velocity amplitude; VdB = Vibration Decibel; PPV = peak particle velocity

Caltrans has developed criteria that are commonly applied as an industry standard to determine the impacts of project vibration relative to structural damage and human annoyance. Caltrans has determined that the vibration level of 80 VdB (0.04 in/sec PPV) would be distinctly perceptible. Achieving vibration levels less than 80 VdB at residential

uses would avoid human annoyance. Also, Caltrans recommends staying below 0.3 in/sec PPV at older residential structures and below 0.5 in/sec PPV for new residential structures (Table NOI-7), to avoid structural damage (Caltrans 2020). The construction equipment for the proposed project producing the most vibration would include bulldozers, pile drivers, and blasting, which are detailed below:

- **Large Bulldozers.** The vibration level associated with the use of a large bulldozer is 0.089 in/sec PPV (87 VdB) at 25 feet (FTA 2018). The vibration-sensitive receptors (buildings) nearest to the construction site are the residential structures along Scott Road that would be approximately 100 feet away. At these distances, the most substantial vibration generated by project construction equipment would attenuate (at 9 VdB per doubling of distance) to less than 70 VdB and 0.019 in/sec PPV, which would be less than the criteria of 80 VdB and 0.3 in/sec PPV recommended by Caltrans.
- **Vibratory Rollers.** Vibratory rollers are frequently used for backfill and paving work. As shown in Table NOI-14, vibratory rollers have a higher reference value of 0.21 in/sec PPV at 25 feet (Caltrans 2020). The resulting vibration level from vibratory roller would be 76 VdB and 0.046 in/sec PPV at a distance of 100 feet (the nearest sensitive receptors), which would be below the 0.3 in/sec PPV recommended by Caltrans for structural damage, and below the criteria of 80 VdB for human annoyance.
- **Pile Drivers.** Pile driving would occur on-site during the PV System Installation construction phase. As shown in Table NOI-14, typical pile driving would generate vibration levels of up to 0.644 in/sec PPV and 104 VdB at a distance of 25 feet. This level, at the noise-sensitive receptors approximately 100 feet from the project construction activities, would attenuate to less than 86 VdB and 0.140 in/sec PPV, which would be less than the structural damage criteria of 0.3 in/sec PPV, however, it would be above the human annoyance criteria of 80 VdB recommended by Caltrans.
- **Blasting.** Blasting would occur during site preparation and trenching. Construction of the project would include up to one blast per day for a total of 35 blasts. Potential blasting locations are included in Plate PD-6, Potential Blasting Areas. As shown in this figure, blasting would occur in specific areas of the site and not throughout the entire site, and blasting activities would be prohibited within 340 feet of the structures located at 3850 Scott Road. Blasting would generate vibration levels that would attenuate to below the structural damage threshold of 0.3 in/sec PPV at a distance of approximately 340 feet and would attenuate to below the human annoyance threshold of 80 VdB at a distance of approximately 1,500 feet.

Therefore, short-term construction of the project would not exceed the threshold for structural damage at the residence at 3850 Scott Road, however, it would expose persons to vibration that could exceed the threshold for human annoyance. Therefore, this impact would be considered **potentially significant**.

### *Mitigation Measures*

*Implement Mitigation Measure NOI-1b: Prepare and Implement a Blasting Plan.*

*NOI-2a: Implement Vibration Control Measures.*

The construction contractor(s) shall implement the following measures to reduce construction- and decommissioning-generated noise and vibration:

- The construction contractor/s shall use construction equipment that is as small as practicable, particularly pile drivers.
- The construction contractor(s) shall prohibit the use of pile drivers within 250 feet of existing off-site structures. If pile driving is necessary within 250 feet of on-site structures where vibration levels exceed human annoyance thresholds or create undue disturbance, the option for temporary relocation shall be provided to affected residents at no cost during the duration of these activities.
- The construction contractor(s) shall prohibit blasting and the use of pile drivers during nighttime (for blasting, these activities shall be limited to the hours between 7 a.m. and 8 p.m. Monday through Friday, and for pile driving, these activities shall be limited to the hours between 7 a.m. and 8 p.m. Monday through Friday, and between 8 a.m. and 6 p.m. on Saturdays and Sundays) to avoid annoyance (refer to Mitigation Measure NOI-1a, above, for additional restrictions on blasting and pile driving activities).
- The construction contractor(s) shall designate a "noise and vibration disturbance coordinator" who shall be responsible for responding to any local complaints about construction vibration. The disturbance coordinator shall determine the cause of any vibration complaint (e.g., human annoyance and structural damage) and require that reasonable measures be implemented to correct the problem. The disturbance coordinator's telephone number shall be posted at the construction site for the entirety of the construction and decommissioning periods.

*NOI-2b: Additional Vibration Controls for Blasting to Avoid Human Annoyance.*

- **Structural Damage:** Blasting activities shall not occur within 340 feet of the on-site structures.
- **Human Annoyance:** Blasting activities shall not occur within 1,500 feet of occupied sensitive receptors unless mitigation measures are implemented to reduce vibration levels to less than 80 VdB. If blasting is conducted within 1,500 feet of occupied sensitive receptors, strategies shall be implemented, as needed, to achieve vibration levels below 80 VdB at occupied sensitive receptors, which may include:

    1. Reduce Charge Weight
        - Reduce the maximum instantaneous charge (MIC) needs to be reduced.

2. Optimize Blasting Patterns
    - Use decking or delayed detonations to split the total charge into smaller sections. This strategy reduces the effective charge weight per delay and ensures compliance with vibration criteria.
3. Use Blast Mats
    - Place blast mats over the blasting area to absorb and diffuse some of the vibration energy. Blast mats can reduce PPV levels by 10 to 15 percent, allowing slight flexibility in MIC, if used.
4. Verify Compliance for Vibration Levels in VdB
    - To ensure vibration levels meet the human annoyance threshold of 80 VdB, additional mitigation measures, such as optimizing delays or using mats, or relocation of the occupants may be necessary to reduce levels further.

### *Significance after Mitigation*

Implementation of Mitigation Measure NOI-1b (Prepare and Implement a Blasting Plan) would further reduce noise and vibration impacts related to blasting activities by outlining specific strategies, such as optimizing blast timing, reducing charge sizes, and increasing stemming, to minimize vibration propagation. With these mitigation measures in place, project-related construction vibration levels off-site would be reduced to below both annoyance and structural damage thresholds. Implementation of Mitigation Measure NOI-2a would serve to minimize vibration levels on adjacent land uses by requiring a minimum distance between blasting and pile drivers and nearby off-site structures; by using smaller sized construction equipment; and by designating a noise disturbance coordinator who will be responsible for responding to any local complaints and addressing the issue related to the complaint. Blasting and the use of pile drivers are prohibited at night, when vibration annoyance is likely to disturb residents who are sleeping.[10] These mitigation measures would reduce project-related construction vibration levels for off-site sensitive receptors to below the applicable thresholds. Therefore, the impact of temporary construction vibration on off-site sensitive receptors would be **less than significant with mitigation**.

While Mitigation Measures NOI-1a and NOI-2a would be effective at reducing impacts for most off-site areas, there are limitations in feasibility when it comes to the residence at 3850 Scott Road, which is located within the project site and cannot maintain the required setback distance due to its proximity to construction activities. Mitigation Measure NOI-2b prohibits blasting within 340 feet of on-site structures in order avoid any structural damage. Due to the proximity, it is anticipated that pile driving and blasting vibration levels are estimated to exceed the annoyance thresholds at this specific location without additional mitigation measures. Implementation of Mitigation Measures NOI-2a and NOI-

[10] Vibration impacts are normally only assessed within the structure (and especially residential structure where people sleep), not at outdoor areas or the property line. Therefore, human annoyance from vibration would be assessed at the structure and interior uses.

2b would require additional measures to reduce the impacts to on-site residential receptors to levels below the human annoyance vibration thresholds. Additionally, by including offering the option of temporary relocation for the residents 3850 Scott Road within the project site for the duration of blasting activities within 0.5 miles of this receptor, short-term exposure of sensitive receptors to construction vibration (annoyance) would be reduced. As a result, the impact on the residence at 3850 Scott Road is considered **less than significant with mitigation**.

### Impact NOI-3. Permanent Exposure of Off-Site Noise-Sensitive Receptors to Generation of Non-Transportation Noise Levels in Excess of Local Standards

The proposed project would introduce non-transportation noise sources from the operation and maintenance of the solar panels. These non-transportation noise sources would not exceed the applicable noise standards and would not result in a substantial increase in ambient noise levels. Therefore, as detailed in the discussion that follows, this impact is considered less than significant with mitigation.

Noise may be generated by equipment within the substation; typically, this includes switches, protection and control equipment, transformers, and the incoming transmission lines. The noise generated by transmission lines and switches were previously analyzed to be 25 dBA at 50 feet. Transformers within the substation would generate noise levels like those at the inverters. Substation switches do not generate an audible noise, and circuit breakers (70 dBA at 65 feet) would not be a common noise source because they would only operate for short periods of time during an emergency event to protect the switches and transformers within the substation. Additionally, the primary noise generator from the BESS facilities would be the air conditioning units. The BESS facilities would generally be set back from the property lines and located near the substation, and the nearest neighbor is the Prairie City SVRA. The Prairie City SVRA obtained a noise easement over a portion of the Barton Ranch to ensure that the noise generated by off-road-vehicle activities at Prairie City SVRA were accepted by the neighbors. The substation and BESS facilities, which are located along with the transmission line, are all within the noise easement of the Prairie City SVRA (Dudek 2023).

The project would include the installation of solar panels and associated facilities that include inverters, transformers, a gen-tie facility, a new substation, and switchyard. Table NOI-16 provides the estimated noise level from these facilities at a given distance. Operations of the solar panels would be nearly silent, with small amounts of noise on-site caused by the tracking motors. As provided on Table NOI-16 the average sound level of tracker motors at a distance of 1 foot is 58 dBA and at a distance of 10 feet it is reduced to 46.5 dBA, at which point it is generally no longer discernable from background noise (City of Adelanto 2020). Moreover, tracker motors would not be operational during the nighttime when the panels are not generating power.

**Table NOI-16: Estimated Noise Rating of Project Facilities**

| Equipment | Reference Noise Level (dBA $L_{eq}$) | Distance from Source (feet) | Noise Level at 50 feet, (dBA $L_{eq}$) |
|---|---|---|---|
| Gen-Tie 1 | 20 | 50 | 20 |
| PV Panel | 44 | 50 | 44 |
| Inverter (unenclosed) | 52 | 75 | 56 |
| Inverter (enclosed with HVAC system) | 58 | 75 | 62 |
| Transformer | 58 | 3.3 | 34 |
| Battery Energy Storage Systems | 79 | 5 | 59 |
| Solar Panel Tracking Motors | 58 | 1 | 24 |

Sources: U.S. Department of Energy 2011; San Luis Obispo County 2011; Illingworth and Rodkin 2009; Kern County 2014; Monterey County 2014; Marvair ComPac I & ComPac II 2-6 Vertical All Mount Air Conditions, Models AVP24-30-36-42-48-60-72

Notes: dBA = A-weighted decibel(s); HVAC = Heating Ventilation and Air Conditioning; $L_{eq}$ = Equivalent Sound Level; PV = photovoltaic

As shown on Table NOI-16, the highest operational noise levels would occur from the inverter and Heating Ventilation and Air Conditioning (HVAC) system (i.e., 62 dBA at 50 feet). Because the proposed project would provide backup battery power, the inverter/HVAC facilities would be operational during evening and nighttime hours. To comply with the County's exterior nighttime noise limitation of 50 dB as provided in Table NOI-8, based on a noise rating of 62 dBA at 50 feet from the inverter and HVAC system, such facilities would need to be located approximately 200 feet from the nearest noise-sensitive receptors (which are depicted in Plate NOI-2).

### ***Mitigation Measures***

*NOI-3. Site Project Facilities Sufficiently Distant to Reduce Operational Noise Levels Below County General Plan Standards.*

- Prior to issuance of building permits, the applicant shall provide sufficiently detailed designs demonstrating that operation of the proposed project facilities would not exceed County noise standards as prescribed by Table 2 of the County General Plan Noise Element, including the nighttime standard of 50 dB $L_{50}$. The design of the facility shall be based on reference noise levels for operation equipment (e.g., transformer) from the manufacturer's specifications document, enclosure type and material, and calculations demonstrating that the siting of the project facilities is sufficiently distanced and the project's operational noise reduced to comply with the applicable County noise standards.
- Upon request from the County in instances when complaints are received, the applicant shall provide an acoustical analysis consistent with the requirements provided in the Noise Element of the County General Plan.

### *Significance after Mitigation*

Implementation of Mitigation Measure NOI-3 would ensure, as the project proceeds through final design and permitting, that noise-generating facilities are properly designed and located—whether through appropriate distancing or enclosure—to maintain noise levels below the applicable County standards. As a result, the noise impact resulting from operation of the proposed project facilities would be **less than significant with mitigation.**

Maintenance activities for the proposed project would include periodic inspections, and as-needed repair or replacement of the panels or platforms, power distribution facilities, and fencing. Additional activities would include ongoing agricultural operations (e.g., grazing) and weed management as needed, and periodic panel washing. Due to the limited scale, intensity, and periodic frequency of these activities, the associated noise impact during proposed project operations would be **less than significant**.