4.10 NOISE AND VIBRATION

This section 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 noise and vibration impacts.

Potential impacts to sensitive wildlife species from Project-related noise and vibration are evaluated as part of the overall consideration of potential impacts to biological resources in Section 4.3 of this EIR, "Biological Resources."

4.10.1 ENVIRONMENTAL SETTING

ACOUSTIC FUNDAMENTALS

Noise is 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 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 sound board 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 is an energy transport phenomenon that 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

[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] Each particle vibrates as a result of the motion of its nearest neighbor. For example, the first particle of the medium begins vibrating at 500 Hz and sets the second particle of the medium into motion at the same frequency (500 Hz). The second particle begins vibrating at 500 Hz and sets the third particle into motion at 500 Hz. The process continues throughout the medium; hence each particle vibrates at the same frequency, which is the frequency of the original source. A guitar string vibrating at 500 Hz will set the air particles in the room vibrating at the same frequency (500 Hz), which carries a sound signal to the ear of a listener that is detected as a 500-Hz sound wave. The back-and-forth vibration motion of the particles of the medium would not be the only observable phenomenon occurring at a given frequency. Because a sound wave is a pressure wave, a detector could be used to detect oscillations in pressure from high to low and back to high pressure. As the compression (high-pressure) and rarefaction (low-pressure) disturbances move through the medium, they would reach the detector at a given frequency. For example, a compression would reach the detector 500 times per second if the frequency of the wave were 500 Hz. Similarly, a rarefaction would reach the detector 500 times per second if the frequency of the wave were 500 Hz. Thus, the frequency of a sound wave refers not only to the number of back-and-forth vibrations of the particles per unit of time, but also to the number of compression or rarefaction disturbances that pass a given point per unit of time. A detector could be used to detect the frequency of these pressure oscillations over a given period of time. The period of the sound wave can be found by measuring the time between successive high-pressure points (corresponding to the compressions) or the time between successive low-pressure points (corresponding to the rarefactions). The frequency is simply the reciprocal of the period; thus, an inverse relationship exists so that as frequency increases, the period decreases, and vice versa.

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.

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.

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 is used to regulate environmental noise. Typical indoor and outdoor noise levels are presented in Exhibit 4.10-1.

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 (Caltrans 2013), as presented in Table 4.10-1.[3]

Table 4.10-1. Subjective Reaction to Changes in Noise Levels of Similar Sources

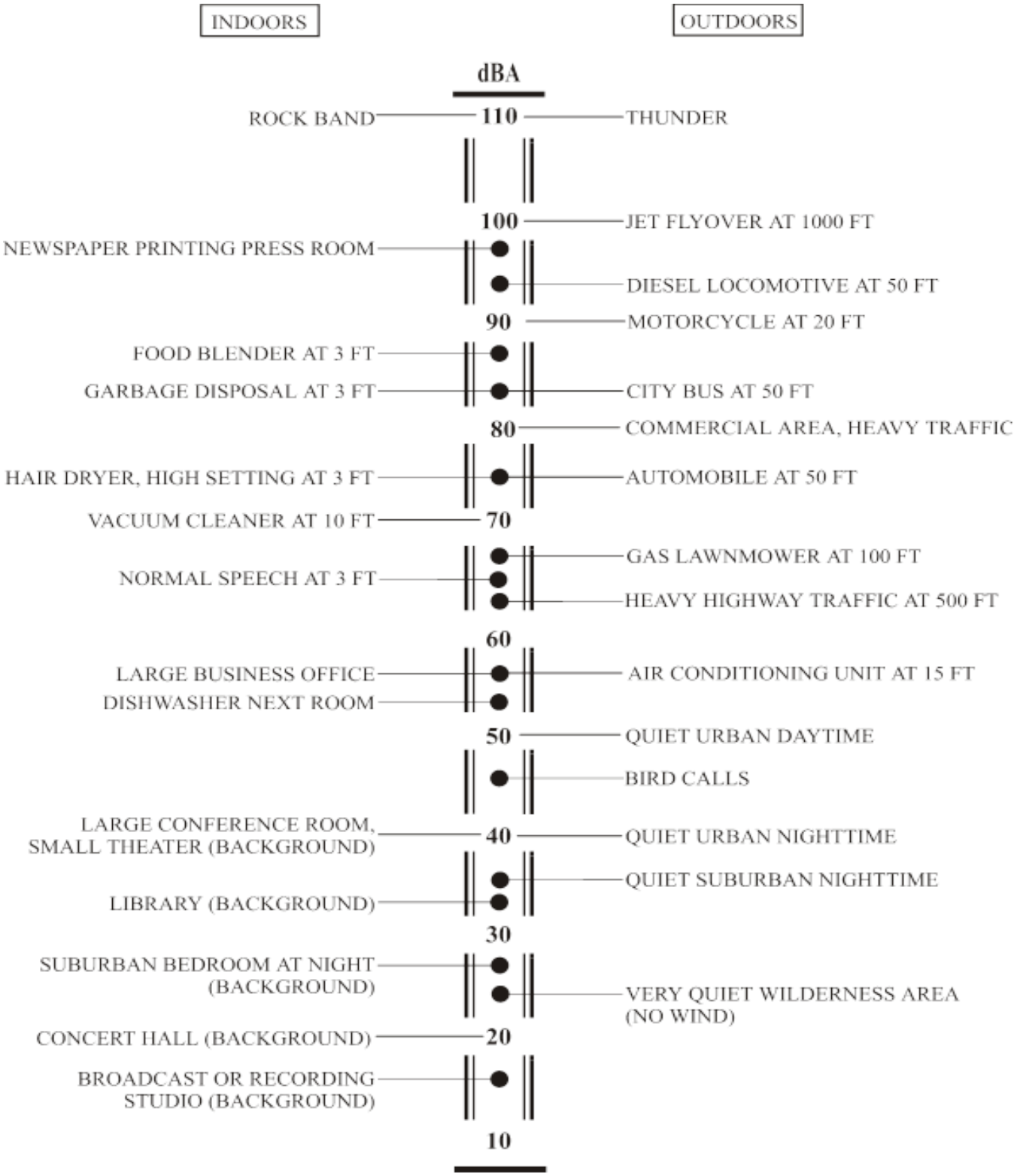
Change in Level, dBA	Subjective Reaction	Factor Change in Acoustical Energy
1	Imperceptible (except for tones)	1.3
3	Just barely perceptible	2.0
6	Clearly noticeable	4.0
10	About twice (or half) as loud	10.0

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

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.

[3] Table 4.10-1 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 to 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.



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

Exhibit 4.10-1. Typical Noise Levels

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).

All buildings provide some exterior-to-interior noise reduction. A building constructed with a wood frame and a stucco or wood sheathing exterior typically provides an approximate exterior-to-interior noise reduction of 25 dB with its windows closed, and 15 dB with its windows open (EPA 1974).

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 10:00 p.m. and 7:00 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 at night is a potential source of disturbance with respect to normal sleeping hours.
- **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 7:00 p.m. and 10:00 p.m., which are typically reserved for relaxation, conversation, reading, and television. 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 1 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. 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, and 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. Fundamental noise control options are described below.

Setbacks

Noise exposure may be reduced by increasing the distance between the noise source and the receiving use. Setback areas can, for example, take the form of open space, frontage roads, recreational areas, and storage yards. The available noise attenuation from this technique is limited by the characteristics of the noise source but is generally about 4–6 dBA.

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. The difference between the distance over a barrier and a straight line between source and receiver is called the “path length difference,” and is the basis for calculating barrier noise reduction.

Barrier effectiveness depends upon the relative heights of the source, barrier, and receiver. In general, barriers are most effective when placed close to either the receiver or the source. An intermediate barrier location yields a

smaller path length difference for a given increase in barrier height than does a location closer to either source or receiver.[4] Earth, in the form of berms or the face of a depressed area, is also an effective barrier material.

There are practical limits to the noise reduction provided by barriers. For vehicle traffic or railroad noise, a noise reduction of 5–10 dBA may often be reasonably attained. A 15-dBA noise reduction is sometimes possible, but a 20-dBA noise reduction is extremely difficult to achieve. Barriers usually are provided in the form of walls, berms, or berm/wall combinations. The use of an earth berm in lieu of a solid wall may provide up to 3 dBA additional attenuation over that attained by a solid wall alone, because of the absorption provided by the earth. Berm/wall combinations offer slightly better acoustical performance than solid walls alone, and they are sometimes preferred for aesthetic reasons.

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. 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 to remain closed under any weather condition.

Where greater noise reduction is required, acoustical treatment of the building façade is necessary. Reducing relative window area is the most effective control technique, followed by providing acoustical glazing (thicker glass or increased air space between panes) in frames with low air infiltration rates, using fixed (non-movable) acoustical glazing, or eliminating windows. Noise transmitted through walls can be reduced by increasing wall mass (using stucco or brick in lieu of wood siding), isolating wall members by using double or staggered stud walls, or mounting interior walls on resilient channels. Noise control for exterior doorways is provided by reducing door area, using solid-core doors, and by acoustically sealing door perimeters with suitable gaskets. Roof treatments may include the use of plywood sheathing under roofing materials.

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 2013). 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. Planting trees

[4] For maximum effectiveness, barriers must be continuous and relatively airtight along their length and height. To ensure that sound transmission through the barrier is insignificant, barrier mass should be about 4 pounds per square foot, although a lesser mass may be acceptable if the barrier material provides sufficient transmission loss. Satisfaction of the above criteria requires substantial and well-fitted barrier materials, placed to intercept the line of sight to all significant noise sources.

and shrubs also offers aesthetic and psychological value, and it may reduce adverse public reaction to a noise source by removing the source from view, even though noise levels will be largely unaffected. The effects of vegetation on noise transmission are minor and are primarily limited to increased absorption of high-frequency sounds and to reducing adverse public reaction to the noise by providing aesthetic benefits.

Vibration Fundamentals

Vibration is the periodic oscillation of a medium or object. The rumbling sound caused by the vibration of room surfaces is called structureborne noise. Similar to noise, groundborne vibration and groundborne noise can be generated from construction and operational sources. If vibration levels are high enough, groundborne vibration has the potential to damage structures, cause cosmetic damage (e.g., crack plaster), or disrupt the operation of vibration-sensitive equipment. Groundborne vibration and groundborne noise can also be a source of annoyance to individuals who live or work close to vibration-generating activities. Groundborne noise is the noise generated by the indoor movement of room surfaces, such as walls, resulting from groundborne vibration.

Vibration Descriptors

As is the case with airborne sound, groundborne vibrations may be described by amplitude and frequency. Vibration levels are usually expressed as a single-number measure of vibration magnitude in terms of velocity or acceleration, which describes the severity of the vibration without the frequency variable. 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 defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV and RMS are normally described in inches per second (in/sec). PPV is often used in monitoring of blasting vibration because it is related to the stresses that are experienced by buildings (FTA 2018).

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 1 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 1 microinch per second (µin/sec).

Vibration Sources

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, or transient, or random. Continuous vibrations result from operating factory machinery, vibratory pile drivers, large pumps, horizontal directional drilling, and compressors. Transient vibrations are generated by explosions, blasting, impact pile driving, and wrecking balls. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment.

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). Heavy construction operations can cause substantial groundborne vibration in proximity to the source. The highest vibration levels are generated by impact equipment or heavy equipment, such as pile drivers or vibratory rollers, respectively.

The primary vibration sources associated with transportation include heavy truck and bus traffic along roadways and train traffic along rail lines. Vehicle traffic, including heavy trucks traveling on a highway, rarely generates vibration amplitudes high enough to cause structural or cosmetic damage. In some cases, however, heavy trucks traveling over potholes or other discontinuities in the pavement have caused vibration high enough to result in complaints from nearby residents; these complaints typically can be resolved by smoothing the roadway surface. Freight trains, commuter trains, and light rail trains can also be sources of ground vibration.

Effects of Vibration

The effects of groundborne vibration include movement of building floors, rattling of windows, shaking of items that sit on shelves or hang on walls, and rumbling sounds. In extreme cases, vibration can damage buildings, although this is not a factor for most projects. Human annoyance from groundborne vibration often occurs when vibration exceeds the threshold of perception by only a small margin. A vibration level that causes annoyance can be well below the damage threshold for normal buildings.

Vibrations transmitted through the ground during construction equipment operations or transportation system operations may annoy people and detrimentally affect structures and sensitive devices. Where construction vibration does cause structural damage, it is through direct damage and/or vibration-induced settlement. Structural damage depends on the frequency of the vibration at the structure, as well as the condition of the structure and its foundation. Human annoyance by vibration is related to the number and duration of events. The more events or the greater the duration, the more annoying it will be to humans.

Table 4.10-2 displays the reactions of people and the effects on buildings that continuous vibration levels produce. The annoyance levels shown in Table 4.10-2 should be interpreted with care since vibration may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to vibration complaints, even when there is very little risk of actual structural damage.

Table 4.10-2. Reaction of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

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

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

EXISTING NOISE ENVIRONMENT

Sensitive Receptors

Noise-sensitive land uses are those uses where quiet is an essential element of their intended purpose. This typically would include residences, schools, hospitals, nursing homes, retirement residences, places of worship, libraries, and sometimes parks, historic sites, cemeteries, and other places where low interior noise levels are essential.

For the most part, surrounding uses are not noise sensitive. The city of Fairfield's southern city limit is on the opposite side of SR 12, north of the Project Site. Existing uses in this portion of Fairfield include single-family residences, offices, and light industrial uses. The nearest noise and vibration-sensitive uses to the north of the Project Site are single-family residences located approximately 500 feet (north of SR 12), from the northern Project boundary.

East of the Union Pacific Railroad tracks that are adjacent to the eastern perimeter of the Project Site is Downtown Suisun City and the Suisun City waterfront, which is developed with a variety of commercial, residential, assembly, repair, and retail land uses. The nearest noise and vibration-sensitive uses east of the Project Site are single-family residences located approximately 200 feet east of the eastern Project boundary.

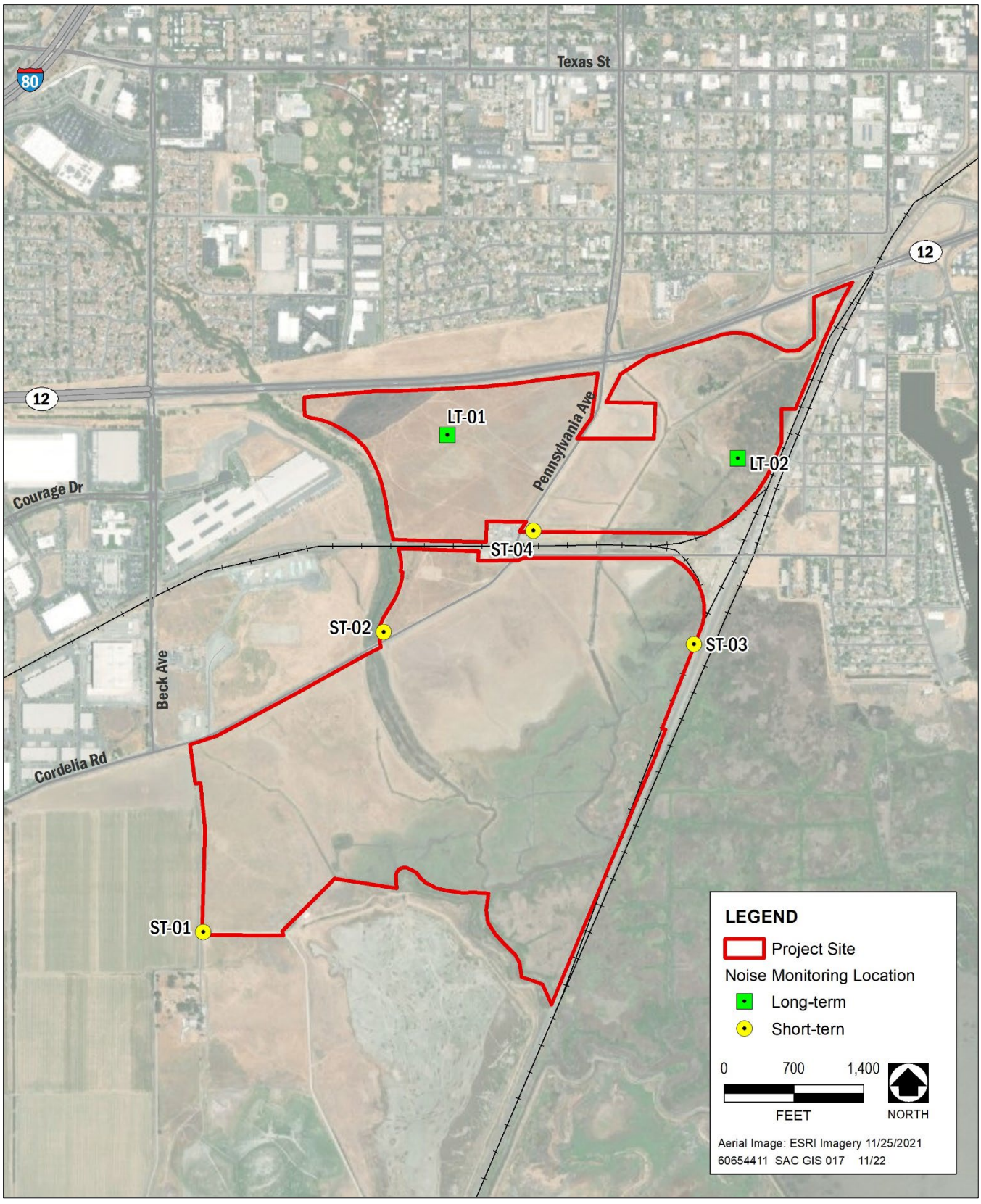
West of the Project Site, across Ledgewood Creek, are industrial warehouse and office uses. The nearest vibration-sensitive uses (the industrial warehouse and office buildings) to the west of the Project Site are approximately 300 feet from the western Project boundary. Undeveloped land is to the west and south of the Project Site, including Suisun Marsh to the south. The nearest noise and vibration-sensitive use from the southern Project boundary is a single-family residence located along Orehr Road, approximately 700 feet from the southern Project boundary.

Community Noise Survey

A community noise survey was conducted on May 21st through May 25th, 2021, to document the existing noise environment at various locations within the proposed Project area. The dominant noise source identified during the ambient noise survey was traffic from the State Route 12 along the northern boundary of the proposed Project Site. Other noise sources include Pennsylvania Avenue and Cordelia Road/Cordelia Street adjacent to the Project Site, more distant traffic along Beck Avenue to the west, and commuter and freight rail activity along the Union Pacific railway east of the Project Site.[5]

Community noise survey locations are shown in Exhibit 4.10-2. The L_{eq}, and L_{max} values were taken at each ambient noise measurement location presented in Table 4.10-3. During the survey, average daytime ambient noise levels ranged from 50 dB to 77 dB L_{eq}, with maximum noise levels that ranged from 58 dB to 101 dB L_{max}.

[5] Measurements of noise levels were taken in accordance with ANSI standards. Continuous 24-hour, long-term monitoring of noise levels was conducted at three locations in the City 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]).



Source: AECOM 2022

Exhibit 4.10-2. Noise Monitoring Locations Map

Table 4.10-3. Summary of Measured 24-hour Long Term Ambient Noise Levels, dBA

Site	Location	Date	L_{dn}	Daytime (7 a.m.–10 p.m.) $L_{eq} \setminus L_{max}$	Nighttime (10 p.m.–7 a.m.) $L_{eq} \setminus L_{max}$
LT-1	Northern Project Site	5/21/21 – 5/22/21	60.8	57.3 \ 68.5	53.6 \ 67.6
LT-1	Northern Project Site	5/22/21 – 5/23/21	60.5	56.0 \ 68.6	53.7 \ 68.6
LT-1	Northern Project Site	5/23/21 – 5/24/21	61.6	55.8 \ 67.9	55.1 \ 68.8
LT-1	Northern Project Site	5/24/21 – 5/25/21	63.4	58.7 \ 72.7	56.7 \ 71.0
LT-2	Eastern Project Site	5/21/21 – 5/22/21	61.7	53.5 \ 74.2	55.5 \ 79.1
LT-2	Eastern Project Site	5/22/21 – 5/23/21	59.2	53.3 \ 71.3	52.7 \ 72.1
LT-2	Eastern Project Site	5/23/21 – 5/24/21	59.8	53.0 \ 70.8	53.5 \ 75.1
LT-2	Eastern Project Site	5/24/21 – 5/25/21	61.8	56.6 \ 78.4	55.1 \ 77.0
ST-1	Southern Project Site	5/25/21	--	49.6 \ 58.2	--
ST-2	Southwestern Project Site	5/25/21	--	60.0 \ 81.5	--
ST-3	Eastern Project Site	5/25/21	--	72.2 \ 99.2	--
ST-4	Middle Project Site	5/25/21	--	77.3 \ 101.4	--

Notes: dB = 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 Exhibit 4.10-2.
Source: Data collected by AECOM 2021

Existing Noise Sources

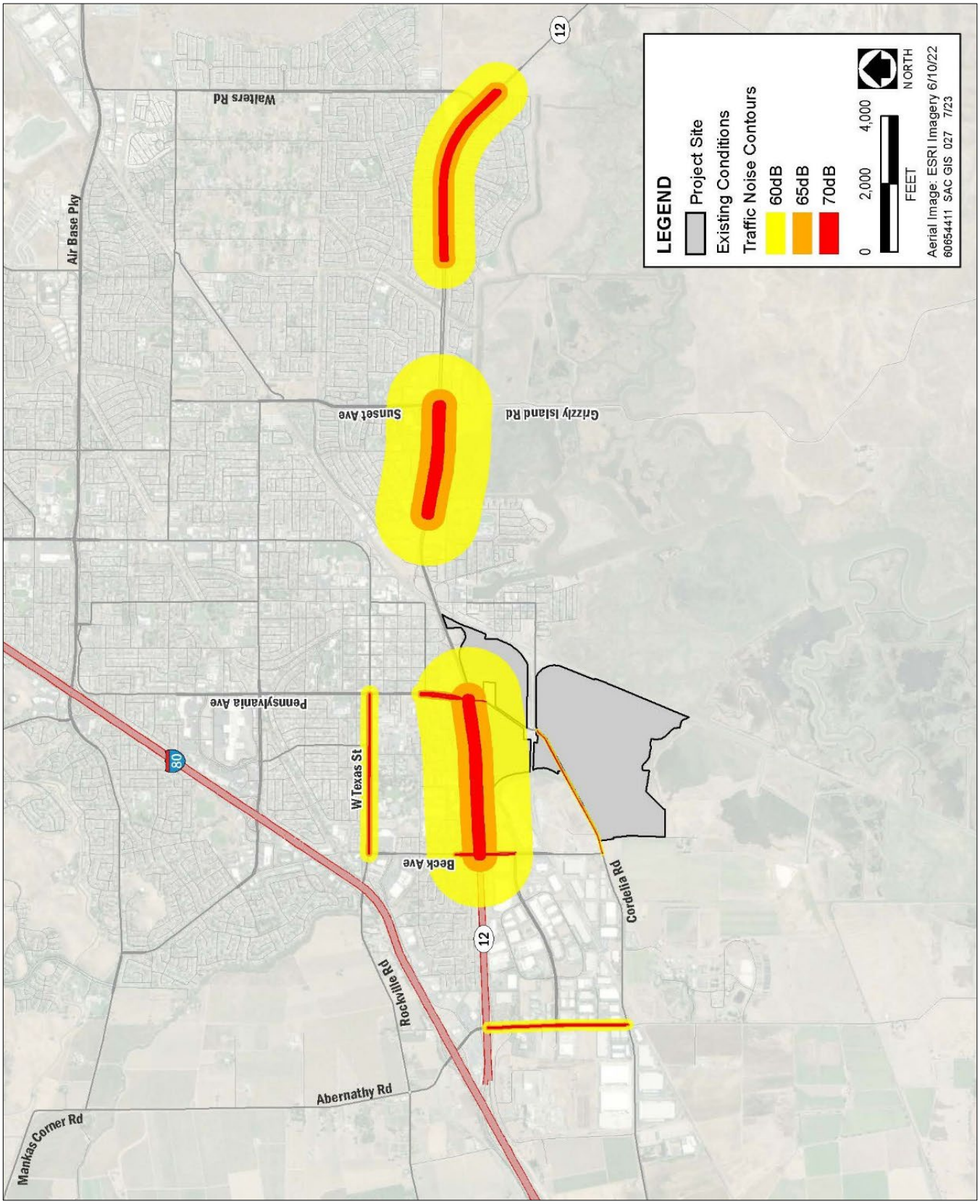
Roadways

The proposed Project Site is bounded by State Route 12 (SR 12) to the north, Pennsylvania Avenue to the east, Cordelia Road to the south, and Ledgewood Creek to the west. Regional access to the site is primarily provided by SR 12 via Pennsylvania Avenue. Local access is provided by Pennsylvania Avenue and Cordelia Road.

Existing vehicle traffic noise levels in the Project area were modeled using the Federal Highway Administration (FHWA 1978) Highway Traffic Noise Prediction Model (FHWA-RD-77-108)[6] and traffic data was used from the traffic study for the proposed Project (Fehr & Peers 2022).

Table 4.10-4 summarizes the modeled traffic noise levels, provides noise levels at 50 feet from the centerline of roadways, and lists distances from the roadway centerlines to the 60 dB, 65 dB, and 70 dB L_{dn} traffic noise contours. Exhibit 4.10-3 shows the traffic noise contours for roadways within the vicinity of the Project area. These traffic noise modeling results are based on existing average daily traffic (ADT) volumes. As shown in Table 4.10-4, the location of the 60 dB L_{dn} contour ranges from 53 to 1,531 feet from the centerline of the modeled surface street roadways. The extent to which noise-sensitive uses in the area are affected by existing traffic noise depends on their respective proximity to the roadways and their individual sensitivity to noise.

[6] The FHWA model is based on 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.



Source: AECOM 2023

Exhibit 4.10-3. Existing Roadway Noise Contours

Table 4.10-4. Summary of Modeled Levels of Existing Traffic Noise and Distance (feet) from Roadway Centerline to L_{dn} Contour

Roadway Segment	From	To	L_{dn} (dB) 50 Feet	Distance to 70 dB Contour	Distance to 65 dB Contour	Distance to 60 dB Contour
Chadbourne Road	SR-12	Cordelia Road	65	15	48	152
Beck Avenue	SR-12	North of SR-12	66	21	65	206
Beck Avenue	SR-12	South of SR-12	63	11	34	109
West Texas Street	Beck Avenue	Pennsylvania Avenue	67	26	82	258
SR-12	Beck Avenue	Pennsylvania Avenue	75	153	484	1,531
Cordelia Road	Beck Avenue	Pennsylvania Avenue	60	5	17	53
Pennsylvania Avenue	SR-12	North of SR-12	67	26	83	262
Pennsylvania Avenue	SR-12	South of SR-12	62	8	25	79
SR-12	Marina Boulevard	Grizzly Island Road	75	151	476	1,506
SR-12	Emperor Drive	Walters Road	72	86	273	862

Notes: dB = A-weighted decibels; L_{dn} = day-night average noise level, SR = State Route.
Source: Data modeled by AECOM in 2023

Railways

There are two railroad lines that operate in the vicinity of the Project Site. The California Northern Railroad (CFNR) operates 24 miles of the Schellville Sub line from Suisun City to Schellville. The Schellville Sub-line enters Suisun City from the west and parallels Cordelia Street. The CFNR line traverses the area in an east-west direction from the Union Pacific Railroad (UPRR) line to the west. The CFNR Schellville Sub-line operates approximately 6 daily train trips through Suisun City (Suisun City 2023). UPRR operates the Overland Route, in the city. The UPRR Overland Route traverses the northern boundary of the city and the western edge of the city's downtown area, carrying both freight and commuter passenger trains. The UPRR Overland Route extends to the west to Oakland and to the east to Chicago. Based on noise measurements gathered along the UPRR Overland Route line, approximately 43 daily train trips occur through Suisun City. These train trips include Amtrak operations and freight transportation. The 60 dB L_{dn} contour extends out approximately 361 feet from the center of the tracks, while the 65 dB L_{dn} contour is at approximately 168 feet. Single-event train pass bys were measured at 108 feet from the UPRR track centerline (Suisun City 2010).

The California Northern Railroad is oriented west to east, horizontally dividing the Project Site and meeting with the Union Pacific Railroad tracks at the eastern perimeter of the Project Site. The Project Site is bounded to the east by the Union Pacific Railroad.

4.10.2 REGULATORY FRAMEWORK

Various private and public agencies have established noise guidelines and standards to protect citizens from potential hearing damage and other adverse physiological and social effects associated with noise and vibration.

FEDERAL PLANS, POLICIES, REGULATIONS, AND LAWS

Although not directly applicable to the proposed Project, 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.[7] Although the U.S. Environmental Protection Agency (EPA) 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.[8]

In 1974, in response to the requirements of the federal Noise Control Act, the EPA 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 EPA's Office of Noise Abatement and Control was established to coordinate federal noise control activities. In 1981, EPA 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 Housing and Urban Development Noise Abatement and Control

The U.S. Department of Housing and Urban Development (HUD) has established guidelines for evaluating noise impacts on residential projects seeking financial support under various grant programs (HUD 2013), as summarized below:

- **Acceptable $\leq$ 65 dB.** Sites are generally considered acceptable for residential use if they are exposed to outdoor noise level of 65 dB L_{dn} or less.
- **Normally Unacceptable 65-75 dB.** Sites are considered "normally unacceptable" if they are exposed to outdoor noise levels of 65-75 dB L_{dn}.
- **Unacceptable > 75 dB.** Sites are considered "unacceptable" if they are exposed to outdoor noise levels above 75 dB L_{dn}.

The HUD goal for the interior noise levels in residences is 45 dB L_{dn} or less.

[7] The U.S. Environmental Protection Agency (EPA) 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.

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

Federal Aviation Administration Airport Noise Compatibility Planning

14 CFR Part 150, "Airport Noise Compatibility Planning" prescribes the procedures, standards, and methodology to be applied to airport noise compatibility planning activities. Noise levels below 65 dB L_{dn} are normally considered to be acceptable for noise-sensitive land uses.

Federal Highway Administration Procedures for Abatement of Highway Traffic Noise and Construction Noise Regulations

FHWA regulations (23 CFR 772) specify procedures for evaluating noise impacts associated with federally funded highway projects and determining whether these impacts are sufficient to justify funding noise abatement. The FHWA noise abatement criteria are based on worst hourly L_{eq} sound levels, not 24-hour average values (e.g., L_{dn} or CNEL). The worst-hour L_{eq} criteria for residential, educational, and healthcare facilities are 67 dB outdoors and 52 dB indoors. The worst-hour L_{eq} criterion for commercial and industrial areas is 72 dB (outdoors).

Federal Transit Administration Transit Noise and Vibration Impact Assessment

Federal Transit Administration (FTA) procedures for the evaluation of noise from transit projects are specified in the document entitled, "Transit Noise and Vibration Impact Assessment" (FTA 2018). The FTA Noise Impact Criteria address the following categories:

- **Category 1:** Buildings or parks, where quiet is an essential element of their purpose.
- **Category 2:** Residences and buildings where people normally sleep. This includes residences, hospitals, and hotels where nighttime sensitivity is assumed to be of utmost importance.
- **Category 3:** Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, churches, and active parks.

The L_{dn} noise level descriptor is used to characterize noise exposure for residential areas (Category 2). For other noise-sensitive land uses, such as outdoor amphitheaters and school buildings (Categories 1 and 3), the maximum hourly L_{eq} during the facility's operating period is used. Noise impacts are identified based on absolute predicted noise levels and increases in noise associated with the subject project.

With respect to vibration, 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. 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).

U.S. Department of Transportation and U.S. EPA 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 referenced to 1 μin/sec and based on RMS velocity amplitude 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 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 (CHABA) at the request of the U.S. Environmental Protection Agency (FTA 2018). For fragile structures, CHABA recommends a maximum limit of 0.25 in/sec PPV (FTA 2018).

STATE PLANS, POLICIES, REGULATIONS, AND LAWS

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 55-70 dB L_{dn}. The "normally acceptable" range for high-density residential uses is identified as below 65 dB L_{dn}, and the "conditionally acceptable" range is identified as 60-70 dB L_{dn}. For educational and medical facilities, levels below 70 dB L_{dn} are considered "normally acceptable," and levels of 60-70 dB L_{dn} are considered "conditionally acceptable." For office and commercial land uses, levels below 70 dB L_{dn} are considered "normally acceptable," and levels of 67.5–77.5 dB L_{dn} are considered "conditionally acceptable." 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 4.10-5.

Table 4.10-5. 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+	

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.

Source: OPR 2017

In 1984, State noise element provisions were revised to "recognize" guidelines prepared by the Office of Noise Control of the California Department of Health Services and to analyze and quantify, "to the extent practicable, as determined by the legislative body," noise from the following sources: highways and freeways; primary arterials and major local streets; passenger and freight online railroad operations and ground rapid transit systems; commercial, general aviation, heliport, helistop, and military airport operations, aircraft overflights, jet engine test stands, and other ground facilities and maintenance functions related to airport operation; local industrial plants, including, but not limited to, railroad classification yards; and other ground stationary noise sources identified by local agencies as contributing to the community noise environment. As noted in the draft update to the General Plan Guidelines, the Office of Planning and Research notes that the Department of Health Services Office of Noise Control no longer exists, and the guidelines have been incorporated into the General Plan Guidelines for Noise Elements (OPR 2017).

California Department of Transportation

For the protection of fragile, historic, and residential structures, Caltrans recommends for highway construction analysis a threshold of 0.2 in/sec PPV for normal residential buildings and 0.08 in/sec PPV for old or historically significant structures (Caltrans 2020). These standards are more stringent than the recommended guidelines established by the FTA, presented above. Table 4.10-6 shows the general thresholds for structural responses to vibration levels.

Table 4.10-6. 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

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

REGIONAL AND LOCAL PLANS, POLICIES, REGULATIONS, AND ORDINANCES

HEALTH AND SAFETY ELEMENT OF THE EXISTING SOLANO COUNTY GENERAL PLAN

The criteria contained within the Health and Safety Element of the existing Solano County General Plan (Solano County 2008) is used for the purposes of evaluating noise impacts from new projects in Solano County.

Policies

- **HS.I-62:** When reviewing new development proposals:
    - Require noise abatement measures to ensure that noise levels will not exceed those indicated in Table 4.10-7.

- Require buffering between noise-sensitive land uses and noise sources unless a detailed noise analysis is conducted, and noise abatement measures can be taken to reduce noise to acceptable levels as shown in Table 4.10-7.

- Where development projects produce or are affected by, non-transportation-related noise, require the inclusion of project features that will enable the project to achieve acceptable levels specified in Table 4.10-7, as measured at outdoor activity areas of existing and planned noise-sensitive land uses.

- Require noise mitigation to reduce construction and other short-term noise impacts as a condition of approval for development projects by applying the performance standards outlined in Table 4.10-7. The total noise level resulting from new sources and ambient noise shall not exceed the standards in Table HS-4, as measured at outdoor activity areas of any affected noise-sensitive land use except:

  – If the ambient noise level exceeds the standard in Table 4.10-7, the standard becomes the ambient level plus 5 dB.

  – Reduce the applicable standards in Table 4.10-7 by 5 dB if they exceed the ambient level by 10 or more dB.

- Under the conditions outlined below, require acoustical studies to be prepared as part of the development review process to ensure adequate analysis of proposed development and incorporation of noise-reducing features in project designs. Acoustical studies with appropriate noise abatement measures will be required for all discretionary projects where any of the following conditions apply:

  – The project is located within the existing or future 60 dB CNEL transportation noise contours as measured at outdoor activity areas of noise-sensitive land uses.

  – The project will cause future traffic volumes to exceed 5,000 average daily trips on any roadway that fronts residential, institutional, and open space land uses or will cause traffic volume to increase by 25 percent or more, on any of these roadways.

  – The project will introduce noise or vibration sources associated with mechanical equipment operations, entertainment, maintenance, and facility operations.

  – The project is a proposed residential use in the vicinity of existing and proposed commercial and industrial areas.

  – The project is proposed in an area where existing noise levels exceed acceptable levels in Table 4.10-7 as measured in outdoor activity areas of noise-sensitive land uses.

- Where it is not possible to reduce noise levels in outdoor activity areas to 60 dB or less using practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dB may be allowed, provided that all available exterior noise level reduction measures have been implemented.

► **HS.I-64:** Promote the use of berms, landscaping, setbacks, or architectural design for noise abatement, in addition to conventional wall barriers, to enhance aesthetics and minimize pedestrian barriers.

► **HS.I-66:** Locate industrial and other noise-generating land uses away from noise-sensitive land uses and/or require substantial noise sources to be completely enclosed within buildings or structures.

Table 4.10-7. Noise Standards for New Uses Affected by Traffic and Railroad Noise - Public Health and Safety Chapter of the Solano County General Plan [Table HS-4]

New Land Use	Sensitive Outdoor Area–L_{dn}	Sensitive[1] Interior Area–L_{dn}	Notes
All Residential	65	45	2
Transient Lodging	65	45	2,3
Hospitals & Nursing Homes	65	45	2, 3, 4
Theaters & Auditoriums	---	35	3
Churches, Meeting Halls Schools, Libraries, etc.	65	40	3
Office Buildings	65	45	3
Commercial Buildings	---	50	3
Playgrounds, Parks, etc.	70	---	---
Industry	65	50	3

Notes: dBA = A-weighted decibels; L_{dn} = day-night average noise level
1 Interior-noise-level standards are applied within noise-sensitive areas of the various land uses, with windows and doors in closed positions.
2 If these uses are affected by nighttime railroad passages, the potential for sleep disturbance shall be addressed,
3 Where there are no sensitive exterior spaces proposed for these uses, only the interior-noise level standard shall apply.
4 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.
Source: Solano County 2008.

Daytime noise standards are typically set at noise levels that would not annoy or impede human interaction or function in outdoor activity areas. Nighttime noise standards are typically set to result in acceptable noise levels that would not interfere with sleep for most people inside a building with windows closed. In general, noise standards are designed to prevent annoyance or sleep disruption in sensitive members of the public. Table 4.10-7 provides acceptable outdoor and interior noise levels for land uses. Table 4.10-8 defines noise performance standards for non-transportation noise sources.

Table 4.10-8. Non-Transportation Noise Standards - Average (dBA L_{eq}) / Maximum (L_{max})[1] - Public Health and Safety Chapter of the Solano County General Plan [Table HS-5]

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

Notes: --- = not applicable; L_{eq} = equivalent or energy-averaged sound level; L_{max} = Highest root-mean-square sound level measured over a given period of time.
1 The standards shall be reduced by 5 dBA for sounds consisting primarily of speech or music, and for recurring impulsive sounds. If the existing ambient noise level exceeds the standards, then the noise level standards shall be increased at 5-dBA increments to encompass the ambient.
2 Interior-noise-level standards are applied within noise-sensitive areas of the various land uses, with windows and doors in closed positions.
3 Outdoor activity areas of transient lodging facilities are not commonly used during nighttime hours.
4 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.
5 The outdoor activity areas of these uses (if any), are not typically utilized during nighttime hours.
Source: Solano County 2008.

Solano County Code

The County Code contains 60 references to noise under various sections: Agriculture (Section 2.2), Animals (Section 4), Miscellaneous Offences (Section 18), Parks and Recreation (Section 19), and Zoning (Section 28). The County's intent is to maintain quiet in those areas which exhibit low noise levels and to implement programs aimed at reducing noise in those areas within the County where noise levels are above acceptable limits. The code provides regulations that establish the required ambient noise levels and maximum allowable noise levels based on the land use. The Solano County Code, Chapter 28, Land Use Regulations, includes standards to control excessive noise and vibration in the unincorporated County.

Article II. Noise Restrictions

Section 28.1.20 General Noise Restrictions

a) It is unlawful for any person to willfully or negligently make or continue, or cause to be made or continued, any noise or sound which exceeds the allowed decibel level identified in this chapter or which is offensive to persons of normal sensitivities.

Section 28.1-30 Interior Noise Standards

a) The interior noise standards for residential dwelling units within residential zones or areas for noise generated by sources outside the dwelling unit are presented in Table 4.10-9.

Table 4.10-9. Noise Level Permissible by Receiving Land Use - [Table 28.1-30] of Solano County Noise Ordinance

Receiving Land Use	Time Interval	Allowable Interior Noise Level (dBA)
Residential	7 p.m. – 7 a.m.	45
Residential	7 a.m. – 7 p.m.	55

Notes: dBA = A-weighted decibel.
Source: Solano County 2017.

b) Noise from any source on a property within a residential zone or area shall not cause the noise level measured inside a dwelling unit on a neighboring property to exceed the noise standard specified in Table 4.10-9 for a cumulative period of more than 5 minutes in any hour.

Section 28.1- 40 Exterior Noise Standards

a) The maximum permissible sound levels by receiving land use shall apply:

   1) The exterior noise standards for residential and agricultural zones or areas are presented in Table 4.10-10.

   2) If the measured ambient noise level at the time of a complaint investigation exceeds the identified permissible noise level for that zone, the allowable noise standard shall be the ambient noise level.

   3) Except as provided in subsection (b) of Section 28.1-30, noise from any source shall not cause the noise level measured on a property in an agricultural or residential zone or area to exceed the exterior noise levels specified in Table 4.10-10 or in subsection (2), whichever is greater, for a period of more than 5 minutes in any hour.

Table 4.10-10. Exterior Noise Standards - [Table 28.1-40] of Solano County Noise Ordinance

Receiving Land Use	Noise Level (dBA) 7 a.m. – 7 p.m.	Noise Level (dBA) 7 p.m. – 7 a.m.
Agricultural	55	50
Residential	55	50

Notes: dBA = A-weighted decibel.
Source: Solano County 2017.

Section 28.1-50 Specific Noise Regulations

In addition to the standards established in Sections 28.1-30 and 28.1-40, noise created by specific activities shall be subject to the following additional regulations.

a) Construction or Demolition

1) Construction and demolition activities within a residential district or within a radius of 500 feet are allowed only during the times specified in Table 4.10-11.

2) Except as set forth in subsection (5) of this section, the noise created by construction activity shall not cause:

a. The noise level to exceed the noise standards specified in Table 4.10-10 of this chapter, for the land use where the measurement is taken, plus 20 dBA, for a period of more than 2 minutes; or

b. A maximum noise at the receiving property line of more than 90 dBA at any time.

3) Any construction that exceeds noise levels established in Sections 28.1-30 or 28.1-40 shall occur between the hours of 9 a.m. and 4 p.m., Monday through Friday.

4) Construction or demolition activity during the times otherwise prohibited by this section may be allowed as described in this subsection if it is found to be in the public interest.

a. A request for such allowance shall be in writing and shall set forth in detail facts showing that the public interest will be served by the grant of such allowance.

b. If the allowance is being requested in connection with construction or demolition activities to be undertaken in connection with a land division, use permit, or other discretionary entitlement, the request shall be submitted as part of the application for such entitlement and shall be acted upon by the official or decision-making body taking action on such application, after considering the recommendation of the noise control officer.

c. If the allowance is being requested in connection with a building permit, demolition permit, or grading permit and is not in connection with a discretionary entitlement, the request shall be considered and acted on by the noise control officer before the construction or demolition permit has been issued.

Table 4.10-11. Time Limits for Noise Associated with Commercial Construction Activities - [Table 28.1-50] of Solano County Noise Ordinance

Day of Week	Time Frame
Monday–Friday	7 a.m. – 6 p.m.
Saturday	8 a.m. – 5 p.m.
Sunday	Not allowed
Federal Holidays	Not allowed

Source: Solano County 2017.

Section 28.1-60 Exemptions

a) The following activities and noise sources are exempt from the provisions of this chapter:

1) Emergency sirens.

2) Any operation or action required to respond to an emergency.

3) Emergency construction or maintenance work conducted by public agencies or their contractors which is necessary to maintain the health and safety of the public.

4) Agricultural activities.

5) Those commercial and industrial operations in existence prior to the date of adoption of the ordinance codified in this chapter, if in compliance with local zoning statutes, shall be granted a five-year period from the date of adoption within which to comply with the provisions of this chapter. If, at the end of the five years, it can be shown that compliance with the provisions in this chapter constitutes a hardship in terms of technical and economic feasibility, a waiver may be requested following procedures established in Section 28.1-80 of this code until such time as compliance may be affected.

6) Any activity which regulation thereof has been preempted by state or federal law.

CITY OF SUISUN CITY GENERAL PLAN

Public Health and Safety Element

- **Policy PHS-1.1:** Large-scale commercial land uses that could require 50 or more large truck trips per day shall route truck traffic to SR 12 or Arterials and avoid Collectors and Local Streets.
- **Policy PHS-1.2:** New development shall be designed to disperse vehicular traffic onto a network of fully connected smaller roadways.
- **Policy PHS-1.3:** Industrial and other noise-generating land use should be located away from noise-sensitive land uses or should use noise attenuation methods, such as enclosing substantial noise sources within buildings or structures, using muffling devices, or incorporating other technologies designed to reduce noise levels.
- **Policy PHS-1.4:** The City will use all feasible means to reduce the exposure of sensitive land uses to excessive noise levels and mitigate where noise levels exceed those specified in Table 4.10-12.

Table 4.10-12. Maximum Allowable Noise Exposure from Transportation Noise Sources at Noise-Sensitive Land Uses- [Table 9-1] of City of Suisun City Public Health and Safety Element

Land Use	Outdoor Activity Area–L_{dn}	Interior Spaces–L_{dn}	Interior Spaces–L_{eq}
Residential	60	45	---
Residential (in Downtown Waterfront Specific Plan Area or other Mixed-Use Designations)	70	45	---
Transient Lodging	60	45	---
Hospitals, Nursing Homes	60	45	---
Theaters, Auditoriums, Music Halls	---	---	35
Churches, Meeting Halls	60	---	40
Office Buildings	---	---	45
Schools, Libraries, Museums	60	---	45
Playgrounds, Neighborhoods	70	---	---

Notes: --- = not applicable; dBA = A-weighted decibels; L_{dn} = day-night average noise level L_{eq} = equivalent or energy-averaged sound level
Noise-sensitive land uses include schools, hospitals, rest homes, long-term care, mental care facilities, residences, and other similar land uses. Outdoor activity areas are considered to be the portion of a noise-sensitive property where outdoor activities would normally be expected (i.e., patios of residences and outdoor instructional areas of schools). Outdoor activity areas for the purposes of this element do not include gathering spaces alongside transportation corridors or associated public rights-of-way. Where development projects or roadway improvement projects could potentially create noise impacts, an acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be included in the project design. Such analysis shall be the financial responsibility of the applicant and be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics. Mitigation strategies shall include site planning and design over other types of mitigation.
Source: City of Suisun City 2023.

- **Policy PHS-1.5:** It is the City's policy to allow outdoor transportation noise levels for residential uses in mixed-use land use designations, including the Downtown Waterfront Specific Plan Area, of up to 70 dBA L_{dn} and this level of noise exposure will not be considered a significant impact for the purposes of California Environmental Quality Act review.

- **Policy PHS-1.7:** The City should coordinate with Union Pacific and the Public Utilities Commission to replace at-grade railroad crossings with Federal Railroad Administration-approved quiet zone rated crossing systems designed to reduce or eliminate the use of rail horn blasts within the City, as funding is available.

- **Policy PHS-1.8:** Soundwalls are prohibited as a method for reducing noise exposure that could be addressed through other means, such as site design, setbacks, earthen berms, or a combination of these techniques.

- **Policy PHS-1.9:** New developments shall implement feasible noise mitigation to reduce construction noise and vibration impacts. Projects that incorporate feasible mitigation will not be considered by the City to have significant impacts for the purposes of the California Environmental Quality Act review.

- **Policy PHS-1.10**: Public events, such as school sporting events, festivals, and other similar community and temporary events are exempt from the noise standards outlined in this Element.

- **Program PHS-1.1:** Reduce Noise Exposure for Noise-Sensitive Land Uses. Development of noise-sensitive land uses in areas with existing noise from mobile, stationary, or agricultural sources will be reviewed and conditioned according to the City's noise policies. Projects that could expose noise-sensitive uses will be required to incorporate feasible mitigation to address potentially significant noise effects. Methods may include but are not limited to: traffic calming, site planning that orients noise-sensitive outdoor gathering areas away from sources, buffering, sound insulation, and other methods deemed effective by the City. Development projects that are affected by non-transportation-related noise shall be mitigated to achieve

acceptable levels specified in Table 4.10-13, as measured at outdoor activity areas of existing and planned noise-sensitive land uses. If existing noise levels exceed acceptable levels in Table 4.10-13 as measured at outdoor activity areas of noise-sensitive land uses, then:

- Where existing exterior noise levels are between 60 and 65 dBA in outdoor activity areas of noise-sensitive uses, an increase of 3 dBA or greater is considered significant and requires mitigation to achieve acceptable levels.

- Where existing exterior noise levels are greater than 65 dBA in outdoor activity areas of noise-sensitive uses, an increase of 1.5 dBA or greater is considered significant and requires mitigation to achieve acceptable levels.

- Where it is not possible to reduce noise in outdoor activity areas to 60 dBA or less using practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dBA may be allowed, provided that feasible exterior noise level reduction measures have been implemented.

- The City will identify regional, state, and federal sources of funding to make improvements that would attenuate noise as experienced by existing noise-sensitive land uses, where feasible.

Table 4.10-13. Noise Level Performance Standards for New Projects Affected By, or Including, Non-Transportation Noise Sources - [Table 9-2] of City of Suisun City Public Health and Safety Element

Noise Level Descriptor	Daytime (7 am – 10 pm)	Nighttime (10 pm – 7 am)
Hourly L_{eq}	60 dBA	45 dBA
L_{max}	75 dBA	65 dBA

Notes: dBA = A-weighted decibel; L_{eq} = equivalent or energy-averaged sound level; L_{max} = Highest root-mean-square sound level measured over a given period of time.
Each of the noise levels specified shall be lowered by five dBA for simple tone noises, noises consisting primarily of speech, or music, or for recurring impulsive noises. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).
Source: City of Suisun City 2015.

- **Program PHS-1.2:** Review and Conditioning of Noise-Generating New Uses. New developments that generate noise will be reviewed and feasible mitigation will be required to reduce effects on existing noise-sensitive land uses. Methods may include, but are not limited to: operating at less noise-sensitive parts of the day, better distribution of vehicle traffic to avoid large volumes on any one street, traffic calming, buffering, sound insulation, and other methods deemed effective by the City. The maximum noise level resulting from new sources and ambient noise shall not exceed the standards in Table 4.10-13, as measured in outdoor activity areas of any affected noise-sensitive land use except:

  - If the ambient noise level exceeds the standard in Table 4.10-13, the standard becomes the ambient level plus 5 dBA.

  - Reduce the applicable standards in Table 4.10-14 by 5 decibels if they exceed the ambient level by 10 or more decibels.

  - The City shall exempt all school-related events and City-sponsored events from noise standards outlined in this chapter.

Table 4.10-14. Noise Level Performance Standards for Non-Transportation Noise Sources - [Table 9-3] of City of Suisun City Public Health and Safety Element, Maximum Exterior Noise Level Standards (dBA)[2]

Cumulative Duration of a Noise Event[1] (Minutes)	Daytime[3,5]	Nighttime[4,5]
30-60	50	45
15-30	55	50
5-15	60	55
1-5	65	60
0-1	65	60

Notes: dBA = A-weighted decibel.
1 Cumulative duration refers to the time within any one-hour period.
2 Noise level standards measured in dBA.
3 Daytime = Hours between 7:00 a.m. and 10:00 p.m.
4 Nighttime = Hours between 10:00 p.m. and 7:00 a.m.
5 Each of the noise level standards specified may be reduced by 5 dBA for tonal noise (i.e., a signal which has a particular and unusual pitch) or for noises consisting primarily of speech or for recurring impulsive noises (i.e., sounds of short duration, usually less than one second, with an abrupt onset and rapid decay such as the discharge of firearms).
Source: City of Suisun City 2015.

- **Program PHS-1.3** Train Quiet Zone. The City will coordinate with Union Pacific Railroad, the Federal Railroad Administration, and the City of Fairfield to establish a Quiet Zone. As funding is available, the City will collaborate with other agencies to improve crossings with appropriate technologies to implement the Quiet Zone. The City will coordinate with Union Pacific to reduce or eliminate the use of horns in noise-sensitive areas of the community with the installation of alternative crossing devices.

- **Program PHS-1.5** Construction Noise and Vibration Reduction Measures. The City will require new developments proposing construction adjacent to existing noise-sensitive uses or close enough to noise-sensitive uses that relevant performance standards could be exceeded to incorporate feasible mitigation to reduce construction noise exposure. This may include additional limits on the days and times of day when construction can occur, re-routing construction equipment away from adjacent noise-sensitive uses, locating noisy construction equipment away from noise-sensitive uses, shrouding or shielding impact tools, use of intake and exhaust mufflers and engine shrouds, construction of acoustic barriers (e.g., plywood, sound attenuation blankets), pre-drilling holes for placement of piles or non-impact pile driving where piles would be needed, and other feasible technologies or reduction measures necessary to achieve the City's relevant performance standards.

- **Policy PHS-2.1** New developments that propose vibration-sensitive uses within 100 feet of a railroad or heavy industrial facility shall analyze and mitigate potential vibration impact, as feasible.

- **Policy PHS-2.2** New developments that would generate substantial long-term vibration shall provide analysis and mitigation, as feasible, to achieve velocity levels, as experienced at habitable structures of vibration-sensitive land uses, of less than 78 vibration decibels.

City of Suisun City Noise Ordinance

Presently, the City does not have an adopted noise ordinance. Instead, there are policies in the 2035 General Plan which encourage the discussion and ultimate adoption of noise regulations.

In Title 15, "Buildings and Construction," there are regulations relative to construction work hours, but no regulations that generally address noise or other activities that generate noise or could be considered a nuisance. Absent an adopted ordinance that addresses more comprehensive issues, the Police Department is limited in what they can do in response to citizen complaints.

15.04.075 - Construction work hours.

It shall be the responsibility of anyone engaging in construction or demolition work to restrict the hours of work activity on the site as follows.

a. No construction equipment shall be operated nor any outdoor construction, non-residential projects, or repair work shall be permitted within 600 feet from any occupied residence except during the hours of 7:00 a.m. to 8:00 p.m., Monday through Friday, and 8:00 a.m. to 8:00 p.m., on Saturday and Sunday.

b. Construction work hours on residential projects shall be from 7:00 a.m. to 8:00 p.m.

c. A request for an exception to the permitted construction hours and days may be granted by the chief building inspector for emergency work, to offset project delays due to inclement weather, for 24-hour construction projects, or other similar occurrences.

d. City projects determined by the director of public works to be emergencies shall be exempt from these provisions.

e. For construction work hours for earthwork, trenching, concrete, or paving see Section 15.12.320.

f. Interior work which would not create noise or disturbance noticeable to a reasonable person of normal sensitivity in the surrounding neighborhood shall not be subject to these restrictions.

CITY OF FAIRFIELD GENERAL PLAN

While the City of Fairfield General Plan is not directly relevant to the proposed Project, which proposes development within Suisun City and Solano County, this information is presented for context and understanding of the City of Fairfield's expectation for noise environment for areas within the city of Fairfield.

- **Policy HS 9.1.** Ground transportation noise: The compatibility of proposed projects with existing and future noise levels due to ground transportation noise sources shall be evaluated by comparison to Table HS-1 where the existing or future noise level from ground transportation noise sources is determined to exceed the standards of Table HS-1. Noise levels in outdoor activity areas and interior spaces shall be mitigated to the levels shown in Table HS-1.

- **Policy HS 9.3.** Non-transportation noise: Noise created by new non-transportation noise sources shall be mitigated so as not to exceed the interior and exterior noise level standards of Table HS-2. Where proposed non-transportation noise sources are likely to produce noise levels exceeding the performance standards of Table HS-2, an acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be included in the project design.

- **Policy HS 9.4.** Non-transportation noise: New development of noise-sensitive land uses shall not be allowed where the noise level due to non-transportation noise sources will exceed the standards of Table HS-2. Where noise-sensitive land uses are proposed in areas exposed to existing or projected exterior non-transportation noise levels exceeding the performance standards of Table HS-2, an acoustical analysis shall be required so that noise mitigation may be included in the project design.

- **Policy HS 9.5.** All acoustical analyses required by the Noise Component of the Health and Safety Element shall:

  - Be the responsibility of the applicant.

  - Be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics.

  - Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions.

  - Estimate existing and projected (20 years) noise levels in terms of L_{dn} and/or the standards of Table HS-2, and compare those levels to the policies of this Element.

  - Recommend appropriate mitigation to achieve compliance with the adopted policies and standards of this Element. Where the noise source in question consists of intermittent single events, the report must address the effects of maximum noise levels in sleeping rooms in terms of possible sleep disturbance.

  - Estimate noise exposure after the prescribed mitigation measures has been implemented.

  - Describe a post-project assessment program that could be used to evaluate the effectiveness of the proposed mitigation measures.

- **Policy HS 9.6.** The City shall utilize procedures for project review and issuance of building permits to ensure that noise mitigation measures identified in an acoustical analysis are implemented in the project design.

- **Policy HS 9.7.** The City shall require monitoring of compliance with the standards of the Noise Element after completion of projects where noise mitigation measures have been required.

- **Policy HS 9.10.** The City shall periodically review and update the Noise component of the Health and Safety Element to ensure that noise exposure information and policies are consistent with changing conditions within the community and with noise control regulations or policies enacted after the adoption of the Element.

- **Policy HS 9.11.** The City shall require all development projects to mitigate noise impacts associated with construction activities.

- **Policy HS 9.13.** The City may adopt a citywide noise ordinance to address excessive noise. The noise ordinance may include special standards for residential development near the Fairfield-Vacaville Train Station and for new mixed-use projects that exceed the exterior noise standards included in Table HS-1 [Table 4.10-15] and Table HS-2 [Table 4.10-16].

Table 4.10-15. Maximum Allowable Noise Exposure to Ground Transportation Noise Sources - [Table HS-1] of City of Fairfield Health and Safety Element

Land Use	Outdoor Activity Area [a] – L_{dn}	Interior Spaces–L_{dn}	Interior Spaces [b] – L_{eq}
Residential	60[c]	45	---
Transient Lodging	60[c]	45	---
Hospitals, Nursing Homes	60[c]	45	---
Theaters, Auditoriums, Music Halls	---	---	35
Churches, Meeting Halls	60[c]	---	40
Office Buildings	---	---	45
School, Libraries, Museums	---	---	45
Playgrounds, Neighborhoods	70	---	---

Notes: --- = not applicable; CNEL = Community Noise Equivalent Level; dBA = A-weighted decibels; L_{dn} = day-night average noise level; L_{eq} = equivalent or energy-averaged sound level

a. Where the location of outdoor activity areas is unknown, the exterior noise-level standard shall be applied to the property line of the receiving land use.
b. As determined for a typical worst-case hour during periods of use.
c. Where it is not possible to reduce noise in outdoor activity areas to 60 dB L_{dn}/CNEL or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dB L_{dn}/CNEL may be allowed provided that available exterior noise-level reduction measures have been implemented and interior noise levels are in compliance with this table.

Source: City of Fairfield 2004.

Table 4.10-16. Noise Level Performance Standards for New Projects Affected By, or Including, Non-Transportation Noise Sources - [Table HS-2] of City of Fairfield Health and Safety Element

Land Use	Noise Level Descriptor	Exterior Noise-Level Standard, dBA (Applicable at Property Line) Daytime (7 am – 10 pm)	Exterior Noise-Level Standard, dBA (Applicable at Property Line) Nighttime (10 pm – 7 am)	Interior Noise-Level Standard, dBA Daytime (7 am – 10 pm)	Interior Noise-Level Standard, dBA Nighttime (10 pm – 7 am)
Residential	L_{eq}	50	45	40	35
	L_{max}	70	65	60	55
Transient Lodging, Hospitals, Nursing Homes	L_{eq}	---	---	40	35
	L_{max}	---	---	60	55
Theaters, Auditoriums, Music Halls	L_{eq}	---	---	35	35
Churches, Meeting Halls	L_{eq}	---	---	40	40
Office Buildings	L_{eq}	---	---	45	---
Schools, Libraries, Museums	L_{eq}	---	---	45	---
Playgrounds, parks	L_{eq}	65	---	---	---

Notes: --- = not applicable; dBA = A-weighted decibel; L_{eq} = equivalent or energy-averaged sound level; L_{max} = Highest root-mean-square sound level measured over a given period of time.

Each of the noise levels specified shall be lowered by five dBA for simple tone noises, noises consisting primarily of speech, or music, or for recurring impulsive noises. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).

Source: City of Fairfield 2004.

City of Fairfield Noise Ordinance

Section 25.1403 Noise Standards.

It is unlawful for any person to create any noise at any location in the City of Fairfield that results in exposure to other properties in the vicinity that exceeds the levels of Table 25.1401 (Table 4.10-16 above), except as otherwise provided for in this ordinance.

Section 25.1404 Specific Prohibition

Construction activities - Operating or permitting the operation of any tools or equipment used in construction, grading or demolition works between the hours of 10:00 p.m. and 7:00 a.m. except by written permission of the Director of Public Works.

Section 25.1405 Exemptions.

Sound or noise emanating from the following sources and activities are exempt from the provisions of this ordinance:

F. Portable or stationary emergency generators used to provide backup power during a power outage or an emergency, or as required for routine testing of the generator. Portable and stationary emergency generators must not exceed 70 dBA during full speed diagnostics and normal operations when measured at 21 feet with no loads, must comply with all requirements of the California Fire Code as amended by the City, and must comply with setback requirements pursuant to Section 25.30.6 of this Code. Installations of stationary emergency generators shall require a building permit and must comply with the screening requirements in Section 25.30.3. Testing of generators shall be limited to the hours of 7:00 a.m. and 10:00 p.m. on any day and limited to the duration specified by the manufacturer's recommendations. For the purpose of this subsection, an "emergency" means any city, county, or state declared emergency, or any interruption of utility power due to preventive utility shut-off measures or due to damage to utility infrastructure from accidents, earthquakes, fires, floods, storms, winds, or other acts.

H. Any activity related to the construction, development, manufacture, maintenance, testing, or operation of any aircraft engine, or of any weapons system or subsystems which are owned, operated, or under the jurisdiction of the United States.

Section 25.1406 Noise Standards for New Development Projects.

The following noise standards shall apply to proposed development projects, unless otherwise specifically indicated otherwise in this ordinance.

Section 25.1407 Non-transportation Noise.

Noise created by new non-transportation noise sources shall be mitigated so as not to exceed the interior and exterior noise level standards of Table 25.1401 (Table 4.10-15 above). Where a proposed project includes non-transportation noise sources that are likely to produce noise levels exceeding the performance standards of Table 25.1401 (Table 4.10-15 above) or where a proposed project is likely to be exposed to existing non-transportation noise sources exceeding the standards of Table 15.1401 (Table 4.10-15 above), an acoustical analysis shall be required so that noise mitigation may be included in the project design.

Section 25.1408 Ground Transportation.

The compatibility of proposed projects with existing and future noise levels due to ground transportation noise sources shall be evaluated in comparison with Table 25.1402 (Table 4.10-16 above). Where a proposed project is likely to be exposed to ground transportation noise sources exceeding the performance standards of Table 25.1402, an acoustical analysis shall be required so that noise mitigation may be included in the project design.

4.10.3 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

METHODOLOGY

Data included in Chapter 3 of this EIR, "Project Description," and obtained during on-site noise monitoring was used to determine potential locations of sensitive receptors and potential noise- and vibration-generating land uses in the vicinity of the Project Site. Noise-sensitive land uses and major noise sources near the proposed Project area were identified based on existing documentation (e.g., equipment noise levels and attenuation rates) and site reconnaissance data.

To assess the impacts of potential short-term construction noise on future sensitive receptors, the sensitive receptors and their relative exposure to the impacts were identified. The construction noise and vibration could be generated if there were development within the vicinity of the Project Site or off-site improvement areas. Construction noise was predicted by using the Federal Highway Construction Noise Model (RCNM, FHWA 2006). The emission noise levels referenced, and the usage factors were based on the Federal Highway Administration Roadway Construction Noise Model. Construction vibration was estimated using Federal Transit Noise and Vibration Impact Assessment methodology (FTA 2018). Groundborne vibration impacts were qualitatively assessed based on existing documentation (e.g., vibration levels produced by specific construction equipment operations) and the distance of sensitive receptors from the given source. The noise and vibration levels of the specific construction equipment that would be used and the resulting noise levels where sensitive receptors are located were calculated.

Traffic noise modeling was conducted based on average daily traffic volumes forecasted by the transportation analysis conducted to support this EIR. This is discussed in more detail in Section 3.14, "Transportation." The FHWA RD 77-108 was used to calculate traffic noise levels along affected roadways, based on the trip distribution estimates as discussed in Section 4.12, "Transportation." The proposed Project's contribution to the existing traffic noise levels along area roadways was determined by comparing the predicted noise levels at a reference distance of 100 feet from the roadway centerline for the baseline, baseline conditions with the addition of Project-generated traffic, and cumulative conditions with and without Project-generated traffic.

Potential noise impacts from long-term (operation-related) stationary sources were assessed based on existing documentation (e.g., equipment noise levels) and site reconnaissance data. This analysis also included an evaluation of noise-generating uses that could affect noise-sensitive receptors near the proposed Project area. As noted in the introduction of this section, potential impacts to wildlife species from Project-related noise and vibration are evaluated in Section 4.3 of this EIR, "Biological Resources."

THRESHOLDS OF SIGNIFICANCE

Based on Appendix G of the CEQA Guidelines, the proposed Project would have a significant impact related to noise and vibration if it would:

- 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*: (Solano County Policies HS.P-49, HS.P-61, and HS.P-62 for Transportation Noise Sources, and Policies HS.P-48, HS.P-49, HS.P-51, HS.P-52, HS.P-62 and HS.P-64 through HS.P-67 for Non-Transportation Noise Sources),* (Table 4.10-7 *for Transportation Noise Sources and* Table 4.10-8 *for Non-*

Transportation Noise Sources, and Section 28.1.20 through Section 28.1.60 of the County of Solano Code for Construction Noise); City of Suisun City Policies PHS-1.1 through PHS 1.5 for Transportation Noise Sources, and Policies PHS-1.8 through PHS 1.10 for Non-Transportation Noise Sources), (Table 4.10-12 *for Transportation Noise Sources and* Table 4.10-14 *for Non-Transportation Noise Sources, and Title 15, "Buildings and Construction of the City of Suisun City Noise Ordinance); City of Fairfield Policy HS-9.1 for Transportation Noise Sources, and Policies HS-9.3 and HS 9.4 for Non-Transportation Noise Sources),* (Table 4.10-15 *for Transportation Noise Sources and* Table 4.10-16 *for Non-Transportation Noise Sources, and Section 25.1403 through Section 25.1408 of the City of Fairfield Noise Ordinance);*

- Generation of excessive groundborne vibration or groundborne noise levels *(Vibration impacts would be significant if vibration levels would exceed the Caltrans-recommended standard of 0.2 in/sec PPV with respect to the prevention of structural damage for normal buildings or FTA's maximum-acceptable vibration standard of 80 VdB with respect to human response (i.e., annoyance) at nearby vibration-sensitive land uses, such as residences)*; (*City of Suisun City Program PHS-1.5, Goal PHS-2, and Policies PHS-2.1 and PHS-2.2);*.

- 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 for people residing or working in the project area to excessive noise levels *(Significant if the proposed Project would expose people to excessive noise levels from an airport or private airstrip, or if located within the 60 dB L_{dn}/CNEL contour of any airport)*. (*City of Suisun City Policy PHS-1.6).*

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. The nearest airport to the Project Site would be the Travis Air Force Base (AFB) which is located approximately four miles to the northeast of the Project Site. Because the proposed Project area would not be 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.

IMPACT ANALYSIS

Impact 4.10-1: Temporary, short-term exposure of sensitive receptors to construction noise. *Short-term construction source noise levels could exceed the applicable City standards at nearby noise-sensitive receptors. In addition, if construction activities were to occur during more noise-sensitive hours, construction source noise levels could also result in annoyance and/or sleep disruption to occupants of existing and proposed noise-sensitive land uses and create a substantial temporary increase in ambient noise levels. This impact would be* ***significant****.*

Construction of the Development Area would be phased, subject to market conditions. Construction would typically occur 5 days per week, Monday through Friday, between the hours of 7 a.m. and 8 p.m. On-site construction activities would include site clearing, excavation and fill, grading, utility trenching, foundation and building construction, paving, and architectural coatings. Additional off-site construction activities will include utility trenching and installation and roadway improvements. Phase 1 of construction would take approximately 9 months and include site preparation, grading, utility trenching for the entire Project Site and off-site improvements. Phase 1 initial site work will be followed by Phase 2 development that will include construction of Buildings A and B/C and the related on-site parking and circulation and stormwater improvements, as shown on Exhibit 3-2. The remainder of the Development Area, including Buildings D, E, F, and G would be constructed

during Phase 3. Each of Phases 2 and 3 would take approximately 10 months. Wetland construction, primarily in the form of rough and fine grading, would also occur during this time in the Managed Open Space area, as shown on Exhibit 3-7.

Residences and businesses located adjacent to areas of construction activity could be exposed to Project construction noise from on-site construction activity or from off-site construction activity associated with infrastructure improvements. These off-site infrastructure improvements could be for existing roadway improvements, utilities, or water connections. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction durations last over extended periods of time.

Major noise-generating construction activities could include site grading and excavation, installation of infrastructure, building erection, paving, and landscaping. The highest construction noise levels are typically generated during grading and excavation and lower noise levels typically occur during building construction.

To assess 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.

Without feasible noise control, large pieces of earth-moving equipment, such as graders, excavators, and dozers, generate maximum noise levels of 85 dBA to 90 dBA at a distance of 50 feet (refer to Table 4.10-17) (EPA 1971: 11). Typical hourly average construction-generated noise levels are about 80 dBA to 85 dBA, measured at a distance of 50 feet from the site during busy construction periods. It is possible that pile driving could occur during the proposed Project construction. This type of construction activity could produce noise levels of approximately 95 dB at 50 feet.

Noise from localized point sources (such as construction sites) typically decreases by 6 dB to 7.5 dB with each doubling of distance from source to receptor. The existing intervening ground type at the Project Site is currently soft and attenuates noise due to absorption; therefore, an attenuation rate of 7.5 dB per doubling of distance was assumed and accounted for in construction operation noise level predictions. The nearest noise and vibration-sensitive uses to the Project Site are single-family residences located approximately 500 feet (north of SR 12 within the city of Fairfield limit) from the northern Project boundary; approximately 200 feet (east of the railway within the city of Suisun City limit) from the eastern Project boundary; approximately 300 feet from the western Project boundary; and approximately 700 feet (along Orehr Road within the Solano County limit) from the southern Project boundary. Table 4.10-18 presents Project-related construction noise at the nearest noise-sensitive uses.

Table 4.10-17. Typical Construction Equipment Noise Levels

Equipment Item	Typical Maximum Noise Level (dB) at 50 Feet
Earthmoving	--
Backhoes	80
Bulldozers	85
Front Loaders	80
Graders	85
Paver	85
Roller	85
Scrapers	85
Tractors	84
Slurry Trencher	82
Dump Truck	84
Pickup Truck	55
Materials Handling	--
Concrete Mixer Truck	85
Concrete Pump Truck	82
Crane	85
Man Lift	85
Stationary Equipment	--
Compressors	80
Generator	82
Pumps	77
Impact Equipment	--
Compactor	80
Jack Hammers	85
Impact Pile Drivers (Peak Level)	95
Pneumatic Tools	85
Rock Drills	85
Other Equipment	--
Concrete Saws	90
Vibrating Hopper	85
Welding Machine / Torch	73

Notes: — = no data; dB = A-weighted decibels
Noise levels are for equipment fitted with properly maintained and operational noise control devices, per manufacturer specifications.
Source: FTA 2018

Table 4.10-18. Project-Related Construction Noise (dBA) at Nearest Noise-Sensitive Land Uses

Source of Construction Noise	Distance (feet)	Typical Construction Noise - L_{eq}	Including Pile Driving Noise - L_{eq}
From Utilities (Potentially within the County and City Limits)	50	85	95
From Northern Boundary (City of Fairfield)	500	60	70
From Eastern Boundary (City of Suisun City)	200	70	80
From Southern Boundary (County of Solano)	700	56	66

Notes: dBA = A-weighted decibels; L_{eq} = equivalent or energy-averaged sound level.
Source: Calculated by AECOM 2022.

Permitted hours of construction and applicable thresholds in Solano County, City of Suisun City, and the City of Fairfield are described above in Section 4.10.2 and summarized in Table 4.10-19, below. As seen, the County of Solano exempts daytime construction noise from applicable standards. However, if construction activities occur during the more noise-sensitive evening and nighttime hours, due to the potential necessity of continuous activity for specific components to maintain structural integrity, Project-generated noise levels could exceed nighttime exterior and interior noise standards of 55 dB L_{eq} and 45 dB L_{eq}, respectively, at the nearest noise-sensitive receptors.

Table 4.10-19. Permitted Hours of Construction and Applicable Construction and Operation Thresholds in Solano County, City of Suisun City, and City of Fairfield

Thresholds	Solano County	City of Suisun City	City of Fairfield
Monday through Friday	Permitted from 7 a.m. to 6 p.m.	Permitted from 7:00 a.m. to 8:00 p.m.	Permitted from 7:00 a.m. to 10:00 p.m.
Saturdays	Permitted from 8 a.m. to 5 p.m.	Permitted from 8:00 a.m. to 8:00 p.m.	Not specified.
Sundays	Not allowed.	8:00 a.m. to 8:00 p.m.	Not specified.
Holidays	Not allowed.	Not specified.	Not specified.
Applicable Residential Thresholds (Construction Equipment) – Beyond Permitted Hours	55 /50 L_{eq}. Interior Daytime/Nighttime 55 / 45 L_{eq}. (as shown in Table 4.10-9. Interior Noise Level Permissible by Receiving Land Use) & 55 /50 L_{eq}. Exterior Daytime/Nighttime (as shown in Table 4.10-10. Exterior Noise Standards	Table 4.10-14. Noise Level Performance Standards for Non-Transportation Noise Sources	Table 4.10-16. Noise Level Performance Standards for Non-Transportation Noise Sources
Applicable Residential Thresholds (Construction Traffic) – Beyond Permitted Hours	Not specified.	Table 4.10-14. Noise Level Performance Standards for Non-Transportation Noise Sources	Table 4.10-15. Maximum Allowable Noise Exposure from Transportation Noise Sources at Noise-Sensitive Land Uses
Applicable Residential Thresholds (Operation) - Transportation	65 L_{dn} - Sensitive Outdoor Area & 45 L_{dn} - Sensitive Interior Area (as shown in Table 4.10-7. Noise Standards for New Uses Affected by Traffic and Railroad Noise).	Table 4.10-12. Maximum Allowable Noise Exposure from Transportation Noise Sources at Noise-Sensitive Land Uses	Table 4.10-15. Maximum Allowable Noise Exposure from Transportation Noise Sources at Noise-Sensitive Land Uses
Applicable Residential Thresholds (Operation) – Non-Transportation	55 /50 L_{eq}. Outdoor Area Daytime/Nighttime 35 / 55 L_{eq}. Interior Day & Night (as shown in Table 4.10-8. Non-Transportation Noise Standards).	Table 4.10-13 and Table 4.10-14. Noise Level Performance Standards for Non-Transportation Noise Sources.	Table 4.10-16. Noise Level Performance Standards for Non-Transportation Noise Sources.

Notes: L_{dn} = day-night average noise level; L_{eq} = the equivalent hourly average noise level
Source: Solano County 2017, City of Suisun City 2015, and the City of Fairfield2004.

As shown in Table 4.10-18, Project-related construction noise range from 57 dBA to 85 dBA (under typical construction activities), and from 66 dBA to 95 dBA (with pile driving). These noise levels exceed the applicable thresholds summarized in Table 4.10-19 when construction occurs beyond permitted hours. Therefore, the

construction of on-site and off-site of the proposed Project facilities could expose existing off-site sensitive receptors to equipment noise levels that exceed the applicable noise standards and/or result in a substantial increase in ambient noise levels. This would be a **significant** impact.

Mitigation Measures

Mitigation Measure 4.10-1a: Implement Noise-Reducing Construction Practices, Prepare and Implement a Noise Control Plan, and Monitor and Record Construction Noise near Sensitive Receptors.

The Project applicant(s) and their primary contractors for engineering design and construction of all Project phases 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:

- Noise-generating construction operations shall be limited to the hours between 7 a.m. and 6 p.m. Monday through Friday, and between 8 a.m. and 5 p.m. on Saturdays (conservatively assuming the hours based on Solano County's permitted hours of construction).
- Noisy construction equipment and equipment staging areas shall be located as far as possible from nearby noise-sensitive land uses.
- 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) as planned phases are built out and future noise-sensitive receptors are located within 250 feet of future construction activities.
- Written notification of construction activities shall be provided to all noise-sensitive receptors located within 800 feet of typical construction activities and 2,000 feet of pile driving activity. The 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 land uses in reducing interior noise levels (e.g., closing windows and doors) shall also be included in the notification.
- To the extent feasible and necessary to reduce construction noise levels consistent with applicable policies, acoustic barriers (e.g., lead curtains, sound barriers) shall be constructed to reduce construction-generated noise levels at affected noise-sensitive land uses. The barriers shall be designed to obstruct the line of sight between the noise-sensitive land use and on-site construction equipment.

- When future noise-sensitive uses are within close proximity to prolonged construction noise, noise-attenuating buffers such as structures, truck trailers, or soil piles shall be located between noise sources and future residences, as feasible, to shield sensitive receptors from construction noise.

Significance after Mitigation

With implementation of Mitigation Measure 4.10-1a, construction would be limited to daytime hours, for which associated noise levels are considered exempt from the provisions of applicable standards established by the City and the County. On-site and off-site impacts from temporary, short-term exposure of sensitive receptors to increased equipment noise from the Project would be reduced. With enforcement of the above mitigation measure and existing noise regulations, future development in the proposed Project Site and off-site improvements would be designed to minimize potential impacts. For example, when installed properly, acoustic barriers can reduce construction noise levels by approximately 8–10 dB (EPA 1971). This mitigation measure would reduce potential impacts. However, it is not possible to demonstrate that this would avoid significant construction noise impacts in every case. There is no additional feasible mitigation. The impact is considered **significant and unavoidable.**

Impact 4.10-2: Temporary, short-term exposure of sensitive receptors to increased traffic noise levels from Project construction. *Future development would result in temporary increases in on- and off-site roadway traffic noise associated with Project construction. Construction-generated traffic could expose sensitive receptors to noise levels along on- and off-site roadways that would not exceed the applicable noise standards and/or result in a substantial increase in ambient noise levels. This impact would be* ***less than significant****.*

Future development would result in an increase of traffic volumes due to the addition of construction-generated traffic associated with on-site future development and off-site infrastructure improvements. Construction-generated traffic on the local roadway network was analyzed based on a maximum construction-related traffic volume of 500 vehicles daily and assuming eight hours of construction period per, the Project would result in 63 construction vehicles per hour. As such, all materials would be transported using the local roadway network, thus increasing traffic volumes along affected roadway segments.

To examine the effect of Project-generated traffic increases, traffic noise levels associated with the proposed Project were calculated for roadway segments in the vicinity of the proposed Project area studied under the Transportation Section of this EIR. Traffic noise levels were modeled using the FHWA-RD-77-108 under existing conditions, with and without construction traffic. Additional input data included day/night percentages of autos, medium and heavy trucks, vehicle speeds, ground attenuation factors, and roadway widths.

Table 4.10-20 summarizes the modeled traffic noise levels for existing and existing plus construction conditions at 50 feet from the centerline of roadways. Project-related construction traffic increases accounted for a 0.1 to 0.5 dB increase in short-term traffic noise levels. Thus, implementation of the proposed Project would not result in a substantial temporary or periodic increase in ambient noise levels in the vicinity of the proposed Project area associated with construction traffic. As a result, this impact would be **less than significant**.

Table 4.10-20. Summary of Modeled Levels of Existing Traffic Noise and Distance (feet) from Roadway Centerline to L_{dn} Contour

Roadway Segment	Segment Location	Existing, L_{eq} (dB) 50 Feet	Existing plus Construction, L_{eq} (dB) 50 Feet	Increase dB
Chadbourne Road	From SR-12 to Cordelia Road	68.5	68.8	0.2
Beck Avenue	From SR-12 to North of SR-12	69.1	69.3	0.2

Roadway Segment	Segment Location	Existing, L_{eq} (dB) 50 Feet	Existing plus Construction, L_{eq} (dB) 50 Feet	Increase dB
Beck Avenue	From SR-12 to South of SR-12	67.1	67.4	0.3
West Texas Street	From Beck Avenue to Pennsylvania Avenue	69.7	69.9	0.2
SR-12	From Beck Avenue to Pennsylvania Avenue	76.2	76.3	0.1
Cordelia Road	From Beck Avenue to Pennsylvania Avenue	66.9	67.3	0.3
Pennsylvania Avenue	From SR-12 to North of SR-12	69.4	69.6	0.2
Pennsylvania Avenue	From SR-12 to South of SR-12	64.8	65.4	0.5
SR-12	From Marina Boulevard to Grizzly Island Road	76.1	76.2	0.1
SR-12	From Emperor Drive to Walters Road	74.1	74.2	0.1

Notes: dB = A-weighted decibels; Notes: L_{eq} = equivalent or energy-averaged sound level; SR = State Route.
Source: Data modeled by AECOM in 2023.

Mitigation Measures

No mitigation measures are required.

Impact 4.10-3: Temporary, short-term exposure of sensitive receptors to potential groundborne noise and vibration from Project construction. *Future development could expose sensitive receptors to groundborne noise and vibration levels that exceed applicable standards that could cause human disturbance or damaged structures. Construction could cause a temporary, short-term disruptive vibration if construction activities were to occur near sensitive receptors. This impact would be* ***significant****.*

Construction activities associated with future development 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 buildings housing affected vibration-sensitive uses. Vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. The type and density of soil can also affect the transmission of energy. Table 4.10-21 provides vibration levels at 25 feet for impact and heavy construction equipment, in terms of PPV (for structural damage) and VdB (for human annoyance).

Table 4.10-21. Typical Vibration Levels for Construction Equipment

Equipment	PPV at 25 Feet (in/sec)	Approximate L_v 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
Vibratory Roller	0.21	94
Large Bulldozer	0.089	87
Caisson Drilling	0.089	87
Truck	0.076	86
Jackhammer	0.035	79
Small Bulldozer	0.003	58
Significance Threshold	0.2/0.08 [1]	80

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; PPV = peak particle velocity
[1] For normal residential buildings and for buildings more susceptible to structural damage, respectively.
Sources: FTA 2018, Caltrans 2020.

Construction vibration would occur during the construction of the proposed Project and equipment operation on the proposed Project Site and during the transport of construction equipment and materials to and from the site.

New development should minimize vibration impacts to adjacent uses during construction based on Caltrans vibration standards. A vibration limit of 0.20 in/sec PPV will be used to minimize the potential for cosmetic damage in buildings of normal conventional construction. A vibration level of 80 VdB will be used to evaluate human response to groundborne vibration levels.

The required construction equipment is not known at this time, but could possibly include pile drivers, loaded trucks, bulldozers, and vibratory roller. According to the FTA, vibration levels associated with the use of such equipment would range from approximately 0.003 in/sec PPV (referenced to 1 μin/sec and based on the root mean square velocity amplitude) and 58 VdB for a vibratory roller to 1.518 in/sec PPV and 112 VdB for a pile driver, at 25 feet, as shown in Table 4.10-21. Typical construction equipment, loaded trucks, jackhammers, and bulldozers, generate vibration levels that decrease quickly over distance, and pile driving activities generate significantly more vibration energy and require more distance for it to decrease the vibration levels. If construction activities were to occur during more noise-sensitive hours, vibration from construction sources could annoy and/or disrupt the sleep of occupants of existing and proposed residences and expose persons to excessive groundborne vibration or groundborne noise levels.

The vibration-sensitive uses (buildings) nearest to the Project Site are residential uses approximately 350 feet to the west, approximately 550 feet to the north, approximately 200 feet to the east, and approximately 650 feet to the south from the proposed Project area boundaries. The majority of the construction activities would take place farther from the nearest noise-sensitive uses; most would occur in the central portion of the site where the buildings would be constructed. At distances of 200 to 650 feet, the vibration generated by Project construction equipment would result in 45 to 60 VdB and 0.001 to 0.004 in/sec PPV, respectively for a bulldozer (the heaviest equipment). The vibration levels from vibratory roller operation would result in 52 to 67 VdB and 0.002 to 0.009 in/sec PPV, at distances of 200 to 650 feet, respectively. The vibration generated by the pile driver would result in 62 to 77 VdB and 0.005 to 0.17 in/sec PPV. These levels would be below the criteria of 80 VdB, and above 0.2 in/sec PPV recommended for older building structures by Caltrans. However, for the existing commercial buildings located in the middle of the Project Site to the west of the intersection of Pennsylvania Avenue and Cordelia Street, the vibration levels due to construction would exceed the thresholds of building damage, conservatively assuming these structures would occur to be within 100 feet for the pile driver, and within 45 feet for vibratory rollers. Therefore, short-term construction of the Project would exceed the threshold for structural damage and would expose persons to or generate excessive ground-borne noise or vibration. For these reasons, this impact associated with groundborne noise or vibration from proposed Project construction would be **potentially significant**.

Long-term Project operations of the proposed Project would not include any major new sources of groundborne noise or vibration. Maintenance vehicles and delivery trucks would be restricted to existing and improved public roadways, and the anticipated number of trips generated would not have the potential to substantially increase vibration levels at adjacent land uses. Therefore, this impact associated with groundborne noise or vibration from proposed Project operations would be **less than significant.**

Mitigation Measures

Mitigation Measure 4.10-2a: Implement Measures to Reduce Groundborne Noise and Vibration Levels at Sensitive Receptors during Pile Driving Activities.

The Project applicant and contractor(s) for engineering design and construction of all proposed Project components and offsite improvements shall ensure that the following controls are implemented to minimize or avoid construction vibration effects on sensitive receptors:

- Place stationary construction equipment as far as possible from vibration sensitive uses.
- Use smaller construction equipment when practical, particularly smaller vibratory rollers that are as small as practicable, or that have an adjustable vibratory force feature.
- Locate loading areas, staging areas, stationary noise, vibration-generating equipment, etc., as far as feasible from sensitive receptors.
- Prohibit the use of vibratory rollers near the existing structures.
- If vibratory rollers are required to be used and need to be used within 110 feet of structures, the contractor must use a vibratory roller whose vibratory force can be turned down or turned off.
- A disturbance coordinator shall be designated and this person's contact information shall be posted in a location near the Project Site that is clearly visible to the nearby receivers most likely to be disturbed. The director would manage complaints and concerns resulting from activities that cause vibrations. The severity of the vibration concern should be assessed by the disturbance coordinator, and if necessary, evaluated by a professional with construction vibration expertise.
- The pre-existing condition of all buildings within a 500-foot radius within the immediate vicinity of proposed pile driving activities shall be recorded in the form of a preconstruction survey. The preconstruction survey shall determine conditions that exist before construction begins for use in evaluating the damage caused by construction activities. Fixtures and finishes within a 500-foot radius of construction activities susceptible to damage shall be documented (photographically and in writing) before construction. All damage will be repaired to its pre-existing condition.
- Vibration monitoring shall be conducted before and during pile driving operations occurring within 500 feet of the sensitive receptors. Every attempt shall be made to limit construction-generated vibration levels in accordance with Caltrans recommendations during pile driving and impact activities in the vicinity of the historic structures.
- Pile driving required within a 500-foot radius of sensitive receptors should use alternative installation methods, where possible (e.g., pile cushioning, jetting, predrilling, cast-in-place systems, resonance-free vibratory pile drivers). This would reduce the number and amplitude of impacts required to seat the pile.

Significance after Mitigation

Implementation of Mitigation Measure 4.10-2a would substantially limit the effects of groundborne vibration on sensitive receptors. Pile driving construction would be conducted at least 500 feet from vibration-sensitive receptors, or use alternative methods when within 500 feet from a vibration-sensitive receptor. Therefore, Project-generated groundborne noise and vibration levels would be reduced to below the impact threshold levels.

The impact is considered **less than significant with mitigation.**

Impact 4.10-4: Long-term transportation noise levels at existing noise-sensitive receivers. *Future development would result in an increase in vehicle trips and train trips, which would result in a noticeable (3 dB or greater) increase in transportation noise along one roadway segment in and within the vicinity of the proposed Project area. Therefore, this impact would be* ***less than significant.***

Vehicular Traffic Noise

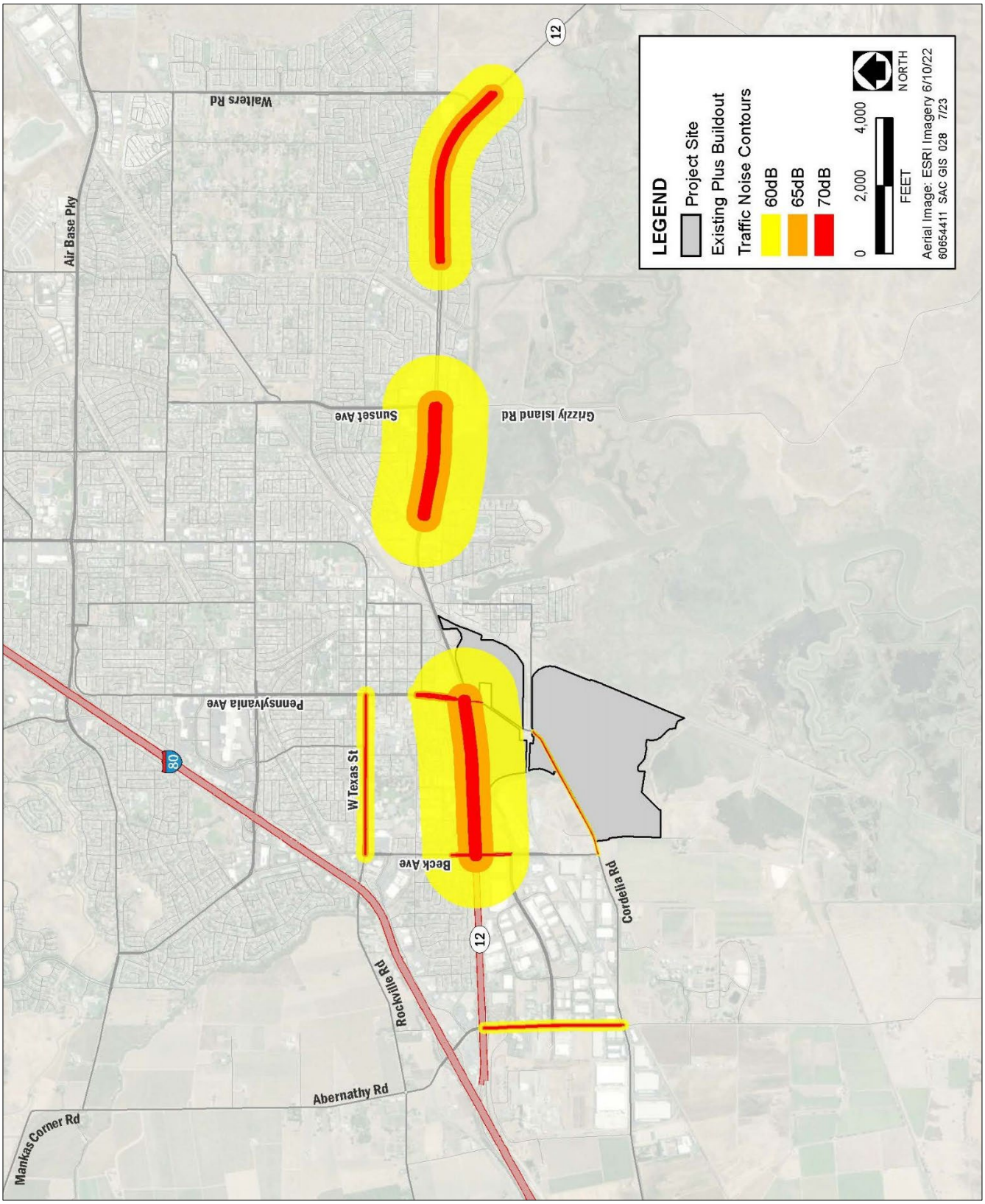
Operations of the proposed Project would result in an increase in traffic volumes on the local roadway network and, consequently, an increase in noise levels from traffic sources along affected roadway segments. To assess the impact of Project-generated traffic increases, traffic noise levels associated with the proposed Project were calculated for roadway segments in the Project study area using the FHWA-RD-77-108. Traffic noise levels were modeled under existing and future conditions, with and without Project implementation. ADT volumes and the distribution were obtained from the traffic study for the proposed Project. Additional input data included day/night percentages of autos, medium and heavy trucks, vehicle speeds, ground attenuation factors, and roadway widths. Refer to Appendix E of this EIR for complete modeling inputs and results.

The proposed Project's contribution to the existing and future traffic noise levels along area roadways was determined by comparing the predicted noise levels with and without Project-generated traffic. Table 4.10-22 summarizes the modeled traffic noise levels at 50 feet from the centerline of affected roadway segments in the vicinity of the proposed Project Site. Exhibit 4.10-4 illustrates traffic noise contours for existing plus Project conditions. Modeled increases that would be considered substantial, an increase of 3 dBA, in comparison to existing no Project conditions are indicated in bold. Modeled roadway noise levels assume no natural or artificial shielding between the roadway and the receptor.

As shown in Table 4.10-22, the modeling conducted shows that future development, in addition to existing conditions, would result in traffic noise level increases ranging from 0.1 dBA to 0.5 dBA L_{dn}, compared to noise levels without the Project. As seen, traffic generated under existing and future conditions by the proposed Project would not contribute to a substantial increase in future traffic noise conditions along one Project area roadway. Therefore, long-term noise levels from Project-generated traffic sources would not result in a substantial permanent increase in ambient noise levels (an increase of 3 dBA or greater) under existing and future conditions. As a result, this impact would be **less than significant**.

Train Noise

The California Northern Railroad line is oriented west to east, horizontally dividing the Project Site and meeting with the Union Pacific Railroad tracks at the eastern perimeter of the Project Site. The Project Site is bounded to the east by the Union Pacific Railroad line.



Source: AECOM 2022

Exhibit 4.10-4. Existing Plus Project Roadway Noise Contours

Table 4.10-22. Predicted Traffic Noise Levels, Existing Plus Project Conditions, L_{dn} at 50 Feet, dB

Roadway Segment	Segment Location	No Project	Plus Project	Net Change	Significant Impact?
Chadbourne Road	From SR-12 to Cordelia Road	68.5	68.8	0.2	No
Beck Avenue	From SR-12 to North of SR-12	69.1	69.3	0.2	No
Beck Avenue	From SR-12 to South of SR-12	67.1	67.4	0.3	No
West Texas Street	From Beck Avenue to Pennsylvania Avenue	69.7	69.9	0.2	No
SR-12	From Beck Avenue to Pennsylvania Avenue	76.2	76.3	0.1	No
Cordelia Road	From Beck Avenue to Pennsylvania Avenue	66.9	67.3	0.3	No
Pennsylvania Avenue	From SR-12 to North of SR-12	69.4	69.6	0.2	No
Pennsylvania Avenue	From SR-12 to South of SR-12	64.8	65.4	0.5	No
SR-12	From Marina Boulevard to Grizzly Island Road	76.1	76.2	0.1	No
SR-12	From Emperor Drive to Walters Road	74.1	74.2	0.1	No

Notes: dB = A-weighted decibels; L_{dn} = day-night average noise level; SR = State Route
a There is no existing noise-sensitive use along this segment of the roadway.
Source: AECOM 2023

Single-event train pass-bys were measured at 108 feet from the Union Pacific Railroad track centerline (Suisun City 2010). Based on noise measurements gathered along the Union Pacific Railroad Overland Route line, approximately 43 daily train trips occur through Suisun City. These train trips include Amtrak operations and freight transportation. The 60 dB L_{dn} contour extends out approximately 361 feet from the center of the tracks, while the 65 dB L_{dn} contour is at approximately 168 feet.

The proposed Project may result in a one additional rail trip per day. This number of train trips would not increase overall day-night noise level in the area. Also, the new train trips due to the Project, would conceptually reduce traffic trips associated with truck transport of goods to the site. As a result, this impact would be **less than significant**

Impact 4.10-5: Long-term non-transportation noise levels at existing noise-sensitive receivers. *Future development would result in an increase in stationary and non-transportation noise sources. These non-transportation noise sources could exceed the applicable noise standards (hourly L_{eq} dBA) and result in a substantial increase in ambient noise levels. Therefore, this impact would be* ***significant.***

The proposed Project, as described in Section 3.2.1, proposes development of approximately 1.28 million square feet of building space on approximately 93 acres of land area (Development Area) and approximately 393 acres of permanently Managed Open Space. The Development Area would encompass three separate Planning Areas (1, 2, 3) and consist of six buildings, as summarized in Table 3-1 and Table 3-2, and Exhibit 3-6. The Development Area within the proposed Project Site would accommodate light manufacturing, research and development, warehousing, and accessory office space. The long-term operation of these uses could result in non-transportation noise from, but not limited to, the following potential sources:

- landscape and building maintenance activities (e.g., hand tools, power tools, lawn and garden equipment);
- mechanical equipment (e.g., pumps, generators heating, ventilation, and cooling systems);
- garbage collection;
- parking lots; and
- commercial, office, and industrial activities.

The OS zoning of the Managed Open Space portion of the Project Site would accommodate agriculture, resource protection and restoration, and resource-related recreation. However, the Managed Open Space areas would be managed to protect the existing habitat and also to provide for mitigation of development impacts, and noise-generating activities associated with uses such as agriculture or recreation would be minimal.

Potential Long-Term Project-Generated Stationary Source Noise

Landscape and Building Maintenance Activities

Landscape maintenance activities include the use of leaf blowers, power tools, and gasoline-powered lawn mowers, which could result in intermittent noise levels that range from approximately 88.3 dB at 6.5 feet, respectively. Based on an equipment noise level of 88.3 dB, the use of such equipment, assuming a noise attenuation rate of 6 dB per doubling of distance from the source, would result in exterior noise levels of approximately 70.1 dB at 50 feet. Although such activities would likely occur during the daytime hours, the exact hours and locations are unknown at this time. Such activities are intermittent and would occur during the daytime, which is a less noise-sensitive time of day. The use of such equipment is not so frequent that applicable daily noise standards or maximum single-event noise standards would be exceeded for noise-sensitive land uses. This impact would be **less than significant**.

Mechanical HVAC Equipment

HVAC equipment is often mounted on rooftops, located on the ground, or located within mechanical equipment rooms. The noise sources could take the form of fans, pumps, air compressors, and chillers. Packaged rooftop units contain all necessary mechanical equipment, such as fans, pumps, condensers, and compressors, within a single enclosure. AECOM has measured noise levels from HVAC systems at 70 dBA L_{eq} at a distance of 6 feet. This would result in a noise level of 52 dBA at a distance of 50 feet. Noise levels from commercial HVAC equipment can reach 100 dBA at a distance of 3 feet; this would result in a noise level of 76 dBA at a distance of 50 feet (EPA 1971). However, as described in "Project Description," HVAC systems would be enclosed and/or shielded to reduce exterior noise levels. Noise from mechanical equipment associated with the operation of the proposed Project is required to comply with the California Building Standards Code requirements pertaining to noise attenuation.

The closest off-site noise-sensitive land uses in the vicinity of the Project Site are single-family residences located approximately 200 feet east of the Project Site from the boundary of the Project Site and HVAC would be farther away (200 feet to 300 feet) assuming the HVAC would be located in the center of a rooftop of buildings within the Development Area. Furthermore, the HVAC systems would be enclosed and/or shielded to reduce exterior noise, which would reduce the HVAC noise at least by 15 dB (EPA 1974). Based on the cooling capacity of the packaged systems and their locations with respect to sensitive uses, noise levels for mechanical HVAC systems would be less than 50 dBA L_{eq} at the nearest noise-sensitive receptors to the Development Area. Therefore, HVAC equipment would not exceed the City's performance standard of 55 dB L_{eq} for noise-sensitive land uses affected by non-transportation noise during the daytime period, and would not result in a substantial permanent increase (more than 3–5 dB) in ambient noise levels in the Project vicinity above levels existing without the proposed Project. This impact would be **less than significant**.

Garbage Collection Activities

Garbage collection activities (e.g., emptying large refuse dumpsters, possibly multiple times per week, and the shaking of containers with a hydraulic lift), could result in instantaneous maximum noise levels of approximately 89 dB L_{max} at 50 feet. Such activities are anticipated to be very brief, intermittent, and would occur during daytime hours, which are considered to be less noise-sensitive times of the day. Garbage collection activities are infrequent, and therefore would not be expected to exceed daily noise standards. Noises would typically emanate from public rights-of-way, which would normally be separated from outdoor gathering spaces associated with residential uses. Noise associated with garbage collection would not be expected to create single-event noise that would be substantially disruptive to daily activities or cause sleep disturbance. This impact would be **less than significant**.

Parking Lots

Parking lots and parking structures include noise sources such as vehicles entering/exiting the lot, alarms/radios, and doors slamming. The proposed Project would introduce approximately 416 new parking stalls at the nearest proposed Project building (Building A) on the north side of the Project Site approximately 500 feet from adjacent noise-sensitive residential uses to the north across SR 12. Based on previous noise measurements, the sound exposure level (SEL) associated with a parking event is approximately 71 dB SEL at 50 feet. Assuming that each parking stall adjacent to residential uses were to fill and empty (416 parking events total) during the peak hour, parking noise level is predicted to be 62 dBA L_{eq} at 50 feet, 50 dBA L_{eq} at 200 feet, and 42 dBA L_{eq} at 500 feet from the center of the parking stalls. The closest off-site noise-sensitive land uses in the vicinity of the Project Site are single-family residences located approximately 200 feet east of the Project Site from the boundary of the Project Site. Existing ambient noise levels at the residential uses to the north of the Project Site were measured at 56 to 59 dBA L_{eq}, represented by LT-1. Therefore, noise levels associated with parking would not be distinguishable from the existing ambient noise levels. As a result, this impact would be **less than significant**.

Light Manufacturing, Research and Development, Warehousing, and Accessory Office Space Activities

Light manufacturing, research and development, warehousing, and accessory office space noise sources include loading dock activities, air circulation systems, delivery areas, and the operation of trash compactors and air compressors. Such activities could result in intermittent noise levels of approximately 91 dB L_{max} at 50 feet (79 dB L_{max} at 200 feet) (EPA 1971) and high single-event noise levels from backup alarms from delivery trucks during the more noise-sensitive hours of the day. Neither the exact hours of operation nor the location of such potential noise sources is known at this time. Thus, land-use related noise levels could exceed the applicable standards at existing and proposed noise-sensitive receptors, especially if such activities were to occur during the more noise-sensitive hours (e.g., evening, nighttime, and early morning) and create a substantial increase in ambient noise levels at existing noise-sensitive receptors located approximately at 200 feet. Therefore, this impact would be **potentially significant**.

The proposed Project would introduce new sources of noise to the site. Thus, this impact would be considered **significant**.

Mitigation Measures

Mitigation Measure 4.10-3a: Implement Measures to Reduce Potential Exposure of Sensitive Receptors to Non-Transportation Source–Generated Noise.

To reduce potential long-term exposure of sensitive receptors to noise generated by Project-related non-transportation noise sources, the Project applicant or contractor(s) for all Project phases shall implement the below measures to assure maximum reduction of Project interior and exterior noise levels from operational activities. The City shall evaluate individual facilities for compliance with the City Noise Ordinance and policies contained in the City's General Plan at the time that tentative subdivision maps and improvements plans are submitted. All Project elements shall comply with City noise standards.

- The proposed land uses shall be designed so that on-site mechanical equipment (e.g., HVAC units, compressors, and generators) and area-source operations (e.g., loading docks, parking lots, and recreational-use areas) are located as far as possible from or shielded from nearby noise-sensitive land uses.

- Air conditioning units shall be shielded to reduce operational noise levels at adjacent dwellings or designed to meet City noise standards. Shielding may include the use of fences or partial equipment enclosures. To provide effectiveness, fences or barriers shall be continuous or solid, with no gaps, and shall block the line of sight to windows of neighboring dwellings.

- To the extent feasible, residential land uses located within 2,500 feet of and within the direct line of sight of major noise-generating commercial uses (e.g., loading docks and equipment/vehicle storage repair facilities,) shall be shielded from the line of sight of these facilities by construction of a noise barrier. To provide effectiveness, noise barriers shall be continuous or solid, with no gaps, and shall block the line of sight to windows of neighboring dwellings.

- Routine testing and preventive maintenance of emergency electrical generators shall be conducted during the less sensitive daytime hours (i.e., 7:00 a.m. to 6:00 p.m.). All electrical generators shall be equipped with noise control (e.g., muffler) devices in accordance with manufacturers' specifications.

- On-site landscape maintenance equipment shall be equipped with properly operating exhaust mufflers and engine shrouds, in accordance with manufacturers' specifications.

- For maintenance areas located within 500 feet of noise-sensitive land uses, the operation of on-site landscape maintenance equipment shall be limited to the least noise-sensitive periods of the day, between the hours of 7 a.m. and 6 p.m.

Significance after Mitigation

Compliance with the applicable City Noise Ordinance and implementation of additional mitigation measures for the control of non-transportation source noise as identified above in Mitigation Measure 4.10-3a would reduce non-transportation source noise levels. Restricting noise-generating activities to daytime hours as outlined in the City's Noise Control Ordinance would reduce the potential for noise impacts at sensitive receptors. Achievable noise reductions from fences or barriers can vary but typically range from approximately 5 to 10 dBA, depending

on construction characteristics, height, and location. The impact is considered **less than significant with mitigation.**