3.10 NOISE AND VIBRATION

This section includes a summary of applicable regulations related to noise and vibration, a description of ambient-noise conditions, and an analysis of potential short-term construction and long-term operational-source noise impacts associated with the Folsom Corporation Yard Sphere of Influence Amendment (SOIA) and annexation. Mitigation measures are recommended as necessary to reduce significant noise impacts. Additional data are provided in Appendix D, *Noise Measurement Data and Noise Modeling Calculations.*

Comments received on the notice of preparation regarding noise included a concern that the City be aware of nearby noise sources at Prairie City SVRA.

3.10.1 Environmental Setting

ACOUSTIC FUNDAMENTALS

Prior to discussing the noise setting for the project, background information about sound, noise, vibration, and common noise descriptors is needed to provide context and a better understanding of the technical terms referenced throughout this section.

Sound, Noise, and Acoustics

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a human ear. Noise is defined as loud, unexpected, annoying, or unwanted sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

Frequency

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz, or thousands of hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (mPa). One mPa is approximately one hundred billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this large range of values, sound is rarely expressed in terms of mPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of dB.

Addition of Decibels

Because decibels are logarithmic units, SPLs cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness at the same time, the resulting sound level at a given distance would be 3 dB higher than if only one of the sound sources was producing sound under the same conditions. For example, if one idling truck generates an SPL of 70 dB, two trucks idling simultaneously

would not produce 140 dB; rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together produce a sound level approximately 5 dB louder than one source.

A-Weighted Decibels

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

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the SPL in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hz, and perceive sounds within this range better than sounds of the same amplitude with frequencies outside of this range. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies. Then, an "A-weighted" sound level (expressed in units of A-weighted decibels) can be computed based on this information.

The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgment correlates well with the A-scale sound levels of those sounds. Thus, noise levels are typically reported in terms of A-weighted decibels. All sound levels discussed in this section are A-weighted decibels. Table 3.10-1 describes typical A-weighted noise levels for various noise sources.

Table 3.10-1 Typical A-Weighted Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 1,000 feet	— 100 —	
Gas lawn mower at 3 feet	— 90 —	
Diesel truck at 50 feet at 50 miles per hour	— 80 —	Food blender at 3 feet, Garbage disposal at 3 feet
Noisy urban area, daytime, Gas lawn mower at 100 feet	— 70 —	Vacuum cleaner at 10 feet, Normal speech at 3 feet
Commercial area, Heavy traffic at 300 feet	— 60 —	
Quiet urban daytime	— 50 —	Large business office, Dishwasher next room
Quiet urban nighttime	— 40 —	Theater, large conference room (background)
Quiet suburban nighttime	— 30 —	Library, Bedroom at night
Quiet rural nighttime	— 20 —	
	— 10 —	Broadcast/recording studio
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Notes: dBA = A-weighted decibels

Source: Caltrans 2013b: Table 2-5

Human Response to Changes in Noise Levels

As discussed above, the doubling of sound energy results in a 3-dB increase in the sound level. However, given a sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different from what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1-dB changes in sound levels when exposed to steady, single-frequency ("pure-tone") signals in the mid-frequency (1,000–8,000 Hz) range. In general, the healthy human ear is most sensitive to sounds between 1,000 and 5,000 Hz and perceives both higher and lower frequency sounds of the same magnitude with

less intensity (Caltrans 2013b:2-18). In typical noisy environments, changes in noise of 1–2 dB are generally not perceptible. However, it is widely accepted that people are able to begin to detect sound level increases of 3 dB in typical noisy environments. Further, a 5-dB increase is generally perceived as a distinctly noticeable increase, and a 10-dB increase is generally perceived as a doubling of loudness (Caltrans 2013b:2-10). Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3-dB increase in sound would generally be perceived as barely detectable.

Vibration

Vibration is the periodic oscillation of a medium or object with respect to a given reference point. Sources of vibration include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) and those introduced by human activity (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, (e.g., operating factory machinery) or transient in nature (e.g., explosions). Vibration levels can be depicted in terms of amplitude and frequency, relative to displacement, velocity, or acceleration.

Vibration amplitudes are commonly expressed in peak particle velocity (PPV) or root-mean-square (RMS) vibration velocity. PPV and RMS vibration velocity are normally described in inches per second (in/sec) or in millimeters per second. PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is typically used in the monitoring of transient and impact vibration and has been found to correlate well to the stresses experienced by buildings (FTA 2006:7-3, Caltrans 2013b:6).

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 1-second period. As with 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 2006:7-4; Caltrans 2013a:7). This is based on a reference value of 1 micro inch per second.

The typical background vibration-velocity level in residential areas is approximately 50 VdB. Ground 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 2006:7-8; Caltrans 2013a:27).

Typical outdoor sources of perceptible ground vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur to fragile buildings. Construction activities can generate sufficient ground vibrations to pose a risk to nearby structures. Constant or transient vibrations can weaken structures, crack facades, and disturb occupants (FTA 2006:7-5).

Vibrations generated by construction activity can be transient, random, or continuous. Transient construction vibrations are generated by blasting, impact pile driving, and wrecking balls. Continuous vibrations are generated by vibratory pile drivers, large pumps, and compressors. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment.

Table 3.10-2 summarizes the general human response to different ground vibration-velocity levels.

Table 3.10-2 Human Response to Different Levels of Ground Noise and Vibration

Vibration-Velocity Level	Human Reaction
65 VdB	Approximate threshold of perception.
75 VdB	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find that transportation-related vibration at this level is unacceptable.
85 VdB	Vibration acceptable only if there are an infrequent number of events per day.

Notes: VdB = vibration decibels referenced to 1 µ inch/second and based on the root mean square (RMS) velocity amplitude.

Source: FTA 2006:7-8

Common Noise Descriptors

Noise in our daily environment fluctuates over time. Various noise descriptors have been developed to describe time-varying noise levels. The following are the noise descriptors used throughout this section.

Equivalent Continuous Sound Level (L_{eq}): L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound level that actually occurs during the same period (Caltrans 2013b:2-48). For instance, the 1-hour equivalent sound level, also referred to as the hourly L_{eq}, is the energy average of sound levels occurring during a 1-hour period and is the basis for noise abatement criteria used by California Department of Transportation (Caltrans) and Federal Highway Administration (FHWA) (Caltrans 2013b:2-47; FTA 2006:2-19).

Percentile-Exceeded Sound Level (L_x): L_X represents the sound level exceeded for a given percentage of a specified period (e.g., L_{10} is the sound level exceeded 10 percent of the time, and L_{90} is the sound level exceeded 90 percent of the time) (Caltrans 2013b:2-16).

Maximum Sound Level (L_{max}): L_{max} is the highest instantaneous sound level measured during a specified period (Caltrans 2013b:2-48; FTA 2006:2-16).

Day-Night Level (L_{dn}): L_{dn} is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10-dB "penalty" applied to sound levels occurring during nighttime hours between 10 p.m. and 7 a.m. (Caltrans 2013b:2-48; FTA 2006:2-22).

Community Noise Equivalent Level (CNEL) or Day-Evening-Night Level (L_{den}): CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to sound levels occurring during the nighttime hours between 10 p.m. and 7 a.m. and a 5-dB penalty applied to the sound levels occurring during evening hours between 7 p.m. and 10 p.m. (Caltrans 2013b:2-48).

Single Event [Impulsive] Noise Level (SENL): The SENL describes a receiver's cumulative noise exposure from a single impulsive noise event (e.g., an automobile passing by or an air craft flying overhead), 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.

Sound Propagation

When sound propagates over a distance, it changes in level and frequency content. The manner in which a noise level decreases with distance depends on the following factors:

Geometric Spreading

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 dB for each doubling of distance from a point source. Roads and highways consist of several localized noise sources on a defined path and hence can be treated

as a line source, which approximates the effect of several point sources, thus propagating at a slower rate in comparison to a point source. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source.

Ground Absorption

The propagation path of noise from a source to a receiver is usually very close to the ground. Noise attenuation from ground absorption and reflective-wave canceling provides additional attenuation associated with geometric spreading. Traditionally, this additional attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually sufficiently accurate for distances of less than 200 feet. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, such as a parking lot or body of water), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receiver, such as soft dirt, grass, or scattered bushes and trees), additional ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the attenuate rate associated with cylindrical spreading, the additional ground attenuation results in an overall drop-off rate of 4.5 dB per doubling of distance. This would hold true for point sources, resulting in an overall drop-off rate of up to 7.5 dB per doubling of distance.

Atmospheric Effects

Receivers located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels, as wind can carry sound. Sound levels can be increased over large distances (e.g., more than 500 feet) from the source because of atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also effect sound attenuation.

Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receiver attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction (Caltrans 2013b:2-41; FTA 2006:5-6, 6-25). Barriers higher than the line of sight provide increased noise reduction (FTA 2006:2-12). Vegetation between the source and receiver is rarely effective in reducing noise because it does not create a solid barrier unless there are multiple rows of vegetation (FTA 2006:2-11).

EXISTING NOISE ENVIRONMENT

Existing Noise- and Vibration-Sensitive Land Uses

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels, and because of the potential for nighttime noise to result in sleep disruption. Additional land uses such as schools, transient lodging, historic sites, cemeteries, and places of worship are also generally considered sensitive to increases in noise levels. These land use types are also considered vibration-sensitive land uses in addition to commercial and industrial buildings where vibration would interfere with operations within the building, including levels that may be well below those associated with human annoyance.

The project site is currently surrounded by agricultural, industrial, and public/utility land uses. There are no existing offsite residential receptors located near the project site; however, there are proposed single-family and multi-family residential receptors located approximately 50 feet north of the project site along White Rock Road. Exhibit 3.10-1 shows the layout of these receptors relative to the project site.

Existing Noise Sources and Ambient Levels

Transportation Noise

The predominant noise source in the project site is vehicle traffic on the surrounding roadway network (e.g., White Rock Road, Prairie City Road, Scott Road) and noise generated from off-highway vehicle activities within the Prairie City SVRA. However, the Prairie City SVRA is located south of, and adjacent to the project site approximately 3,700 feet from where noise- and vibration-sensitive land uses would be located. Thus, vehicle traffic on the surrounding roadway network is considered the predominant noise-source influencing the ambient noise environment near the proposed single-family and multi-family residential receptors located north of the project site along White Rock Road.

Existing traffic noise levels on roadway segments in the project site was modeled using calculation methods consistent with FHWA Traffic Noise Model, Version 2.5 (FHWA 2004) and using average daily traffic (ADT) volumes based on the peak-hour traffic volumes provided in the traffic analysis conducted by Fehr & Peers and summarized in Section 3.11, *Transportation and Circulation*. Table 3.10-3 summarizes the modeled existing traffic noise levels at 100 feet from the centerline of each area roadway segment, and lists distances from each roadway centerline to the 70, 65, and 60 CNEL traffic noise contours. For further details on traffic-noise modeling inputs and parameters, refer to Appendix D.

Table 3.10-3 Summary of Modeled Existing Traffic Noise Levels

Roadway Segment	CNEL at 100 feet from Roadway Centerline (dBA)	Distance (feet) from Roadway Centerline to CNEL Contour		
		70 dBA	65 dBA	60 dBA
Prairie City Road (White Rock Road to US 50 eastbound ramps)	67.1	51	162	513
White Rock Road (West of Prairie City Road to Prairie City Road)	70.2	104	328	1037
White Rock Road (Prairie City Road to Scott Road [west])	68.9	77	244	772
White Rock Road (Scott Road [west] to Scott Road [east])	69.0	79	249	788
White Rock Road (Scott Road [east] to east of Scott Road [east])	66.9	49	156	493
Scott Road (east) (White Rock Road to north of White Rock Road)	67.9	61	194	613
Scott Road (west) (White Rock Road to south of White Rock Road)	62.0	16	50	159

Notes: CNEL = Community Noise Equivalent Level; dBA = A-weighted decibels.

All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow, and does not account for shielding of any type or finite roadway adjustments. For additional details, refer to Appendix D for detailed traffic data, and traffic-noise modeling input data and output results.

Source: Data modeled by Ascent Environmental in 2017

EXISTING NOISE SURVEY

To characterize the operation-related noise impacts of the project on the surrounding environment, long-term (24-hour continuous) and short-term ambient noise level measurements were conducted at three locations within the existing Leidesdorff Yard on December 21, 2017. The two, short-term noise measurements were taken during the mobilization of the solid waste and transit fleets which includes up to approximately 20 vehicles simultaneously the starting their engines and idling, performing pre-departure equipment and horn checks, and departing the corporation yard. These activities are the most noise intensive that occur within the existing corporation yard and take place on the weekdays during the more noise-sensitive nighttime hours (5:00 a.m. to 7 a.m.). The short-term noise measurements were taken approximately 25 feet from where these activities were occurring. The long-term noise measurement was taken near the entrance of the project site where the most active land uses (e.g., vehicle refueling station, offices, repair operations) occur.

A Larson Davis Laboratories LxT precision integrating sound level meter was used for the ambient noise level measurement surveys. The meters were calibrated before use with Larson Davis Laboratories Model CAL200 acoustical calibrators to ensure measurement accuracy. The measurement equipment meets all pertinent

specifications of the American National Standards Institute. The results of the ambient noise measurement survey are summarized in Table 3.10-4.

Table 3.10-4 Noise Measurement Summary

Measurement[1]	Start (Date/Time)	Stop (Date/Time)	A-Weighted Sound Level (dBA)					
Short-Term			L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}
ST-1	December 21, 2017/6:00 a.m.	December 21, 2017/6:20 a.m.	68.1	59.8	79.4	71.5	62.7	60.5
ST-2	December 21, 2017/6:30 a.m.	December 21, 2017/6:55 a.m.	75.0	66.1	86.6	77.0	73.2	71.6
Long-Term			CNEL/L_{dn}	Daytime (7:00 a.m.-10:00 p.m.			Nighttime (10:00 p.m.-7:00 a.m.)	
				L_{eq}	L_{min}	L_{max}	L_{eq}	L_{min}	L_{max}
LT-1	December 21, 2017/7:00 a.m.	December 22, 2017/7:00 a.m.	63.9	56.3	40.9	85.2	52.5	37.7	86.5

See Appendix D for detailed noise measurement data.

Source: Data collected by Ascent Environmental in 2017

3.10.2 Regulatory Framework

FEDERAL

U.S. Environmental Protection Agency Office of Noise Abatement and Control

The U.S. Environmental Protection Agency (EPA) Office of Noise Abatement and Control was originally established to coordinate Federal noise control activities. In 1981, EPA administrators determined that subjective issues such as noise would be better addressed at more local levels of government. Consequently, in 1982 responsibilities for regulating noise control policies were transferred to State and local governments. However, documents and research completed by the EPA Office of Noise Abatement and Control continue to provide value in the analysis of noise effects.

Federal Transit Administration

To address the human response to ground vibration, the Federal Transit Administration (FTA) has set forth guidelines for maximum-acceptable vibration criteria for different types of land uses. These guidelines are presented in Table 3.10-5.

Table 3.10-5 Ground-Borne Vibration (GBV) Impact Criteria for General Assessment

Land Use Category	GVB Impact Levels (VdB re 1 micro-inch/second)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where vibration would interfere with interior operations.	65 [4]	65 [4]	65 [4]
Category 2: Residences and buildings where people normally sleep.	72	75	80
Category 3: Institutional land uses with primarily daytime uses.	75	78	83

Notes: VdB = vibration decibels referenced to 1 µ inch/second and based on the root mean square (RMS) velocity amplitude.

1 "Frequent Events" is defined as more than 70 vibration events of the same source per day.

2 "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day.

3 "Infrequent Events" is defined as fewer than 30 vibration events of the same source per day.

4 This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research would require detailed evaluation to define the acceptable vibration levels.

Source: FTA 2006

STATE

California General Plan Guidelines

Though not adopted by law, the *State of California General Plan Guidelines 2003*, published by the California Governor's Office of Planning and Research (2003), provide guidance for the compatibility of projects within areas of specific noise exposure. Acceptable and unacceptable community noise exposure limits for various land use categories have been determined to help guide new land use decisions in California communities. In many local jurisdictions, these guidelines are used to derive local noise standards and guidance. Citing EPA materials and the State Sound Transmissions Control Standards, the State's general plan guidelines recommend interior and exterior noise standards of 45 and 60 A-weighted decibels (dBA) community noise equivalent level (CNEL) for residential units, respectively (OPR 2003: 253-254).

California Department of Transportation

In 2013, the California Department of Transportation (Caltrans) published the Transportation and Construction Vibration Manual (Caltrans 2013a). The manual provides general guidance on vibration issues associated with construction and operation of projects in relation to human perception and structural damage. Table 3.10-6 presents recommendations for levels of vibration that could result in damage to structures exposed to continuous vibration.

Table 3.10-6 Caltrans Recommendations Regarding Levels of Vibration Exposure

PPV (in/sec)	Effect on Buildings
0.4-0.6	Architectural damage and possible minor structural damage
0.2	Risk of architectural damage to normal dwelling houses
0.1	Virtually no risk of architectural damage to normal buildings
0.08	Recommended upper limit of vibration to which ruins and ancient monuments should be subjected
0.006-0.019	Vibration unlikely to cause damage of any type

Notes: PPV= Peak Particle Velocity; in/sec = inches per second

Source: Caltrans 2013a

LOCAL

The project site lies within the jurisdictional boundaries of Sacramento County; therefore, the County's policies, as well as Sacramento LAFCo's polices, would apply. Furthermore, if the SOIA and annexation are approved, the project site would be in the jurisdiction of the City of Folsom. Thus, applicable policies of the City of Folsom's General Plan are described below.

Sacramento County General Plan

The following policies and standards of the *Sacramento County 2030 General Plan* (Sacramento County 2011) are applicable to the project:

Table 3.10-7 Noise Standards for New Uses Affected by Traffic and Railroad Noise

New Land Use	Sensitive[1] Outdoor Area (L_{dn})	Sensitive[2] Interior Area (L_{dn})	Notes
All Residential	65	45	5
Transient Lodging	65	45	3, 5
Hospitals and Nursing Homes	65	45	3, 4, 5
Theaters and Auditoriums	—	35	3
Churches, Meeting Halls, Schools, Libraries, etc.	65	40	3
Office Buildings	65	45	3

Table 3.10-7 Noise Standards for New Uses Affected by Traffic and Railroad Noise

New Land Use	Sensitive[1] Outdoor Area (L_{dn})	Sensitive[2] Interior Area (L_{dn})	Notes
Commercial Buildings	–	50	[3]
Playgrounds, Parks, etc.	70	–	–
Industry	65	50	[3]

Notes: L_{dn}= day-night average noise level

[1] Sensitive areas are defined in acoustic terminology section.
[2] Interior noise level standards are applied within noise-sensitive area of the various land uses, with windows and doors in the closed position.
[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.
[5] If this use is affected by railroad noise, a maximum (L_{max}) noise level standard of 70 A-weighted decibels (dBA) shall be applied to all sleeping rooms to reduce the potential for sleep disturbance during nighttime train passages.

Source: FTA 2006

- **Policy NOI-1:** The noise level standards for noise-sensitive areas of new uses affected by traffic or railroad noise sources in Sacramento County are shown by Table 1 [as shown in Table 3.10-7 of this Draft EIR]. Where the noise level standards of Table 1 [as shown in Table 3.10-7 of this Draft EIR] are predicted to be exceeded at new uses proposed within Sacramento County which are affected by traffic or railroad noise, appropriate noise mitigation measures shall be included in the project design to reduce projected noise levels to a state of compliance with the Table 1 [as shown in Table 3.10-7 of this Draft EIR] standards.

- **Policy NOI-5:** The interior and exterior noise level standards for noise-sensitive areas of new uses affected by existing non-transportation noise sources in Sacramento County are shown by Table 2 [as shown in Table 3.10-8 of this Draft EIR]. Where the noise level standards of Table 2 [as shown in Table 3.10-8 of this Draft EIR] are predicted to be exceeded at a proposed noise-sensitive area due to existing non-transportation noise sources, appropriate noise mitigation measures shall be included in the project design to reduce projected noise levels to a state of compliance with the Table 2 [as shown in Table 3.10-8 of this Draft EIR] standards within sensitive areas.

- **Policy NOI-6:** Where a project would consist of or include non-transportation noise sources, the noise generation of those sources shall be mitigated so as not exceed the interior and exterior noise level standards of Table 2 [as shown in Table 3.10-8 of this Draft EIR] at existing noise-sensitive areas in the project vicinity.

- **Policy NOI-7:** The "last use there" shall be responsible for noise mitigation. However, if a noise-generating use is proposed adjacent to lands zoned for uses which may have sensitivity to noise, then the noise-generating use shall be responsible for mitigating its noise generation to a state of compliance with the Table 2 [as shown in Table 3.10-8 of this Draft EIR] standards at the property line of the generating use in anticipation of the future neighboring development.

Table 3.10-8 Non-Transportation Noise Standards

Receiving Land Use	Outdoor Area[2]		Interior[3]
	Daytime (L_{50}/L_{max})[1]	Nighttime (L_{50}/L_{max})[1]	Day/Nigh t(L_{50}/L_{max})[1]
All Residential	55/75	50/70	35/55
Transient Lodging[4]	55/75	–	35/55
Hospitals & Nursing Homes[5, 6]	55/75	–	35/55
Theaters & Auditoriums[6]	–	–	30/50
Churches, Meeting Halls, Schools, Libraries, etc.[6]	55/75	–	35/60
Office Buildings[6]	60/75	–	45/65

Table 3.10-8 Non-Transportation Noise Standards

Receiving Land Use	Outdoor Area[2]		Interior[3]
	Daytime (L_{50}/L_{max})[1]	Nighttime (L_{50}/L_{max})[1]	Day/Nigh t(L_{50}/L_{max})[1]
Commercial Buildings[6]	–	–	45/65
Playgrounds, Parks, etc.[6]	65/75	–	–
Industry[6]	60/80	–	50/70

Notes: L_{50}= noise level that occurs 50% of the time during measurement duration; L_{max}= the maximum instantaneous noise level

1 Standards in this table shall be reduced by 5 A-weighted decibels (dBA) for sounds consisting primarily of speech or music, and for recurring impulsive sounds. If the existing ambient noise level exceeds the standards of this table, then the noise level standards shall be increased at 5 dBA increments to encompass the ambient.
2 The primary outdoor activity area associated with any given land use at which noise-sensitivity exists and the location at which the County's exterior noise level standards are applied.
3 The primary outdoor activity area associated with any given land use at which noise-sensitivity exists and the location at which the County's exterior noise level standards are applied.
4 Outdoor activity areas of transient lodging facilities are not commonly used during nighttime hours.
5 Hospitals are often noise-generating uses. The exterior noise level standards for hospitals are applicable only at clearly identified areas designated for outdoor relaxation by either hospital staff or patients.
6 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.
7 Where median (L_{50}) noise level data is not available for a particular noise source, average (L_{eq}) values may be substituted for the standards of this table provided the noise source in question operates for at least 30 minutes of an hour. If the source in question operates less than 30 minutes per hour, then the maximum noise level standards shown would apply.

Source: Sacramento County 2011:15

- **Policy NOI-8:** Noise associated with construction activities shall adhere to the County Code requirements. Specifically, Section 6.68.090(e) addresses construction noise within the County.

- **Policy NOI-13:** Where noise mitigation measures are required to satisfy the noise level standards of this Noise Element, emphasis shall be placed on the use of setbacks and site design to the extent feasible, prior to consideration of the use of noise barriers.

- **Policy NOI-16**: The following sources of noise shall be exempt from the provisions of this Noise Element:

    a. Emergency warning devices and equipment operated in conjunction with emergency situations, such as sirens and generators which are activated during power outages. The routine testing of such warning devices and equipment shall also be exempt provided such testing occurs during daytime hours.

    b. Activities associated with events for which a permit has been obtained from the County.

In addition to the policies listed above, Sacramento County has established noise standards for the significant incremental increase in traffic noise in relation to transportation projects, as shown in Table 3.10-9.

Table 3.10-9 Significant Increase in Transportation Noise

Pre-Project Noise Environment (L_{dn})	Significant Increase
Less than 60 dBA	5+ dBA
60-65 dBA	3+ dBA
Greater than 65 dBA	1.5+ dBA

Notes: dBA = A-weighted decibels; L_{dn}= day-night average noise level

Source: Sacramento County 2011:11

Sacramento County Code

Section 6.68.070 of the Sacramento County Code contains exterior noise standards for specific zoning districts (Table 3.10-10).

Table 3.10-10 Exterior Noise Standards

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

Notes: dBA = A-weighted decibels

Source: Sacramento County 2017

Section 6.68.080 of the Sacramento County Code contains interior noise standards for specific zoning districts as detailed below.

a. In any apartment, condominium, townhouse, duplex or multiple dwelling unit it is unlawful for any person to create any noise from inside his unit that causes the noise level when measured in a neighboring unit during the periods 10 p.m. to 7 a.m. to exceed:

    1. 45 dBA for a cumulative period of more than 5 minutes in any hour;
    2. 50 dBA for a cumulative period of more than 1 minute in any hour; and
    3. 55 dBA for any period of time.

b. If the ambient noise level exceeds that permitted by any of the noise level categories specified in subdivision (a) of this section, the allowable noise limit shall be increased in 5-dBA increments in each category to encompass the ambient noise level. (SCC 254 § 1, 1976.)

Section 6.68.090 of the Sacramento County Code provides the following exemption to its exterior noise standards:

> Noise sources associated with construction, repair, remodeling, demolition, paving or grading of any real property, provided said activities do not take place between the hours of 8:00 p.m. and 6:00 a.m. on weekdays and Friday commencing at 8:00 p.m. through and including 7:00 a.m. on Saturday; Saturdays commencing at 8:00 p.m. through and including 7:00 a.m. on the next following Sunday and on each Sunday after the hour of 8:00 p.m. Provided, however, when an unforeseen or unavoidable condition occurs during a construction project and the nature of the project necessitates that work in process be continued until a specific phase is completed, the contractor or owner shall be allowed to continue work after 8:00 p.m. and to operate machinery and equipment necessary until completion of the specific work in progress can be brought to conclusion under conditions which will not jeopardize inspection acceptance or create undue financial hardships for the contractor or owner.

City of Folsom General Plan

The Noise Element of the City of Folsom General Plan (1993) has various goals and policies in place related to protecting the citizens of Folsom from the harmful effects of exposure to excessive noise and to protect the economic base of Folsom by preventing the encroachment of incompatible land uses within areas affected by existing noise-producing uses. The City of Folsom's exterior noise level performance standards for new projects and developments are presented in Table 3.10-11. City of Folsom's land use compatibility for community noise environments are presented in Exhibit 3.10-1

Table 3.10-11 Noise Level Performance Standards for New Projects and Developments Exterior Noise Level Standards, dBA

Category	Cumulative Number of Minutes in Any One-Hour Time Period	Daytime 7:00 a.m. to 10:00 p.m.	Nighttime 10:00 p.m. to 7:00 a.m.
1	30	50	45
2	15	55	50
3	5	60	55
4	1	65	60
5	0	70	65

Notes: dBA = A-weighted decibels

[1] Each of the noise level standards specified shall be reduced by 5 dBA for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises.

[2] Noise from single occurrences such as the passage of locomotives, heavy trucks, or aircraft should also be evaluated in terms of single event noise levels. The maximum noise level created by such an event may have the potential to result in activity interference even though the cumulative noise exposure in terms of day-night average noise level (L_{dn}) is within acceptable limits.

Source: City of Folsom 1993

The following policies of the *City of Folsom General Plan* (1993) are applicable to the project.

- **Policy 30.2:** Develop and implement effective strategies to abate and avoid excessive noise exposures in the City by requiring that effective noise mitigation measures be incorporated into the design of new noise-generating and new noise-sensitive land uses.

- **Policy 30.4:** Areas within the City of Folsom shall be designated as noise impacted if exposed to existing or projected exterior noise levels exceeding 60 decibels (dB) L_{dn}/CNEL or the performance standards of Table 26-3 [as shown in Table 3.10-11 of this Draft EIR] of the Noise Element.

  Noise created by non-transportation-related noise sources associated with new projects or developments shall be controlled so as not to exceed the noise level standards as set forth (in Table 26-3 of the Noise Element [as shown in Table 3.10-11 of this Draft EIR]) as measured at any affected residentially designated lands or land use situated in either the incorporated or unincorporated areas. New residential development shall not be allowed where the ambient noise levels due to non-transportation-related noise sources will not exceed the noise standard levels set forth in Table 26-3 [as shown in Table 3.10-11 of this Draft EIR] of the Noise Element.

  Noise from single occurrences such as the passage of locomotives, heavy trucks, or aircraft should also be evaluated in terms of single event noise levels. The maximum noise level created by such an event may have the potential to result in activity interference even though the cumulative noise exposure in term of L_{dn} is within acceptable limits. The potential for sleep disturbance is usually of primary concern in such cases, and should be evaluated on a case-by-case basis.

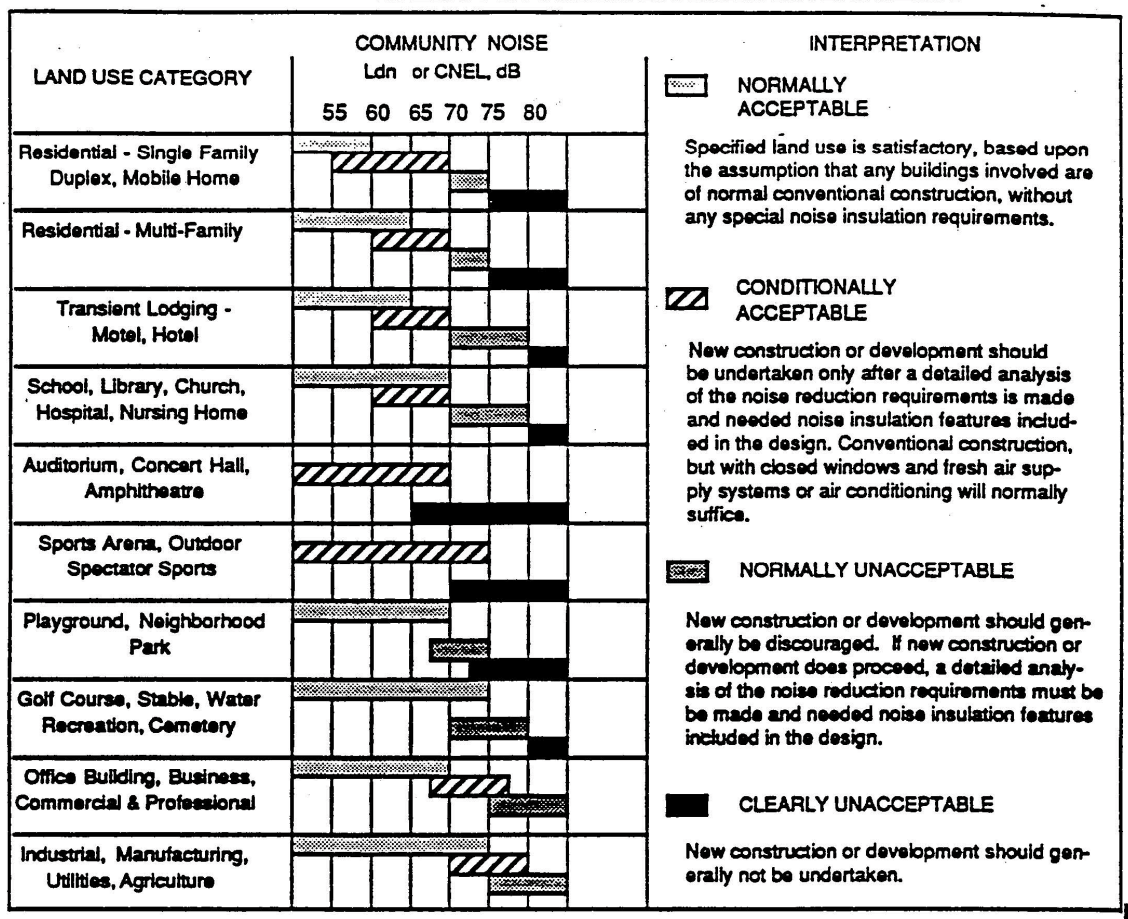
- **Policy 30.5:** New development of residential or other noise sensitive land uses will not be permitted in noise impacted areas unless effective mitigation measures are incorporated into the project design to reduce noise levels to:

  1. For noise due to traffic on public roadways, railroad line operations and aircraft: 60 dB L_{dn}/CNEL or less in outdoor activity areas, and interior noise levels to 45 dB L_{dn}/CNEL or less. Where it is not possible to reduce exterior noise due to these sources to 60 dB L_{dn}/CNEL or less by incorporating a practical application of the best available noise reduction technology, an exterior noise level of up to 65 dB L_{dn}/CNEL will be allowed. Under no circumstances will interior noise levels be permitted to exceed 45 dB L_{dn}/ CNEL with the windows and doors closed.

2. For non-transportation related noise sources: achieve compliance with the performance standards contained Within Table 26-3 [as shown in Table 3.10-11 of this Draft EIR].

3. If compliance with the adopted standards and policies of the Noise Element will not be achieved, a statement of overriding considerations for the project must be provided.

FIGURE 26-5
LAND USE COMPATIBILITY FOR COMMUNITY NOISE ENVIRONMENTS



CONSIDERATIONS IN DETERMINATION OF NOISE - COMPATIBLE LAND USE

A. NORMALIZATION NOISE EXPOSURE INFORMATION DESIRED

Where sufficient data exists, evaluate land use suitable with respect to a "normalized" value of CNEL or L_{dn}. Normalized values are obtained by adding or subtracting the constants described in Table 1 to the measured or calculated of CNEL or L_{dn}.

B. NOISE SOURCE CHARACTERISTICS

The land use-noise compatibility recommendations should be viewed in relation to specific source of the noise. For example, aircraft and railroad noise is normally made up of higher single noise events than auto traffic but occurs less frequently. Therefore, different sources yielding the same composite noise exposes do not necessarily create the same noise environment. The State Aeronautics Act uses 65 dB CNEL as the criterion which airports must eventually meet to protect existing residential communities from unacceptable exposure to aircraft noise. In order to facilitate the purposes of the Act, one of which to encourage land compatible with the 65 dB CNEL criterion wherever possible, and in order to facilitate the ability of airports to comply with the Act, residential uses located in Community Noise Exposure Areas greater than 65 dB should be discouraged and considered located within normally unacceptable areas.

C. SUITABLE INTERIOR ENVIRONMENTS

One objective of locating residential units relative to a known noise source is to maintain a suitable interior noise environment at no greater than 45 dB CNEL of L_{dn}. This requirement, coupled with the measured or calculated noise reduction performance of the type of structure under consideration, should govern the minimum acceptable distance to noise source.

D. ACCEPTABLE OUTDOOR ENVIRONMENTS

Another consideration, which in some communities is an overriding factor, is the desire for an acceptable outdoor noise environment. When this is the case, more restrictive standards for land use compatibility, typically below the maximum considered "normally acceptable" for that land use category, may be appropriate.

13

Source: City of Folsom 1993

Exhibit 3.10-1 Land Use Compatibility for Community Noise Environments

- **Policy 30.6:** When industrial, commercial land uses, or other uses including non-transportation-related noise sources are proposed which would affect areas containing noise sensitive land uses, noise levels generated by the proposed use shall not exceed the performance standards contained within Table 26-3 [as shown in Table 3.10-11 of this Draft EIR].

- **Policy 30.9:** Noise level criteria applied to land uses other than residential or other noise sensitive uses shall be consistent with the standards in Figure 26-5 [as shown in Exhibit 3.10-1 of this Draft EIR].

- **Policy 30.15:** If noise barriers are required to achieve the noise level standards contained within this Element, the following construction practices are recommended:

    1. Noise barriers exceeding six feet in height relative to the roadway should incorporate an earth berm so that the total height of the solid portion of the barrier (such as masonry or concrete) does not exceed six feet.

    2. The total height of a noise barrier above roadway elevation should normally be limited to 12 feet.

    3. The noise barriers should be designed that their appearance is consistent with other noise barriers in the project vicinity.

City of Folsom Code

Section 8.42.040 of the City of Folsom Code contains exterior noise standards for sensitive receptors (e.g., single- or multiple-family residence, school, church, hospital or public library) (Table 3.10-12).

Table 3.10-12 Exterior Noise Level Standards

Noise Level Category	Cumulative Number of minutes in any 1-hour time period	dBA Daytime (7 a.m. to 10 p.m.)	dBA Nighttime (10 p.m. to 7 a.m.)
1	30	50	45
2	15	55	50
3	5	60	55
4	1	65	60
5	0	70	65

Notes:

A. It is unlawful for any person at any location within the incorporated area of the city to create any noise, or to allow the creation of any noise, on property owned, leased, occupied or otherwise controlled by such person which causes the exterior noise level when measured at any affected single- or multiple-family residence, school, church, hospital or public library situated in either the incorporated or unincorporated area to exceed the noise level standards

B. In the event the measured ambient noise level exceeds the applicable noise level standard in any category above, the applicable standard shall be adjusted so as to equal the ambient noise level.

C. Each of the noise level standards specified above shall be reduced by 5 dB(A) for simple tone noises, noises consisting primarily of speech or music, or for recurring noises.

D. If the intruding noise source is continuous and cannot reasonably be discontinued or stopped for a time period whereby the ambient noise level can be measured, the noise level measured while the source is in operation shall be the noise level standards as specified above.

Source: City of Folsom 2017

Section 8.42.060 of the City of Folsom Code provides the following exemption to the exterior noise standards:

C. Noise sources associated with construction, provided such activities do not take place before 7 a.m. or after 6 p.m. on any day except Saturday or Sunday, or before 8 a.m. or after 5 p.m. on Saturday or Sunday.

3.10.3 Environmental Impacts and Mitigation Measures

METHODOLOGY

While approval of the SOIA and annexation, along with changes to land use and zoning designations, would not result in physical changes to the site, approval of the SOIA/annexation would remove barriers to the development of a future corporation yard at this site. Therefore, this analysis considers the potential environmental impacts of the development of a future corporation yard.

The project site is directly south of the Folsom Plan Area Specific Plan (FPASP), an area approved for development by the Folsom City Council in 2011. The portion of the FPASP area, directly north of the project site is the portion of the FPASP area which will consist of single-family, multi-family, commercial, and open space land uses. Because the FPASP has been approved and is planned for development, it is assumed as part of the analysis for the project that the FPASP planned land uses would be present when a future City of Folsom corporation yard is developed. Thus, the planned land uses within the FPASP development area are analyzed as existing receptors in this Draft EIR.

Construction Noise and Vibration

To assess potential short-term (construction-related) noise and vibration impacts, sensitive receptors and their relative exposure were identified. Potential project-generated construction source noise and vibration levels were determined based on methodologies, reference emission levels, and usage factors from FTA's *Guide on Transit Noise and Vibration Impact Assessment* methodology (FTA 2006) and FHWA's *Roadway Construction Noise Model User's Guide* (FHWA 2006). Reference levels for noise and vibration emissions for specific equipment or activity types are well documented and the usage thereof common practice in the field of acoustics.

Operational Noise and Vibration

To assess potential long-term (operation-related) noise impacts because of project-generated increases in traffic, noise levels were estimated in using calculations consistent with the Federal Highway Administration's Traffic Noise Model Version 2.5 and project-specific traffic data (Appendix D). The analysis is based on the reference noise emission levels for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and ground attenuation factors. Truck usage and vehicle speeds on area roadways were estimated from field observations and the project-specific traffic report. Note that the modeling conducted does not account for any natural or human-made shielding (e.g., the presence of walls or buildings) or reflection off building surfaces. Additionally, the analysis of SENLs was based on reference noise levels for garbage trucks collected by Ascent in 2016.

With respect to non-transportation noise sources (e.g., stationary) associated with project implementation, the assessment of long-term (operational-related) impacts was based on reconnaissance data, reference noise emission levels, and measured noise levels at the existing Leidesdorff Yard for activities and equipment associated with project operation (e.g., heating, ventilation and air conditioning [HVAC] units, refueling of fleet vehicles, ignition, testing, arrival, and departure of the garbage truck and bus fleets, vehicle repair activities, material moving and loading/unloading), and standard attenuation rates and modeling techniques.

THRESHOLDS OF SIGNIFICANCE

Based on the Appendix G of the State CEQA Guidelines, noise policies and standards established by the City of Folsom and Sacramento County, the development of the project would result in a significant impact related to noise if it would result in:

- Construction-generated noise levels exposing noise-sensitive receptors in the City of Folsom or the unincorporated portion of Sacramento County to noise levels that exceed the respective applicable noise

standards, as listed in Table 3.10-8, 3.9-6, and Table 3.10-11/3.9-12, outside of hours considered exempt (7:00 a.m. to 6:00 p.m. Monday through Friday, and 8:00 a.m. to 5:00 p.m. Saturday and Sunday).

- Exposure of persons to or generation of excessive ground vibration or ground noise levels (e.g., exceed Caltrans's recommended level of 0.2 in/sec PPV with respect to the prevention of structural damage for normal buildings or FTA's maximum acceptable level of 80 VdB with respect to human response for residential uses [i.e., annoyance] at nearby existing vibration-sensitive land uses).

- Long-term, traffic-generated noise that results in the following:

  - Exposure of noise-sensitive land uses located in the City of Folsom to noise levels that exceed the traffic noise standards established by the City of Folsom in Policy 30.5 (60 dB L_{dn}/CNEL or less in outdoor activity areas, and interior noise levels to 45 dB L_{dn}/CNEL or less).

  - Exposure of interior rooms of residential structures, regardless of location, to SENLs generated by truck pass-bys generated by the project that exceed 64.8 SENL, which is the level determined by the Federal Interagency Committee on Aviation Noise (FICAN) to result in sleep disturbance to 5% of the exposed population (FICAN 1997).

- Long-term noise levels generated by stationary or area sources from new industrial, commercial land uses, or other uses including non-transportation-related noise sources that result in the exceedance of City of Folsom performance standards contained within Table 3.10-11/3.10-12 at surrounding noise-sensitive land uses.

- Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels.

- For a project located within 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, expose people residing or working in the project site to excessive noise levels.

- For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project site to excessive noise levels.

ISSUES NOT DISCUSSED FURTHER

No major sources of vibration would be potentially constructed within the SOIA/annexation area and construction of the proposed Folsom Corporation Yard would not include vibration-intensive activities such as blasting or pile driving. This is based on the geology of the SOIA/annexation area which would not require blasting activities for construction, and the scale and intensity of the proposed uses and facilities (e.g., office space, warehouse and storage space, solid waste and material recovery station) are not likely to necessitate the construction of multi-story structures that require pile-driving activities. Additionally, the nearest proposed noise-sensitive receptor (if constructed prior to construction of the corporation yard) would be located approximately 250 feet from where construction activities would occur. Thus, with the diminishment in magnitude of vibration levels because of distance alone, operation of heavy-duty construction equipment that generate relatively high levels of ground vibration and vibration noise (e.g., dozers, trucks) would not result in exposure of persons to or generation of excessive ground vibration or ground noise levels at nearby existing vibration-sensitive land uses. Therefore, the project would not result in excessive vibration or vibration levels such that any receptors would be adversely affected and vibration-related impacts are not discussed further in this Draft EIR.

The project is not located within an airport land use plan, or within two miles of a public airport or public use airport. Additionally, the project is not located within two miles of a private airstrip; Mather Airport is the closest airport and is located approximately 7.5 miles southwest of the project site. Thus, the project would

not result in noise impacts related to the exposure of people residing or working in the project site to excessive aircraft-related noise levels. This issue is not discussed further in this Draft EIR.

As described in Chapter 2, *Project Description, t*he project has three potential access options. The evaluation of noise would not be affected by these options. Therefore, this is not discussed further in this section.

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact 3.10-1: Construction-generated noise

Short-term construction-generated noise levels associated with the future development of the SOIA/annexation area could expose nearby noise-sensitive receptors to noise levels that exceed applicable local standards. If construction activity were to occur during more noise-sensitive nighttime hours it could result in annoyance and sleep disruption to occupants of nearby residential land uses and substantial periodic increases in ambient noise levels. This would be a **significant** impact.

Construction of a future corporation yard would involve noise-generating activities. Short-term construction noise levels on and near the project site would fluctuate depending on the type, number, and duration of usage for the varying types of heavy-duty equipment. The effects of construction noise largely depend on the type of construction activities being performed, noise levels generated by those activities, distances to noise-sensitive receptors, the relative locations of noise attenuating features such as vegetation and existing structures, and existing ambient noise levels.

Construction noise would be temporary in nature and would include noise from activities such as site preparation, truck hauling of material, pouring of concrete, paving, and construction of buildings. It is not anticipated that pile driving or rock blasting would occur as part of construction. Construction noise typically occurs intermittently and varies depending on the nature of the construction activities being performed. Noise is generated by construction equipment, including excavation equipment, material handlers, and portable generators. Thus, existing and future noise-sensitive land uses located near areas of potential construction activity could be exposed to future construction noise within the SOIA/annexation area, or from offsite construction activity associated with infrastructure improvements.

Noise-generating activities occurring during the more noise-sensitive evening and nighttime hours are of increased concern. Because exterior ambient noise levels typically decrease during the late evening and nighttime hours as typical levels of community activities (e.g., industrial activities, vehicle traffic) decrease, construction activities performed during the more noise-sensitive evening and nighttime hours can result in increased annoyance and potential sleep disruption for occupants of nearby residential land uses.

Based on the types of construction activities assumed for the project (e.g., paving, earth moving, trenching, structure erection) it is expected that the primary sources of noise would include backhoes, dozers, graders, excavators, dump trucks, pavers and various trucks (e.g., job trucks, water trucks, fuel trucks). Noise levels generated by common types of construction equipment are shown in Table 3.10-13.

Construction phasing and activity is not known at the time of writing this Draft EIR and; therefore, the construction-noise evaluation conservatively assumed that five of the highest noise-generating pieces of equipment could operate simultaneously near each other near the boundaries of the project site.

Based on the reference noise levels listed in Table 3.10-13 and accounting for typical usage factors of individual pieces of equipment, onsite construction-related activities could generate a combined hourly average noise level of approximately 88 L_{eq} and a maximum noise level as high as 92 L_{max} at 50 feet from the project boundary. Detailed inputs and parameters for the estimated construction noise exposure levels are provided in Appendix D.

Table 3.10-13 Noise Emission Levels from Construction Equipment

Equipment Type	Typical Noise Level (dBA) @ 50 feet
Dump Truck	76
Drill Rig Truck	79
Concrete Mixer	85
Crane	85
Dozer	85
Grader	85
Excavator	85
Front End Loader	80
Paver	89
Roller	85
Scraper	89

Notes: Assumes all equipment is fitted with a properly maintained and operational noise control device, per manufacturer specifications. Noise levels listed are manufacturer-specified noise levels for each piece of heavy construction equipment.

Source: FTA 2006

Nearby noise-sensitive receptors that could be adversely affected by construction noise are shown in Table 3.10-14. These values represent a conservative assessment because the modeling assumes that five of the highest noise-generating pieces of equipment could operate simultaneously near each other near the boundaries of the project site. All nearby-sensitive receptors would be located within the City of Folsom and; thus, City of Folsom noise standards would apply. The distance to, and daytime noise exposure levels at each receptor location were estimated for the closest possible construction activities (at the project boundary) and are also listed in Table 3.10-14. Based on the Capitol Southeast Connector right-of-way (as shown in Exhibit 3.10-1), the distance at which the nearest proposed receptor north of the project site is likely to be located is approximately 250 feet from the northernmost boundary of the future corporation yard.

Table 3.10-14 Levels of Noise Exposure at Offsite Noise-Sensitive Receptors during Typical Daytime Construction Activity

Sensitive Receptor[1]	Distance to Project Site (feet)	Daytime Construction Noise Exposure Level at Sensitive Receptor[2]	
		L_{eq} (dBA)	L_{max} (dBA)
FPASP Residences[3]	250	74	78

Notes:

[1] See Exhibit 3.10-1 for locations of sensitive land uses relative to the project site.

[2] Assumes all equipment is fitted with a properly maintained and operational noise control device, per manufacturer specifications. Noise levels listed are manufacture-specified noise levels for each piece of heavy construction equipment.

[3] Receptor would be located in the City of Folsom.

Source: Data modeled by Ascent Environmental in 2017

As shown in Table 3.10-14, daytime construction-generated noise levels could be as high as 74 L_{eq} and 78 L_{max} at the FPASP development area residences. The City of Folsom Code, *Section 8.42.060 Noise Source Exemptions*, exempts noise sources associated with construction, provided such activities do not take place between 6:00 p.m. and 7:00 a.m., Monday through Friday and 5:00 p.m. and 8:00 a.m., Saturday and Sunday.

However, it is possible that certain construction activities would need to occur during the non-exempt and more noise-sensitive nighttime hours. Nighttime construction activities are not exempt and would be subject to the City and County nighttime noise standards. Thus, depending on the activities being performed, as well as the duration and hours during which activities occur, construction generated noise levels at nearby residences could violate applicable noise standards. Additionally, activities occurring during the evening and

nighttime hours, when people are more sensitive to noise, could result in increased levels of annoyance and sleep disruption to occupants of nearby residences. This would be a **significant** impact.

Mitigation Measure 3.10-1a: Implement construction-noise reduction measures.

To minimize noise levels during nighttime construction activities, the City and their construction contractors will comply with the following measures during all nighttime construction work:

- All construction equipment shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturer's recommendations. Equipment engine shrouds shall be closed during equipment operation.
- 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) where feasible and consistent with building codes and other applicable laws and regulations.
- To the maximum extent feasible, construction activity shall take place within the City of Folsom construction noise exemption timeframes (i.e., 7:00 a.m. and 6:00 p.m., Monday through Friday, and 8:00 a.m. and 5:00 p.m., Saturday and Sunday).

Mitigation Measure 3.10-1b: Implement construction-noise reduction measures during noise-sensitive time periods.

At the time of construction, the City of Folsom will comply with the following construction noise requirements:

For all construction activity that would take place outside of the City of Folsom construction noise exemption timeframe when located adjacent to residential uses (i.e., 7:00 a.m. and 6:00 p.m., Monday through Friday, and 8:00 a.m. and 5:00 p.m., Saturday and Sunday), and that is anticipated to generate noise levels that exceed the City of Folsom nighttime exterior noise standards for sensitive receptors (Table 3.10-11/3.9-12), the City will require their construction contractors to comply with the following measures:

- Implement noticing to adjacent landowners at least one week in advance if construction activity would take place outside of the City of Folsom's construction noise exemption timeframe when located adjacent to residential uses (i.e., 7:00 a.m. and 6:00 p.m., Monday through Friday, and 8:00 a.m. and 5:00 p.m., Saturday and Sunday, as identified in the City of Folsom Code), and is anticipated to exceed the City of Folsom nighttime exterior noise standards for sensitive receptors (Table 3.10-11/3.9-12).
- Install temporary noise curtains as close as feasible to noise-generating activity and that blocks the direct line of sight between the noise source and the nearest noise-sensitive receptor(s). Temporary noise curtains shall consist of durable, flexible composite material featuring a noise barrier layer bounded to sound-absorptive material on one side. The noise barrier layer shall consist of rugged, impervious, material with a surface weight of at least one pound per square foot.
- Noise-reducing enclosures and techniques shall be used around stationary noise-generating equipment (e.g., concrete mixers, generators, compressors).
- Operate heavy-duty construction equipment at the lowest operating power possible.

Significance after Mitigation

Implementation of mitigation measures 3.10-1a and 3.10-1b would provide substantial reductions in daytime and nighttime construction noise levels by ensuring proper equipment use; locating equipment away from sensitive land uses; and requiring the use of enclosures, shields, and noise curtains. However, construction activities could occur in close proximity to residential uses to the north of the project site (within 250 feet). Although noise reduction would be achieved with implementation of mitigation measures 3.10-1a and 3.10-1b, reductions of up to 29 dBA would be required during some of the more intensive nighttime

construction (e.g., during the most noise-intensive construction periods) to comply with the City nighttime exterior standards of 45 L_{eq} and 65 L_{max}. Reductions of this magnitude may not be achievable under all circumstances with implementation of Mitigation Measures 3.10-1a and 3.10-1b. Therefore, this impact would be **significant and unavoidable**.

Impact 3.10-2: Exposure of existing sensitive receptors to excessive traffic noise levels and/or substantial increases in traffic noise

Future development of a future corporation yard within the SOIA/annexation area would generate vehicle trips and result in an increase in ADT volumes on affected roadway segments; and thus, an increase in traffic source noise levels. However, surrounding receptors would not be exposed to traffic noise levels or traffic noise level increases that exceed applicable City of Folsom or Sacramento County noise standards. This impact would be **less than significant**.

Future development of a corporation yard within the SOIA/annexation area would generate vehicle trips and result in an increase in ADT volumes on affected roadway segments and an increase in traffic source noise levels. To analyze the impact of operational project-generated transportation noise sources, traffic noise levels under existing, and existing-plus-project conditions were modeled for affected roadway segments. For further details about traffic volumes and conditions, see Section 3.11, *Transportation and Circulation*.

Table 3.10-15 summarizes the modeled traffic noise levels at 100 feet from the roadway centerline under existing and existing-plus-project conditions, along with the overall net change in noise level as a result of the added traffic generated by development of the SOIA/annexation area. It is assumed that the FPASP planned land uses would be present when a future corporation yard is developed. Thus, the planned land uses within the FPASP development area are analyzed as existing receptors in this Draft EIR.

Table 3.10-15 Summary of Modeled Traffic Noise Levels under Existing and Existing -Plus-Project Conditions

Roadway Segment	Applicable Exterior L_{dn}/CNEL Noise Standard for Land Uses along Roadway Segment (dBA)[1,2]	Allowable Exterior L_{dn} Noise Standard Increase (dBA)[3]	L_{dn} at 100 feet from Roadway Centerline		Change (dBA)
			Existing-No-Project Condition	Existing-Plus-Project Condition	
Prairie City Road (White Rock Road to US 50 eastbound ramps)	60[1]	1.5	**67.1**	67.8	0.7
White Rock Road (West of Prairie City Road to Prairie City Road)	75[2]	1.5	70.2	70.7	0.5
White Rock Road (Prairie City Road to Scott Road [west])	60[1]	1.5	**68.9**	69.5	0.6
White Rock Road (Scott Road [west] to Scott Road [east])	60[1]	1.5	**69.0**	69.6	0.6
White Rock Road (Scott Road [east] to east of Scott Road [east])	60[1]	1.5	**66.9**	67.5	0.6
Scott Road (east) (White Rock Road to north of White Rock Road)	60[1]	1.5	**67.9**	68.5	0.6
Scott Road (west) (White Rock Road to south of White Rock Road)	75[2]	3	62.0	62.7	0.7

Notes: CNEL = Community Noise Equivalent Level; L_{dn} = Day-Night Level; dBA = A-weighted decibels;

[1] 60 CNEL/L_{dn}– Land use compatibility noise standard for single-family residential land uses per the City of Folsom General Plan. See Exhibit 3.10-1.

[2] 75 CNEL/L_{dn} – Land use compatibility noise standard for industrial, manufacturing, utilities, and agricultural land uses per the City of Folsom General Plan. See Exhibit 3.10-1.

[3] Incremental traffic noise increase standard per the County of Sacramento General Plan (see Table 3.10-9).

Refer to Appendix D for detailed traffic data, and traffic-noise modeling input data and output results.

Values shown in bold exceed the applicable land use compatibility noise standards for surrounding land uses per the City of Folsom General Plan. See Exhibit 3.10-1.

Source: Noise levels modeled by Ascent Environmental in 2017

As shown in Table 3.10-15, in the existing-no-project scenario, traffic noise levels along the roadways adjacent to noise-sensitive land uses within the FPASP development area would exceed the City land use compatibility noise standards (60 CNEL/L_{dn} for single-family residential land uses).

However, for the segments that exceed CNEL/L_{dn} in the existing-no-project scenario, traffic noise increases would be considered substantial if they exceeded the incremental noise standards for noise-sensitive land uses per the Sacramento County General Plan (see Table 3.10-9). The addition of project-generated traffic to the surrounding roadway network would not result in any of the roadway study segments experiencing noise increases that exceed the incremental noise standards for noise-sensitive land uses per the Sacramento County General Plan. Therefore, the project would not result in existing receptors being exposed to traffic noise levels or traffic noise level increases that exceed applicable local noise standards. This impact would be **less than significant**.

Mitigation Measures

No mitigation is required.

Impact 3.10-3: Intermittent single-event noise from trucks passing offsite sensitive receptors

Intermittent SENL's from project generated truck trips passing offsite sensitive receptors during the more noise-sensitive hours would not exceed 65 SENL. Therefore, the percentage of people expected to be awakened when inside the affected homes would not exceed 5 percent. This impact would be **less than significant**.

The project would include the operation of heavy vehicles (e.g., busses, garbage trucks, fleet vehicles) entering and exiting the project site using the surrounding roadway network during more noise-sensitive nighttime and early-morning hours. In addition to increases in average daily traffic noise, as discussed in Impact 3.10-2, intermittent SENLs associated with the operation of heavy vehicles on the surrounding roadway network, and increases in the frequency of occurrence of such levels would be of additional concern, particularly during the more noise-sensitive evening and nighttime hours.

Although the average daily noise descriptors (i.e., L_{dn} and CNEL) incorporate a nighttime weighting or "penalty" that is intended to reflect the expected increased sensitivity to noise annoyance at night, L_{dn} and CNEL standards do not fully protect residents from sleep disturbance. The SENL describes a receiver's cumulative noise exposure from a single impulsive noise event (e.g., a passing truck, a truck downshifting to engine brake, or an air craft flying overhead), which is a rating of a discrete noise event that compresses the total sound energy of the event into a 1-second time period, measured in decibels (Caltrans 2011). These noise events can be more startling to receptors if they occur when ambient noise levels are quieter such as during nighttime hours.

Many studies have been conducted regarding the effects of single-event noise on sleep disturbance, but because of the wide variation in the reaction of test subjects to SENLs of various levels no definitive consensus has been reached with respect to a universal criterion to apply. Upon a review of studies about sleep disturbance and aircraft-generated SENLs, the FICAN provided estimates of the percentage of people expected to be awakened when exposed to specific SELs inside a home (FICAN 1997). According to the FICAN's review, 10 percent of the population is estimated to be awakened when the SEL interior noise level is 81 dBA. An estimated 5 to 10 percent of the population is affected when the SEL interior noise level is between 65 and 81 dBA, and few sleep awakenings (less than 5 percent) are predicted if the interior SEL is less than 65 dBA. However, FICAN did not recommend a threshold of significance based on the percent of people awakened.

For the purposes of this analysis, exposure of interior rooms of residential structures, regardless of location, to SENLs generated by truck pass-bys generated by the project that exceed 65 SENL, which is the level determined by the FICAN to result in sleep disturbance to 5 percent of the exposed population (FICAN 1997), would be considered significant.

Reference SENLs for heavy truck (garbage trucks) passbys were measured by Ascent in 2016 (Refer to Appendix D for detailed SENL measurements). The results of the outdoor measurements indicated that heavy truck passby levels ranged from 79 to 83 SENL, with a mean of 81 SENL at a reference distance of 50 feet. It is assumed that SENLs from engine braking (e.g., Jake braking) is at least as loud.

Assuming the average exterior-to-interior noise level reduction of 24 dBA typically provided by residential buildings with the windows closed (EPA 1978: 11), the maximum SENL in the interior of rooms located farther than 50 feet from a passing truck would not exceed 65 SENL. The distance at which a sensitive receptor would experience 65 SENL or higher is 25 feet. The exact location and orientation of the future residential receptors along Prairie City Road and White Rock Road are not known at this time; however, it is unlikely that residential receptors would be located within 25 feet of Prairie City Road and/or White Rock Road. Therefore, the percentage of people expected to be awakened when inside the affected homes would not exceed 5 percent. This impact would be a **less than significant**.

Mitigation Measures

No mitigation is required.

Impact 3.10-4: Long-term operational non-transportation noise levels

The SOIA/annexation area could result in future corporation yard land uses in close proximity to noise-sensitive land uses. Thus, offsite receptors could experience project-generated noise levels that exceed the City's daytime and nighttime noise levels standards. This impact would be **significant**.

This impact assesses the long-term exposure of existing sensitive receptors to increased operational-source noise levels from the potential development of a future corporation yard within the SOIA/annexation area. The project includes development of land uses and facilities as shown in Table 2-2 in Section 2, *Project Description*. Noise generated by land uses and activities within a future corporation yard can vary substantially. To estimate the noise that would be generated within a future corporation yard, the predominant sources of noise were identified (e.g., heating, ventilation and air conditioning [HVAC] units, mobilization of solid waste and transit fleet, refueling of fleet vehicles, vehicle repair activities, material moving and loading/unloading).

One long-term (24-hour continuous) and two short-term noise level measurements were conducted within the existing City of Folsom Leidesdorff Yard to capture the noise levels (shown in Table 3.10-4) associated with general activities occurring for this land use. Two short-term noise measurements were taken during the more noise-sensitive early morning hours when the solid waste and transit fleets were starting engines, performing pre-departure equipment and horn checks, and departing the corporation yard. The long-term noise measurement was conducted to capture the L_{eq} and L_{max} during the daytime and the more noise-sensitive nighttime hours.

The peak L_{eq} (67 dBA) and L_{max} (85 dBA) noise levels measured during the daytime at the Leidesdorff Yard were combined with reference noise levels for equipment associated with material loading and unloading to analyze the potential daytime noise-generated by the project. Reference noise levels for equipment associated with material loading and unloading including idling trucks, vehicle backup alarms, decompression of truck brakes, and forklifts can generate noise levels of approximately 71 L_{eq} and 86 L_{max} at a distance of 50 feet.

The measured reference noise levels (75 L_{eq} and 87 L_{max}) generated during the solid waste and transit fleet mobilization and departure during the more noise-sensitive early-morning hours were used to analyze the potential nighttime noise-generated by the project.

Based on the daytime reference noise levels, the City's daytime exterior noise standard of 50 L_{eq} for residential receptors could be exceeded within approximately 663 feet from the project. Additionally, the

City's daytime exterior noise standard of 70 L_{max} for residential receptors could be exceeded within approximately 423 feet from the project.

Based on the measured nighttime reference noise levels (75 L_{eq} and 87 L_{max}), the City of Folsom nighttime exterior noise standard of 45 L_{eq} could be exceeded within approximately 889 feet from the where the solid waste and transit vehicles are located. Additionally, the City's nighttime exterior noise standard of 65 L_{max} for residential receptors could be exceeded within approximately 500 feet from where the solid waste and transit vehicles are located.

The offsite noise-sensitive land uses nearest to the project would consist of the future residential dwellings located north of the project site along White Rock Road and Prairie City Road. The project would be located a minimum of 250 feet from these noise-sensitive receptors because of the Southeast Connector ROW separating the two. At this time the site design of the project has not be determined; thus, it cannot be known where the more noise-intensive activities and land uses would be located. Therefore, the conservative approach of assuming they could potentially be located along the boundary of the project site nearest to the future sensitive receptors, is assumed.

Based on the reference noise levels identified above, and distance at which noise generating project activities could be located in relation to noise-sensitive receptors, the offsite residential receptors could be exposed to project generated noise levels that exceed the City and County daytime and nighttime L_{eq} and L_{max} noise standards. This would be a **significant** impact.

Mitigation Measure 3.10-4: Reduce noise exposure to existing sensitive receptors from proposed stationary noise sources.

City of Folsom

The City shall require the future development of a corporation yard to meet the following noise requirements in the design of the development:

Locate and design the more noise-intensive lands uses and activities so that noise emissions do not exceed the applicable stationary noise source criteria (i.e., exterior daytime [7:00 a.m. to 10:00 p.m.] standards of 50 L_{eq} and 70 L_{max} for receptors within the City, and exterior nighttime [10:00 p.m. to 7:00 a.m.] standards of 45 L_{eq} and 65 L_{max} for receptors within the City.

At the time of approval of special permits and/or development plan review, the City shall conduct a site-specific noise analysis to evaluate design and ensure compliance with City of Folsom noise standards. Reduction of specific noise activities can be achieved by locating activities as far away as feasible from noise-sensitive land uses, constructing noise barriers between where these activities would take place and noise-sensitive land uses, or using buildings and topographic features to provide acoustic shielding for noise-sensitive land uses. Final design, location, orientation and use restrictions shall be dictated by findings in the noise analysis and approved by City staff.

Significance after Mitigation

Implementation of Mitigation Measure 3.10-4 would require that the more noise-intensive activities and land uses of the project are oriented, located, and designed in such a way to ensure that stationary noise sources would comply with City of Folsom noise standards for surrounding land uses. Implementation of Mitigation Measure 3.10-4 would reduce predicted noise levels at proposed land uses consistent with City and County noise standards. As a result, this impact would be reduced to a **less-than-significant** level.

This page intentionally left blank.