5.10 Noise

This section describes the existing noise environment in the Planning Area and the potential of the proposed Project to generate noise levels exceeding the City's applicable exterior noise level standards at noise-sensitive receptors in the Planning Area. This section includes analysis of potential non-transportation and transportation source noise and groundborne vibration impacts at nearby existing as well as proposed land uses.

5.10.1 BACKGROUND INFORMATION ON NOISE AND VIBRATION

ACOUSTIC FUNDAMENTALS

Prior to discussing the noise setting for the Project, background information about sound, noise, and vibration and common noise descriptors is needed to provide context for 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 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 decibels (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 only 3 dB higher than if only one of the 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, dBA) can be computed based on this information.

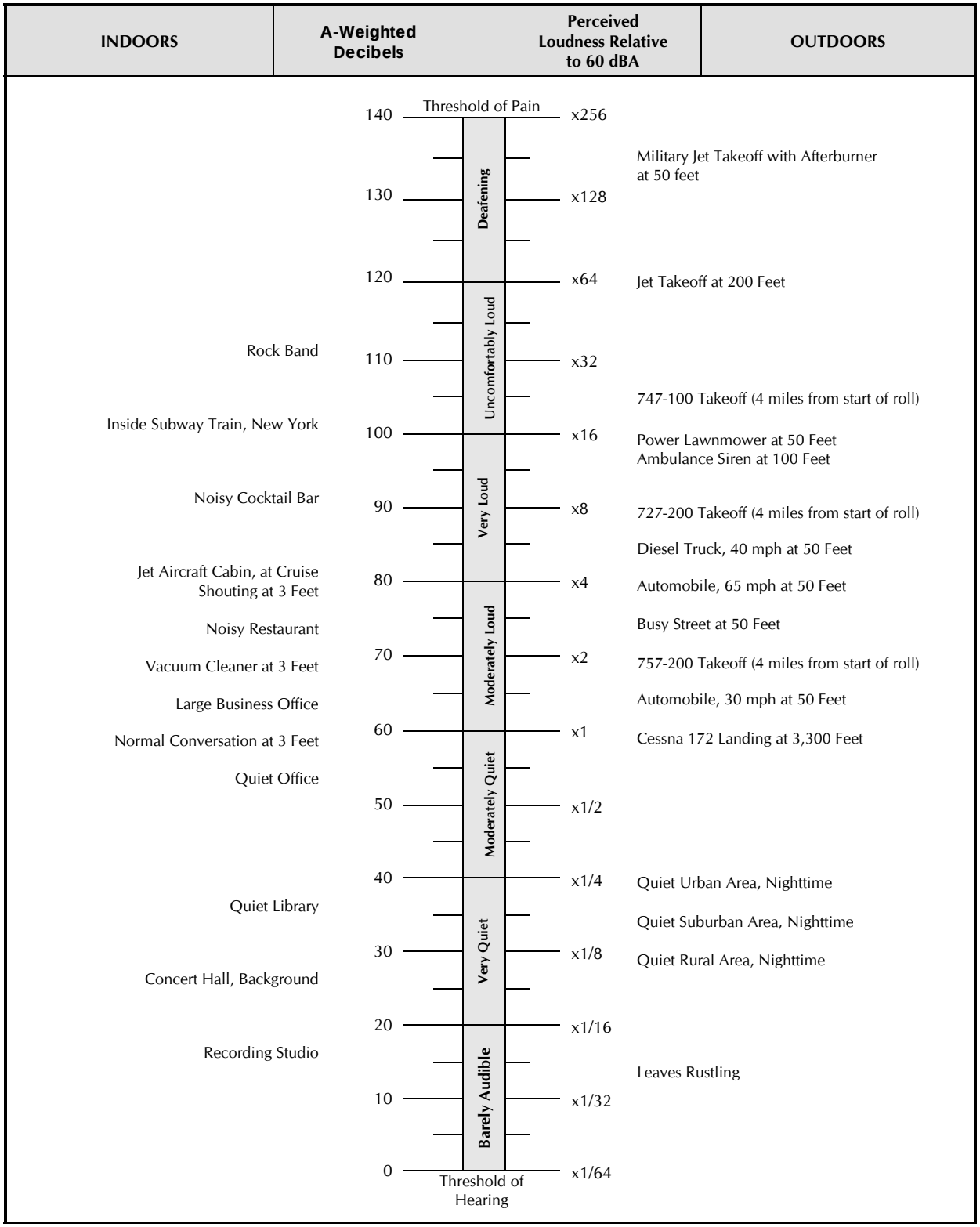
The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgment correlates well with the A-scale sound levels of those sounds. Thus, noise levels are typically reported in terms of A-weighted decibels. All sound levels discussed in this section are A-weighted decibels (dBA), but may be expressed as dB, unless otherwise noted. **Figure 5.10-1** describes typical A-weighted noise levels for various noise sources.

HUMAN RESPONSE TO NOISE

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 2009). In typical noisy environments, changes in noise of 1–2 dB are generally not perceptible. However, it is widely accepted that people can 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. 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.

FIGURE 5.10-1
TYPICAL NOISE LEVELS



Sources: Caltrans 2002a; HUD 1985

As depicted in **Table 5.10-1**, based on criteria recommended by the Federal Interagency Committee on Noise (FICON), a noise level increase of 5.0 or greater would typically be considered to result in increased levels of annoyance where existing ambient noise levels are less than 60 dB. Within areas where the ambient noise level ranges from 60 to 65 dB, increased levels of annoyance would be anticipated at increases of 3 dB, or greater. Increases of 1.5 dB, or greater, could result in increased levels of annoyance in areas where the ambient noise level exceeds 65 dB. The rationale for the FICON-recommended criteria is that as ambient noise levels increase, a smaller increase in noise resulting from a project is sufficient to cause significant increases in annoyance (FICON 1992).

TABLE 5.10-1
FEDERAL INTERAGENCY COMMITTEE ON NOISE
RECOMMENDED CRITERIA FOR EVALUATION OF INCREASES IN AMBIENT NOISE LEVELS

Ambient Noise Level Without Project	Increase Required for Significant Impact
< 60 dB	5.0 dB, or greater
60–65 dB	3.0 dB, or greater
> 65 dB	1.5 dB, or greater

Source: FICON 1992

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).

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). 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).

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 in 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 5.10-2 summarizes the general human response to different ground vibration-velocity levels.

TABLE 5.10-2
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.

Source: FTA 2006, pp. 7–8

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

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 occurs during the same period. For instance, the 1-hour A-weighted equivalent sound level (L_{eq}), also referred to as the hourly L_{eq}, is the energy average of A-weighted sound levels occurring during a 1-hour period and is the basis for noise abatement criteria used by Caltrans and the Federal Highway Administration (FHWA) (Caltrans 2013:2-47; FTA 2006:2-19).

Maximum Sound Level (L_{max}): L_{max} is the highest instantaneous sound level measured during a specified period (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 A-weighted sound levels occurring during nighttime hours between 10 p.m. and 7 a.m. (FTA 2006:2-22).

Community Noise Equivalent Level (CNEL): CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during the nighttime hours between 10 p.m. and 7 a.m. and a 5-dB penalty applied to the A-weighted sound levels occurring during evening hours between 7 p.m. and 10 p.m. Many agencies and local jurisdictions in California often have established noise standards using the CNEL metric. Because L_{dn} and CNEL are similar 24-hour averages, some agencies and local jurisdictions use L_{dn} and CNEL interchangeably.

SOUND PROPAGATION

When sound propagates over a distance, it changes in level and frequency content. The way 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 decreases from ground absorption and reflective-wave canceling provides additional attenuation associated with geometric spreading, which has traditionally 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., sites with features such as soft dirt, grass, or scattered bushes and trees), an excess additional ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the attenuation rate associated with line sources, the excess additional ground attenuation results in an overall drop-off rate of 4.5 dB per doubling of distance. For point sources, this would result in an overall drop-off rate of up to 7.5 dB per doubling of distance.

Atmospheric Effects

Because wind can carry sound, 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. 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 have significant effects on sound attenuation.

Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain

features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction. Taller barriers higher than the line of sight provide increased noise reduction (FTA 2006, p. 2-12). Vegetation between the source and receiver is rarely effective in reducing noise because, unless there are multiple rows of dense vegetation, it does not create a solid barrier (FTA 2006, p. 2-11).

5.10.2 EXISTING SETTING

EXISTING NOISE RECEPTORS

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential uses are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels, and because these land uses are places of rest and sleep for City residents. Additional land uses such as parks, historic sites, cemeteries, and recreation areas are also considered sensitive to increases in exterior noise levels. Schools, churches, hotels, libraries, and other places where low interior noise levels are essential are also considered noise-sensitive land uses. The City includes many of these types of noise-sensitive land uses including residential, hotel/motel, parks and recreational facilities, religious institutions, and schools. These land uses are given priority in assessing and addressing noise exposure given the noise-sensitive nature of the land uses and activities occurring in these locations.

EXISTING NOISE ENVIRONMENT

The noise environment in the Planning Area is defined primarily by vehicular traffic on State Route (SR) 99, Interstate 5 (I-5), and local roadways. To a lesser extent, railroad traffic, occasional aircraft overflights, nearby agricultural activities, and landscape maintenance activities at residential and commercial uses also contribute on an intermittent basis to ambient noise levels. Industrial uses in the City are located primarily in the south-central and northwest portions of the City and are co-located adjacent to the two existing rail lines which run north–south through the City.

TRANSPORTATION NOISE SOURCES

Roadway Noise Sources

Noise levels along roadways are affected by several traffic characteristics, including average daily traffic (ADT) volumes, the vehicle mix, roadway conditions, vehicle speed, and the gradient of the roadway. The major east–west roadways in the City are Laguna Boulevard, Elk Grove Boulevard, and Calvine Road. The major north–south roadways are Grant Line Road, Bond Road, Elk Grove Florin Road, Bruceville Road, and Franklin Boulevard. SR 99 runs north–south through the City, running adjacent to predominantly mixed-use, commercial, and office land uses. In general, these roadways abut commercial or residential land uses with some sound-reducing measures (e.g., sound walls, setbacks from roadways) incorporated into site design. I-5 runs north–south along the western border of the City's boundaries. Currently, residential, commercial, and residential land uses are located adjacent to I-5, although a significant buffer distance (approximately 160 feet) exists between City boundaries and the nearest travel lane on I-5. Land uses adjacent to I-5 also include some sound-reducing measures to address traffic noise exposure for nearby noise-sensitive land uses.

Rail Noise

Two major rail lines run through the Planning Area. A Union Pacific Railroad (UPRR) line in the eastern portion of the Planning Area runs north–south and enters the City just south of Eschinger Road. This rail line is adjacent to residential and industrial land uses in the City and currently has an average of 32 daily pass-through train trips. The UPRR line bisects some of the City's major arterials, including Grant Line Road, Elk Grove Boulevard, Bond Road, Elk Grove Florin Road, Sheldon Road, and Calvine Road. This rail line also serves Amtrak passenger trains with an average of seven daily passenger train trips. Except for Grant Line Road, these crossings occur at grade. The UPRR line in the western portion of the Planning Area runs north–south and bisects Franklin Boulevard, Elk Grove Boulevard, and Laguna Boulevard. This line is located adjacent to residential and industrial land uses in the City and currently has an average of three daily freight train trips. At 100 feet, the average train operating on these tracks would produce a sound exposure level of approximately 105 dB with usage of the warning horn, and approximately 100 dB without usage of the horn. Trains are generally required to sound warning horns within 800 feet of at-grade crossings.

The City has established a series of quiet zones for many of the at-grade crossings to limit noise exposure to residents from train warning horns. These quiet zones include the at-grade crossings which intersect with Calvine Road, Sheldon Road, Elk Grove Florin Road, Bond Road, Elk Grove Boulevard, Franklin Boulevard, and Bilby Road. While railroads are directed to not sound warning horns at these crossings, warning horns would still be used in emergency situations per Federal Railroad Administration regulations and UPRR operating rules. Where the rail lines are adjacent to residential uses, sound walls have been erected to reduce noise exposure levels.

Aircraft Noise

There are seven airports in Sacramento County. Each airport has an Airport Land Use Compatibility Plan (also previously referred to as a Comprehensive Land Use Plan) that identifies hazard zones surrounding the airport. No portion of the Planning Area is located within noise contours or land use overlay areas for any airport in Sacramento County. One public airport and two private airports are located within 3 miles of the Planning Area, which, though small, might have some impacts on surrounding land uses. They are Franklin Field, which is public, and the Sky Way Estates Airport and Borges-Clarksburg Airport, which are private. In addition, the Sacramento International Airport (SMF) is a high-traffic airport approximately 20 miles north-northwest of Elk Grove, and the City is not within the airport influence area, nor is it within the primary or secondary approach area in which aircraft fly below 3,000 feet (SACOG 2013 :Map 6). Flights arriving at SMF from the south that may fly over Elk Grove are typically more than 8,000 feet in altitude and, therefore, result in minimal noise exposure in the City.

Construction Noise Sources

Construction activities are a regular and ongoing source of noise throughout the City. The noise levels generated by construction activities are generally isolated to the vicinity of a construction site and occur during daytime hours in accordance with City regulations. Construction activities also occur for relatively short-term periods of a few weeks to several months; upon completion of construction activity, noise exposure ceases. **Table 5.10-3** illustrates noise levels for common construction equipment and activities at 50 feet. According to the EPA, construction noise levels are highest for pile-driving activities, and can reach as high as 107 dBA.

TABLE 5.10-3
NOISE RANGES OF TYPICAL CONSTRUCTION EQUIPMENT

Construction Equipment	Noise Levels at dBA Leq at 50 feet
Front Loader	73-86
Truck	82-95
Crane (movable)	75-88
Crane (derrick)	86-89
Vibrator	68-82
Saw	72-82
Pneumatic Impact Equipment	83-88
Pile Driving (peaks)	95-107
Jackhammer	81-98
Pump	68-72
Generator	71-83
Compressor	75–87
Concrete Mixer	75–88
Concrete Pump	81–85
Backhoe	73–95
Tractor	77–98
Scraper/Grader	80–93
Paver	85–88

Source: EPA 1971

Industrial Noise Sources

The largest concentrations of industrial land in the City are in the north-central, northwest, and south-central sections. Current industrial uses in the City include heavy industrial and light industrial/warehouse. Generally, heavy industrial uses are located away from noise-sensitive uses and near other noise-generating land uses such as major roadways and/or railroad lines. Primary noise sources associated with industrial uses include motors, agitators, forklifts, air compressors, and heavy- and medium-duty trucks with specific equipment use largely based on the type of industrial operation or use occurring at specific locations.

Agricultural Activities

Noise levels associated with agricultural activities can vary substantially depending on the type of activities being conducted and equipment used. Depending on various factors such as horsepower ratings and equipment age, maximum noise levels generated by farm-related tractors typically range from approximately 77 to 85 dBA at a distance of 50 feet. Due to the seasonal nature of agricultural activities, there are often extended periods of time when no noise is generated on properties that are actively being farmed, followed by short-term periods of more intensive equipment use and associated noise levels. However, such noise levels are typically distributed over a large area and prolonged noise levels at individual nearby receptors

would not be anticipated for most activities. In addition, given that agricultural activities typically occur during the daytime hours, noise generated by nearby agricultural activities are often largely masked by vehicle traffic noise along nearby roadways (i.e., Kammerer Road, Bruceville Road, Promenade Parkway, and SR 99).

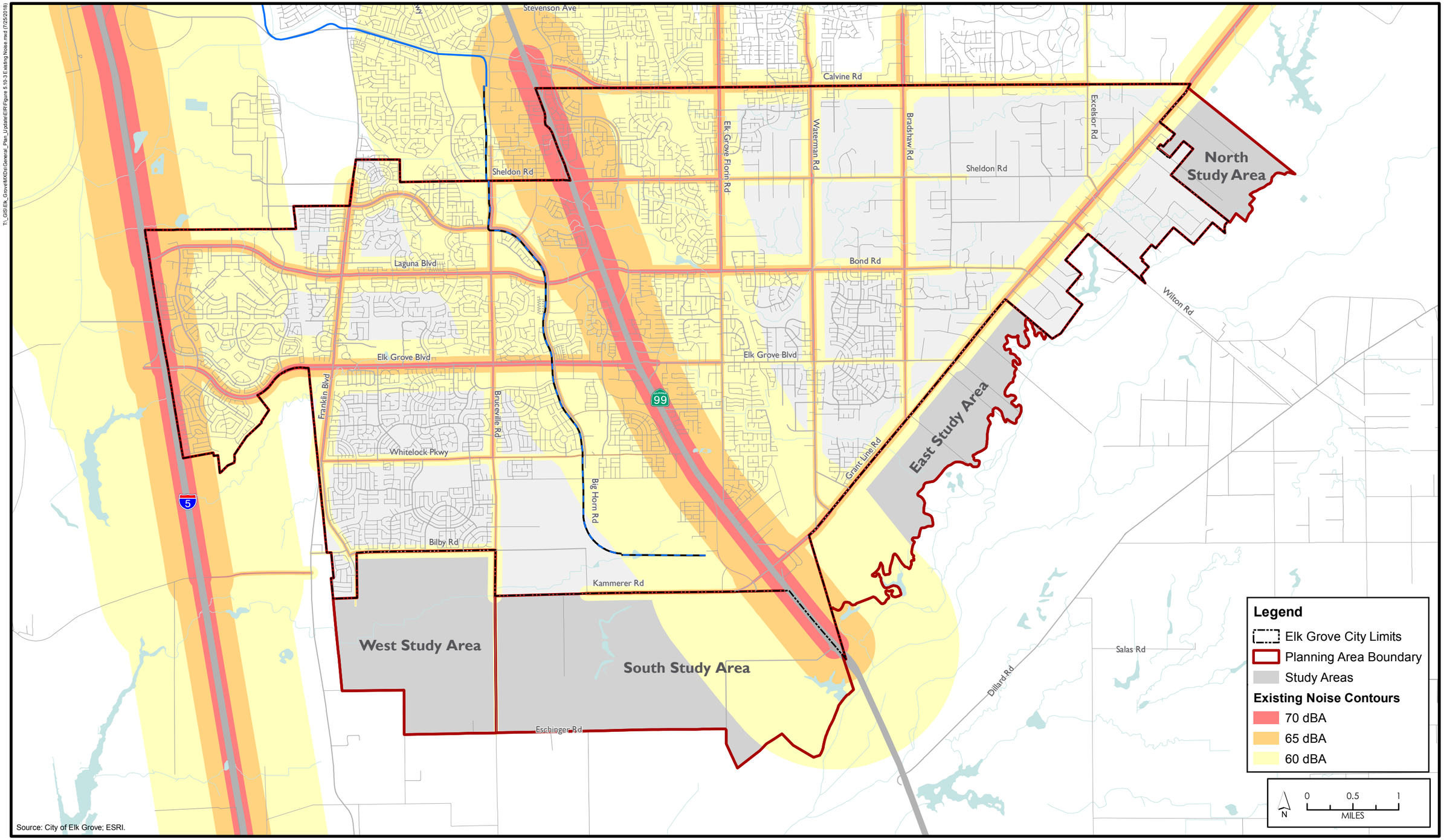
Roadway Traffic

As mentioned previously, major east–west roadways in the City include Laguna Boulevard, Elk Grove Boulevard, and Calvine Road. Major north–south roadways include Grant Line Road, Bond Road, Elk Grove Florin Road, Bruceville Road, and Franklin Boulevard. The FHWA Highway Traffic Noise Prediction Model was used to determine noise levels associated with existing vehicle traffic on major roadways in the City. The FHWA model used California vehicle reference noise emission factors for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, and distance to the receiver. Traffic data used in the modeling effort was obtained from the traffic analysis data prepared for this Project (Fehr & Peers 2017).

Table 5.10-4 depicts predicted existing average-daily traffic noise levels (in L_{dn}) at 50 feet from the near travel-lane centerline for major roadways in the Planning Area, as well as distances to the predicted 70, 65, and 60 dBA L_{dn} traffic noise contours. Existing noise contours are illustrated in **Figure 5.10-2.** Several roadway segments in the table are left blank because existing traffic volume data were not available for this roadway segment, in most cases because these are future roadways that would be built and used as part of the Project. Noise levels associated with future traffic volumes on these roadway segments are provided and discussed further in the impact analysis section of this chapter.

The extent to which nearby land uses are affected by existing traffic noise depends on multiple factors, including their respective proximity to the roadways, shielding provided by intervening terrain and structures, and their individual sensitivity to noise.

T:_GIS\Elk_Grove\MXDs\General_Plan_Update\EIR\Figure 5.10-2 Existing Noise.mxd (7/25/2019)



City of Elk Grove
Development Services

Figure 5.10-2
Existing Noise Contours

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TABLE 5.10-4
EXISTING TRAFFIC NOISE LEVELS

Roadway	From	To	Distance to Directional Centerline, L_{dn} (50 feet)	Distance (feet) to Noise Level Contours (L_{dn}, dBA) from Roadway Centerline		
				70	65	60
Big Horn Blvd	Franklin Blvd	Bruceville Rd	69.5	66	209	662
	Bruceville Rd	Laguna Blvd	70.0	75	236	745
	Laguna Blvd	Elk Grove Blvd	67.9	39	124	393
	Elk Grove Blvd	Lotz Pkwy	68.1	40	126	397
	Lotz Pkwy	Whitelock Pkwy	65.3	23	71	225
	Whitelock Pkwy	Bilby Rd	—	—	—	—
	Bilby Rd	Kammerer Rd	—	—	—	—
	Kammerer Rd	Eschinger Rd	—	—	—	—
Bilby Rd	Franklin Blvd	Willard Pkwy	63.4	11	35	110
	Willard Pkwy	Bruceville Rd	68.9	39	123	390
	Bruceville Rd	Big Horn Blvd	55.0	2	5	16
	Big Horn Blvd	Lotz Pkwy	—	—	—	—
	Lotz Pkwy	Promenade Pkwy	—	—	—	—
Bond Rd	SR 99	E Stockton Blvd	70.6	112	355	1,124
	E Stockton Blvd	Elk Crest Dr	72.0	108	342	1,082
	Elk Crest Dr	Elk Grove Florin Rd	74.4	118	374	1,183
	Elk Grove Florin Rd	Waterman Rd	72.1	91	287	909
	Waterman Rd	Bradshaw Rd	70.4	64	202	638
	Bradshaw Rd	Bader Rd	66.3	42	132	417
	Bader Rd	Grant Line Rd	63.4	21	67	212
Bradshaw Rd	Vintage Park Dr	Calvine Rd	72.2	122	386	1,220
	Calvine Rd	Sheldon Rd	67.4	60	191	605
	Sheldon Rd	Bond Rd	68.0	68	214	675
	Bond Rd	Elk Grove Blvd	67.0	54	170	536
	Elk Grove Blvd	Grant Line Rd	65.5	34	108	341
Bruceville Rd	Damascus Dr	Sheldon Rd	67.3	46	146	462
	Sheldon Rd	Big Horn Blvd	69.1	86	273	864
	Big Horn Blvd	Laguna Blvd	69.2	65	206	650
	Laguna Blvd	Elk Grove Blvd	69.2	64	204	644
	Elk Grove Blvd	Whitelock Pkwy	68.3	53	166	526
	Whitelock Pkwy	Bilby Rd	65.9	27	86	272

Roadway	From	To	Distance to Directional Centerline, L_{dn} (50 feet)	Distance (feet) to Noise Level Contours (L_{dn}, dBA) from Roadway Centerline		
				70	65	60
	Bilby Rd	Kammerer Rd	68.4	42	132	417
	Kammerer Rd	Eschinger Rd	63.3	13	41	130
Calvine Rd	Power Inn Rd	Elk Grove Florin Rd	71.7	117	370	1,169
	Elk Grove Florin Rd	Waterman Rd	70.6	101	318	1,007
	Waterman Rd	Bradshaw Rd	69.2	79	249	786
	Bradshaw Rd	Vineyard Rd	69.3	67	211	668
	Vineyard Rd	Excelsior Rd	68.2	63	200	631
	Excelsior Rd	Grant Line Rd	65.9	27	87	275
Center Parkway	Laguna Village	Bruceville Rd	65.8	31	97	305
E. Stockton Blvd	Grant Line Rd	Elk Grove Florin Rd	63.3	21	65	206
Elk Grove Blvd	I-5	Harbour Point Dr	68.9	91	286	906
	Harbour Point Dr	Four Winds Dr	70.3	138	438	1,385
	Four Winds Dr	Franklin Blvd	70.8	182	577	1,825
	Franklin Blvd	Bruceville Rd	72.0	153	483	1,526
	Bruceville Rd	Big Horn Blvd	72.6	156	493	1,558
	Big Horn Blvd	Laguna Springs Dr	70.3	165	520	1,646
	Laguna Springs Dr	Auto Center Dr	73.5	185	584	1,845
	Auto Center Dr	SR 99	73.6	200	632	2,000
	SR 99	Emerald Vista Dr/ E Stockton Blvd	73.1	188	594	1,878
	Emerald Vista Dr/ E Stockton Blvd	Elk Grove Florin Rd	69.2	57	180	569
	Elk Grove Florin Rd	Waterman Rd	63.8	15	46	146
	Waterman Rd	Bradshaw Rd	64.9	20	62	197
	Bradshaw Rd	Grant Line Rd	59.4	10	32	102
Elk Grove Florin Rd	Vintage Park Dr	Calvine Rd	70.3	106	336	1,063
	Calvine Rd	Sheldon Rd	71.4	103	325	1,028
	Sheldon Rd	Bond Rd	69.9	86	272	859
	Bond Rd	Elk Grove Blvd	68.2	37	119	375
	Elk Grove Blvd	E Stockton Blvd	67.9	30	96	305
Eschinger Rd	Willard Pkwy	Bruceville Rd	—	—	—	—
	Bruceville Rd	Big Horn Blvd	—	—	—	—
	Big Horn Blvd	Lotz Pkwy	—	—	—	—
	Lotz Pkwy	Promenade Pkwy	—	—	—	—

Roadway	From	To	Distance to Directional Centerline, L_{dn} (50 feet)	Distance (feet) to Noise Level Contours (L_{dn}, dBA) from Roadway Centerline		
				70	65	60
Excelsior Rd	Gerber Rd	Calvine Rd	62.5	20	64	203
	Calvine Rd	Sheldon Rd	62.8	17	55	173
Franklin Blvd	Sims Rd	Big Horn Blvd	70.4	104	330	1,043
	Big Horn Blvd	Laguna Blvd	70.4	98	311	983
	Laguna Blvd	Elk Grove Blvd	69.0	72	229	723
	Elk Grove Blvd	Whitelock Pkwy	66.6	70	220	697
	Whitelock Pkwy	Bilby Rd	—	—	—	—
	Bilby Rd	Hood Franklin Rd	—	—	—	—
	Hood Franklin Rd	Lambert Rd	—	—	—	—
Grant Line Rd	Sloughhouse Rd	Calvine Rd	71.7	112	354	1,119
	Calvine Rd	Sheldon Rd	69.4	91	288	912
	Sheldon Rd	Wilton Rd	71.4	107	339	1,073
	Wilton Rd	Bond Rd	70.9	98	309	979
	Bond Rd	Elk Grove Blvd	68.5	68	216	682
	Elk Grove Blvd	Bradshaw Rd	66.1	47	148	467
	Bradshaw Rd	Mosher Rd	68.9	79	249	789
	Mosher Rd	Waterman Rd	69.2	85	267	846
	Waterman Rd	E. Stockton/Survey Rd	70.4	110	347	1,098
	E. Stockton/Survey Rd	SR 99	71.1	148	468	1,481
Harbour Point Dr	Elk Grove Blvd	Laguna Blvd	66.7	40	126	399
Hood Franklin Rd	I-5	Franklin Blvd	66.6	39	124	392
Kammerer Rd	Franklin Blvd	Willard Pkwy	—	—	—	—
	Willard Pkwy	Bruceville Rd	—	—	—	—
	Bruceville Rd	Big Horn Blvd	—	—	—	—
	Big Horn Blvd	Lotz Pkwy	68.9	43	137	434
	Lotz Pkwy	Promenade Pkwy	66.6	47	148	467
	Promenade Pkwy	SR 99	68.8	78	248	785
Laguna Blvd	SR 99	Franklin Blvd	70.8	111	350	1,108
	Franklin Blvd	Bruceville Rd	70.5	102	323	1,022
	Bruceville Rd	Big Horn Blvd	70.8	104	329	1,039
	Big Horn Blvd	Laguna Springs Dr	71.2	131	414	1,310
	Laguna Springs Dr	SR 99	71.1	128	405	1,280

Roadway	From	To	Distance to Directional Centerline, L_{dn} (50 feet)	Distance (feet) to Noise Level Contours (L_{dn}, dBA) from Roadway Centerline		
				70	65	60
Laguna Springs Dr	Laguna Blvd	Laguna Palms Wy	64.8	23	72	229
	Laguna Palms Wy	Elk Grove Blvd	65.6	22	70	222
	Elk Grove Blvd	Lotz Pkwy	60.8	9	27	87
Lent Ranch Pkwy	Kammerer Rd	Promenade Pkwy	44.8		1	2
Lewis Stein Rd	Sheldon Rd	Big Horn Blvd	65.3	20	64	202
Lotz Pkwy	Big Horn Blvd	Laguna Springs Dr	58.6	6	18	56
	Laguna Springs Dr	Whitelock Pkwy	53.1	1	4	12
	Whitelock Pkwy	Promenade Pkwy	—	—	—	—
	Promenade Pkwy	Bilby Rd	—	—	—	—
	Bilby Rd	Kammerer Rd	—	—	—	—
	Kammerer Rd	Eschinger Rd	—	—	—	—
Mosher	Grant Line Rd	Waterman Rd	62.0	9	28	88
Power Inn Rd	Calvine Rd	Sheldon Rd	65.8	25	80	254
Promenade Pkwy	Lotz Pkwy	Bilby Rd	—	—	—	—
	Bilby Rd	Kammerer Rd	64.2	20	63	200
	Kammerer Rd	Eschinger Rd	—	—	—	—
Sheldon Rd	Bruceville Rd	Lewis Stein Rd	68.6	65	207	654
	Lewis Stein Rd	SR 99	70.7	97	306	969
	SR 99	E. Stockton Blvd	70.8	118	372	1,177
	E. Stockton Blvd	Power Inn Rd	71.0	109	344	1,087
	Power Inn Rd	Elk Grove Florin Rd	69.5	78	246	777
	Elk Grove Florin Rd	Waterman Rd	66.1	39	124	392
	Waterman Rd	Bradshaw Rd	66.3	24	75	237
	Bradshaw Rd	Bader Rd	65.8	21	67	213
	Bader Rd	Dillard Oaks Ct	64.5	19	59	187
	Excelsior Rd	Grant Line Rd	65.3	22	70	222
Waterman Rd	Vintage Park Dr	Calvine Rd	69.0	55	174	550
	Calvine Rd	Sheldon Rd	70.0	57	181	573
	Sheldon Rd	Bond Rd	66.2	56	178	564
	Bond Rd	Elk Grove Blvd	70.7	66	208	659
	Elk Grove Blvd	Grant Line Rd	66.9	42	132	417
Whitelock Pkwy	Franklin Blvd	Bruceville Rd	66.9	36	114	361
	Bruceville Rd	Big Horn Blvd	63.1	19	61	191

Roadway	From	To	Distance to Directional Centerline, L_{dn} (50 feet)	Distance (feet) to Noise Level Contours (L_{dn}, dBA) from Roadway Centerline		
				70	65	60
	Big Horn Blvd	Lotz Pkwy	62.3	13	41	128
	Lotz Pkwy	SR 99	—	—	—	—
Willard Pkwy	Whitelock Pkwy	Bilby	65.1	32	102	322
	Bilby Rd	Kammerer Rd	58.2	6	19	59
Wilton Rd	Grant Line Rd	Leisure Oak Ln	68.7	57	179	565
SR-99	Calvine Rd	Sheldon Rd	78.8	1,000	3,162	9,999
	Sheldon Rd	Bond Rd	77.4	902	2,854	9,024
	Bond Rd	Elk Grove Blvd	76.4	744	2,352	7,438
	Elk Grove Blvd	Whitelock Pkwy	77.2	669	2,116	6,691
	Whitelock Pkwy	Grant Line Rd	70.1	643	2,032	6,425
	Grant Line Rd	Eschinger Rd	75.4	708	2,238	7,077
I-5	Cosumnes River Blvd	Laguna Blvd	65.0	855	2,702	8,546
	Laguna Blvd	Elk Grove Blvd	75.0	712	2,251	7,117
	Elk Grove Blvd	Hood Franklin Rd	73.8	592	1,871	5,915
	Hood Franklin Rd	Twin Cities Rd	62.5	474	1,498	4,738

Source: Ascent Environmental 2017

Notes: Traffic inputs include cumulative development in addition to the proposed Project volumes. Traffic noise levels were calculated using the FHWA Roadway Noise Prediction Model and do not include shielding from existing structures, sound barriers, or intervening terrain. Roadway segments that do not include traffic noise levels are future roadway segments in which existing data is not available.

*Refer to **Appendix E** for modeling assumptions and results.*

MEASURED AMBIENT NOISE LEVELS

Long- and short-term noise measurements were taken over the course of a three-week period in August and September 2015 for inclusion in the General Plan Existing Conditions Report (City of Elk Grove 2016). These measurements are the most recent noise measurement data available that assess the whole Planning Area. Noise sources that would substantially alter ambient noise levels in the Planning Area would be associated primarily with traffic volumes on roadways throughout the City. Considering that traffic volumes do not typically change drastically from year to year, the noise measurement data included in this section are considered adequate for this analysis. Noise measurements were conducted using a Larson Davis Laboratories, Type I, Model 820 integrating sound-level meter positioned at a height of approximately 5 feet above ground level. For details on noise measurements, see the Existing Conditions Report.

Long-Term Results

Long-term 24-hour ambient noise measurements were taken at eight locations throughout the Planning Area chosen in consultation with City staff. These locations were identified as unique noise generators in the Planning Area due to a high volume of traffic, large number of truck trips, or commercial activities occurring in the vicinity. As shown in **Figure 5.10-3**, monitoring was conducted in residential, commercial, and industrial portions of the Planning Area. **Table 5.10-5**

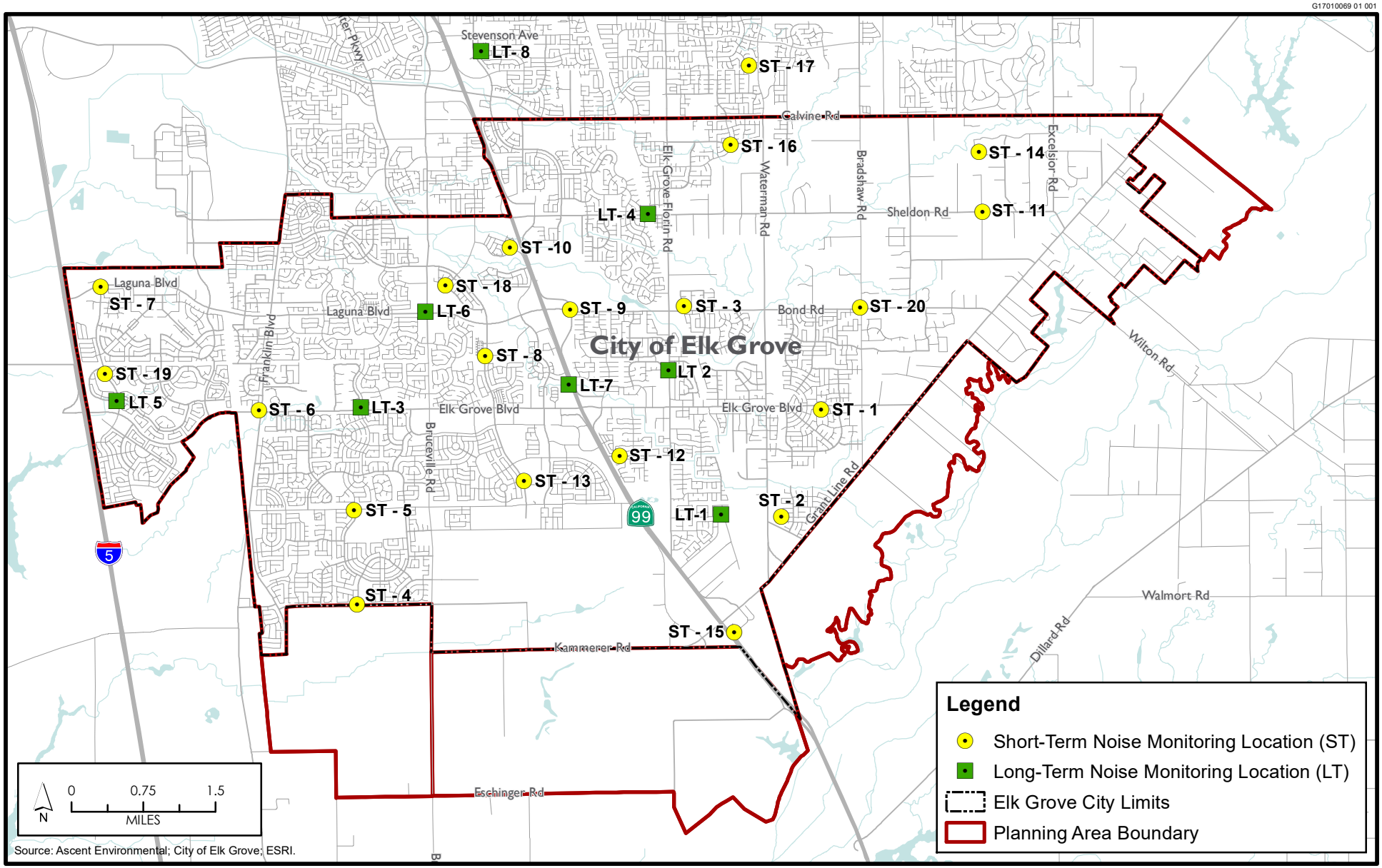
summarizes the L_{eq} measurements by location for each 24-hour period of the survey and the 24-hour L_{dn}, and the L_{max} and L_{min} for each hour of the 24-hour recording. As shown in the table, the average 24-hour noise levels ranged between 55.3 dBA L_{eq} and 73.0 dBA L_{eq}, with L_{dn} noise levels ranging between 61.2 dBA and 77.7 dBA. The highest recorded noise levels occurred adjacent to major roadways including Sheldon Road (LT-4), Laguna Boulevard (LT-6), and Elk Grove Boulevard (LT-7). Noise levels in the residential and rural residential areas, such as locations LT-1 and LT-5, were substantially lower than levels in the commercial areas.

TABLE 5.10-5
SUMMARY OF LONG-TERM AMBIENT NOISE MEASUREMENT DATA

Site	Location	Date	Measured Noise Levels (dBA, L_{eq})					
			24-Hour L_{eq}	L_{max}	L_{min}	Daytime (7:00 a.m. to 10:00 p.m.) L_{eq}	Nighttime (10:00 p.m. to 7:00 a.m.) L_{eq}	L_{dn}
LT-1	Iron Rock Way/ Hampton Oak Drive	August 26, 2015	55.3	90.8	37.4	54.6	55.3	61.2
LT-2	Elk Grove Florin Road, south of Sharkey Avenue	September 2, 2015	61.7	91.6	39.1	62.6	58.5	65.5
LT-3	Foulkes Ranch Road, north of Elk Grove Boulevard	September 1, 2015	59.9	96.6	31.1	61.4	51.4	61.4
LT-4	Sheldon Road, west of rail line	November 20, 2015	69.6	99.7	34.6	70.5	66.8	73.7
LT-5	Maritime Drive, south of Sea Cliff Way	August 28, 2015	57.7	82.6	37.3	58.7	54.3	61.5
LT-6	Laguna Boulevard, west of Bruceville Road	August 31, 2015	71.4	94.1	34.8	72.7	66.5	74.4
LT-7	West Stockton Boulevard, north of Elk Grove Boulevard	August 27, 2015	73.0	92.6	43.7	73.7	71.1	77.7
LT-8	Visalia Way, south of Lemon Grove	September 2, 2015	66.1	96.4	33.8	68.0	63.4	66.0

Source: City of Elk Grove 2016

Short-term (i.e., 15-minute) noise measurement surveys were conducted at 20 locations throughout the Planning Area from September 2 through September 4, 2015, with supplemental measurements taken on November 20, 2015. The locations of the short-term sites were chosen in consultation with City staff. The sites generally represent residential areas in the Planning Area where ambient noise levels are anticipated to be lower than those along the major transportation corridors and commercial areas. The microphone was positioned at a height of 5 feet, 6 inches above ground level during the short-term measurements.



City of Elk Grove
Development Services

Figure 5.10-3

Short- and Long-Term Noise Monitoring Locations

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Short-term noise measurement data corresponding to these measurement locations are summarized in **Table 5.10-6**. Based on the measurements conducted, ambient noise levels at the measurement locations generally range from approximately 50 to 71 dBA L_{eq}.

TABLE 5.10-6
SUMMARY OF SHORT-TERM AMBIENT NOISE MEASUREMENT DATA

Site	Location	Date	Primary Noise Source	Measured Noise Levels (dBA)		
				L_{eq}	L_{max}	L_{min}
ST-1	Grasmeer Way and Hagerman Drive	September 2, 2015 10:00 a.m.	Traffic on Elk Grove Boulevard	67.5	73.3	59.1
ST-2	Oreo Ranch Circle, adjacent fallow agricultural land	September 2, 2015 10:29 a.m.	Traffic on Waterman Avenue	57.7	64.6	51.1
ST-3	Quail Cove Drive, north of Quail Brook Circle	September 2, 2015 11:04 a.m.	Railroad noise	65.7	71.2	56.4
ST-4	Bilby Road, west of Stathos Drive	September 2, 2015 11:40 a.m.	Traffic on Bilby Road	66.0	75.0	49.5
ST-5	Whitelock Parkway, west of Franklin High Way	September 2, 2015 12:08 p.m.	Traffic on Whitelock Parkway	67.4	76.4	50.9
ST-6	Elk Grove Boulevard, west of Franklin Boulevard	September 2, 2015 12:39 p.m.	Traffic on Elk Grove Boulevard, railroad	60.9	70.3	44.4
ST-7	Laguna Boulevard, east of Harbor Point Drive	September 2, 2015 1:21 p.m.	Traffic on I-5, Laguna Boulevard	57.6	63.4	52.7
ST-8	Big Horn Boulevard and Crystal Walk Circle	September 2, 2015 2:02 p.m.	Traffic on Big Horn, commercial parking lot	50.5	56.7	46.4
ST-9	Bond Road, east of West Stockton Boulevard	September 2, 2015 2:35 p.m.	Traffic on Bond	54.6	57.9	51.9
ST-10	Lauffer Way, west of Grisham Way	September 2, 2015 3:06 p.m.	Traffic on SR 99	70.6	75.7	62.6
ST-11	Sheldon Road, east of Mackey Road	September 2, 2015 3:35 p.m.	Traffic on Sheldon	55.9	62.9	49.6
ST-12	Valley Oak Lane, west of Corte Dorado Court	September 2, 2015 4:05 p.m.	Traffic on SR 99	64.0	71.1	57.9
ST-13	Big Horn Boulevard, south of Hopewell Drive	September 3, 2015 1:05 p.m.	Traffic on Big Horn	50.6	55.9	46.1
ST-14	Atlantis Drive, east of railroad	September 4, 2015 10:20 a.m.	Railroad approximately 300 feet from measurement site	52.7	68.3	35.9
ST-15	East Stockton Road and Survey Road	September 4, 2015 12:35 p.m.	Industrial uses, railroad and SR 99	71.3	78.9	61.8
ST-16	Heritage Hill Drive, south of Brown Road	November 20, 2015 4:03 p.m.	Traffic on Heritage Hill	57.2	71.5	35.9
ST-17	Westray Drive, east of Rothbury Drive	September 4, 2015 11:13 a.m.	Machinery associated with Westray Water Well	55.4	74.4	40.6

Site	Location	Date	Primary Noise Source	Measured Noise Levels (dBA)		
				L_{eq}	L_{max}	L_{min}
ST-18	Generations Drive, east of Ancestor Drive	September 3, 2015 1:36 p.m.	Commercial uses to south	49.7	56.7	41.9
ST-19	Maritime Drive, west of Harbour Point Drive	September 3, 2015 2:12 p.m.	Traffic off Harbour Point Drive, water treatment plan	62.5	70.1	52.8
ST-20	Bradshaw Road, north of Bond Road	September 3, 2015 1:51 p.m.	Traffic on Bradshaw Road	68.8	78.6	44.1

Source: City of Elk Grove 2016

5.10.3 REGULATORY FRAMEWORK

US ENVIRONMENTAL PROTECTION AGENCY OFFICE OF NOISE ABATEMENT AND CONTROL

The EPA Office of Noise Abatement and Control was originally established to coordinate federal noise control activities. In 1981, the EPA administrators determined that subjective issues such as noise would be better addressed at 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 be valuable 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 5.10-7.**

TABLE 5.10-7
GROUNDBORNE VIBRATION IMPACT CRITERIA FOR GENERAL ASSESSMENT

Land Uses	Groundborne Vibration 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	654	654	654
Category 2: Residences and buildings where people normally sleep	72	75	80
Category 3: Institutional land uses with primarily daytime uses	75	78	83

Source: FTA 2006, Table 8-1

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 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 acceptable vibration levels.*

STATE

California Building Code

Title 24 of the California Code of Regulations contains standards for allowable interior noise levels associated with exterior noise sources (California Building Code, 2016 edition, Volume 1, Chapter 12, Section 1207). The standards apply to new hotels, motels, dormitories, apartment houses, and dwellings other than detached single-family residences. The standards state that the interior noise level attributable to exterior sources may not exceed 45 dBA L_{dn} or CNEL in any habitable room, consistent with the noise element of the local general plan. Worst-case noise levels, either existing or future, are to be used as the basis for determining compliance with these standards.

LOCAL

City of Elk Grove General Plan Noise Element

The City's existing Noise Element (2003) includes goals and policies to address noise exposure within the community. The Noise Element also includes noise level criteria both for transportation noise sources and for non-transportation (stationary) noise sources.

General Plan

Transportation Noise Sources

For transportation noise sources, the current General Plan includes the noise criteria presented in **Table 5.10-8** for determination of land use compatibility ranges from an exterior noise level of 60 dBA CNEL/L_{dn} for residential uses to 70 dBA CNEL/L_{dn} for parks and playgrounds. The intent of this standard is to provide an acceptable noise environment for outdoor activities. The City has also established an interior noise standard of 45 dBA CNEL/L_{dn} for residential, school, and office uses exposed to transportation noise sources. Interior hourly noise limitations (in dBA L_{eq}) are also established for land uses that are sensitive to daytime noise levels, such as churches, offices, libraries, and schools. The intent of the interior noise standards is to provide a suitable environment for indoor activities and reduced levels of annoyance.

TABLE 5.10-8
MAXIMUM ALLOWABLE NOISE EXPOSURE –TRANSPORTATION NOISE SOURCES
(EXISTING GENERAL PLAN TABLE NO-C)

Land Use	Outdoor Activity Areas[1] L_{dn}/CNEL, dB	Interior Spaces	
		L_{dn}/CNEL, dB	L_{eq}, dB[2]
Residential	60[3]	45	-
Residential subject to noise from railroad tracks, aircraft overflights, or similar noise sources which produce clearly identifiable, discrete noise events (the passing of a single train, as opposed to relatively steady noise sources as roadways)	60[3]	40[5]	
Transient Lodging	60[4]	45	-
Hospitals, Nursing Homes	60[3]	45	-
Theaters, Auditoriums, Music Halls	-	-	35
Churches, Meeting Halls	60[3]	-	40

Land Use	Outdoor Activity Areas[1] L_{dn}/CNEL, dB	Interior Spaces	
		L_{dn}/CNEL, dB	L_{eq}, dB[2]
Office Buildings	-	-	45
Schools, Libraries, Museums			45
Playgrounds, Neighborhood Parks	70		

Source: City of Elk Grove 2003

Notes:

1. *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. Where it is not practical to mitigate exterior noise levels at patio or balconies of apartment complexes, a common area such as a pool or recreation area may be designated as the outdoor activity area.*
2. *As determined for a typical worst-case hour during periods of use.*
3. *Where it is not possible to reduce noise in outdoor activity areas to 60 dB Ldn/CNEL or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dB Ldn/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.*
4. *In the case of hotel/motel facilities or other transient lodging, outdoor activity areas such as pool areas may not be included in the project design. In these cases, only the interior noise level criterion will apply.*
5. *The intent of this noise standard is to provide increased protection against sleep disturbance for residences located near railroad tracks.*

Non-Transportation Noise Sources

Table 5.10-9 provides the current (2003) General Plan noise level performance criteria for new projects that are affected by or include non-transportation noise sources, such as those attributed to commercial and industrial land uses. These criteria are applied at the property line of noise-sensitive land uses. Typical noise sources in this category include drive-through speaker boxes, punch presses, steam valves, and transformer stations.

TABLE 5.10-9
EXTERIOR NOISE LEVEL PERFORMANCE STANDARDS FOR NON-TRANSPORTATION NOISE SOURCES
(EXISTING GENERAL PLAN TABLE NO-A)

Performance Standards for Stationary Sources	Noise Level Descriptor	Maximum Acceptable Noise Level, dBA	
		Daytime (7 a.m.–10 p.m.)	Nighttime (10 p.m.–7 a.m.)
Performance Standards for Typical Stationary Noise Sources[a]	Hourly Leq, dB	55[c,d]	45[c,d]
Performance Standards for Stationary Noise Sources Which Are Tonal, Impulsive, Repetitive, or Consist Primarily of Speech or Music[b]	Hourly Leq, dB	50[c,d]	40[c,d]

Source: City of Elk Grove 2003

Notes:

a. *These standards will apply generally to noise sources that are not tonal, impulsive, or repetitive in nature. Typical noise sources in this category would include HVAC systems, cooling towers, fans, and blowers.*

b. *These standards apply to noises which are tonal in nature, impulsive, repetitive, or which consist primarily of speech or music (e.g., humming sounds, outdoor speaker systems). Typical noise sources in this category include: pile drivers, drive-through speaker boxes, punch presses, steam valves, and transformer stations.*

c. *These noise levels do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).*

d. *The City may impose noise level standards which are more or less restrictive based upon determination of existing low or high ambient noise levels.*

ELK GROVE MUNICIPAL CODE

The City's noise control requirements for existing non-transportation noise sources are included in Chapter 6.32 of the Municipal Code. The noise control chapter identifies hourly noise standards that are applicable to existing non-transportation noise sources and consistent with those identified in the current General Plan, as depicted in **Table 5.10-9**. In accordance with the Municipal Code Section 6.32.100, construction activities are generally prohibited between the hours of 7:00 p.m. and 7:00 a.m., excluding emergency work. In addition, the operation of pavement-sweeping equipment and associated equipment (e.g., blowers), as well as material loading and unloading activities that would result in a noise disturbance, are typically prohibited between the hours of 10:00 p.m. and 7:00 a.m. Section 6.32.110 establishes noise standards for mechanical equipment, pump, fan, air conditioning apparatus, similar mechanical devices, or any combination thereof. The City is considering an amendment to this section that would provide for specific exemptions for certain types of activities or equipment (e.g., home improvement projects, power tool use, pool filters, HVAC units).

VIBRATION CRITERIA

The City does not have specific policies or standards pertaining to vibration levels. However, various agencies, such as Caltrans, have developed recommended criteria for the evaluation of groundborne vibration levels regarding potential human annoyance and building structural damage. Caltrans-recommended criteria for the evaluation of groundborne vibration events are summarized in **Table 5.10-10**. The vibration levels are presented in terms of peak particle velocity (ppv) in inches per second (in/sec) for continuous/frequent sources.

The effects of groundborne vibration levels regarding human annoyance and structural damage are influenced by numerous factors, including soil type and moisture content, frequency (Hz) of vibrations, distance between source and receptor, duration, and the type of vibration events (i.e., continuous or transient). As indicated in **Table 5.10-10,** the threshold at which there is a risk to normal structures is 0.2 PPV in/sec. This same threshold is typically considered the level at which increased levels of annoyance may begin to occur to occupants of nearby buildings. The recommended criteria for transient sources of single isolated events (i.e., blasting or demolition ball drops) is generally twice the level identified for continuous/frequent sources (Caltrans 2002b, 2004).

TABLE 5.10-10
EFFECTS OF VIBRATION ON PEOPLE AND BUILDINGS

Peak Particle Velocity (inches/second)	Human Reaction	Effect on Buildings
0.006–0.019	Range of threshold of perception	Vibrations unlikely to cause damage of any type
0.08	Vibrations readily perceptible	Recommended upper level to which ruins and ancient monuments should be subjected
0.1	Level at which continuous vibrations may begin to annoy people, particularly those involved in vibration sensitive activities	Virtually no risk of architectural damage to normal buildings

Peak Particle Velocity (inches/second)	Human Reaction	Effect on Buildings
0.2	Vibrations may begin to annoy people in buildings	Threshold at which there is a risk of architectural damage to normal dwellings
0.4–0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Architectural damage and possibly minor structural damage

Source: Caltrans 2002b, 2004

Notes: Vibration levels are based on peak particle velocity in the vertical direction for continuous/frequent intermittent sources. The criteria for transient sources of single isolated events (i.e., blasting or demolition ball drops) is generally twice the level identified for continuous/frequent sources. Where human reactions are concerned, the value is at the point at which the person is situated. For buildings, the value refers to the ground motion. No allowance is included for the amplifying effect, if any, of structural components.

5.10.3 IMPACTS AND MITIGATION MEASURES

The following section discusses the analysis methodology and significance criteria used for assessing noise-related impacts associated with the proposed Project. The section includes results and discussion of each noise-related impact analyzed using the established significance criteria.

METHODS OF ANALYSIS

Short-Term Construction Activities

Predicted short-term noise levels at nearby noise-sensitive land uses were calculated using typical noise levels and usage rates associated with construction equipment, derived from the FHWA's Roadway Construction Noise Model (Version 1.1). The proposed Project was assumed to result in construction activity typical of residential and commercial developments. To remain conservative, construction noise was modeled for construction phases which typically use the loudest equipment (i.e., demolition, site preparation).

Long-Term Operational Activities

Non-Transportation Noise

Long-term non-transportation noise impacts were assessed based on representative noise levels obtained from existing literature, as well as noise measurement data obtained from similar land uses. Noise levels were predicted assuming an average noise attenuation rate of 6 dB per doubling of distance from the source. To determine the impact significance, estimated operational noise levels were compared to the City's proposed noise standards for non-transportation noise sources, as summarized in **Table 5.10-12**.

Transportation Noise and Land Use Compatibility

Traffic noise levels were calculated using the FHWA Roadway Noise Prediction Model (FHWA-RD-77-108) based on California vehicle reference noise emission factors. Traffic data for City roadways and adjacent federal and State routes were obtained from the traffic analysis prepared for this Project for modeling purposes. Additional input data included day/night percentages of autos, medium and heavy trucks, vehicle speeds, ground attenuation factors, and roadway widths. For this analysis, the mix of vehicles on the roadway was adjusted based on information from the

traffic analysis conducted for the Project. For roadway segments included in this analysis, distances to the nearest receptor adjacent to roadways were used in the FHWA model to calculate traffic noise level at the receptor site. Increases in traffic noise levels attributable to the Project were determined based on a comparison of predicted noise levels, with and without adoption and buildout of the General Plan. For roadway segments that would be constructed or widened due to Project buildout, future roadway widths were assumed to be the same as existing roadways with similar characteristics (e.g., number of lanes). Note that the modeling does not account for any natural or human-made shielding (e.g., trees, vegetation, solid backyard fences, walls); consequently, it estimates worst-case noise exposure levels. The compatibility of proposed land uses was evaluated based on projected future transportation noise levels. Predicted noise levels were compared with the City's corresponding noise criteria for determination of land use compatibility (**Table 5.10-11**). For complete details on model inputs, outputs, and assumptions, see **Appendix E**.

For analysis of potential noise exposure from railroads, the Transit Noise and Vibration Impact Assessment Guidelines (FTA 2006) were used to determine approximate noise and vibration levels near rail lines. As with the roadway modeling, no natural or human-made noise shielding or barriers are accounted for; therefore, modeled noise levels are also considered worst-case conditions along the rail corridors. Modeling for train-related noise exposure was adjusted to specific characteristics of each rail line (e.g., at grade crossing) as well as specific quiet zones in the City which would exclude noise exposure associated with the train warning horns.

Groundborne Vibration

Construction activities in the Planning Area have the potential to expose nearby buildings to levels of ground vibration that could result in structural damage and/or negative human response. These activities were assessed based on the types of construction equipment that would be used, the levels of ground vibration typically generated by these types of equipment, and the proximity of construction activity to existing nearby buildings. Referenced ground vibration levels for typical construction equipment are provided by FHWA's Roadway Construction Noise Model (FHWA 2006). Construction vibration levels and contour distances were calculated based on typical construction equipment vibration levels and assuming a conservative rate of 1.1 for ground attenuation. Groundborne vibration impacts were evaluated based on Caltrans's (2004) recommended standard of 0.2 ppv in/sec for the prevention of structural damage to nonhistorical buildings. This is also the level at which vibrations may begin to annoy people in buildings (see **Table 5.10-10**).

Substantial Increases in Noise Levels

For purpose of this analysis, a substantial increase in noise levels is defined as an increase of 5.0 dBA, or greater, where noise levels are less than the City's normally acceptable minimum noise level of 60 dBA L_{dn}; 3 dBA, or greater, where noise levels range from 60 to 65 dBA L_{dn}; and 1.5 dBA, or greater, where the noise level exceeds 65 dBA L_{dn} without the proposed Project. These criteria are based on the FICON criteria (**Table 5.10-1**) and are consistent with the City's commonly applied noise criteria for roadway construction and improvement projects. In the proposed Project, Policy N-2-2 includes CEQA significance thresholds for incremental noise increases, which are also consistent with the FICON criteria in **Table 5.10-1.**

General Plan Policies and Standards

The proposed Project contains the following policies and standards for managing future development in the City to reduce effects related to noise and vibration.

Policy N-1-1: New development of the uses listed in Table 8-3 [**Table 5.10-11**, below] shall conform with the noise levels contained in the table. All indoor and outdoor areas shall be located, constructed, and/or shielded from noise sources in order to achieve compliance with the City's noise standards.

Policy N-1-2: Where noise mitigation measures are required to achieve the standards of Tables 8-3 [**Table 5.10-11**, below] and 8-4 [**Table 5.10-12**, below], the emphasis of such measures shall be placed upon site planning and project design. The use of noise barriers shall be considered a means of achieving the noise standards only after all other practical design-related noise mitigation measures, including the use of distance from noise sources, have been integrated into the project.

Policy N-1-3: Use the noise contour mapping identified in Figure 8-6 [**Figure 5.10-4**, below] to inform land use decisions.

Policy N-1-4: Protect noise-sensitive land uses, identified in Table 8-3 [**Table 5.10-11**, below], from noise impacts.

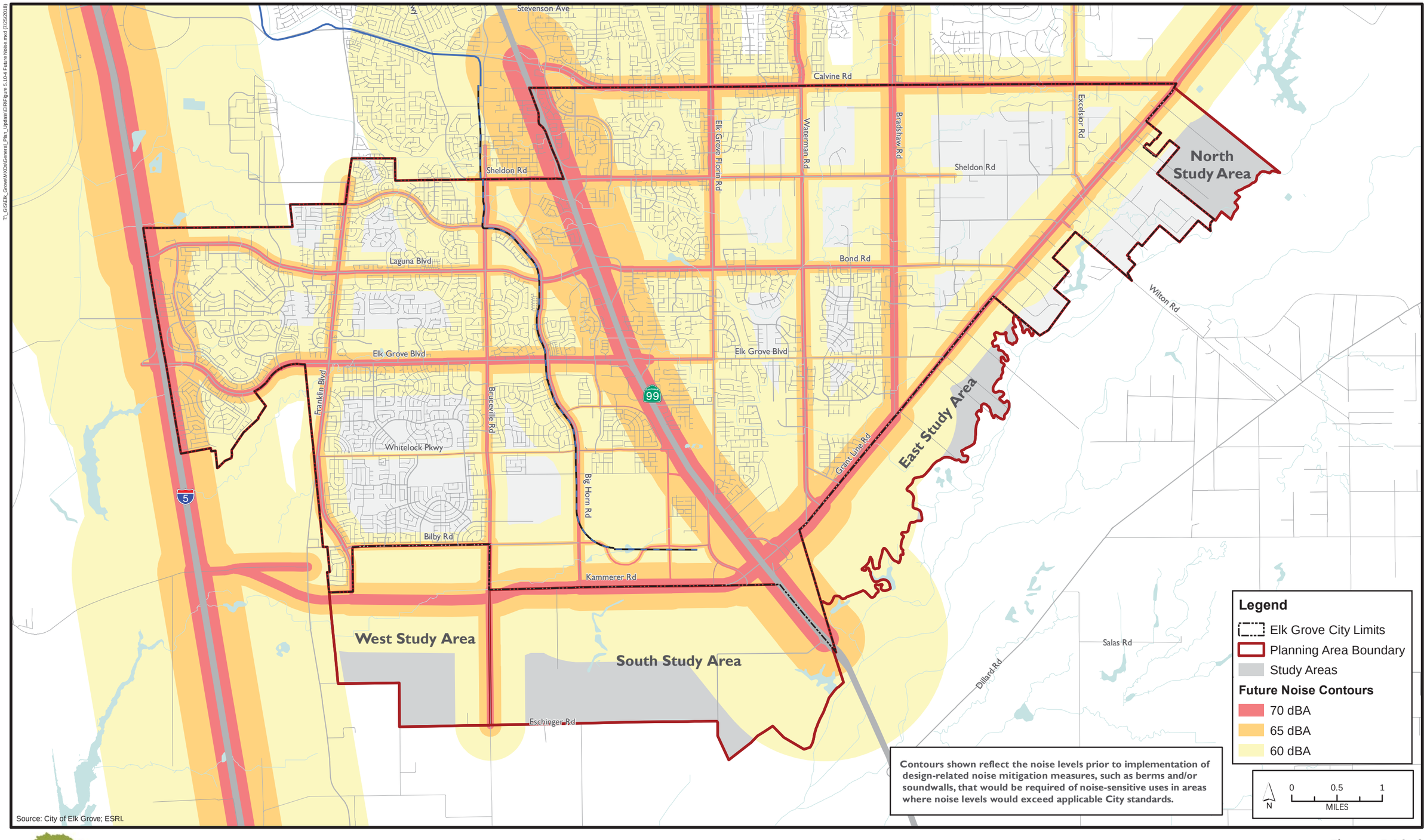
Policy N-1-5: Where noise-sensitive land uses are proposed in areas exposed to existing or projected exterior noise levels exceeding the levels specified in Table 8-3 [**Table 5.10-11**, below] or the performance standards of Table 8-4 [**Table 5.10-12**, below], an acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be included in the project design.

Policy N-1-6: Where proposed nonresidential land uses are likely to produce noise levels exceeding the performance standards of Table 8-4 [**Table 5.10-12**, below] at existing or planned noise-sensitive uses, 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 N-1-7: The standards outlined in Table 8-4 [**Table 5.10-12**, below] shall not apply to transportation- and City infrastructure-related construction activities as long as construction occurs between the hours of 7 a.m. and 7 p.m., Monday through Friday, and 8 a.m. and 5 p.m. on weekends and federally recognized holidays. Work may occur beyond these time frames for construction safety or because of existing congestion that makes completing the work during these time frames impractical.

Policy N-1-8: For development projects that are subject to discretionary review, the City may require applicants to assess potential construction noise impacts on nearby sensitive uses and to minimize impacts on those uses.

Policy N-1-9: For projects involving the use of major vibration-generating equipment (e.g., pile drivers, vibratory rollers) that could generate groundborne vibration levels in excess of 0.2 in/sec ppv, the City may require a project-specific vibration impact assessment to analyze potential groundborne vibrational impacts and may require measures to reduce ground vibration levels.



City of Elk Grove
Development Services

Figure 5.10-4

Future Noise Contours

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Policy N-1-10: For new development involving noise-sensitive receptors that could be exposed to high levels of ground vibration levels generated by freight or transit rail, the City may require a project-specific vibration impact assessment to analyze potential groundborne vibrational impacts and may require measures to reduce ground vibrational levels.

Policy N-2-1: Noise created by new proposed non-transportation noise sources shall be mitigated so as not to exceed the noise level standards of Table 8-4 [**Table 5.10-12**, below] as measured immediately within the property line of lands designated for noise-sensitive uses.

Policy N-2-2: The following criteria shall be used as CEQA significance thresholds for transportation and stationary noise sources:

- Where existing ambient noise levels are less than 60 dB Ldn at the outdoor activity areas of noise-sensitive uses, a +5 dB Ldn increase in noise levels shall be considered significant; and
- Where existing ambient noise levels range between 60 and 65 dB Ldn at the outdoor activity areas of noise-sensitive uses, a +3 dB Ldn increase in noise levels shall be considered significant; and
- Where existing ambient noise levels are greater than 65 dB Ldn at the outdoor activity areas of noise-sensitive uses, a +1.5 dB Ldn increase in noise levels shall be considered significant.
- Public roadway improvements to alleviate traffic congestion and safety hazards shall utilize FHWA noise standards to allow a reasonable dollar threshold per dwelling to be used in the evaluation and abatement of impacts. [Subject to removal pending City review]
- The standards outlined in Table 8-4 [**Table 5.10-12**, below] shall not apply to public projects to alleviate traffic congestion and safety hazards.

Policy N-2-3: Emphasize methods other than installation of sound walls in front yard areas to reduce noise to acceptable levels in residential areas that were originally constructed without sound walls.

Policy N-2-4: Where sound walls or noise barriers are constructed, strongly encourage and consider requiring a combination of berms and walls to reduce the apparent height of the wall and produce a more aesthetically appealing streetscape.

For transportation noise sources, the proposed Project includes noise criteria for determination of land use compatibility ranges from an exterior noise level of 60 dBA L_{dn} for residential uses to 70 dBA L_{dn} for parks and playgrounds. The proposed Project would also establish an interior noise standard of 45 dBA L_{dn} for residential, school, and office uses exposed to transportation noise sources. The proposed Project criteria for transportation noise sources are summarized in **Table 5.10-11**.

TABLE 5.10-11
MAXIMUM ALLOWABLE NOISE EXPOSURE – TRANSPORTATION NOISE SOURCES
(PROPOSED GENERAL PLAN TABLE 8-3)

Land Use	Outdoor Activity Areas[a,b] L_{dn} dB	Interior Spaces	
		L_{dn} dB	L_{eq} dB[c]
Residential	60[d,g]	45	-
Residential subject to noise from railroad tracks, aircraft overflights, or similar noise sources which produce clearly identifiable, discrete noise events (the passing of a single train, as opposed to relatively steady noise sources as roadways)	60[d,g]	40[f]	
Transient Lodging	60[e,g]	45	-
Hospitals, Nursing Homes	60[d,g]	45	-
Theaters, Auditoriums, Music Halls	-	-	35
Churches, Meeting Halls	60[d,g]	-	40
Office Buildings	-	-	45
School, Libraries, Museums			45

Notes:

a. *Where the location of outdoor activity areas is unknown, the exterior noise level standards shall be applied to the property line of the receiving land use. Where it is not practical to mitigate exterior noise levels at patios or balconies of apartment complexes, a common area such as a pool or recreation area may be designated as the outdoor activity area.*

b. *Transportation projects subject to Caltrans review or approval shall comply with the Federal Highway Administration noise standards for evaluation and abatement of noise impacts.*

c. *As determined for a typical worst-case hour during periods of use.*

d. *Where it is not possible to reduce noise in outdoor activity areas to 60 dB Ldn or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dB Ldn may be allowed provided that available exterior noise level reduction measures have been implemented and interior noise levels are in compliance with this table.*

e. *In the case of hotel/motel facilities or other transient lodging, outdoor activity areas such as pool areas may not be included in the project design. In these cases, only the interior noise level criterion will apply.*

f. *The intent of this noise standard is to provide increased protection against sleep disturbance for residences located near railroad tracks.*

g. *In cases where the existing ambient noise level exceeds 60 dBA, the maximum allowable project-related permanent increase in ambient noise levels shall be 3 dBA Ldn.*

Non-Transportation Noise Sources

Table 5.10-12 provides the proposed Project noise level performance criteria for new projects that would be affected by or include non-transportation noise sources. These criteria are applied at the property line of noise-sensitive land uses.

TABLE 5.10-12
EXTERIOR NOISE LEVEL PERFORMANCE STANDARDS FOR NON-TRANSPORTATION NOISE SOURCES
(PROPOSED GENERAL PLAN TABLE 8-4)

Performance Standards for Stationary Sources	Noise Level Descriptor	Maximum Acceptable Noise Level, dBA	
		Daytime (7 a.m.–10 p.m.)	Nighttime (10 p.m.–7 a.m.)
Performance Standards for Typical Stationary Noise Sources [a]	Hourly L_{eq}, dB	55[c,d]	45[c,d]
Performance Standards for Stationary Noise Sources Which Are Tonal, Impulsive, Repetitive, or Consist Primarily of Speech or Music [b]	Hourly L_{eq}, dB	50[c,d]	40[c,d]

Notes:

a. *These standards will apply generally to noise sources that are not tonal, impulsive, or repetitive in nature. Typical noise sources in this category would include cooling towers, fans, and blowers.*

b. *These standards apply to noises which are tonal in nature, impulsive, repetitive, or which consist primarily of speech or music (e.g., humming sounds, outdoor speaker systems). Typical noise sources in this category include pile drivers, drive-through speaker boxes, punch presses, steam valves, and transformer stations.*

c. *These noise levels do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwelling).*

d. *The City may impose noise level standards which are more or less restrictive based upon determination of existing low or high ambient noise levels.*

STANDARDS OF SIGNIFICANCE

The impact analysis provided below is based on the following CEQA Guidelines Appendix G thresholds of significance. A noise impact is considered significant if implementation of the Project would result in the projected noise contour zones of surrounding airports and the proposed Project is not in conflict with airport land use compatibility plans for any of the surrounding airports in the region. Therefore, Standards of Significance 5 and 6 would not apply and are not discussed further in the impact analysis section.

PROJECT IMPACTS AND MITIGATION MEASURES

Short-Term Construction Noise Impacts (Standards of Significance 1 and 4)

Impact 5.10.1 Construction activities could result in a substantial temporary increase in noise levels at nearby noise-sensitive land uses, which may result in increased levels of annoyance, activity interference, and/or sleep disruption. Therefore, this impact would be **potentially significant.**

Construction noise associated with future land uses or infrastructure development would be temporary in nature and would vary depending on the characteristics of the construction activities being performed. Noise generated during construction of buildings and related structures is typically associated with the operation of off-road equipment, including excavation and demolition equipment. Noise levels associated with construction activities occurring during the more noise-sensitive evening and nighttime hours (i.e., 7 p.m. to 7 a.m.) are of increased concern. Because exterior ambient noise levels typically decrease during the nighttime hours as community activities (e.g., commercial activities, vehicle traffic) decrease, construction activities performed during these evening hours could result in increased annoyance and potential sleep disruption for occupants of nearby residential dwellings. See **Table 5.10-3** for a list of typical uncontrolled noise levels generated by commonly used construction equipment.

The proposed Project includes new land use designations and new growth areas that would have construction activity as future development projects are approved over a period of several decades. The Project also includes planned construction of new roadways and expansion of existing roadways, with new growth occurring predominantly in the southern portion of the City. Under the proposed Project, the primary sources of temporary or periodic noise would be construction activity and maintenance work. Considering this, construction is a continuous source of temporary noise and would continue to be a major noise source in the City.

Construction noise modeling was conducted for this analysis, using equipment typical of the loudest construction phase (e.g., site preparation), assuming a worst-case scenario for construction noise disturbance. Equipment used in the modeling included an excavator, dozer, dump truck, front end loader, and grader. Modeling results were compared to **Table 5.10-12** to assess potential significant impacts. Results show that typical construction site noise levels could be as high as 93 L_{eq} dBA at 25 feet and 81 L_{eq} dBA at 100 feet. Construction activity that would include an impact pile driver could reach 96.6 L_{eq} dBA at 25 feet and 84.6 L_{eq} dBA at 100 feet. These construction noise levels would exceed the proposed standard (see **Table 5.10-12**) for typical stationary noise sources for residential and agricultural land uses.

Existing Regulations and Proposed General Plan Policies That Provide Mitigation

The City's Municipal Code includes standards for noise-related activities, including exemptions for intermittent noise sources including construction activities. Municipal Code Chapter 6.32.100 contained in Title 6, Health and Sanitation, exempts construction noise from the standards set forth in **Table 5.10-12** for non-transportation noise between the hours of 6:00 a.m. and 8:00 p.m., but construction activities may only occur between the hours of 7:00 a.m. and 7:00 p.m. when located in proximity to residential uses. Policy N-1-7 addresses potential impacts on current and future sensitive land uses associated with construction noise by setting allowable construction hours to limit impacts on sensitive land uses. It does allow for construction outside of the above hours for construction safety or because of existing congestion that makes completing the work during these time frames impractical. Policy N-1-8 would serve to further protect current and future sensitive land uses from noise impacts related to future development in the City. Under Policy N-1-8, for development projects that are subject to discretionary review, the City may require applicants to assess potential construction noise impacts on nearby sensitive uses and to minimize impacts on those uses.

Conclusion

Future construction activity is anticipated with adoption of the proposed Project, but the activity would be temporary, intermittent, and vary in size and characteristics depending on the type of development. Existing receptors and sensitive land uses may be adversely affected by anticipated noise levels from new construction. Construction-related noise generated during the day (7:00 a.m. through 7:00 p.m. in proximity to residential uses and 6:00 a.m. through 8:00 p.m. in other instances) is generally exempt from meeting noise standards, as provided under the Municipal Code and General Plan Policy N-1-7. However, in certain cases, the City could require a site-specific assessment and require mitigation to reduce construction noise levels on nearby sensitive uses. In consideration of these standards and policies, this impact would be reduced to a **less than significant** level.

Mitigation Measures

No additional mitigation required beyond compliance with existing standards and proposed General Plan policies.

Long-Term Traffic Noise Impacts (Standards of Significance 1 and 3)

Impact 5.10.2 Implementation of the proposed Project would result in a significant increase in transportation noise, including traffic noise levels along many existing roadways in the City. Even with implementation of proposed policies to limit traffic noise impacts, predicted traffic noise levels would still result in potential increases above applicable standards. As a result, this impact is considered **potentially significant**.

Railroad Noise

The proposed Project has the potential to expose new receptors to noise exposure levels above the City's outdoor and indoor noise exposure standards from the two railroad lines that currently run through the City. The most common noise sources from railroad operations are generated by diesel locomotives, rail car wheel and track interaction, train warning horns, and gate bells at railroad crossings in the City. However, as discussed previously, the City has established a series of quiet zones for many of the at-grade crossings within the City boundaries to limit noise exposure to residents from train warning horns.

Two existing rail lines run north–south through the City. The rail line running through the western portion of the City is adjacent to residential and industrial land uses within the City and currently has an average of three daily pass-through train trips. The railroad line running through the eastern portion of the City is adjacent to residential, commercial, and industrial land uses within the City and currently supports an average of 32 daily freight train trips. This rail line also services Amtrak passenger trains with an average of seven daily passenger train trips. The proposed Project would allow for development near this rail line and could expose new receptors to noise levels exceeding City standards. However, as discussed in Section 5.0, Introduction to the Environmental Analysis and Assumptions Used, the effect of this existing condition related to rail noise would be an impact of the environment on the Project, and, as such, is not a CEQA consideration. Because the operations on the rail lines are not under control of the City and the proposed Project would not involve any changes in rail operations, the potential for changes in rail operations and potential effects on surrounding land uses would not be exacerbated by the Project and is, therefore, not subject to further analysis in this EIR.

Traffic Noise

The proposed Project includes a series of new land use modifications and designations that would result in increased traffic volumes on major arterial and collector roadways in the City as well as increased volumes on I-5 and SR 99. The Project also includes new proposed roadways which would increase traffic volumes on new and existing City roadways. These increased traffic volumes could expose existing and future sensitive receptors and noise-sensitive land uses to increased traffic noise. Residential developments, schools, libraries, hospitals, convalescent homes, and places of worship are the most noise-sensitive land uses. As shown in **Table 5.10-13**, many of the roadway volumes that were modeled for future conditions under the proposed Project would generate noise levels that exceed the City's current General Plan outdoor noise exposure standard (60 dBA L_{dn}) for residential and other noise-sensitive land uses. See **Table 5.10-11** for the full list of noise standards by land uses. Predicted increases would primarily occur on major arterial and collector roadways that run north–south and east–west through the City. The predicted increase in traffic volumes resulting from implementation of the proposed Project would therefore contribute to increases in traffic noise levels.

While many roadways would experience increased traffic noise levels under the proposed Project, as shown in **Table 5.10-4**, existing traffic noise levels adjacent to many of the major roadways in the City currently exceed the City's noise standard (60 dBA L_{dn}). For cases in which existing noise levels exceed the standard, **Table 5.10-1** serves to determine the standards for incremental noise level increases that would be considered substantial. This policy framework is also included in proposed General Plan Policy N-2-2 and would continue as the threshold used for determining allowable incremental noise increases for transportation and stationary sources used in the CEQA environmental review process. For this analysis, this threshold was used to determine which roadway segments would incur a substantial increase in noise levels over existing conditions. See the Methods of Analysis section for a full description of the traffic noise modeling.

As seen below, **Table 5.10-13** includes modeled traffic noise levels for existing conditions and existing plus Project conditions, as well as the relative distances at which traffic noise would be below 70, 65, 60, and 50 dBA. Future noise contours are illustrated in **Figure 5.10-4**.

TABLE 5.10-13
PREDICTED INCREASES IN TRAFFIC NOISE LEVELS
EXISTING AND EXISTING PLUS PROJECT CONDITIONS

Roadway	From	To	L_{dn} at 50 Feet from Near-Travel-Lane Centerline[1]		Noise Level Increase	Substantial Noise Level Increase?	Distance to Contour (feet)		
			Existing	With Project			70 dBA	65 dBA	60 dBA
Big Horn Blvd	Franklin Blvd	Bruceville Rd	69.5	69.7	0.2	No	70	221	698
	Bruceville Rd	Laguna Blvd	70.0	72.1	2.1	Yes	121	384	1,213
	Laguna Blvd	Elk Grove Blvd	67.9	71.9	4.0	Yes	98	309	977
	Elk Grove Blvd	Lotz Pkwy	68.1	72.8	4.8	Yes	119	376	1,189
	Lotz Pkwy	Whitelock Pkwy	65.3	72.1	6.8	Yes	108	340	1,077
	Whitelock Pkwy	Bilby Rd		71.4	—	Yes	103	325	1,027
	Bilby Rd	Kammerer Rd		71.6	—	Yes	107	337	1,066
	Kammerer Rd	Eschinger Rd		72.3	—	Yes	126	399	1,263
Bilby Rd	Franklin Blvd	Willard Pkwy	63.4	64.5	1.1	No	14	45	141
	Willard Pkwy	Bruceville Rd	68.9	71.9	3.0	Yes	78	245	776
	Bruceville Rd	Big Horn Blvd	55.0	68.6	13.6	Yes	37	115	365
	Big Horn Blvd	Lotz Pkwy		68.0	—	Yes	46	147	465
	Lotz Pkwy	Promenade Pkwy		67.9	—	Yes	45	143	453
Bond Rd	SR 99	E Stockton Blvd	70.6	72.1	1.6	Yes	162	512	1,618
	E Stockton Blvd	Elk Crest Dr	72.0	74.4	2.4	Yes	189	597	1,888
	Elk Crest Dr	Elk Grove Florin Rd	74.4	75.9	1.5	Yes	168	531	1,678
	Elk Grove Florin Rd	Waterman Rd	72.1	74.1	2.0	Yes	145	458	1,450

Roadway	From	To	L_{dn} at 50 Feet from Near-Travel-Lane Centerline[1]		Noise Level Increase	Substantial Noise Level Increase?	Distance to Contour (feet)		
			Existing	With Project			70 dBA	65 dBA	60 dBA
	Waterman Rd	Bradshaw Rd	70.4	72.9	2.5	Yes	114	360	1,138
	Bradshaw Rd	Bader Rd	66.3	67.4	1.1	No	54	171	541
	Bader Rd	Grant Line Rd	63.4	65.4	2.0	No	34	107	339
Bradshaw Rd	Vintage Park Dr	Calvine Rd	72.2	76.1	3.9	Yes	230	728	2,303
	Calvine Rd	Sheldon Rd	67.4	76.0	8.6	Yes	224	707	2,237
	Sheldon Rd	Bond Rd	68.0	76.3	8.2	Yes	239	757	2,393
	Bond Rd	Elk Grove Blvd	67.0	76.2	9.2	Yes	237	749	2,369
	Elk Grove Blvd	Grant Line Rd	65.5	76.0	10.5	Yes	226	713	2,255
Bruceville Rd	Damascus Dr	Sheldon Rd	67.3	70.6	3.3	Yes	100	316	998
	Sheldon Rd	Big Horn Blvd	69.1	72.8	3.6	Yes	200	631	1,997
	Big Horn Blvd	Laguna Blvd	69.2	70.8	1.6	Yes	127	403	1,273
	Laguna Blvd	Elk Grove Blvd	69.2	71.0	1.8	Yes	97	306	969
	Elk Grove Blvd	Whitelock Pkwy	68.3	71.3	3.0	Yes	105	331	1,048
	Whitelock Pkwy	Bilby Rd	65.9	71.2	5.3	Yes	102	323	1,021
	Bilby Rd	Kammerer Rd	68.4	73.2	4.8	Yes	162	513	1,622
	Kammerer Rd	Eschinger Rd	63.3	74.2	10.9	Yes	204	646	2,044
Calvine Rd	Power Inn Rd	Elk Grove Florin Rd	71.7	74.5	2.8	Yes	220	697	2,203
	Elk Grove Florin Rd	Waterman Rd	70.6	73.8	3.2	Yes	189	599	1,895
	Waterman Rd	Bradshaw Rd	69.2	71.0	1.8	Yes	119	377	1,193
	Bradshaw Rd	Vineyard Rd	69.3	73.6	4.2	Yes	176	557	1,762
	Vineyard Rd	Excelsior Rd	68.2	73.1	4.9	Yes	159	504	1,594
	Excelsior Rd	Grant Line Rd	65.9	72.4	6.5	Yes	135	428	1,353
Center Parkway	Laguna Village	Bruceville Rd	65.8	68.5	2.7	Yes	57	180	571
E. Stockton Blvd	Grant Line Rd	Elk Grove Florin Rd	63.3	69.7	6.4	Yes	73	231	730
Elk Grove Blvd	I-5	Harbour Point Dr	68.9	70.2	1.3	No	121	384	1,213
	Harbour Point Dr	Four Winds Dr	70.3	71.5	1.2	No	182	577	1,824
	Four Winds Dr	Franklin Blvd	70.8	71.6	0.8	No	220	694	2,195
	Franklin Blvd	Bruceville Rd	72.0	73.0	1.1	No	196	619	1,957
	Bruceville Rd	Big Horn Blvd	72.6	74.6	2.1	Yes	250	791	2,502

Roadway	From	To	L_{dn} at 50 Feet from Near-Travel-Lane Centerline[1]		Noise Level Increase	Substantial Noise Level Increase?	Distance to Contour (feet)		
			Existing	With Project			70 dBA	65 dBA	60 dBA
	Big Horn Blvd	Laguna Springs Dr	70.3	71.8	1.5	Yes	232	733	2,317
	Laguna Springs Dr	Auto Center Dr	73.5	75.2	1.7	Yes	274	867	2,740
	Auto Center Dr	SR 99	73.6	75.4	1.8	Yes	302	954	3,018
	SR 99	Emerald Vista Dr/E Stockton Blvd	73.1	75.1	2.0	Yes	300	950	3,004
	Emerald Vista Dr/E Stockton Blvd	Elk Grove Florin Rd	69.2	71.3	2.1	Yes	92	291	922
	Elk Grove Florin Rd	Waterman Rd	63.8	65.2	1.4	No	20	64	202
	Waterman Rd	Bradshaw Rd	64.9	66.9	2.0	No	31	99	313
	Bradshaw Rd	Grant Line Rd	59.4	62.4	2.9	No	20	63	200
Elk Grove Florin Rd	Vintage Park Dr	Calvine Rd	70.3	72.8	2.4	Yes	186	590	1,865
	Calvine Rd	Sheldon Rd	71.4	74.3	2.9	Yes	202	638	2,018
	Sheldon Rd	Bond Rd	69.9	72.1	2.2	Yes	143	453	1,431
	Bond Rd	Elk Grove Blvd	68.2	70.8	2.7	Yes	69	218	690
	Elk Grove Blvd	E Stockton Blvd	67.9	68.6	0.7	No	36	113	357
Eschinger Rd	Willard Pkwy	Bruceville Rd		71.3	—	Yes	66	208	657
	Bruceville Rd	Big Horn Blvd		72.5	—	Yes	88	277	877
	Big Horn Blvd	Lotz Pkwy		73.4	—	Yes	108	342	1,080
	Lotz Pkwy	Promenade Pkwy		73.7	—	Yes	114	360	1,138
Excelsior Rd	Gerber Rd	Calvine Rd	62.5	67.4	5.0	Yes	64	203	641
	Calvine Rd	Sheldon Rd	62.8	67.8	5.0	Yes	55	174	551
Franklin Blvd	Sims Rd	Big Horn Blvd	70.4	71.8	1.4	No	143	453	1,433
	Big Horn Blvd	Laguna Blvd	70.4	71.4	1.0	No	124	391	1,238
	Laguna Blvd	Elk Grove Blvd	69.0	70.9	1.9	Yes	112	353	1,115
	Elk Grove Blvd	Whitelock Pkwy	66.6	68.8	2.2	Yes	115	363	1,147
	Whitelock Pkwy	Bilby Rd		59.1	—	No	8	25	78
	Bilby Rd	Hood Franklin Rd		61.8	—	Yes	14	43	136
	Hood Franklin Rd	Lambert Rd		58.4	—	No	6	20	63

Roadway	From	To	L_{dn} at 50 Feet from Near-Travel-Lane Centerline[1]		Noise Level Increase	Substantial Noise Level Increase?	Distance to Contour (feet)		
			Existing	With Project			70 dBA	65 dBA	60 dBA
Grant Line Rd	Sloughhouse Rd	Calvine Rd	71.7	74.3	2.6	Yes	242	765	2,420
	Calvine Rd	Sheldon Rd	69.4	74.6	5.3	Yes	200	632	1,998
	Sheldon Rd	Wilton Rd	71.4	75.0	3.6	Yes	218	690	2,183
	Wilton Rd	Bond Rd	70.9	75.1	4.3	Yes	224	709	2,242
	Bond Rd	Elk Grove Blvd	68.5	74.1	5.5	Yes	175	554	1,753
	Elk Grove Blvd	Bradshaw Rd	66.1	70.9	4.9	Yes	143	452	1,431
	Bradshaw Rd	Mosher Rd	68.9	75.5	6.6	Yes	360	1137	3,595
	Mosher Rd	Waterman Rd	69.2	75.8	6.5	Yes	379	1200	3,794
	Waterman Rd	E. Stockton/ Survey Rd	70.4	77.5	7.1	Yes	568	1796	5,680
	E. Stockton/ Survey Rd	SR 99	71.1	77.8	6.7	Yes	685	2166	6,848
Harbour Point Dr	Elk Grove Blvd	Laguna Blvd	66.7	68.6	1.9	Yes	61	194	614
Hood Franklin Rd	I-5	Franklin Blvd	66.6	74.9	8.3	Yes	266	841	2,660
Kammerer Rd	Franklin Blvd	Willard Pkwy		74.2	—	Yes	271	856	2,708
	Willard Pkwy	Bruceville Rd		74.8	—	Yes	309	978	3,092
	Bruceville Rd	Big Horn Blvd		75.7	—	Yes	377	1193	3,773
	Big Horn Blvd	Lotz Pkwy	68.9	76.3	7.4	Yes	438	1,386	4,382
	Lotz Pkwy	Promenade Pkwy	66.6	76.1	9.5	Yes	418	1,320	4,175
	Promenade Pkwy	SR 99	68.8	77.4	8.5	Yes	562	1,776	5,618
Laguna Blvd	SR 99	Franklin Blvd	70.8	71.6	0.8	No	131	416	1,315
	Franklin Blvd	Bruceville Rd	70.5	71.0	0.5	No	115	363	1,147
	Bruceville Rd	Big Horn Blvd	70.8	70.4	-0.4	No	98	310	979
	Big Horn Blvd	Laguna Springs Dr	71.2	73.2	2.0	Yes	188	594	1,877
	Laguna Springs Dr	SR 99	71.1	74.1	3.0	Yes	231	731	2,311
Laguna Springs Dr	Laguna Blvd	Laguna Palms Wy	64.8	66.0	1.2	No	30	96	303
	Laguna Palms Wy	Elk Grove Blvd	65.6	66.0	0.4	No	24	77	244
	Elk Grove Blvd	Lotz Pkwy	60.8	68.4	7.6	Yes	50	159	502

Roadway	From	To	L_{dn} at 50 Feet from Near-Travel-Lane Centerline[1]		Noise Level Increase	Substantial Noise Level Increase?	Distance to Contour (feet)		
			Existing	With Project			70 dBA	65 dBA	60 dBA
Lent Ranch Pkwy	Kammerer Rd	Promenade Pkwy	44.8	65.6	20.8	Yes	25	79	251
Lewis Stein Rd	Sheldon Rd	Big Horn Blvd	65.3	66.4	1.2	No	26	83	264
Lotz Pkwy	Big Horn Blvd	Laguna Springs Dr	58.6	65.7	7.1	Yes	29	92	290
	Laguna Springs Dr	Whitelock Pkwy	53.1	67.2	14.0	Yes	31	98	311
	Whitelock Pkwy	Promenade Pkwy		71.3	—	Yes	81	255	807
	Promenade Pkwy	Bilby Rd		69.5	—	Yes	53	167	528
	Bilby Rd	Kammerer Rd		68.3	—	Yes	41	128	406
	Kammerer Rd	Eschinger Rd		70.8	—	Yes	71	225	712
Mosher	Grant Line Rd	Waterman Rd	62.0	67.8	5.8	Yes	33	106	335
Power Inn Rd	Calvine Rd	Sheldon Rd	65.8	67.4	1.6	Yes	37	116	368
Promenade Pkwy	Lotz Pkwy	Bilby Rd		69.6	—	Yes	62	195	616
	Bilby Rd	Kammerer Rd	64.2	70.3	6.1	Yes	97	307	972
	Kammerer Rd	Eschinger Rd		67.9	—	Yes			
Sheldon Rd	Bruceville Rd	Lewis Stein Rd	68.6	71.7	3.0	Yes	132	417	1,318
	Lewis Stein Rd	SR 99	70.7	72.6	1.9	Yes	166	524	1,657
	SR 99	E. Stockton Blvd	70.8	73.6	2.8	Yes	206	651	2,059
	E. Stockton Blvd	Power Inn Rd	71.0	73.0	2.1	Yes	181	574	1,815
	Power Inn Rd	Elk Grove Florin Rd	69.5	72.4	2.9	Yes	152	479	1,516
	Elk Grove Florin Rd	Waterman Rd	66.1	68.8	2.7	Yes	72	228	721
	Waterman Rd	Bradshaw Rd	66.3	70.7	4.4	Yes	65	205	647
	Bradshaw Rd	Bader Rd	65.8	69.4	3.6	Yes	48	153	484
	Bader Rd	Dillard Oaks Ct	64.5	68.7	4.1	Yes	48	153	483
	Excelsior Rd	Grant Line Rd	65.3	70.6	5.4	Yes	76	241	763
Waterman Rd	Vintage Park Dr	Calvine Rd	69.0	74.2	5.2	Yes	181	573	1,813
	Calvine Rd	Sheldon Rd	70.0	72.4	2.4	Yes	100	315	998
	Sheldon Rd	Bond Rd	66.2	69.4	3.2	Yes	119	375	1,186
	Bond Rd	Elk Grove Blvd	70.7	73.8	3.0	Yes	133	420	1,329
	Elk Grove Blvd	Grant Line Rd	66.9	72.5	5.6	Yes	150	475	1,502

Roadway	From	To	L_{dn} at 50 Feet from Near-Travel-Lane Centerline[1]		Noise Level Increase	Substantial Noise Level Increase?	Distance to Contour (feet)		
			Existing	With Project			70 dBA	65 dBA	60 dBA
Whitelock Pkwy	Franklin Blvd	Bruceville Rd	66.9	64.9	-2.0	No	23	72	227
	Bruceville Rd	Big Horn Blvd	63.1	63.9	0.8	No	23	72	229
	Big Horn Blvd	Lotz Pkwy	62.3	67.0	4.7	Yes	38	121	381
	Lotz Pkwy	SR 99		72.5	—	Yes	125	395	1,248
Willard Pkwy	Whitelock Pkwy	Bilby	65.1	71.7	6.6	Yes	147	464	1,467
	Bilby Rd	Kammerer Rd	58.2	70.3	12.2	Yes	97	308	973
Wilton Rd	Grant Line Rd	Leisure Oak Ln	68.7	70.5	1.7	Yes	84	266	842
SR-99	Calvine Rd	Sheldon Rd	78.8	81.7	2.9	Yes	1,000	3,162	9,999
	Sheldon Rd	Bond Rd	77.4	80.5	3.1	Yes	902	2,854	9,024
	Bond Rd	Elk Grove Blvd	76.4	79.8	3.4	Yes	744	2,352	7,438
	Elk Grove Blvd	Whitelock Pkwy	77.2	80.6	3.4	Yes	669	2,116	6,691
	Whitelock Pkwy	Grant Line Rd	70.1	72.8	2.7	Yes	643	2,032	6,425
	Grant Line Rd	Eschinger Rd	75.4	77.7	2.3	Yes	708	2,238	7,077
I-5	Cosumnes River Blvd	Laguna Blvd	65.0	67.1	2.1	Yes	855	2,702	8,546
	Laguna Blvd	Elk Grove Blvd	75.0	77.3	2.3	Yes	712	2,251	7,117
	Elk Grove Blvd	Hood Franklin Rd	73.8	76.3	2.5	Yes	592	1,871	5,915
	Hood Franklin Rd	Twin Cities Rd	62.5	64.3	1.9	No	730	2,307	7,295

Source: Ascent Environmental 2017

Note: 1. Substantial increases defined as an increase of 5.0, or greater, where noise levels are less than the City's normally acceptable minimum noise level of 60 dBA L_{dn}; 3 dBA, or greater, where noise levels range from 60 to 65 dBA L_{dn}; and 1.5 dB, or greater, where the noise level exceeds 65 dBA L_{dn} without the proposed Project.

As shown in **Table 5.10-13** and **Figure 5.10-4**, the proposed Project would increase traffic noise levels to above the current 60 dBA L_{dn} standard for many existing roadway segments in the City, and would also result in significant increases in traffic noise levels along many roadways that are already above the 60 dBA L_{dn} threshold, including the federal and State routes providing access to the City. Additionally, the proposed Project includes plans for new roadway segments to be developed in the City. As indicated by blank cells, new roadway segments do not include existing condition noise levels, but future traffic noise levels are estimated using modeled future traffic volumes for these new roadways. See **Appendix E** for traffic noise modeling assumptions and results.

Proposed General Plan Policies That Provide Mitigation

The proposed Project includes a series of policies to address future impacts caused by increases in traffic noise. Proposed Policy N-1-1, Policy N-1-2, Policy N-1-4, Policy N-1-5, and Policy N-2-3 all serve to address and limit noise impacts caused or subject to future development in the City.

These policies are intended to ensure that new specific proposed development would comply with noise standards and would not adversely impact sensitive land uses from traffic noise.

Conclusion

While General Plan policies would serve to limit traffic noise exposure to sensitive receptors, these policies cannot ensure that noise levels would be reduced to levels within the City's noise standards at all sensitive receptors. With increases for existing roadways ranging from 3 dB or more and up to 20 dB along some roadway segments, the ability to reduce impacts along roadways with measures such as sound walls or berms may not be feasible. Therefore, this impact would remain **significant and unavoidable**.

Mitigation Measures

No additional feasible mitigation measures available beyond compliance with proposed General Plan policies.

Exposure to Non-Transportation Source Noise (Standard of Significance 3)

Impact 5.10.3 The proposed Project would result in future development that could expose existing noise-sensitive land uses to new non-transportation noise sources that could exceed the City's applicable noise standards. However, several policies, discussed below, address and limit the exposure of existing and future noise-sensitive land uses to non-transportation noise sources. Therefore, this impact would be considered **less than significant**.

The proposed Project would allow for future development of land uses including residential, light and heavy industrial, commercial, employment center/offices, and public services. Buildout of the Project could potentially result in the exposure of new or existing receptors and noise-sensitive land uses to noise levels above the City's established threshold for outdoor noise exposure from non-transportation sources (see **Table 5.10-12**). Typical stationary and area noise sources include landscaping activities, building maintenance, stationary mechanical equipment (e.g., pumps, generators, HVAC units), garbage collection activities, and commercial and industrial processes.

Residential Land Uses

The Project would allow for the development of new residential land uses, predominantly located in the southern portion of the Planning Area. Noise from proposed residential land uses could increase ambient noise levels, due to typical activities associated with residential land uses, such as lawn and garden equipment, voices, and amplified music. These noise sources would be intermittent in nature and would vary considerably, depending on the specific characteristics of that residential area.

Commercial and Industrial Land Uses

The Project would allow for development of various nonresidential land uses, including commercial, heavy industrial, light industrial/flex, and public services. Noise sources associated with these land uses can vary substantially depending on the type of business or facility in operation. Noise sources often associated with these uses can include site-specific mechanical building equipment (e.g., heating equipment, HVAC systems) and other types of machinery associated with the use, such as impact processes, electrical machines, internal combustion

engines, pneumatic equipment, electric motors, and machine tools. In consideration of the land use changes included in the proposed Project, siting of new commercial and industrial uses could result in new stationary and area sources as well as exposure of new sensitive land uses to existing stationary and area sources.

Existing Regulations and Proposed General Plan Policies That Provide Mitigation

The City's noise control requirements for existing non-transportation noise sources such as mechanical equipment are included in Section 6.32.110 of the Municipal Code. The noise control chapter identifies hourly noise standards that are applicable to non-transportation noise sources and consistent with those identified in the current General Plan, as depicted in **Table 5.10-9**. Policy N-1-6 requires an acoustical study to assess and limit impacts from any proposed nonresidential land uses that are likely to produce noise levels exceeding the performance standards included in **Table 5.10-12**.

Conclusion

While the proposed Project includes land uses that could result in future non-transportation or stationary noise increases, it also includes several policies to assess and limit potential increases in noise levels from stationary and area sources associated with the proposed Project.

The proposed policies, as well as existing standards included in the City's Municipal Code regarding applicable non-transportation noise sources (Section 6.32.110), serve to address and limit the noise impacts of non-transportation noise sources on sensitive land uses. With implementation of these standards and policies, this impact would be **less than significant.**

Mitigation Measures

No additional mitigation required beyond compliance with existing standards and proposed General Plan policies.

Groundborne Vibration Impacts (Standard of Significance 2)

Impact 5.10.4 The proposed Project would result in development projects involving construction activities that could expose receptors to excessive groundborne vibration, and new industrial and commercial land uses that could expose receptors to excessive groundborne vibration from long-term operations. This impact is considered **less than significant.**

Long-Term Operational Impacts

Groundborne vibration is most commonly associated with land uses near transit system routes and maintenance activities. Groundborne vibration associated with buses or trucks are not commonly perceptible. Roadway vibration is correlated to the smoothness of the running surface for vehicles. If the roadway is smooth, vehicle groundborne vibration is typically not perceptible (FTA 2006, p. 7-5). While the proposed Project includes land use changes as well as population and job growth assumptions that would result in traffic volume increases along major arterial and collector roads throughout the City, these increases in vibration would not be perceptible based on the aforementioned factors.

Long-term operational activities associated with the proposed Project would include new commercial or industrial land uses. Depending on the type of activities occurring, new commercial

excessive groundborne vibration. Given that groundborne vibration associated with commercial or industrial processes is specific to the type of operation, groundborne vibration impacts for specific development projects cannot be assessed at this time.

Two major rail lines run through the Planning Area. The eastern line runs north–south and enters the City just south of Eschinger Road, and is operated by UPRR and Amtrak. The western UPRR line runs north–south and bisects Franklin Boulevard, Elk Grove Boulevard, and Laguna Boulevard. Noise-sensitive land uses currently exist adjacent to both rail lines. The proposed Project would allow for development activity adjacent to the eastern rail line and would result in development of new noise-sensitive land uses near this rail line.

The FTA's Transit Noise and Vibration Impact Assessment Guidelines provide recommended vibration level thresholds for various land uses based on the frequency of exposure from vibration events (i.e., number of trains passing by a sensitive land uses). Based on FTA guidance, development within 200 feet of an existing railroad could be exposed to vibration that exceeds the recommended threshold of 72 VdB for sensitive receptors that are exposed to a frequent amount of vibration events, i.e., 70 or more trains passing by in one day (see **Table 5.10-7**). While vibration-sensitive land uses currently exist within as little as 200 feet from the two existing rail lines in the City, as discussed previously in **Impact 5.10.4**, rail transportation activity consists mostly of freight trains and does not exceed 32 trains passing through the City within any given 24-hour period. Based on this relatively low frequency, this would not exceed the recommended threshold of 70 daily train passes for human disturbance.

Short-Term Construction Impacts

Implementation of the proposed Project would result in future construction activities, some of which would occur near existing residences and noise-sensitive land uses throughout the City. Vibration from these activities could cause structural damage to nearby existing buildings and/or cause annoyance to occupants in nearby buildings. The vibration standards in **Table 5.10-10** are used by the City as significance thresholds for analyzing vibration impacts. As stated in the table, a vibration threshold of 0.2 in/sec ppv is typically considered sufficient to protect against structural damage. This same threshold also represents the level at which vibrations would be potentially annoying to people in buildings (Caltrans 2002b, 2004).

Increases in groundborne vibration levels attributable to the proposed Project would be primarily associated with short-term construction-related activities. Groundborne vibration levels associated with typical construction equipment are summarized in **Table 5.10-14.** Based on the levels shown, construction activities often associated with development projects that do not require the use of pile drivers would typically generate ground vibration levels of approximately 0.09 in/sec ppv, or less, at 25 feet.

TABLE 5.10-14
DISTANCE TO POTENTIAL VIBRATION IMPACT CONTOUR FOR CONSTRUCTION EQUIPMENT

Equipment	PPV at 25 feet (in/sec)[1]	Approximate Lv (VdB) at 25 feet[2]
Pile Driver (impact) upper range	1.518	112
typical	0.644	104
Pile Driver (sonic) upper range	0.734	105
typical	0.170	93
Blasting	1.13	109

Equipment	PPV at 25 feet (in/sec)[1]	Approximate Lv (VdB) at 25 feet[2]
Large Dozer	0.089	87
Caisson Drilling	0.089	87
Loaded Trucks	0.076	86
Rock Breaker	0.059	83
Jackhammer	0.035	79
Small Dozer	0.003	58

Source: FTA 2006, pp.12-6,12-8

PPV = peak particle velocity; LV = the root-mean-square velocity expressed in vibration decibels (VdB), assuming a crest factor of 4

1. *Does not include the simultaneous operation of multiple pieces of equipment.*
2. *Based on a vibration threshold of 0.2 in/sec ppv, which is typically considered sufficient to protect against structural damage (excluding fragile and historic structures). This same threshold also represents the level at which vibrations would be potentially annoying to people in buildings (Caltrans 2002b, 2004). Does not include vibration-sensitive exterior activities.*

For most construction projects, groundborne vibration levels would not pose a significant risk to nearby structures or occupants. However, the construction of some facilities may require the use of construction equipment that can cause vibrational impacts (i.e., pile drivers). In addition, road improvement projects often require the use of vibratory rollers, which, when operated close to existing structures, can result in increased levels of annoyance. As depicted in **Table 5.10-14**, ground vibration levels associated with pile drivers can reach levels of approximately 1.52 in/sec ppv at 25 feet. Pile drivers can generate ground vibration levels of 0.2 in/sec ppv at distances up to approximately 200 feet.

Construction activities involving equipment which causes elevated levels of groundborne vibration tend to occur in the early stages of site development (e.g., demolition, site preparation, pile driving) and occur intermittently within the construction phase. In consideration of the potential groundborne vibration impacts associated with construction activities as part of future development in the Planning Area, occupants and residents in nearby buildings may be annoyed or be exposed to temporary disturbance. However, considering the scope of the Project, certain types of construction activity could still result in groundborne vibrational impacts on nearby building occupants.

Depending on the distance to nearby existing structures, the more vibration-intensive construction activities (e.g., pile driving, vibratory rollers) could potentially exceed the criterion of 0.2 in/sec ppv at nearby structures.

Existing Regulations and Standards and Proposed General Plan Policies That Provide Mitigation

Municipal Code Chapter 6.32 includes a noise control standard for construction, limiting construction activity to occur between 7 a.m. and 7 p.m. adjacent to residential land uses and 6 a.m. and 8 p.m. adjacent to nonresidential uses. By restricting construction activities when City residents are typically resting or sleeping (i.e., evening, nighttime), the standard greatly reduces potential vibrational impacts that would result in annoyance or loss of sleep. Policy N-1-7 addresses potential impacts on current and future sensitive land uses associated with construction noise, which would also address construction-generated vibration. Policy N-1-9 requires an impact assessment for projects using major vibration-generating equipment and the implementation of measures to reduce impacts associated with that equipment.

Conclusion

Construction activities in the Planning Area could generate groundborne vibration. In some cases, vibration levels may be high enough to affect structures or cause annoyance at sensitive receptors. As discussed above, the proposed Project includes policies to address the assessment and siting of development that may exceed the City's performance standard for noise-sensitive land uses. These policies would have a mitigating effect on construction vibration. With implementation of Policy N-1.9, this would be a **less than significant** impact.

Mitigation Measures

No additional mitigation required beyond compliance with existing standards and proposed General Plan policies.

5.10.5 CUMULATIVE SETTING, IMPACTS, AND MITIGATION MEASURES

CUMULATIVE SETTING

The proposed Project would result in population and employment growth over the planned buildout period for the Project. This growth would result in increased roadway traffic volumes and associated noise levels for major arterial and collector roadways throughout the Planning Area. Two rail lines currently run north–south through the City. Future plans regarding these rail lines, including increased frequency of train trips, may also affect noise-sensitive land uses in the City. Additionally, the City is located within the greater Sacramento metropolitan area and is also affected by cumulative impacts, including traffic noise, of projects in the surrounding areas that are not under the jurisdiction of the City. Cumulative development conditions would result in increased cumulative roadway noise levels. No stationary or non-transportation noise sources were identified in the surrounding area of the Planning Area that would have a cumulative impact on noise-sensitive land uses in the City. Therefore, the primary factor for cumulative impact analysis is the consideration of future roadway traffic noise levels.

CUMULATIVE IMPACTS AND MITIGATION MEASURES

Contribution to Cumulative Traffic Noise (Standards of Significance 1 and 3)

Impact 5.10.5 Implementation of the proposed Project would contribute to cumulative noise levels along many roadway segments in the Planning Area due to increased cumulative traffic volumes. As a result, the proposed Project would have a **cumulatively considerable** contribution to traffic noise levels on area roadways.

Predicted future cumulative transportation noise levels are projected to exceed the City's noise standards (see **Table 5.10-11**). This is considered a significant cumulative impact. While traffic volumes would likely increase irrespective of Project implementation, the proposed Project would introduce future development that would contribute to cumulative traffic volumes. Modeling results for traffic volumes resulting from the proposed Project show that there would be a cumulative contribution to traffic noise levels along major roadways in the Planning Area. As seen in **Table 5.10-13**, which includes cumulative traffic volumes in the with-Project scenario, traffic noise levels along roadways in the Planning Area would exceed the City's applicable noise standards for traffic noise as well as contribute to substantial increases in traffic noise levels along roadways that already currently exceed the City's noise level standards. These noise levels represent the existing plus Project condition. The cumulative condition would include this noise

and any traffic noise resulting from growth outside of the Planning Area and would still exceed the City's noise level standards. The proposed Project's contribution would be cumulatively considerable.

Mitigation Measures

No additional feasible mitigation available beyond compliance with proposed General Plan policies.

The proposed Project includes policies specifically to address and limit traffic noise impacts on noise-sensitive land uses. However, given that information on all future development activity is not currently available, traffic noise mitigation measures may not be considered feasible for all noise-sensitive land uses that may be impacted. This may result in noise-sensitive land uses that are still exposed to traffic noise levels above applicable City standards. As a result, this impact is considered **cumulatively considerable** and **significant and unavoidable**.

Contribution to Cumulative Construction Noise and Vibration (Standards of Significance 1, 2, and 4)

Impact 5.10.6 Implementation of the proposed Project would not result in a substantial contribution to cumulative construction vibration and noise levels in the Project area. As a result, this impact would be considered **less than cumulatively considerable.**

Because construction noise and vibration are localized effects, only construction projects that occur close to one another could combine to result in a cumulative noise or vibration effect. Therefore, noise and vibration from construction projects outside of the City would not contribute to noise and vibration impacts in the City. This would be a **less than cumulatively considerable** impact. Impact 5.10.1 considers the potential for concurrent projects to be constructed in the City. As discussed in Impact 5.10.1, construction activities associated with future development projects may result in increases in noise levels surrounding individual project sites and may expose noise-sensitive land uses to intermittent vibration and noise levels above the City's applicable standards. As discussed previously, this construction activity would be intermittent and highly localized in nature. Policy N-1-7 addresses potential impacts on current and future sensitive land uses associated with construction noise by setting allowable construction hours to limit impacts on sensitive land uses. Considering the anticipated construction activity associated with the proposed Project, Policy N-1-8 would serve to further protect current and future sensitive land uses from noise impacts related to future development in the City. The City's Municipal Code regulations (Chapter 6.32) would also serve to mitigate the severity of construction noise associated with the proposed Project. With regard to construction vibration, Policy N-1-9 requires an impact assessment for projects using major vibration-generating equipment and the implementation of measures to reduce impacts associated with that equipment. In addition, noise-related policies controlling for construction noise would have a mitigating effect on construction vibration. With implementation of these policies, the proposed Project's contribution to construction-related noise and vibration would be **less than cumulatively considerable** and the cumulative impact would remain less than significant.

Mitigation Measures

No additional mitigation required beyond compliance with existing standards and proposed General Plan policies.

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