

3.6 NOISE AND VIBRATION

This section includes a summary of applicable regulations related to noise and vibration, a description of ambient-noise conditions, and an analysis of potential short-term construction and long-term operational-source noise impacts associated with the Elk Grove General Plan Amendments and Update of VMT Standards (Project). The primary source of information used for this analysis is the General Plan EIR (City of Elk Grove 2018, 2019).

There were no comments regarding noise that were received in response to circulation of the notice of preparation (NOP).

3.6.1 Regulatory Setting

FEDERAL

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

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

Federal Transit Administration

To address the human response to ground vibration, the Federal Transit Administration (FTA) has set forth guidelines for maximum-acceptable vibration criteria for different types of land uses. These guidelines are presented in Table 3.6-1.

Table 3.6-1 Ground-Borne Vibration (GBV) Impact Criteria for General Assessment

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

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

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

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

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

⁴ This criterion 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.

Source: FTA 2018.

STATE

California Building Code Sound Transmission Standards

Noise within habitable units that is attributable to external sources is regulated by the California Building Standards codified in the California Code of Regulations, Title 24, Part 2, Section 1207. These standards are enforceable at the time of construction or during occupancy and apply to habitable units with common interior walls, partitions, and ceilings or those adjacent to public areas, such as halls, corridors, stairways, and service areas. Under these standards, the interior noise levels attributable to exterior sources shall not exceed 45 decibels (dB) in any habitable room. The noise metrics used to measure these levels can be day-night average sound level (L_{dn}) or Community Noise

Equivalent Level (CNEL), consistent with the local general plan. An acoustical analysis documenting compliance with the interior sound level standards shall be prepared for structures containing habitable rooms. Under Public Resources Code Section 25402.1(g), all cities and counties in the State are required to enforce the adopted California Building Code, including these standards for noise in interior environments.

California Department of Transportation

In 2013, Caltrans published the Transportation and Construction Vibration Manual (Caltrans 2020). The manual provides general guidance on vibration issues associated with construction and operation of projects in relation to human perception and structural damage. Table 3.6-2 presents recommendations for levels of vibration that could result in damage to structures exposed to continuous vibration.

Table 3.6-2 Caltrans Recommendations Regarding Levels of Vibration Exposure

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

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

Source: Caltrans 2020.

LOCAL

City of Elk Grove General Plan

Chapter 8 of the *City of Elk Grove General Plan* (City of Elk Grove 2019) includes noise policies that are applicable to the Project:

- **Policy N-1-1:** New development of the uses listed in Table 8-3 [presented as Table 3.6-3 of this SEIR] 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 to achieve compliance with the City's noise standards.

Table 3.6-3 Maximum Allowable Noise Exposure, Transportation Noise Sources

Land Use	Outdoor Activity Areas ^{1,2} L _{dn}	Interior Spaces	
		L _{dn}	L _{eq} ^{3,4}
Residential	60 ⁵	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 ⁷	40 ⁶	-
Transient Lodging	60 ^{5,7}	45	-
Hospitals, Nursing Homes	60 ^{4,7}	45	-
Theaters, Auditoriums, Music Halls	-	-	35
Churches, Meeting Halls	60 ^{4,7}	-	40
Office Buildings	-	-	45
Schools, Libraries, Museums	-	-	45

Notes: L_{dn} = Day-Night Level, L_{eq} = Equivalent Continuous Sound Level

¹ 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.

- ² Transportation projects subject to California Department of Transportation review or approval shall comply with the Federal Highway Administration noise standards for evaluation and abatement of noise impacts.
- ³ As determined for a typical worst-case hour during periods of use.
- ⁴ 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 (Caltrans 2013: 2-48).
- ⁵ Where it is not possible to reduce noise in outdoor activity areas to 60 dB L_{dn} or less using a practical application of the best available noise reduction measures, an exterior noise level of up to 65 dB L_{dn} may be allowed provided that available exterior noise level reduction measures have been implemented and interior noise levels are in compliance with this table.
- ⁶ 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.
- ⁷ The intent of this noise standard is to provide increased protection against sleep disturbance for residences located near railroad tracks.
- ⁸ In cases where the existing ambient noise level exceeds 60 dB, the maximum allowable project-related permanent increase in ambient noise levels shall be 3 dB L_{dn} .

Source: City of Elk Grove 2019: 8-57

- ▶ **Policy N-1-2:** Where noise mitigation measures are required to achieve the standards of Tables 8-3 and 8-4 [presented as Tables 3.6-3 and 3.6-4, respectively, in this SEIR], 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.

Table 3.6-4 Noise Level Performance Standards for New Projects Affected by or Including Non-Transportation Noise Sources*

Performance Standards for Stationary Sources	Noise Level Descriptor	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Performance Standards for Typical Stationary Noise Sources ¹	Hourly L_{eq} , dB	55 ^{3,4}	45 ^{3,4}
Performance Standards for Stationary Noise Sources Which Are Tonal, Impulsive, Repetitive, or Consist Primarily of Speech or Music ²	Hourly L_{eq} , dB	50 ^{3,4}	40 ^{3,4}

* Applies to noise-sensitive land uses only.

- ¹ 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.
- ² 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. HVAC/pool equipment are exempt from these standards.
- ³ These noise levels do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwelling). HVAC/pool equipment are exempt from these standards.
- ⁴ The City may impose noise level standards which are more or less restrictive based upon determination of existing low or high ambient noise levels.

Source: City of Elk Grove 2019: 8-58

- ▶ **Policy N-1-3:** Use the noise contour mapping identified in Figure 8-6 to inform land use decisions.
- ▶ **Policy N-1-4:** Protect noise-sensitive land uses, identified in Table 8-3 [presented as Table 3.6-3 in this SEIR], 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 [presented as Table 3.6-3] or the performance standards of Table 8-4 [presented as Table 3.6-4], 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 [presented as Table 3.6-4] 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 [presented as Table 3.6-4] shall not apply to transportation- and City infrastructure-related construction activities as long as construction occurs between the hours of 7:00 a.m. and 7:00 p.m., Monday through Friday, and 8:00 a.m. and 5:00 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 infeasible.
- ▶ **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.
- ▶ **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 [presented as Table 3.6-4 in this SEIR], 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 L_{dn} at the outdoor activity areas of noise-sensitive uses, a +5 dB L_{dn} increase in noise levels shall be considered significant; and
 - Where existing ambient noise levels range between 60 and 65 dB L_{dn} at the outdoor activity areas of noise-sensitive uses, a +3 dB L_{dn} increase in noise levels shall be considered significant; and
 - Where existing ambient noise levels are greater than 65 dB L_{dn} at the outdoor activity areas of noise-sensitive uses, a +1.5 dB L_{dn} increase in noise levels shall be considered significant. Public roadway improvements to alleviate traffic congestion and safety hazards shall utilize FHWA [Federal Highway Administration] noise standards to allow a reasonable dollar threshold per dwelling to be used in the evaluation and abatement of impacts.
 - The standards outlined in Table 8-4 [presented as Table 3.6-4 in this EIR] 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.

City of Elk Grove Municipal Code

Chapter 6.32 of the Elk Grove Municipal Code (EGMC) addresses noise generation in the City. Section 6.32.080 of the EGMC contains exterior noise standards for sensitive receptors, outlined in Table 6.32-1 [presented as Table 3.6-5 in this SEIR]. The metric of these standards is L_{eq} because they are identical to the noise level performance standards included in the General Plan presented in Table 3.6-4.

Table 3.6-5 Exterior Noise Standards for Sensitive Receptors¹

	7:00 am to 10:00 pm	10:00 pm to 7:00 am
Stationary noise sources, generally	55 dB	45 dB
Stationary noise sources which are tonal, impulsive, repetitive, or consist primarily of speech or music	50 dB	40 dB

Source: Section 6.32.080 of the Elk Grove Municipal Code

¹ Sensitive receptors are defined as receiving premises used for residential purposes and for nonresidential purposes that are sensitive to noise, including, but not limited to, residential dwellings, schools, hospitals, hotels, and community care facilities.

In the case that the measured ambient noise level exceeds the noise levels identified in Table 6.32-1 of the EGMC (presented as Table 3.6-5 in this SEIR), a maximum increase of 5-dBA is allowed where the ambient noise level is above that shown in the table but less than 60 dB. Where the ambient noise level is between sixty (60) dB and sixty-five (65) dB, inclusive, a maximum increase of three (3) dB above the ambient noise level is allowed. Finally, where the ambient noise level is greater than sixty-five (65) dB, a maximum increase of one and one-half (1.5) dB above the ambient noise level is allowed.

Section 6.32.100 of the EGMC provides the several exemptions to all noise regulations specified within Chapter 6.32.100 of the Code. Relevant to the Project, the exemption includes:

- ▶ activities conducted on parks, public playgrounds and school grounds, provided such parks, playgrounds and school grounds are owned and operated by a public entity or private school;
- ▶ any mechanical device, apparatus or equipment related to or connected with emergency activities or emergency work; the exemption does not include permanently installed emergency generators;
- ▶ noise sources associated with construction, repair, remodeling, demolition, paving, or grading of any real property, provided said activities only occur between the hours of 7:00 a.m. and 7:00 p.m. when located in close proximity to residential uses. Noise associated with these activities not located in close proximity to residential uses may occur between the hours of 6:00 a.m. and 8:00 p.m. However, when an unforeseen or unavoidable condition occurs during a construction project and the nature of the project necessitates that work in process be continued until a specific phase is completed, the contractor or owner shall be allowed to continue work after 7:00 p.m. and to operate machinery and equipment necessary until completion of the specific work in progress can be brought to conclusion under conditions which will not jeopardize inspection acceptance or create undue financial hardships for the contractor or owner;
- ▶ all transportation, flood control, and utility company maintenance and construction operation at any time on public rights-of-way, and those situations that may occur on private property deemed necessary to serve the best interest of the public and to protect the public's health and well-being, including debris and limb removal, removal of damaged poles and vehicles, removal of downed wires, repairing traffic signals, repair of water hydrants and mains, gas lines, oil lines, and sewers, restoring electrical service, street sweeping, unplugging sewers, vacuuming catch basins, etc. The regular testing of motorized equipment and pumps shall not be exempt;
- ▶ noise sources associated with the authorized collection of solid waste (e.g., refuse and garbage); and
- ▶ noise sources associated with the minor maintenance and operation of residential real property, including but not limited to pool equipment and heating and air conditioning units. Additionally, yard maintenance equipment and other power tools may be allowed provided the activities take place between the hours of 7:00 a.m. and 10:00 p.m.

Section 6.32.110 of the EGMC pertains to the operation of machinery, equipment, fans, and air conditioning.

- ▶ Except as otherwise provided, it is unlawful for any person to operate any mechanical equipment, pump, fan, air conditioning apparatus, stationary pumps, stationary cooling towers, stationary compressors, similar mechanical devices, or any combination thereof in any manner so as to create any noise which would cause the maximum noise level to exceed a maximum limit of fifty-five (55) dBA.

Section 6.32.140 of the EGMC prohibits the following activities which are relevant to the Project:

- ▶ operating or causing the operation of tools or equipment on private property used in alteration, construction, demolition, drilling or repair work daily between the hours of 7:00 p.m. and 7:00 a.m. when located in close proximity to residential uses, or between the hours of 8:00 p.m. and 6:00 a.m. when not located in close proximity to residential uses, so that the sound creates a noise disturbance across a residential property line, except for emergency work of public service utilities. However, when an unforeseen or unavoidable condition occurs during a construction project and the nature of the project necessitates that work in process be continued until a specific phase is completed, the contractor or owner shall be allowed to continue work after 8:00 p.m. and to operate machinery and equipment necessary until completion of the specific work in progress can be brought to conclusion under conditions which will not jeopardize inspection acceptance or create undue financial hardships for the contractor or owner.
- ▶ loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, garbage cans, or similar objects on private property between the hours of 10:00 p.m. and 7:00 a.m. in a manner to cause a noise disturbance.

City of Elk Grove Standard Construction Specifications Manual

The Elk Grove Standard Construction Specifications Manual (City of Elk Grove 2022) includes the following standards that are applicable to the Project and noise:

- ▶ **Section 7-8.01: Allowable Times and Hours of Work.** Unless otherwise noted in the Special Provisions or approved by the City, no work shall be done between the hours of 6:00 p.m. and 7:00 a.m., or on Saturdays, Sundays, or legal holidays. Unless otherwise noted in the Special Provisions or approved by the City, no lane of traffic shall be closed to the public during the peak hours of 7:00 a.m. to 8:30 a.m. and 3:00 p.m. to 6:00 p.m., except as necessary for the proper care and protection of work already performed or in case of an emergency repair as defined below. Exceptions are allowed only with the City's written permission.
- ▶ **Section 7-8.02: Off-Period Work.** A written request to work between 6:00 p.m. and 7:00 a.m. or on Saturdays, Sundays, or legal holidays, or to close a lane of traffic during peak hours must be submitted at least two (2) Working Days in advance of the intended work. The City will evaluate the Contractor's request to determine if there is a benefit to the City, a nuisance or a hazard to the public, the project, or the area surrounding the site, and if the Contractor should pay any City overtime costs related to the off-period work. The City may place conditions on any approval of off-period work based on this analysis.
- ▶ **Section 10-6: Noise Control.** The Contractor shall comply with all local noise control and noise level rules, regulations, and ordinances that apply to the Work. The Special Provisions may contain specific or additional requirements. Internal combustion engines used for any purpose on the Work must be equipped with a muffler recommended by the manufacturer.

3.6.2 Environmental Setting

ACOUSTIC FUNDAMENTALS

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

Sound, Noise, and Acoustics

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

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors

affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

Frequency

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

Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. A logarithmic scale is used to describe sound pressure level (SPL) in terms of decibels (dB). Because decibels are logarithmic units, SPLs cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness at the same time, the resulting sound level at a given distance would be 3 dB higher than if only one of the sound sources was producing sound under the same conditions. For example, if one idling truck generates an SPL of 70 dB, two trucks idling simultaneously would not produce 140 dB; rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together produce a sound level approximately 5 dB louder than one source.

A-Weighted Decibels

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

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

The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgment correlates well with the A-scale sound levels of those sounds. Thus, noise levels are typically reported in terms of A-weighted decibels. All sound levels discussed in this section are expressed in A-weighted decibels. Table 3.6-6 describes typical A-weighted noise levels for various noise sources.

Table 3.6-6 Typical A-Weighted Noise Levels

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

Source: Caltrans 2013: Table 2-5.

Human Response to Changes in Noise Levels

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 can 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 2013: 2-18). 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 (Caltrans 2013: 2-10). Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3-dB increase in sound would generally be perceived as barely detectable.

Vibration

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

Vibration amplitudes are commonly expressed in peak particle velocity (PPV) or root-mean-square (RMS) vibration velocity. PPV and RMS vibration velocity are normally described in inches per second (in/sec) or in millimeters per second. PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is typically used in the monitoring of transient and impact vibration and has been found to correlate well to the stresses experienced by buildings (FTA 2018: 110, Caltrans 2013: 6].

Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a 1-second period. As with airborne sound, the RMS velocity is often expressed in decibel notation as vibration decibels (VdB), which serves to compress the range of numbers required to describe vibration (FTA 2018: 7-4; Caltrans 2020: 7). This is based on a reference value of 1 micro inch per second.

The typical background vibration-velocity level in residential areas is approximately 50 VdB. Ground vibration is normally perceptible to humans at approximately 65 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels (FTA 2018: 7-8; Caltrans 2020: 27).

Typical outdoor sources of perceptible ground vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur to fragile buildings. Construction activities can generate sufficient ground vibrations to pose a risk to nearby structures. Constant or transient vibrations can weaken structures, crack facades, and disturb occupants (FTA 2018: 7-5).

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

Table 3.6-7 summarizes the general human response to different ground vibration-velocity levels.

Table 3.6-7 Human Response to Different Levels of Ground Noise and Vibration

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

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

Source: FTA 2018: 7-8

Common Noise Descriptors

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

Equivalent Continuous Sound Level (L_{eq}): L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound level that occurs during the same period (Caltrans 2013: 2-48). For instance, the 1-hour equivalent sound level, also referred to as the hourly L_{eq} , is the energy average of sound levels occurring during a 1-hour period and is the basis for noise abatement criteria used by California Department of Transportation (Caltrans) and Federal Transit Administration (FTA) (Caltrans 2013: 2-47; FTA 2018: 210).

Maximum Sound Level (L_{max}): L_{max} is the highest instantaneous sound level measured during a specified period (Caltrans 2013: 2-48; FTA 2018: 207–208).

Day-Night Level (L_{dn}): L_{dn} is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10-dB “penalty” applied to sound levels occurring during nighttime hours between 10:00 p.m. and 7:00 a.m. (Caltrans 2013: 2-48; FTA 2018: 214).

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 sound levels occurring during the nighttime hours between 10:00 p.m. and 7:00 a.m. and a 5-dB penalty applied to the sound levels occurring during evening hours between 7:00 p.m. and 10:00 p.m. (Caltrans 2020).

Sound Propagation

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

Geometric Spreading

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 dB for each doubling of distance from a point source. Roads and highways consist of several localized noise sources on a defined path and hence can be treated as a line source, which approximates the effect of several point sources, thus propagating at a slower rate in comparison to a point source. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source.

Ground Absorption

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

Atmospheric Effects

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

Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receiver attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction (Caltrans 2013: 2-41; FTA 2018: 42). Barriers higher than the line of sight provide increased noise reduction (FTA 2018: 2-12). Vegetation between the source and receiver is rarely effective in reducing noise because it does not create a solid barrier unless there are multiple rows of vegetation (FTA 2018: 15, 104, 106).

EXISTING NOISE ENVIRONMENT

Existing Noise- and Vibration-Sensitive Land Uses

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential 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. Additionally, the City of Elk Grove defines sensitive receptors as "receiving premises used for residential purposes and for nonresidential purposes that are sensitive to noise, including, but not limited to, residential dwellings, schools, hospitals, hotels, and community care facilities as those uses are defined in [EGMC] Title 23 (Zoning)." 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 Sources

The noise environment in the City and its 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 collocated adjacent to the two existing rail lines which traverse north-south through the City.

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/Bond Road, Elk Grove Boulevard, and Calvine Road. The major north-south roadways are Grant Line Road, Bond Road, Elk Grove-Florin Road, Bruceville Road, Bradshaw Road, and Franklin Boulevard. SR 99 traverses north-south through the City, 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 traverses 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.

Table 3.6-8 depicts estimated 2019 average-daily traffic noise levels (dB L_{dn}) at 50 feet from the near travel-lane centerline for major roadway segments adjacent to the development identified as part of the Project. The extent to which nearby land uses are affected by 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.

Table 3.6-8 2019 Traffic Noise Levels

Roadway	From	To	L_{dn} at 50 Feet from Near-Travel-Lane Centerline ¹ (dB L_{dn})	Noise Contour Distance in Feet		
			Existing Conditions (2019)	60 dB	65 dB	70 dB
Laguna Boulevard	Harbour Point Dr	Franklin Blvd	72.0	783	248	78
	Franklin Blvd	Bruceville Rd	72.2	827	262	83
	Bruceville Rd	Big Horn Blvd	72.8	946	299	95
	Big Horn Blvd	Laguna Springs Dr	74.1	1294	409	129
Bond Rd	E. Stockton Blvd	Emerald Crest Dr	72.4	871	275	87
	Elk Grove Florin Rd	Waterman Rd	70.9	620	196	62
	Waterman Rd	Bradshaw Rd	67.9	307	97	31
	Bradshaw Rd	Grant Line Rd	64.0	127	40	13
Elk Grove Blvd	Harbour Point Dr	Franklin Blvd	73.5	1110	351	111
	Franklin Blvd	Bruceville Rd	73.7	1167	369	117
	Bruceville Rd	Big Horn Blvd	74.2	1312	415	131
	Laguna Springs Dr	SR 99	75.0	1571	497	157
	E. Stockton Blvd	Elk Grove Florin Rd	68.8	381	120	38
	Elk Grove Florin Rd	Waterman Rd	63.0	100	32	10
	Bradshaw Rd	Grant Line Rd	60.7	59	19	6

Roadway	From	To	L _{dn} at 50 Feet from Near-Travel-Lane Centerline ¹ (dB L _{dn})	Noise Contour Distance in Feet		
			Existing Conditions (2019)	60 dB	65 dB	70 dB
Bilby Rd	Franklin Blvd	Willard Pkwy	60.8	60	19	6
	Willard Pkwy	Bruceville Rd	67.8	304	96	30
Kammerer Rd	Bruceville Rd	Promenade Pkwy	68.8	383	121	38
	Promenade Pkwy	SR 99	72.2	832	263	83
Grant Line Rd	E. Stockton Blvd	Waterman Rd	74.0	1264	400	126
Sheldon Rd	Lewis Stein Rd	SR 99	72.7	937	296	94
	Elk Grove Florin Rd	Waterman Rd	68.6	360	114	36
Franklin Blvd	Big Horn Blvd	Laguna Blvd	70.8	606	192	61
	Laguna Blvd	Elk Grove Blvd	70.1	508	161	51
	Elk Grove Blvd	Whitelock Pkwy	70.3	538	170	54
Bruceville Rd	Big Horn Blvd	Laguna Blvd	70.4	544	172	54
	Laguna Blvd	Elk Grove Blvd	69.7	471	149	47
	Elk Grove Blvd	Whitelock Pkwy	69.7	462	146	46
	Whitelock Pkwy	Bilby Road	66.2	209	66	21
Big Horn Boulevard	Lewis Stein Rd	Laguna Blvd	67.4	276	87	28
	Laguna Blvd	Longleaf Dr	69.0	395	125	39
	Elk Grove Blvd	Civic Center Dr	69.0	397	125	40
	Lotz Pkwy	Whitelock Pkwy	67.4	275	87	27
Power Inn Rd	Aubury Dr	Sheldon Rd	63.5	112	36	11
Elk Grove Florin Rd	Calvine Rd	Sheldon Rd	71.6	725	229	73
	Sheldon Rd	Bond Rd	70.8	599	189	60
	Bond Rd	Elk Grove Blvd	66.5	222	70	22
	Valley Oak Lane	E. Stockton Blvd	61.8	75	24	7
Waterman Rd	Sheldon Rd	Bond Rd	70.6	572	181	57
	Bond Rd	Elk Grove Blvd	70.5	564	178	56
	Mosher Rd	Grant Line Rd	65.7	187	59	19
Bradshaw Rd	Sheldon Rd	Bond Rd	71.6	727	230	73
	Elk Grove Blvd	Grant Line Rd	68.7	370	117	37
Harbour Point Dr	Laguna Blvd	Babson Dr	66.6	231	73	23
Willard Pkwy	Whitelock Pkwy	Blossom Ridge Dr	67.3	268	85	27
	Blossom Ridge Dr	Bilby Rd	66.8	239	75	24
Civic Center Drive	Bruceville Rd	Wymark Dr	61.2	65	21	7
	Wymark Dr	Big Horn Blvd	61.8	75	24	7
	Big Horn Blvd	Laguna Springs Dr	58.6	36	11	4
Lotz Pkwy	Big Horn Blvd	Laguna Springs Dr	61.4	69	22	7
	Laguna Springs Dr	Whitelock Pkwy	60.4	54	17	5

Roadway	From	To	L _{dn} at 50 Feet from Near-Travel-Lane Centerline ¹ (dB L _{dn})	Noise Contour Distance in Feet		
			Existing Conditions (2019)	60 dB	65 dB	70 dB
Whitelock Pkwy	Franklin Blvd	Bruceville Rd	67.2	261	82	26
	Bruceville Rd	Big Horn Blvd	66.7	236	75	24
	Big Horn Blvd	Lotz Pkwy	63.3	106	34	11
W. Stockton Blvd	Lewis Stein Rd	Michener Way	61.3	68	21	7
	Dunisch Rd	Laguna Blvd	61.3	68	21	7
	Whitelock Pkwy	Kyler Rd	63.1	102	32	10
Poppy Ridge Road	Bruceville Rd	Cosby Wy	56.1	21	6	2
Promenade Pkwy	Kyler Rd	Krammerer Rd	66.6	226	72	23
Laguna Springs Blvd	Laguna Blvd	Longleaf Dr	66.7	236	75	24
	Longleaf Dr	Elk Grove Blvd	63.3	108	34	11
	Elk Grove Blvd	Civic Center Dr	62.9	97	31	10
Auto Center Dr	Elk Grove Blvd	W. Stockton Blvd	65.3	168	53	17
Lewis Stein Rd	Sheldon Rd	W. Stockton Blvd	65.6	181	57	18
E. Stockton Blvd	Marketplace 99 South	Bond Rd	64.7	147	47	15
	Bond Rd	Banff Vista Dr	63.3	108	34	11
	Elk Grove Blvd	SR 99 NB Ramps	68.1	323	102	32
	Elk Grove Florin Rd	Grant Line Rd	64.3	134	42	13
Emerald Vist Dr	E. Stockton Blvd	Elk Grove Blvd	64.0	126	40	13
Mosher Road	Waterman Rd	Grant Line Rd	60.5	56	18	6
Krammerer Rd Extension	Willard Pkwy	Bruceville Rd	--	--	--	--

Notes: SR = State Route; dB = a-weighted decibels; L_{dn} = Day-Night Level

Gray shaded cells reflect roadway segments that were analyzed in the City of Elk Grove General Plan

All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow, and does not account for shielding of any type or finite roadway adjustments. All noise levels are reported as A-weighted noise levels.

Source: Modeled by Ascent, Inc. (2022); based on traffic data provided by Fehr & Peers (2023).

Rail Noise

Two active rail lines are present in the City – one in the central portion and one in the western portion. The central line traverses north–south and enters the City at SR 99. 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 line is operated by Union Pacific Railroad (UPRR) and 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 four daily passenger train trips; this service has since been converted to thruway bus service due to reduced demand caused by the COVID-19 pandemic. Except for Grant Line Road, these crossings occur at grade.

The UPRR line in the western portion of the Planning Area traverses 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. The crossings at Elk Grove Boulevard and Laguna Boulevard are grade-separated.

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 is one public airport and two private airports within 3 miles of the Planning Area. They are Franklin Field, which is public, and Sky Way Estates Airport and Borges-Clarksburg Airport, which are private. Sacramento Executive Airport, a public use airport, is approximately 6 miles north-northwest of the City, and Sacramento International Airport, a high-traffic airport, is approximately 20 miles north-northwest. Franklin Field, Sacramento Executive, and Sacramento International airport noise contours do not extend into the City of Elk Grove (Sacramento Area Council of Governments [SACOG] 1992, SACOG 1999). The Borges-Clarksburg Airport had about 3,000 general aviation operations in 2001, with 18 aircraft based in the field (SkyVector 2022). Operation data was not located for Sky Way Estates Airport, but only 8 aircraft are based in the field (Ainrav 2022). The low number of operations and number of aircraft based at these two fields, and their distance from the City of Elk Grove, indicates that noise generation within the City from these airports is minimal.

Construction Noise Sources

Construction activities are a regular and ongoing source of noise in the developing areas of 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 and upon completion of construction activity, noise exposure ceases. Table 3.6-9 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 dB (EPA 1971).

Table 3.6-9 Noise Ranges of Typical Construction Equipment

Construction Equipment	Noise Levels at dBA Leq at 50 feet
Front Loader	72–86
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. 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).

Ambient Noise Levels

As part of the evaluation of Elk Grove's General Plan Update, long- and short-term noise measurements were taken in 2015 to characterize noise conditions across the Planning Area. The General Plan Draft EIR, released in July 2018, explained that the 2015 measurements were adequate at the time because 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, but that these generally do not drastically change from year to year. Furthermore, these measurements are used to provide a representative idea of the variation in noise levels across the Planning Area for the purposes of this analysis. As a result, those noise measurements are still relevant for this analysis. A summary of measurement data is provided in Table 3.6-10. The long-term noise measurement 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. The eight long-term monitoring locations included residential, commercial, and industrial portions of the Planning Area. Short-term noise measurements were taken at 20 locations that generally represent residential areas in the Planning Area where ambient noise levels were anticipated to be lower than those along major transportation corridors and commercial areas (City of Elk Grove 2018).

Table 3.6-10 Summary of Ambient Noise Measurement Data

Noise Measurement	Range of Noise Levels (dBA)
Long-term Ambient Noise, 24-hour L_{dq}	61–78
Short-term Ambient Noise (L_{eq})	50–71

Note: 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 (Caltrans 2013: 2-48). For instance, the 1-hour equivalent sound level, also referred to as the hourly L_{eq} , is the energy average of sound levels occurring during a 1-hour period and is the basis for noise abatement criteria used by California Department of Transportation (Caltrans) and Federal Transit Administration (FTA) (Caltrans 2013: 2-47; FTA 2018: 2-19).

Source: City of Elk Grove 2018.

3.6.3 Environmental Impacts and Mitigation Measures

METHODOLOGY

This impact analysis is based primarily on review of the analysis presented in the General Plan EIR as well as EIRs prepared the Southeast Policy Area Strategic Plan, Laguna Ridge Specific Plan, and Lent Ranch Special Planning Area.

Construction Noise and Vibration

To assess potential short-term construction-related noise and vibration impacts, typical Project-generated construction source noise and vibration levels were determined based on methodologies, reference emission levels, and usage factors

from FTA's *Guide on Transit Noise and Vibration Impact Assessment* methodology (FTA 2018) and FHWA's *Roadway Construction Noise Model User's Guide* (FHWA 2006). Reference levels for noise and vibration emissions for specific equipment or activity types are well documented and the usage thereof common practice in the field of acoustics.

Operational Noise and Vibration

Non-Transportation Noise

With respect to non-transportation noise sources (e.g., stationary) associated with project implementation, the assessment of long-term (operational-related) impacts was based on reconnaissance data, reference noise emission levels, and measured noise levels for activities and equipment associated with project operation (e.g., building mechanical equipment), and standard attenuation rates and modeling techniques.

Transportation Noise

To assess potential long-term (operational) noise impacts from Project-generated increases in traffic, noise levels were calculated using the FHWA roadway noise prediction model based on California vehicle reference noise emission factors. The analysis is based on the reference noise emission levels for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and ground attenuation factors. Truck usage and vehicle speeds on area roadways were estimated from field observations and the Project-specific traffic report (Appendix C). Modeling does not account for any natural or human-made shielding (e.g., the presence of walls or buildings) or reflection off building surfaces and thus represents a conservative estimation of traffic noise.

Increases in traffic noise levels attributable to the Project were analyzed using roadway traffic data included in the City's General Plan EIR (i.e., baseline) as well as Plus Project roadway traffic data provided in the Project traffic study. New vehicle trips generated by the Project were added to traffic volumes modeled as part of General Plan EIR to analyze the roadway traffic noise level increases on affected roadways that would be associated with the Project. Projected traffic noise level increases were then compared to the City's transportation noise standards (see Section 3.6.1) to identify whether any standards were exceeded and any new or substantially more severe impacts would result from the Project.

THRESHOLDS OF SIGNIFICANCE

For projects undertaken by the City of Elk Grove, City noise standards are reasonable and appropriate thresholds for determination of significance. Therefore, a noise impact is considered significant if implementation of the Project would result in any of the following:

- ▶ construction-generated noise levels at residential receivers exceeding 50 dB L_{eq} or 65 dB L_{max} (the City's nighttime standards for fixed noise sources as shown in Table 3.6-5) during non-exempt nighttime hours from 7:00 p.m. to 7:00 a.m., Monday through Saturday, as defined in the City's Code of Ordinances;
- ▶ long-term, traffic-generated noise levels exceeding the outdoor and interior noise standards for transportation noise sources as specified in Table 3.6-3 or an increase in ambient-noise levels of more than the allowable noise increment at nearby existing noise-sensitive land uses as specified in Policy N-2-2 in the City's General Plan;
- ▶ long-term noise levels generated by stationary or area sources that exceed City standards for fixed noise sources, shown in Table 3.6-5, at existing noise-sensitive land uses;
- ▶ construction-generated or operational vibration levels exceeding Caltrans's recommended standards with respect to the prevention of structural building damage (shown in Table 3.6-2) or human response (shown in Table 3.6-3) at nearby vibration-sensitive land uses;
- ▶ for a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels; or
- ▶ for a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels.

ISSUES NOT DISCUSSED FURTHER

Airport Noise

As described above, Franklin Field, Sacramento Executive, and Sacramento International airport noise contours do not extend into the City of Elk Grove, and noise generation from Sky Way Estates Airport and Borges-Clarksburg Airport within the City of Elk Grove is minimal. As a result, noise impacts due to proximity to public and private airports and airstrips is not discussed further.

General Plan Amendments for VMT

The Project would include revisions to General Plan Chapter 6, "Mobility," to incorporate results of the upgraded Travel Demand Model to SACSIM19. EGSIM20 is the City of Elk Grove Travel Demand Model, which is a modified version of the Sacramento Area of Governments SACIM19 Travel Demand Model. Thus, changes to VMT thresholds resulting from the Project apply only to the transportation efficiency of land uses and do not involve alteration of land use conditions that could result in a noise impact. As a result, there would be no impacts from updating the VMT thresholds. This issue is not discussed further.

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact 3.6-1: Construction Activities Could Result in a Substantial Temporary Increase in Noise Levels at Nearby Noise-Sensitive Land Uses

The General Plan EIR determined that the potential noise generation from construction activities could result in a substantial temporary increase in noise levels, but impacts would be less than significant with adherence to the EGMC and General Plan policies. Potential construction noise impacts would be reduced by adherence to the EGMC and General Plan Policy N-1-7, which 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. Additionally, the City may require site-specific assessment and mitigation for future development under the Project to reduce construction noise. Finally, development facilitated by the Project would be subject to Policy N-1-8 that may require applicants to assess and minimize potential construction noise impacts on nearby sensitive receivers. Construction activities associated with implementation of the Project would be similar to construction activities anticipated under the current General Plan and would be required to comply with these standards as well as General Plan Policy N-1-7 and N-1-8. and would not result in new or substantially more several impacts related to construction noise. This impact would remain **less than significant**.

LEA Community Plan Area

The Project involves the development of a new community plan area which would provide a walkable urban area in the City with a variety of mobility options and neighborhood streets using the urban planning concept of the transect. The LEA Community Plan includes new land use designations and new growth areas that would have construction activity as future development projects are approved. Development in the LEA Community Plan Area would include planned construction of new roadways and expansion of existing roadways. However, implementation of the LEA Community Plan and the associated policies would not expand the development footprint or construction activities beyond what was addressed in the impact analysis of the General Plan EIR. These noise impacts from construction activities were identified in Impact 5.10.1 of the General Plan EIR.

Construction noise associated with development facilitated by the Project would be temporary in nature and 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, with the loudest phases being grading, excavation, and demolition. Construction noise can be disruptive to sensitive receivers during all hours of the day. Additionally, because exterior ambient noise levels typically decrease during the nighttime hours (i.e., 7:00 p.m. to 7:00 a.m.) 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. As shown in Table 3.6-9 typical noise levels generated by commonly

used construction equipment would range from 68 dB to 107 dB. In accordance with City standards the majority of construction activities would occur during daytime hours, when sensitive receivers are less sensitive to increased noise levels. However, nighttime construction may be required and may occur in limited situations if there are scheduling issues with tasks that must be done continuously until completed such as concrete pours. Nighttime construction would occur on a case-by-case basis as permitted by the City, and is not analyzed further.

The EGMC and Elk Grove Standard Construction Specifications Manual include standards for noise-related activities, including exemptions for intermittent noise sources such as construction activities. EGMC Chapter 6.32.100 contained in Title 6, Health and Sanitation, exempts construction noise from the standards set forth in the EGMC between the hours of 6:00 a.m. and 8:00 p.m. If construction occurs in close proximity to residential uses, it is exempt between the hours of 7:00 a.m. to 7:00 p.m. pursuant to General Plan Policy N-1-7. As detailed in Section 6.32.100 of the EGMC, there is also an exemption for unforeseen or unavoidable conditions during construction when the nature of the project necessitates that work continue until completion of a specific phase subject to approval by the City. Adherence to construction noise requirements in the EGMC would reduce the potential for construction noise to occur at the more-sensitive times of day. General Plan Policy N-1-8 would further protect current and future sensitive land uses from construction noise impacts. Under Policy N-1-8, development projects that are subject to discretionary review would be required to assess potential construction noise impacts on nearby sensitive uses and to minimize impacts on those uses.

Since there are no detailed construction plans for the Project it is not possible to determine the exact noise levels from project construction. A standard construction noise scenario 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. Results show that the operation of these five pieces of equipment could result in noise levels as high as 87 L_{eq} dB at 50 feet. Thus, construction noise levels would be loud enough to potentially affect nearby sensitive receivers.

Portions of the LEA Community Plan Area have been previously analyzed in certified CEQA documents for the following projects: Southeast Policy Area Strategic Plan, Laguna Ridge Specific Plan, SouthPoint Policy Area/Sterling Meadows, and Lent Ranch Marketplace Special Planning Area. Mitigation measures from these CEQA documents, as shown in Appendix G, include requirements to reduce construction noise. Mitigation Measure 3.6-1 "Construction Noise Reduction Measures" has been drafted for this SEIR to combine construction noise requirements from previous CEQA documents prepared for the Southeast Policy Area Strategic Plan, Laguna Ridge Specific Plan, and Lent Ranch Marketplace Special Planning Area. This measure contains the same performance standards and is equivalent in effectiveness as mitigation contained in the prior environmental documents. Mitigation Measure 3.6-1 is only applicable to the LEA Community Plan Area and does not supersede mitigation requirements for the other community plan areas outside of the LEA Community Plan Area.

In summary, future construction activity associated with buildout of the Project would be temporary, intermittent, and vary in size and characteristics depending on the type of development. Existing receivers and sensitive land uses may be adversely affected by anticipated noise levels during 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, and unforeseen circumstances necessitating work past 7:00 p.m. is also generally exempt, as provided under the EGMC 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 addition, Mitigation Measure 3.6-1 would require construction noise control measures to reduce temporary noise at nearby receivers. There is no new significant effect, and the impact is not substantially more severe than the impact identified in the General Plan EIR because, similar to what was identified in the General Plan EIR, the construction noise would be consistent with what is allowed in the EGMC and General Plan. This impact would remain **less than significant**.

General Plan Land Use Designation Amendments

Construction noise anticipated to occur from proposed General Plan land use amendments is included in the overall construction equipment noise modeling associated with the Project. As discussed above under, LEA Community Plan,

impacts from construction noise would be less than significant. There is no new significant effect and the impact is not more severe than the impact identified in the General Plan EIR. This impact would remain **less than significant**.

Grant Line Road Precise Roadway Study

The Precise Study was prepared to analyze potential geometric layouts along Grant Line Road. Buildout of roadway configurations, including all alternatives of the Precise Study, would result in similar noise levels from construction as those anticipated from the build out of the LEA Community Plan as discussed above. Therefore, impacts from construction noise would be less than significant. There is no new significant effect and the impact is not more severe than the impact identified in the General Plan EIR would remain **less than significant**.

South and West Study Areas

Construction noise anticipated within the South and West Study Areas is included in the overall construction equipment noise modeling associated with the Project. As discussed above under, LEA Community Plan, impacts from construction noise would be less than significant. There is no new significant effect and the impact is not more severe than the impact identified in the General Plan EIR would remain **less than significant**.

Mitigation Measures

Adherence to Mitigation Measure 3.6-1 would require specific projects within the LEA Community Plan Area to reduce construction near sensitive land uses. Mitigation Measure 3.6-1, in addition to compliance with General Plan Policy N-1-8, EGMC Section 6.32.100, and the Elk Grove Standard Construction Specifications Manual would reduce construction noise levels. Therefore, the impact to construction noise would remain **less than significant**.

Mitigation Measure 3.6-1 Construction Noise Reduction Measures for the LEA Community Plan Area

The following mitigation measures shall be implemented and specified on subsequent project building and improvement plans:

- ▶ Construction equipment shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and shrouds, in accordance with manufacturers' recommendations.
- ▶ Construction equipment staging areas shall be centrally located on the site or located at the farthest distance possible from nearby residential land uses.
- ▶ All motorized construction equipment and vehicles shall be turned off when not in use.
- ▶ To the extent feasible, alternative construction processes that generate lower noise levels shall be selected. Examples include the use of drilled piles as opposed to impact piles, use of electrified equipment as opposed to combustion engines, and temporary noise barriers or noise curtains installation such that they block the line of sight between the noise source and the receiver.
- ▶ Post visible signs along the perimeter of the construction site that disclose construction times and duration, as well as a contact number for a noise complaint and enforcement manager. The on-site noise complaint and enforcement manager's duties shall include documenting noise complaints, responding to and investigating noise-related complaints, implementing any feasible and appropriate measures to reduce noise at the receiving land uses, and reporting the complaints to City staff on a weekly basis.

Significance after Mitigation

The impact to construction noise would remain **less than significant**.

Impact 3.6-2: Traffic Noise

General Plan EIR Impact 5.10.2 identified that implementation of the General Plan would result in a significant and unavoidable increase in transportation noise, including traffic noise levels along many existing roadways in the City. Further, Impact 5.10.2 notes that the General Plan includes a set of policies that 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. The policies include Policy N-1-1, Policy N-1-2, Policy N-1-4, Policy N-1-5, Policy N-1-6, and Policy N-2-2. Implementation of the Project would result in an exceedance of the City's traffic noise standard as identified in General Plan Policy N-2-2 and an increase in traffic noise as compared to roadway segments analyzed in the General Plan EIR. Therefore, the Project would result in substantially more severe traffic noise impacts than the General Plan EIR. Impacts would be **significant and unavoidable**.

LEA Community Plan Area

The 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 traffic volumes on I-5 and SR 99. Buildout anticipated by the Project would also result in new roadways in the LEA Community Plan Area which would increase traffic volumes on new and existing City roadways. These increased traffic volumes could expose existing and future sensitive receivers 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 detailed in the Regulatory Setting, the doubling of sound energy results in a 3-dB increase in the sound level and is generally perceptible. This could result in an adverse effect to humans especially during nighttime hours when people typically sleep.

General Plan EIR Impact 5.10.2 identified that implementation of the General Plan would result in a significant increase in transportation noise, including traffic noise levels along many existing roadways in the City. The General Plan EIR found that the buildout of the General Plan would increase traffic noise at all roadway segments above the City's exterior noise standard (60 dB L_{dn}) for residential and other noise-sensitive land uses. See Table 3.6-3 for the full list of noise standards by land uses.

Table 3.6-11 includes modeled traffic noise levels for General Plan buildout and Plus Project conditions, which includes land use designation changes associated with LEA Community Plan as well as the Old Town Policy Area and other proposed land use changes. Buildout of the General Plan would increase traffic noise levels to above the 60 dB L_{dn} standard for all roadway segments analyzed in the General Plan EIR. The Project would also result in increases in traffic noise levels along roadways that are already anticipated in the General Plan EIR to be above the City's 60 dB L_{dn} exterior threshold for sensitive land uses (see Appendix F for traffic noise modeling assumptions and results). Additionally, existing traffic noise levels adjacent to many of the major roadways in the City currently exceed the City's noise standard (60 dB L_{dn}) (see Table 3.6-8). As shown in Table 3.6-11 traffic noise levels on several roadways would decrease from buildout of the Project as compared to the existing General Plan. This would occur because the Project would result in a redistribution of trips to other roadways such that there would be a reduction in traffic noise on several roadway segments analyzed in the General Plan EIR.

However, similar to roadway segments analyzed in the General Plan EIR the Project would result in an increase in noise on the majority of roadway segments as compared to existing conditions, shown in Table 3.6-8. Future roadway noise contours are shown in Figure 3.6-1 and traffic noise levels generated by the Project for all studied roadway segments are included in Appendix F for informational purposes.

Table 3.6-11 Predicted Increases in Traffic Noise Levels

Roadway	From	To	L _{dn} at 50 Feet from Near-Travel-Lane Centerline ¹ (dB L _{dn})		Noise Level Increase (dB)
			General Plan	General Plan Plus Project	
Elk Grove Blvd	Franklin Blvd	Bruceville Rd	73	74.2	1.2
	Bruceville Rd	Big Horn Blvd	74.6	74.5	-0.1
	E. Stockton Blvd	Elk Grove Florin Rd	71.3	69.7	-1.6
	Elk Grove Florin Rd	Waterman Rd	65.2	63.8	-1.4
	Bradshaw Rd	Grant Line Rd	62.4	67.2	4.8
Kammerer Rd	Promenade Pkwy	SR 99	77.4	78.9	1.5
Grant Line Rd	E. Stockton Blvd	Waterman Rd	77.5	79.0	1.5
Bruceville Rd	Big Horn Blvd	Laguna Blvd	70.8	72.4	1.6
	Laguna Blvd	Elk Grove Blvd	71	72.0	1.0
	Elk Grove Blvd	Whitelock Pkwy	71.3	71.4	0.1
	Whitelock Pkwy	Bilby Road	71.2	71.5	0.3
Big Horn Boulevard	Lotz Pkwy	Whitelock Pkwy	72.1	71.2	-0.9
Bilby Rd	Franklin Blvd	Willard Pkwy	64.5	56.1	-8.4
	Willard Pkwy	Bruceville Rd	71.9	62.7	-9.2
Bond Rd	Elk Grove Florin Rd	Waterman Rd	74.1	71.6	-2.5
	Waterman Rd	Bradshaw Rd	72.9	69.2	-3.7
Elk Grove Florin Rd	Calvine Rd	Sheldon Rd	74.3	73.6	-0.7
	Sheldon Rd	Bond Rd	72.1	72.5	0.4
	Bond Rd	Elk Grove Blvd	70.8	67.9	-2.9
Franklin Blvd	Big Horn Blvd	Laguna Blvd	71.4	71.5	0.1
	Laguna Blvd	Elk Grove Blvd	70.9	71.0	0.1
	Elk Grove Blvd	Whitelock Pkwy	68.8	71.9	3.1
Waterman Rd	Sheldon Rd	Bond Rd	69.4	72.1	2.7
	Bond Rd	Elk Grove Blvd	73.8	72.7	-1.1
Bradshaw Rd	Sheldon Rd	Bond Rd	76.3	74.0	-2.3
	Elk Grove Blvd	Grant Line Rd	76	73.2	-2.8
Laguna Blvd	Franklin Blvd	Bruceville Rd	71	72.6	1.6
	Bruceville Rd	Big Horn Blvd	70.4	73.2	2.8
	Big Horn Blvd	Laguna Springs Dr	73.2	74.4	1.2
Lotz Pkwy	Big Horn Blvd	Laguna Springs Dr	65.7	62.8	-2.9
	Laguna Springs Dr	Whitelock Pkwy	67.2	65.2	-2.0
Whitelock Pkwy	Franklin Blvd	Bruceville Rd	64.9	67.7	2.8
	Bruceville Rd	Big Horn Blvd	63.9	68.8	4.9
	Big Horn Blvd	Lotz Pkwy	67	69.8	2.8
Sheldon Rd	Lewis Stein Rd	SR 99	72.6	73.7	1.1
	Elk Grove Florin Rd	Waterman Rd	68.8	69.0	0.2
E. Stockton Blvd	Elk Grove Florin Rd	Grant Line Rd	69.7	67.2	-2.5
Mosher Road	Waterman Rd	Grant Line Rd	67.8	64.2	-3.6
Krammerer Rd Extension	Willard Pkwy	Bruceville Rd	74.8	72.0	-2.8

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

Source: Modeled by Ascent Environmental 2022.

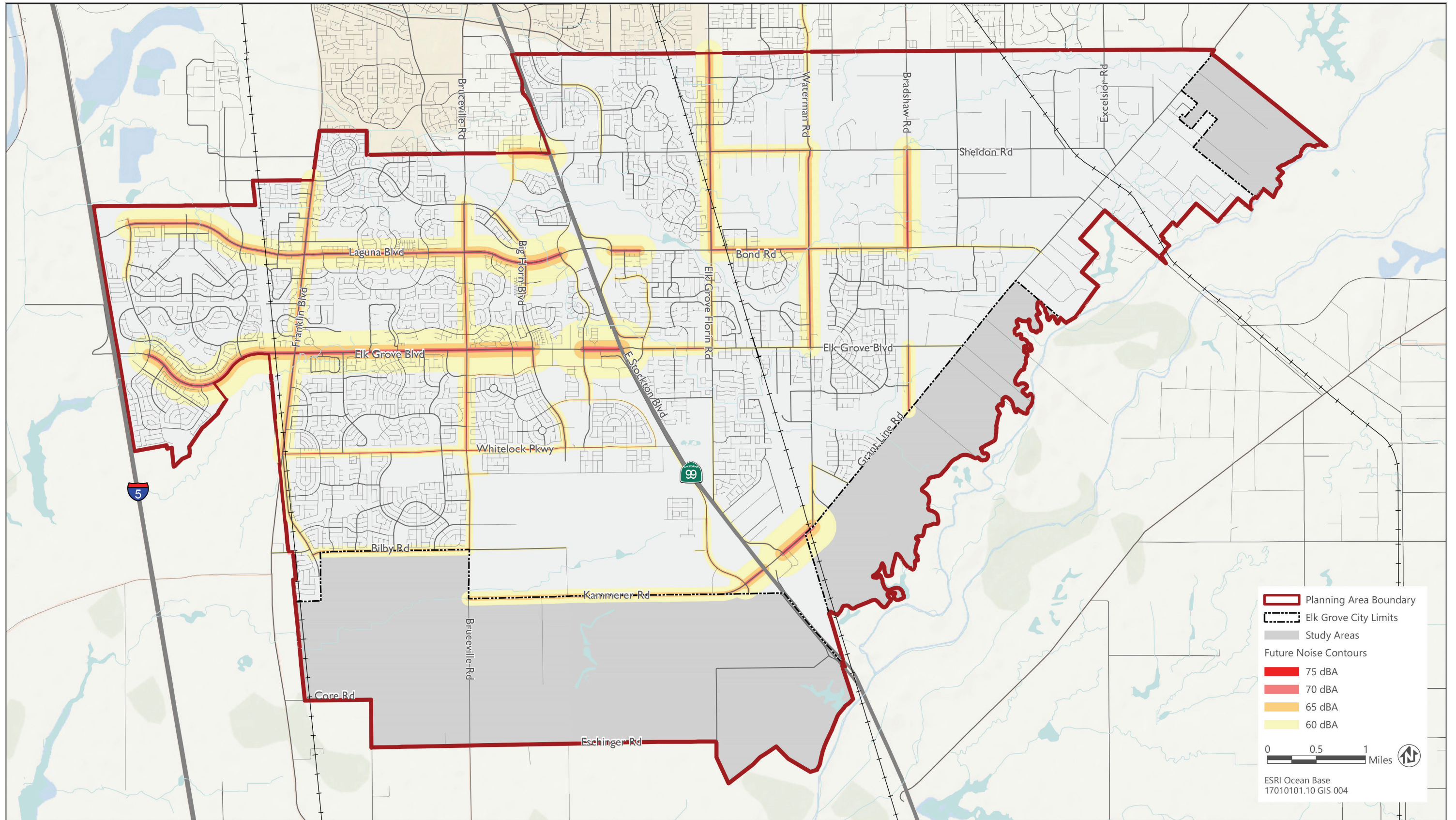
The General Plan includes a set of policies that are intended to ensure that new development would comply with noise standards and would not adversely impact sensitive land uses from traffic noise. These include Policy N-1-1, Policy N-1-2, Policy N-1-4, Policy N-1-5, and Policy N-2-3.

Policy N-1-1 requires that indoor and outdoor areas in new development be located, constructed, and/or shielded from noise sources in order to achieve compliance with the City's noise standards. Policy N-1-2 encourages development projects to use site planning and project design measures before considering using sound barriers to achieve noise standards. Policy N-1-4 and Policy N-1-5 requires the City to protect noise sensitive land uses that are designated in the General Plan. Policy N-2-3 encourages new development to consider alternatives aside from sound walls to reduce noise to acceptable levels in residential areas that were originally constructed without sound walls. However, the General Plan EIR found that while the General Plan policies listed above 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 for all locations of sensitive receptors. Therefore, this impact was determined to be significant and unavoidable.

As shown in Table 3.6-11, traffic generated from the Project would result in additional increases in traffic noise levels not previously analyzed as part of the General Plan EIR. Some roadway segments would result in traffic noise increases that would exceed the City's incremental increase noise standards as detailed in General Plan Policy N-2-2. Project traffic noise on the following roadway segments would exceed the thresholds identified in General Plan Policy N-2-2:

- ▶ Elk Grove Boulevard between Bradshaw Road and Grant Line Road
- ▶ Bruceville Road between Big Horn Boulevard and Laguna Boulevard
- ▶ Franklin Boulevard between Elk Grove Boulevard and Whitelock Parkway
- ▶ Waterman Road between Sheldon Road and Bond Road
- ▶ Laguna Boulevard between Franklin Boulevard and Bruceville Road
- ▶ Laguna Boulevard between Bruceville Road and Big Horn Boulevard
- ▶ Whitelock Parkway between Bruceville Road and Big Horn Boulevard
- ▶ Whitelock Parkway between Big Horn Boulevard and Lotz Pkwy

Portions of the LEA Community Plan Area have been previously analyzed in certified CEQA documents for the following projects: Southeast Policy Area Strategic Plan, Laguna Ridge Specific Plan, SouthPoint Policy Area/Sterling Meadows, and Lent Ranch Marketplace Special Planning Area. Mitigation measures from these CEQA documents, as shown in Appendix G, include requirements to reduce traffic noise associated with sensitive land uses. Mitigation Measure 3.6-2 "Operational Noise Reduction Measures" has been drafted for this SEIR to combine construction noise requirements from previous CEQA documents prepared for the Southeast Policy Area Strategic Plan, Laguna Ridge Specific Plan, and Lent Ranch Marketplace Special Planning Area. This measure contains the same performance standards and is equivalent in effectiveness as mitigation contained in the prior environmental documents. Mitigation Measure 3.6-2 is only applicable to the LEA Community Plan Area and does not supersede mitigation requirements for the other community plan areas outside of the LEA Community Plan Area.



Source: adapted by Ascent in 2023.

Figure 3.6-1 General Plan Future Noise Contours

The General Plan EIR determined the traffic noise impact to be significant and unavoidable. As detailed above, the traffic noise generated by the Project would similarly result in some roadway segments exceeding the City's incremental noise increase standard for traffic noise. Further, traffic noise from the Project would cause an additional exceedance of City noise standards for several roadway segments beyond what was determined in the General Plan EIR; thus exposing nearby receivers to higher noise levels than previously analyzed. As such, the Project would result in a substantial increase in severity of a previously identified significant impact. Although, all mitigation identified in the General Plan EIR would still be applicable, and subsequent project applications would be required to submit noise analyses and associated noise attenuation features as part of building plans and/or site designs that may include building treatments to meet City interior noise standards, sound barriers, or other site improvements (e.g., building orientation to address line of sight associated with noise sources), it cannot be ensured that all individual projects under the General Plan could reduce impacts from traffic noise. Therefore, this impact would be **significant and unavoidable**.

General Plan Land Use Designation Amendments

Traffic noise anticipated from the proposed General Plan land use amendments is included in the overall traffic noise modeling associated with the Old Town Policy Area (see Table 3.6-11). As shown in Table 3.6-11 roadways within the Old Town Policy Area would not result in a significant increase in noise from implementation of the Project. There is no new significant effect, and the impact is not more severe than the impact identified in the General Plan EIR. Impacts would be **significant and unavoidable**.

Grant Line Road Precise Roadway Study

The Precise Study was prepared to analyze potential geometric layouts along Grant Line Road. Buildout of roadway configurations, including all alternatives of the Precise Study, would not result in any changes to traffic noise because the proposed roadway configurations would not result in additional traffic on Grant Line Road. There is no new significant effect, and the impact is not more severe than the impact identified in the General Plan EIR. Impacts would remain **significant and unavoidable**.

South and West Study Areas

Traffic noise anticipated within the South and West Study Areas is included in the overall traffic noise modeling associated with the Project. As discussed above under, LEA Community Plan, impacts from traffic noise would exceed the City's noise standards and traffic noise levels determined in the General Plan EIR for roadway segments in the South and West Study Areas (Table 3.6-11). Therefore, the impact would be more severe than the impact identified in the General Plan EIR. Impacts would be **significant and unavoidable**.

Mitigation Measures

In addition to compliance with General Plan policies N-1-1, N-1-4, N-1-5, and N-2-3, development within the LEA Community Plan Area would be subject to Mitigation Measure 3.6-2. Even with application of this mitigation measure, Project impacts would increase the severity of General Plan EIR traffic noise impacts and would be **significant and unavoidable** as it cannot be ensured that all individual projects under the General Plan could reduce impacts from traffic noise.

Mitigation Measure 3.6-2 Operational Noise Reduction Measures for the LEA Community Plan Area

The City shall require acoustical assessments to be prepared as part of subsequent land use development projects in the LEA Community Plan Area. The acoustical assessments shall evaluate potential environmental noise impacts attributable to the subsequent project, anticipated traffic noise condition, stationary noise sources, and the compatibility of proposed land uses in comparison to applicable City noise standards. Where the acoustical analysis determines that noise levels would exceed applicable City noise standards, noise reduction measures shall be identified and included in the subsequent project. Such measures may include, but are not limited to, the incorporation of setbacks, sound barriers, berms, hourly limitations, or equipment enclosures. The emphasis of such measures shall be placed on site planning and Project design. The acoustical analysis shall be prepared in accordance with City requirements (Elk Grove Municipal Code and General Plan).

Significance after Mitigation

Impacts would be **significant and unavoidable**.

Impact 3.6-3: Future Development Could Expose Existing Noise-Sensitive Land Uses to New Non-Transportation Noise Sources that Could Exceed the City's Applicable Noise Standards

General Plan EIR Impact 5.10.3 determined that potential noise generation from future development could expose existing noise-sensitive land uses to new non-transportation noise sources that could exceed the City's applicable noise standards. Specific to residential land uses, the General Plan EIR identified lawn and garden equipment, voices, and amplified music as potential noise sources associated with residential land uses. Operational noise associated with commercial and industrial land uses typically consists of site-specific mechanical building equipment (e.g., heating equipment, HVAC systems) and other types of machinery. The General Plan EIR identified Section 6.32.110 of the EGMC as containing hourly noise standards that apply to non-transportation noise sources. Additionally, General Plan Policy N-2-1 indicates that noise created by new proposed non-transportation noise sources shall be mitigated so as not to exceed noise level standards. Development facilitated by the Project would be required to comply with these standards and would not result in new or substantially more severe noise impacts than addressed in the General Plan EIR. Project impacts would remain **less than significant**.

LEA Community Plan Area

The Project would allow for future development of land uses including residential, commercial, employment center/offices, and public services. Buildout of the Project could potentially result in the exposure of new or existing receivers and noise sensitive land uses to noise levels above the City's established threshold for outdoor noise exposure from non-transportation sources (see Table 3.6-5). 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.

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, depending on the specific characteristics of each residential area. Additionally, 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 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. Siting of new commercial and industrial uses as a result of the Project could result in new stationary and area sources as well as exposure of new sensitive land uses to existing stationary and area sources.

Non-transportation noise impacts from development from the General Plan were identified in Impact 5.10.3 of the General Plan EIR. As discussed in the General Plan EIR, Policy N-2-1 would require that noise created by new proposed non-transportation noise sources would be mitigated so as not to exceed the noise level standards presented in Table 3.6-5. Thus, implementation of General Plan Policy N-2-1 and compliance with EGMC Chapter 6.32, which limits the hours of the day when loading activities can take place as well as determines the maximum noise level for stationary equipment would limit noise impacts. Additionally, the type of land uses and associated development resulting from the Project would be consistent with what was analyzed under the General Plan EIR.

Portions of the LEA Community Plan Area have been previously analyzed in certified CEQA documents for the following projects: Southeast Policy Area Strategic Plan, Laguna Ridge Specific Plan, SouthPoint Policy Area/Sterling Meadows, and Lent Ranch Marketplace Special Planning Area. Mitigation measures from these CEQA documents include requirements related to preparation of acoustical assessments to evaluate operational noise standards and land use compatibility. A comprehensive list of mitigation measures from other community plans prior environmental review are included in Appendix G. Mitigation measures from the Laguna Ridge Specific Plan EIR include requirements to demonstrate future projects are in compliance with City noise standards. Southeast Policy Area Strategic Plan mitigation includes preparation of acoustical assessments for future development projects to evaluate operational noise impacts

and land use compatibility. Mitigation for the Lent Ranch Marketplace Special Planning Area includes requirements to reduce exterior and interior noise levels below the City's noise thresholds. Mitigation Measure 3.6-2 "Operational Noise Reduction Measures" has been drafted for this SEIR to combine construction noise requirements from previous CEQA documents prepared for the Southeast Policy Area Strategic Plan, Laguna Ridge Specific Plan, and Lent Ranch Marketplace Special Planning Area. This measure contains the same performance standards and is equivalent in effectiveness as mitigation contained in the prior environmental documents. Mitigation Measure 3.6-2 is only applicable to the LEA Community Plan Area and does not supersede mitigation requirements for the other community plan areas outside of the LEA Community Plan Area. There is no new significant effect, and the impact is not more severe than the impact identified in the General Plan EIR. This impact would remain **less than significant**.

General Plan Land Use Designation Amendments

Operational stationary noise anticipated from the proposed General Plan land use amendments is included in the overall stationary noise analysis associated with the Old Town Policy Area. As discussed above under, LEA Community Plan, impacts from long-term stationary noise would be less than significant. There is no new significant effect and the impact is not more severe than the impact identified in the General Plan EIR; therefore, the impact would remain **less than significant**.

Grant Line Road Precise Roadway Study

The Precise Study was prepared to analyze potential geometric layouts along Grant Line Road. Buildout of roadway configurations, including all alternatives of the Precise Study, would not result in any increased noise levels from non-transportation operational activity because the Precise Study would reconfigure the roadway and would not result in additional trips. There would be no impact. There is no new significant effect and the impact is not more severe than the impact identified in the General Plan EIR; therefore, the impact would remain **less than significant**.

South and West Study Areas

Stationary noise anticipated within the South and West Study Areas is included in the overall stationary noise analysis associated with the Project. As discussed above under, LEA Community Plan, impacts from long-term stationary noise would be less than significant. There is no new significant effect and the impact is not more severe than the impact identified in the General Plan EIR; therefore, the impact would remain **less than significant**.

Mitigation Measures

In addition to compliance with General Plan Policy N-2-1 and EGMC Section 6.32.110, development within the LEA Community Plan Area would be subject to Mitigation Measure 3.6-2, listed above under Impact 3.6-2, that would require subsequent projects to demonstrate compliance with City noise standards and not create a new significant noise sources. This impact would remain **less than significant**.

Significance after Mitigation

This impact would remain less than significant.

Impact 3.6-4: Result in Development Projects Involving that Could Expose Receptors to Excessive Groundborne Vibration

General Plan EIR Impact 5.10.4 determined that potential vibration generation from construction and operation could occur as a result of the Project. Long-term vibration was mainly associated with transit system routes and maintenance activities, and vibration from increased traffic would not be perceptible. Short-term vibration associated with construction could be substantial for activities such as pile driving and vibratory rolling. Adherence to Policy N-1.9 was identified as having a mitigating effect on construction vibration and the impact was determined to be less than significant. Implementation of the Project would be required to comply with these standards and would not result in new or substantially more severe vibration impacts. Project impacts would remain **less than significant**.

LEA Community Plan Area

The Project involves the development of a new community plan area which would provide a walkable urban area in the City with a variety of mobility options and neighborhood streets using the urban planning concept of the transect. The vibration standards in Table 3.6-2 are used by the City as significance thresholds for analyzing vibration impacts. As stated in the table, a vibration of 0.2 in/sec ppv or less typically will not result in structural damage. This same threshold also represents the level at which vibration would be potentially annoying to people in buildings. For most construction projects, groundborne vibration levels would not pose a significant risk to nearby structures or occupants. Construction activities often associated with development projects that do not require the use of pile drivers but involve equipment such as a large dozer, loaded trucks, and a jackhammer would typically generate ground vibration levels of approximately 0.09 in/sec ppv, or less, at 25 feet (FTA 2018). However, the construction of some facilities in the LEA Community Plan Area may require the use of construction equipment that can cause vibrational impacts (i.e., pile drivers) for construction of buildings up to 7 stories, as allowed by the LEA Community Plan. However, it is possible for buildings as tall as 7 stories to be constructed without using high vibratory equipment such as pile drivers. In addition to building construction, road improvement projects (e.g., constructing roadways) often require the use of vibratory rollers, which, when operated close to existing structures, can result in increased levels of annoyance. 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 (FTA 2018). 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. These vibration impacts were identified in General Plan EIR Impact 5.10.4.

As described in Elk Grove General Plan 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. EGMC Chapter 6.32.100 contained in Title 6, Health and Sanitation, exempts construction noise from the standards set forth in the EGMC 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; unforeseen circumstances necessitating work past 7:00 p.m. are also generally exempt. This would also reduce the potential for construction-related vibration to occur at the more-sensitive times of day. Subsequent projects would demonstrate compliance through including these requirements on building plans or improvement plans.

Long-term 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 2018). While the Project includes development 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. Development of the land uses themselves would not result in the long-term generation of vibration because residential and commercial land uses generally do not have substantial sources of vibration.

Portions of the LEA Community Plan Area have been previously analyzed in certified CEQA documents for the following projects: Southeast Policy Area Strategic Plan, Laguna Ridge Specific Plan, SouthPoint Policy Area/Sterling Meadows, and Lent Ranch Marketplace Special Planning Area. Mitigation measures from these CEQA documents include requirements related to reducing construction vibration. A comprehensive list of mitigation measures from other community plans prior environmental review are included in Appendix G. Mitigation measures from the Laguna Ridge Specific Plan EIR include an assessment of vibration from pile drivers during construction and Southeast Policy Area Strategic Plan mitigation includes preparation of a vibration assessment for projects that would involve major vibration generating equipment during construction (i.e., pile drivers). Mitigation for the Lent Ranch Marketplace Special Planning Area includes a requirement to prepare a vibration assessment for projects that include pile driving. Noise requirements contained in the Elk Grove General Plan policies and Elk Grove Municipal Code as described above, contain the same performance standards and are equivalent in effectiveness as mitigation contained in prior environmental documents. Specifically, Policy N-1-9 requires preparation of a project specific vibration assessment for

projects that would involve major vibratory generating equipment (i.e., pile driver). Therefore, no additional mitigation is required in the LEA Community Plan Area for vibration.

In summary, construction activities in the Project area could generate groundborne vibration. In some cases, vibration levels may be high enough to affect structures or cause annoyance at sensitive receivers. The Project would need to comply with General Plan 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 reduce construction vibration below applicable levels. Operational vibration would not be substantial due to the nature of transportation vibration and because the proposed land uses do not generate substantial vibration. There is no new significant effect, and the impact is not more severe than the impact identified in the General Plan EIR. This impact would remain **less than significant**.

General Plan Land Use Designation Amendments

Vibration anticipated from the proposed General Plan land use amendments is included in the overall stationary noise and vibration analysis associated with the Old Town Policy Area. As discussed above under, LEA Community Plan, impacts from short- and long-term vibration would remain **less than significant**. There is no new significant effect and the impact is not more severe than the impact identified in the General Plan EIR.

Grant Line Road Precise Roadway Study

The Precise Study was prepared to analyze potential geometric layouts along Grant Line Road. Buildout of roadway configurations, including all alternatives of the Precise Study, would result in similar vibration levels from construction and operational activity as those anticipated from the build out of the LEA Community Plan as discussed above. Therefore, impacts from short- and long-term vibration would remain **less than significant**. There is no new significant effect and the impact is not more severe than the impact identified in the General Plan EIR.

South and West Study Areas

Vibration impacts anticipated within the South and West Study Areas is included in the overall vibration analysis associated with the Project. As discussed above under, LEA Community Plan, impacts from short- and long-term vibration would remain **less than significant**. There is no new significant effect and the impact is not more severe than the impact identified in the General Plan EIR.

Mitigation Measures

No additional mitigation is required beyond compliance with General Plan Policy N-1-9 and EGMC Section 6.32.100.

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