Appendix NOI-1

Noise and Vibration Study

Acoustical Assessment
Sacramento County WattEV Innovative Freight Terminal Project (SWIFT)
Sacramento County, California

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LIST OF ABBREVIATED TERMS

ADT	average daily traffic
dBA	A-weighted sound level
CEQA	California Environmental Quality Act
CNEL	community equivalent noise level
L_{dn}	day-night noise level
dB	decibel
L_{eq}	equivalent noise level
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HVAC	heating ventilation and air conditioning
Hz	hertz
in/sec	inches per second
L_{max}	maximum noise level
µPa	micropascals
L_{min}	minimum noise level
PPV	peak particle velocity
RMS	root mean square
SMF	Sacramento International Airport
VdB	vibration velocity level

1 INTRODUCTION

This report documents the results of an Acoustical Assessment completed for the Sacramento County WattEV Innovative Freight Terminal (SWIFT) project (project). The purpose of this Acoustical Assessment is to evaluate the potential construction and operational noise and vibration levels associated with the project and determine the level of impact the project would have on the environment.

1.1 Project Location

The project site is located within the Sacramento International Airport Master Plan area in the northwest portion of Sacramento County, approximately 7.5 miles from downtown Sacramento; refer to **Figure 1: Regional Map**. Specifically, the project is located south of Interstate 5 (I-5) and immediately south of Sacramento International Airport; see **Figure 2: Local Vicinity Map**. The project site generally covers APNs 225-0010-003, 225-0010-035, 225-0010-036, and 225-0010-006 and encompasses approximately 118 acres.

1.2 Project Description

The Sacramento County Department of Airports has formed a public/private partnership with WattEV to construct, own, operate, and cost share the project. The project would provide a publicly accessible Electric Vehicle (EV) charging facility that would be built along a major freight corridor. Facility development would include the installation of Direct Current Fast Chargers (DCFC) and Megawatt Chargers powered by a new solar array that would support charging for shippers and transporters as well as public transportation and passenger vehicles. In addition, the project would include accessory structures which are discussed further below.

Project Facilities

The proposed project includes deployment of advanced high-powered public charging stations and associated facilities powered by a 12.5 megawatt alternating current (MWac) solar generation field, with nameplate power of 31.2 megawatts of direct current (MWdc), to support zero-electric freight movement in Sacramento. The charging areas and associated support facilities would occupy approximately 24 acres of land on the northern portion of the project site while the remaining 94 acres of the site would be occupied by solar fields; see **Figure 3: Overall Site Plan.**

The project site would be configured with two truck charging areas separated by a publicly accessible central plaza. The truck charging areas would include six 3,600-kilowatt (kW) charger configurations. Each configuration would consist of three Megawatt Charging Standard (MCS) 1,200 kW chargers and fifteen 240 kW Combined Charging Standard (CCS) chargers, for a total of 18 MCS chargers and 90 CCS chargers designed for heavy and medium duty (MHD) trucks. The truck charging pads are expected to cover 7.8 acres. In addition to the charging pads, a parking lot for trailers would be provided with an average of 53 parking stalls spread over 2.8 acres of land. The proposed project would also include the installation of 30 CCS chargers dedicated for passenger vehicles, which would be located at the central plaza.

Three buildings would be included within the public plaza. The first building would include offices for operations staff, a trucker refreshment area, trucker restrooms, and a resting lounge. It would consist of a single story and have a footprint of approximately 2,700 square feet. The second building would include a convenience store, food outlets, restrooms, and a resting lounge for the public. It would also consist of a single story and have a footprint of approximately 7,000 square feet. The third building would contain two stories and be designated as a public visitor center, providing information about California's progress and milestones towards clean air initiatives and emission reduction. The footprint of the public plaza would be approximately 5.25 acres.

Site Access

Access to the project site would be provided along Bayou Way, which borders the site to the north and is parallel to I-5, via Airport Boulevard and its nearby interchange with I-5. Direct access to the project site would be provided by three sets of ingress and egress points (six total access points) along Bayou Way. Two sets of ingress and egress points would serve the truck charging areas while the third set of ingress and egress points would serve the public plaza.

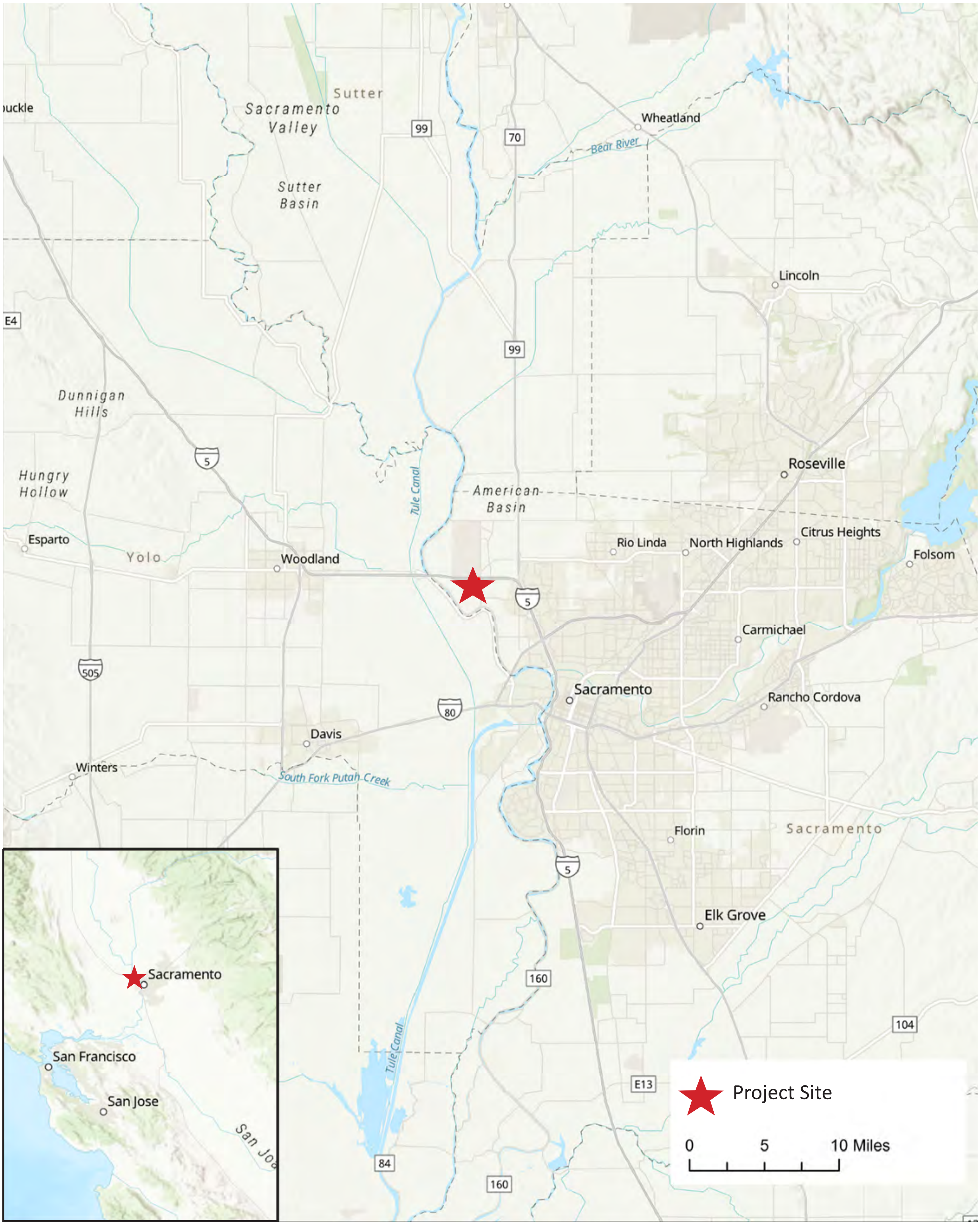
Offsite Improvements

Development of the project would include improvements to portions of Bayou Way to facilitate increased volumes of truck and passenger car traffic. This could include widening of the roadbed and shoulders in some locations. Furthermore, improvements to the interchange of Airport Boulevard and I-5 may be required. The extent of these improvements is still under development.

Construction

The proposed project would be constructed in two phases. Phase 1 would consist of installation of the truck charging areas and public plaza as described above, as well as a 12.5 MWac solar photovoltaic (PV) system with nameplate power of 15.6 MW (50 percent of the final solar array power). Phase 2 would consist of the installation of the remaining 15.6 MW of solar power for a total nameplate of 31.2 MW.

The proposed project would include construction of a customer-owned substation in coordination with SMUD. The provision of the substation would allow the proposed project to export excess generation during peak generation and import power during peak charging sessions. The substation would include medium voltage transformers, switchgears, surge protection, metering equipment, communication equipment, equipment pads, grounding equipment, steel structures, all enclosed by fencing. Outside the substation, sub-transmission poles would provide support for wire entrances, distribution voltage would leave the substation in either overhead or underground configurations and connect to an existing SMUD 69kV overhead transmission line that runs parallel to Power Line Road, about 600 feet east of the project site. Phase 1 of the substation would be sized for 21.6 MW of charging and 12.5 MWac. The substation and switchgear would provide physical space for additional transformer and breakers respectively for Phase 2.



Source: ESRI, 2023

Figure 1: Regional Map

WattEV Innovative Freight Terminal (SWIFT) Project

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Source: ESRI, 2023

Figure 2: Local Vicinity Map

WattEV Innovative Freight Terminal (SWIFT) Project

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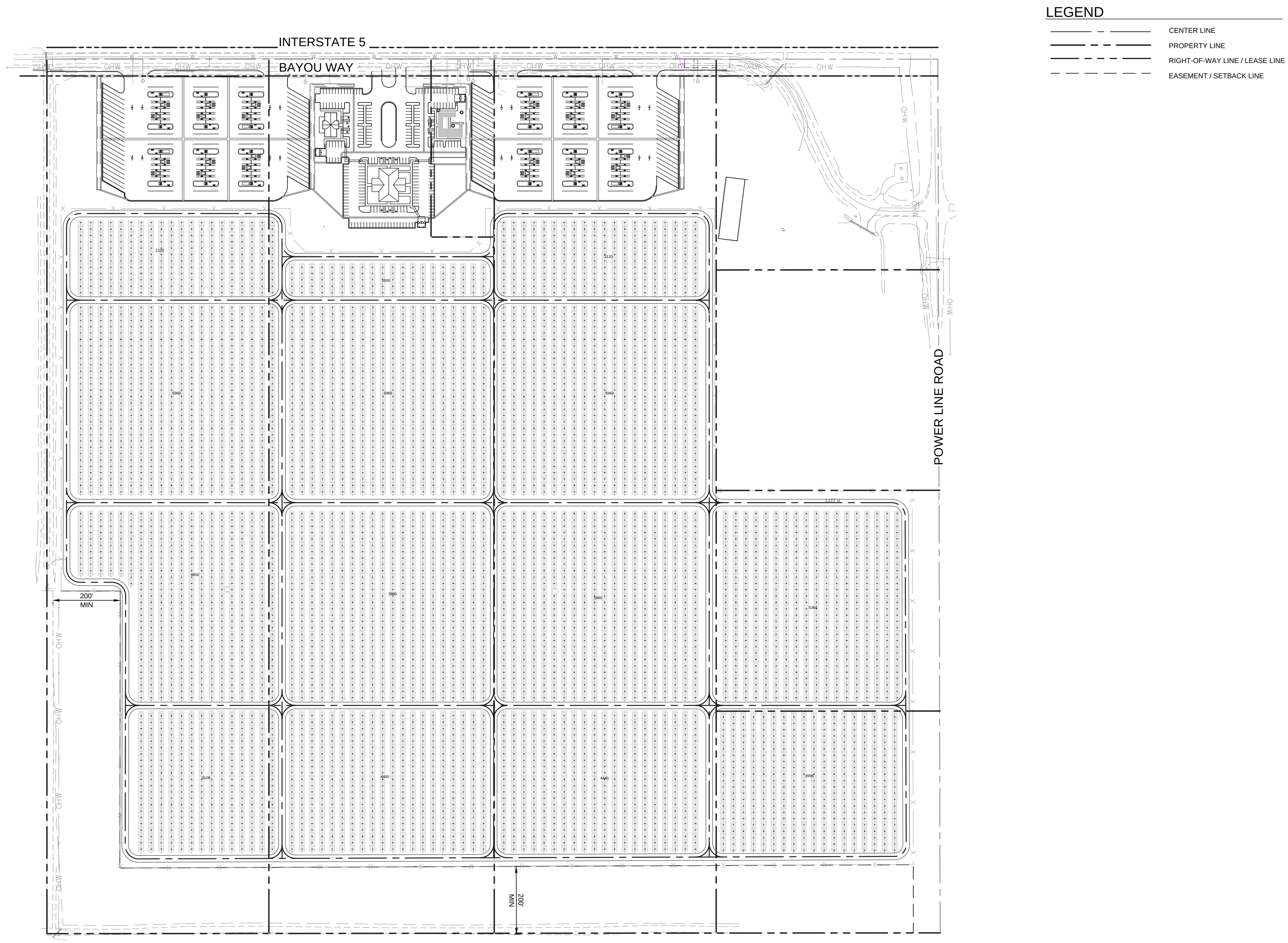

Figure 3: Overall Site Plan

WattEV Innovative Freight Terminal (SWIFT) Project

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2 ACOUSTIC FUNDAMENTALS

2.1 Sound and Environmental Noise

Acoustics is the science of sound. Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a medium (e.g. air) to human (or animal) ear. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound and is expressed as cycles per second, or hertz (Hz).

Noise is defined as loud, unexpected, or annoying sound. In acoustics, the fundamental model consists of a noise source, a receptor, and the propagation path between the two. The loudness of the noise source, obstructions, or atmospheric factors affecting the propagation path, determine the perceived sound level and noise characteristics at the receptor. Acoustics deal primarily with the propagation and control of sound. A typical noise environment consists of a base of steady background noise that is the sum of many distant and indistinguishable noise sources. Superimposed on this background noise is the sound from individual local sources. These sources can vary from an occasional aircraft or train passing by to continuous noise from traffic on a major highway. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a large range of numbers. To avoid this, the decibel (dB) scale was devised. The dB scale uses the hearing threshold of 20 micropascals (µPa) as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The dB scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels correspond closely to human perception of relative loudness. **Table 1: Typical Noise Levels** provides typical noise levels.

Table 1: Typical Noise Levels

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

Source: California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013.

Noise Descriptors

The dB 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. Several rating scales have been developed to analyze the adverse effect of community noise on people. Because environmental noise fluctuates over time, these scales consider that the effect of noise on people is largely dependent on the total acoustical energy content of the noise, as well as the time of day when the noise occurs. The equivalent noise level (L_{eq}) is the average noise level averaged over the measurement period, while the day-night noise level (L_{dn}) and Community Equivalent Noise Level (CNEL) are measures of energy average during a 24-hour period, with dB weighted sound levels from 7:00 p.m. to 7:00 a.m. Most commonly, environmental sounds are described in terms of L_{eq} that has the same acoustical energy as the summation of all the time-varying events. Each is applicable to this analysis and defined in **Table 2: Definitions of Acoustical Terms**.

Table 2: Definitions of Acoustical Terms

Term	Definitions
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in µPa (or 20 micronewtons per square meter), where 1 pascals is the pressure resulting from a force of 1 newton exerted over an area of 1 square meter. The sound pressure level is expressed in dB as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g. 20 µPa). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level (dBA)	The sound pressure level in dB as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level (L_{eq})	The average acoustic energy content of noise for a stated period of time. Thus, the L_{eq} of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure. For evaluating community impacts, this rating scale does not vary, regardless of whether the noise occurs during the day or the night.
Maximum Noise Level (L_{max}) Minimum Noise Level (L_{min})	The maximum and minimum dBA during the measurement period.
Exceeded Noise Levels (L_{01}, L_{10}, L_{50}, L_{90})	The dBA values that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day-Night Noise Level (L_{dn})	A 24-hour average L_{eq} with a 10 dBA weighting added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity at nighttime. The logarithmic effect of these additions is that a 60 dBA 24-hour L_{eq} would result in a measurement of 66.4 dBA L_{dn}.
Community Noise Equivalent Level (CNEL)	A 24-hour average L_{eq} with a 5 dBA weighting during the hours of 7:00 a.m. to 10:00 p.m. and a 10 dBA weighting added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the evening and nighttime, respectively. The logarithmic effect of these additions is that a 60 dBA 24-hour L_{eq} would result in a measurement of 66.7 dBA CNEL.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends on its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

The A-weighted decibel (dBA) sound level scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends on the distance between the receptor and the noise source.

A-Weighted Decibels

The perceived loudness of sounds is dependent on many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable and can be approximated by dBA values. There is a strong correlation between dBA and the way the human ear perceives sound. For this reason, the dBA has become the standard tool of environmental noise assessment. All noise levels reported in this document are in terms of dBA, but are expressed as dB, unless otherwise noted.

Addition of Decibels

The dB scale is logarithmic, not linear, and therefore sound levels cannot be added or subtracted through ordinary arithmetic. Two sound levels 10 dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic dB is A-weighted, an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70-dBA sound is half as loud as an 80-dBA sound and twice as loud as a 60-dBA sound. [1] When two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dBA higher than one source under the same conditions.[2] Under the dB scale, three sources of equal loudness together would produce an increase of 5 dBA.

Sound Propagation and Attenuation

Sound spreads (propagates) uniformly outward in a spherical pattern, and the sound level decreases (attenuates) at a rate of approximately 6 dB for each doubling of distance from a stationary or point source. Sound from a line source, such as a highway, propagates outward in a cylindrical pattern. Sound levels attenuate at a rate of approximately 3 dB for each doubling of distance from a line source, such as a roadway, depending on ground surface characteristics.[3] No excess attenuation is assumed for hard surfaces like a parking lot or a body of water. Soft surfaces, such as soft dirt or grass, can absorb sound, so an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. For line sources, an overall attenuation rate of 3 dB per doubling of distance is assumed.

Noise levels may also be reduced by intervening structures; generally, a single row of buildings between the receptor and the noise source reduces the noise level by about 5 dBA, while a solid wall or berm

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1 FHWA, *Noise Fundamentals,* 2017. Available at: https://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/polguide/polguide02.cfm

2 Ibid.

3 California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, Page 2-29, September 2013.

reduces noise levels by 5 to 10 dBA.[4] The older homes in California constructed generally provide a reduction of exterior-to-interior noise levels of about 20 to 25 dBA with closed windows. The exterior-to-interior reduction of newer residential units is generally 30 dBA or more.[5]

Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise intensity levels.

Noise environments and consequences of human activities are usually well represented by median noise levels during the day or night or over a 24-hour period. Environmental noise levels are generally considered low when the CNEL is below 60 dBA, moderate in the 60 to 70 dBA range, and high above 70 dBA. Examples of low daytime levels are isolated, natural settings with noise levels as low as 20 dBA and quiet, suburban, residential streets with noise levels around 40 dBA.[6] Noise levels above 45 dBA at night can disrupt sleep. Examples of moderate-level noise environments are urban residential or semi-commercial areas (typically 55 to 60 dBA) and commercial locations (typically 60 dBA). People may consider louder environments adverse, but most will accept the higher levels associated with noisier urban residential or residential-commercial areas (60 to 75 dBA) or dense urban or industrial areas (65 to 80 dBA). Regarding increases in dBA, the following relationships should be noted:[7]

- Except in carefully controlled laboratory experiments, a 1-dBA change cannot be perceived by humans.
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference.
- A minimum 5-dBA change is required before any noticeable change in community response would be expected. A 5-dBA increase is typically considered substantial.
- A 10-dBA change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

Effects of Noise on People

Hearing Loss

While physical damage to the ear from an intense noise impulse is rare, a degradation of auditory acuity can occur even within a community noise environment. Hearing loss occurs mainly due to chronic exposure to excessive noise but may be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud noise. The Occupational Safety and Health Administration has a noise exposure standard that is set at the noise threshold where

4 James P. Cowan, *Handbook of Environmental Acoustics,* 1994.
5 HUD, *Noise Guidebook*, 2009. Available at: https://www.hudexchange.info/resource/313/hud-noise-guidebook/
6 Compiled from James P. Cowan, *Handbook of Environmental Acoustics,* 1994 and Cyril M. Harris, Handbook of Noise Control, 1979.
7 Compiled from California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013, and FHWA, *Noise Fundamentals,* 2017.

hearing loss may occur from long-term exposures. The maximum allowable level is 90 dBA averaged over 8 hours. If the noise is above 90 dBA, the allowable exposure time is correspondingly shorter.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. A noise level of about 55 dBA L_{dn} is the threshold at which a substantial percentage of people begin to report annoyance[8].

2.2 Groundborne Vibration

Sources of groundborne vibrations include natural phenomena (earthquakes, volcanic eruptions, sea waves, landslides, etc.) or man-made causes (explosions, machinery, traffic, trains, construction equipment, etc.). Vibration sources may be continuous (e.g. factory machinery) or transient (e.g. explosions). Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One is the peak particle velocity (PPV); another is the root mean square (RMS) velocity. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. The RMS velocity is defined as the average of the squared amplitude of the signal. The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration.

Table 3: Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibrations, displays the reactions of people and the effects on buildings produced by continuous vibration levels. The annoyance levels shown in the table should be interpreted with care since vibration may be found to be annoying at much lower levels than those listed, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage. In high noise environments, which are more prevalent where groundborne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows.

Ground vibration can be a concern in instances where buildings shake, and substantial rumblings occur. However, it is unusual for vibration from typical urban sources such as buses and heavy trucks to be perceptible. Common sources for groundborne vibration are planes, trains, and construction activities such as earth-moving which requires the use of heavy-duty earth moving equipment. For the purposes of this analysis, a PPV descriptor with units of inches per second (in/sec) is used to evaluate construction-generated vibration for building damage and human complaints.

[8] Federal Interagency Committee on Noise, *Federal Agency Review of Selected Airport Noise Analysis Issues*, August 1992.

Table 3: Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibrations

Peak Particle Velocity (in/sec)	Approximate Vibration Velocity Level (VdB)	Human Reaction	Effect on Buildings
0.006-0.019	64-74	Range of threshold of perception	Vibrations unlikely to cause damage of any type
0.08	87	Vibrations readily perceptible	Recommended upper level to which ruins and ancient monuments should be subjected
0.1	92	Level at which continuous vibrations may begin to annoy people, particularly those involved in vibration sensitive activities	Virtually no risk of architectural damage to normal buildings
0.2	94	Vibrations may begin to annoy people in buildings	Threshold at which there is a risk of architectural damage to normal dwellings
0.4-0.6	98-104	Vibrations considered unpleasant by people that are subjected to continuous vibrations and unacceptable to some people walking on bridges	Architectural damage and possibly minor structural damage

Source: California Department of Transportation, *Transportation and Construction Vibration Guidance Manual*, 2013.

3 REGULATORY SETTING

To limit population exposure to physically or psychologically damaging as well as intrusive noise levels, the Federal government, the State of California, various county governments, and most municipalities in the state have established standards and ordinances to control noise.

3.1 State of California

California Government Code

California Government Code Section 65302(f) mandates that the legislative body of each county and city adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines established by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of “normally acceptable”, “conditionally acceptable”, “normally unacceptable”, and “clearly unacceptable” noise levels for various land use types. Single-family homes are “normally acceptable” in exterior noise environments up to 60 CNEL and “conditionally acceptable” up to 70 CNEL. Multiple-family residential uses are “normally acceptable” up to 65 CNEL and “conditionally acceptable” up to 70 CNEL. Schools, libraries, and churches are “normally acceptable” up to 70 CNEL, as are office buildings and business, commercial, and professional uses.

Title 24 – Building Code

The State’s noise insulation standards are codified in the California Code of Regulations, Title 24: Part 1, Building Standards Administrative Code, and Part 2, California Building Code. These noise standards are applied to new construction in California for interior noise compatibility from exterior noise sources. The regulations specify that acoustical studies must be prepared when noise-sensitive structures, such as residential buildings, schools, or hospitals, are located near major transportation noise sources, and where such noise sources create an exterior noise level of 65 dBA CNEL or higher. Acoustical studies that accompany building plans must demonstrate that the structure has been designed to limit interior noise in habitable rooms to acceptable noise levels. For new multi-family residential buildings, the acceptable interior noise limit for new construction is 45 dBA CNEL.

3.2 Local

County of Sacramento General Plan

The County of Sacramento General Plan is a roadmap that encompasses the hopes, aspirations, values, and dreams of the community. The County of Sacramento General Plan specifies exterior noise guidelines for land uses in the Noise Element section. The County requires that new developments be designed to meet these guidelines. Noise compatibility can be achieved by avoiding the location of conflicting land uses adjacent to one another, incorporating buffers and noise control techniques including setbacks, landscaping, building transitions, site design, and building construction techniques. Selection of the appropriate noise control technique would vary depending on the level of noise that needs to be reduced as well as the location and intended land use. General Plan policies that directly address reducing and avoiding noise or vibration impacts include the following:

Goal 1 To protect the existing and future citizens of Sacramento County from the harmful effects of exposure to excessive noise. More specifically, to protect existing noise-sensitive land uses from new uses that would generate noise levels which are incompatible with those uses, and to discourage new noise sensitive land uses from being developed near sources of high noise levels.

GOAL 2 To protect the economic base of Sacramento County by preventing the encroachment of noise-sensitive land uses into areas affected by existing noise-producing uses. More specifically, to recognize that noise is an inherent by-product of many land uses and to prevent new noise-sensitive land uses from being developed in areas affected by existing noise-producing uses.

GOAL 3 To provide the County with flexibility in the development of infill properties which may be located in elevated noise environments.

GOAL 4 To provide sufficient noise exposure information so that existing and potential future noise impacts may be effectively addressed in the land use planning and project review processes.

NO-1. Where the noise level are predicted to be exceeded at new uses proposed within Sacramento County which are affected by traffic or railroad noise, appropriate noise mitigation measures shall be included in the project design to reduce projected noise levels to a state of compliance.

NO-2. Proposals for new development within Sacramento County which may be affected by aircraft noise shall be evaluated relative to Table 4: Land Use Compatibility for Aircraft Noise, except in the following cases. Development proposals which may be affected by aircraft noise from Sacramento International Airport shall be evaluated relative to the Land Use Compatibility Plan prepared for Sacramento International Airport dated December 12, 2013, adopted herein by reference. Development proposals which may be affected by aircraft noise from Mather Airport shall be evaluated relative to the Land Use Compatibility Plan prepared for Mather airport dated February 2021, adopted herein reference, as well as applicable footnotes in Table 4.

NO-5. Where the noise level standards are predicted to be exceeded at a proposed noise-sensitive area due to existing non-transportation noise sources, appropriate noise mitigation measures shall be included in the project design to reduce projected noise levels to a state of compliance.

NO-6. Where a project would consist of or include non-transportation noise sources, the noise generation of those sources shall be mitigated so as not exceed the interior and exterior noise level standards of **Table 4: Non-Transportation Noise Standards** at existing noise-sensitive areas in the project vicinity.

NO-7. The “last use there” shall be responsible for noise mitigation. However, if a noise generating use is proposed adjacent to lands zoned for uses which may have sensitivity to noise, then the noise generating use shall be responsible for mitigating its noise generation to a state of compliance at the property line of the generating use in anticipation of the future neighboring development.

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

NO-12. All noise analyses prepared to determine compliance with the noise level standards contained within this Noise Element shall be prepared in accordance with **Table 5: Requirements for Acoustical Analyses Prepared in Sacramento County**.

NO-13. Where noise mitigation measures are required to satisfy the noise level standards of this Noise Element, emphasis shall be placed on the use of setbacks and site design to the extent feasible, prior to consideration of the use of noise barriers.

Table 4: Non-Transportation Noise Standards[1]

Land Use Category	Community Noise Exposure (L_{50} / L_{max}, dBA)		
	Outdoor Area[2]		Interior Area[3]
	Daytime	Nighttime	Day & Night
All Residential	55 / 75	50 / 70	35 / 55
Transient Lodging[4]	55 / 75	-	35 / 55
Hospitals & Nursing Homes	55 / 75	-	35 / 55
Theaters & Auditoriums	-	-	30 / 50
Churches, Meeting Halls, Schools, Libraries, etc.	55 / 75	-	35 / 60
Office Buildings	60 / 75	-	45 / 65
Commercial Buildings	-	-	45 / 65
Playgrounds, Parks, etc.	65 / 75	-	-
Industry	60 / 80	-	50 / 70

Notes:

1. The Table 6 standards shall be reduced by 5 dB for sounds consisting primarily of speech or music, and for recurring impulsive sounds. If the existing ambient noise level exceeds the standards of Table 6, then the noise level standards shall be increased at 5 dB increments to encompass the ambient.
2. Sensitive areas are defined acoustic terminology section.
3. Interior noise level standards are applied within noise-sensitive areas of the various land uses, with windows and doors in the closed positions.
4. Outdoor activity areas of transient lodging facilities are not commonly used during nighttime hours.
5. Hospitals are often noise-generating uses. The exterior noise level standards for hospitals are applicable only at clearly identified areas designated for outdoor relaxation by either hospital staff or patients.
6. The outdoor activity areas of these uses (if any), are not typically utilized during nighttime hours.
7. Where median (L_{50}) noise level data is not available for a particular noise source, average (L_{eq}) values may be substituted for the standards of this table provided the noise source in question operates for at least 30 minutes of an hour. If the source in question operates less than 30 minutes per hour, then the maximum noise level standards shown would apply.

Source: County of Sacramento, *Noise Element,* December 13, 2022.

Table 5: Requirements for Acoustical Analyses Prepared in Sacramento County
An acoustical analysis prepared pursuant to the Noise Element shall:
A. Be the responsibility of the applicant. B. Be prepared by qualified persons experienced in the fields of environmental noise assessment and architectural acoustics. C. Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions. D. Estimate projected future (20-year) noise levels in terms of the Standards of Table 2, and compare those levels to the adopted policies of the Noise Element. E. Recommend appropriate mitigation to achieve compliance with the adopted policies and standards of the Noise Element. F. Estimate interior and exterior noise exposure after the prescribed mitigation measures have been implemented.

County of Sacramento Code of Ordinances

A noise ordinance is intended to control unnecessary, excessive, and annoying sounds from stationary, non-transportation noise sources. Noise ordinance requirements are not applicable to mobile noise sources such as heavy trucks traveling on public roadways. Federal and State laws preempt control of mobile noise sources on public roads. Noise ordinance standards generally apply to industrial and commercial noise sources, as well as parks and schools affecting residential areas.

The project would be subject to the limitations imposed by the County regarding construction noise. Sacramento County Code section 6.68.090(e) states that noise sources associated with construction, repair, remodeling, demolition, paving or grading of any real property, are exempt from maximum noise level requirements. That said activities must not take place between the hours of 8:00 p.m. and 6:00 a.m. on weekdays and Friday commencing at 8:00 p.m. through and including 7:00 a.m. on Saturday; Saturdays commencing at 8:00 p.m. through and including 7:00 a.m. on the next following Sunday and on Sunday after the hour of 8:00 p.m.

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.

4 EXISTING CONDITIONS

4.1 Existing Noise Source

The County of Sacramento is impacted by various noise sources. Mobile sources of noise, especially cars and trucks, are the most common and significant sources of noise in most communities. Other sources of noise are the various land uses (i.e., residential, commercial, institutional, and recreational and parks activities) throughout the County that generate stationary-source noise.

Mobile Sources

Existing roadway noise levels were calculated for the roadway segments in the project vicinity. This task was accomplished using the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA-RD-77-108) and existing traffic volumes from the provided by Kimley-Horn (October 2023). The noise prediction model calculates the average noise level at specific locations based on traffic volumes, average speeds, roadway geometry, and site environmental conditions. The average vehicle noise rates (also referred to as energy rates) used in the FHWA model have been modified to reflect average vehicle noise rates identified for California by the California Department of Transportation (Caltrans). The Caltrans data indicates that California automobile noise is 0.8 to 1.0 dBA higher than national levels and that medium and heavy truck noise is 0.3 to 3.0 dBA lower than national levels.[9] The average daily noise levels along roadway segments in proximity to the project site are included in **Table 6: Existing Traffic Noise Levels**.

Table 6: Existing Traffic Noise Levels		
Roadway Segment	**ADT**	**dBA L_{dn} 100 Feet from Roadway Centerline**
Bayou Way		
Airport Boulevard and Power Line Road	2,155	52.7
Power Line Road and Metro Air Parkway	1,283	50.5
ADT = average daily trips; dBA = A-weighted decibels; L_{dn} = day-night average noise level.		
Source: Based on traffic data provided by Kimley-Horn, October 2023. Refer to **Appendix A** for traffic noise modeling assumptions and results.		

As depicted in **Table 6**, the existing traffic-generated noise level on project-vicinity roadways currently ranges from 50.5 dBA L_{dn} to 52.7 dBA L_{dn} 100 feet from the centerline. As previously described, L_{dn} is 24-hour average noise level with 10 dBA weighting added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity at nighttime.

Airport Sources

The project site is located approximately 0.6 miles southeast of the Sacramento International Airport, directly south of the east runway. The project site lies within of the 70 to 75 dBA CNEL noise contours shown in the Sacramento International Airport Land Use Compatibility Plan adopted in December 2013 and is exposed to take-off and landing noise.[10]

9 California Department of Transportation, *California Vehicle Noise Emission Levels*, 1987.
10 Sacramento Area Council of Governments, *Sacramento International Airport Land Use Compatibility Plan*, December 2013.

4.2 Sensitive Receptors

Noise exposure goals for various types of land uses reflect the varying noise sensitivities associated with those uses. Noise sensitive uses typically include residences, hospitals, schools, childcare facilities, and places of assembly. Vibration sensitive receivers are generally similar to noise sensitive receivers but may also include businesses, such as research facilities and laboratories that use vibration-sensitive equipment. Sensitive land uses nearest to the project are shown in **Table 7: Sensitive Receptors**.

Table 7: Sensitive Receptors

Receptor Description	Distance and Direction from the Project[1]
Single-Family residence	400 feet southeast
Single-Family Residence	3,830 feet southeast
Single-Family Residence	5,240 feet southeast
Paso Verde School	6,680 feet east

Notes:
1. Distance measured from the project site to the receiver property line.

Source: Google Earth Pro, 2023

5 SIGNIFICANCE CRITERIA AND METHODOLOGY

5.1 CEQA Thresholds

Appendix G of the California Environmental Quality Act (CEQA) Guidelines contains analysis guidelines related to noise impacts. These guidelines have been used by the County to develop thresholds of significance for this analysis. A project would create a significant environmental impact if it would:

- Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Generate excessive groundborne vibration or groundborne noise levels; and
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels.

Thresholds

Construction Noise

The project would be subject to the limitations imposed by the County regarding construction noise. Sacramento County Code section 6.68.090(e) states that noise associated with construction, repair, remodeling, demolition, paving or grading are exempt from maximum noise level requirements. Construction must not take place between the hours of 8:00 p.m. and 6:00 a.m. on weekdays and Friday commencing at 8:00 p.m. through and including 7:00 a.m. on Saturday; Saturdays commencing at 8:00 p.m. through and including 7:00 a.m. on the next following Sunday and on Sunday after the hour of 8:00 p.m.

Operational Stationary Noise

Pursuant to Sacramento County General Plan Policy NO-5, the project would have a significant impact if it caused noise levels to increase above levels specified in the Non-Transportation Noise standards (see **Table 4**).

Operational Traffic Noise

Sacramento County has established some standards for roadway noise ranging from 1.5 dB to 5 dB, depending upon the existing noise environment. The substantial increase would result in an impact if the resulting total noise level would exceed the “normally acceptable” category for a given land use. Based upon the General Plan Noise Element, when pre-project traffic noise levels are less than 60 dB L_{dn}, a 5+ dB increase is required before the change is significant. When pre-project noise levels are between 60 dB and 65 dB L_{dn}, an increase of 3+ dB is required before the change is significant. When pre-project noise levels are above 65 dB L_{dn}, an increase of 1.5+ dB is required before the change is considered significant.

Vibration

The County currently does not have a significance threshold to assess vibration impacts. Thus, the FTA guidelines set forth in FTA's Transit Noise and Vibration Impact Assessment Manual are used to evaluate potential impacts related to vibration.

5.2 Methodology

Construction

Construction noise levels were based on typical noise levels generated by construction equipment published by the Federal Transit Administration (FTA) and FHWA. Construction noise is assessed in dBA L_{eq}. This unit is appropriate because L_{eq} can be used to describe noise level from operation of each piece of equipment separately, and levels can be combined to represent the noise level from all equipment operating during a given period.

Reference noise levels are used to estimate operational noise levels at nearby sensitive receptors based on a standard noise attenuation rate of 6 dB per doubling of distance (line-of-sight method of sound attenuation for point sources of noise). Noise level estimates do not account for the presence of intervening structures or topography, which may reduce noise levels at receptor locations. Therefore, the noise levels presented herein represent a conservative, reasonable worst-case estimate of actual temporary construction noise.

Operations

The analysis of the Existing and With Project noise environments is based on noise prediction modeling and empirical observations. Reference noise level data are used to estimate the project operational noise impacts from stationary sources. Noise levels are collected from field noise measurements and other published sources from similar types of activities are used to estimate noise levels expected with the project's stationary sources. The reference noise levels are used to represent a worst-case noise environment as noise level from stationary sources can vary throughout the day. Operational noise is evaluated based on the standards within the County's General Plan. The Without Project and With Project traffic noise levels in the project vicinity were calculated using the FHWA Highway Noise Prediction Model (FHWA-RD-77-108).

Vibration

Groundborne vibration levels associated with construction-related activities for the project were evaluated utilizing typical groundborne vibration levels associated with construction equipment, obtained from FTA published data for construction equipment. Potential groundborne vibration impacts related to building/structure damage and interference with sensitive existing operations were evaluated, considering the distance from construction activities to nearby land uses and typically applied criteria.

6 POTENTIAL IMPACTS AND MITIGATION

6.1 Acoustical Impacts

Threshold 6.1 Would the project generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Construction

Construction noise typically occurs intermittently and varies depending on the nature or phase of construction (e.g. land clearing, grading, excavation, paving). Noise generated by construction equipment, including earth movers, material handlers, and portable generators, can reach high levels. During construction, exterior noise levels could affect the residential neighborhoods near the construction site. Construction activities would occur throughout the project site and would not be concentrated at a single point near sensitive receptors. Noise levels typically attenuate (or drop off) at a rate of 6 dB per doubling of distance from point sources, such as industrial machinery. During construction, exterior noise levels could affect sensitive receptors near the construction site.

Construction activities associated with development of the project would include some demolition, site preparation, grading, paving, building construction, and architectural coating. Such activities would require graders, scrapers, and tractors during site preparation; graders, dozers, and tractors during grading; cranes, forklifts, generators, tractors, and welders during building construction; pavers, rollers, mixers, tractors, and paving equipment during paving; and air compressors during architectural coating. Grading and excavation phases of project construction tend to be the shortest in duration and create the highest construction noise levels due to the operation of heavy equipment required to complete these activities. It should be noted that only a limited amount of equipment can operate near a given location at a particular time. Equipment typically used during this stage includes heavy-duty trucks, backhoes, bulldozers, excavators, front-end loaders, and scrapers. Operating cycles for these types of construction equipment may involve one or two minutes of full-power operation followed by three to four minutes at lower power settings. Other primary sources of noise would be shorter-duration incidents, such as dropping large pieces of equipment or the hydraulic movement of machinery lifts, which would last less than one minute. According to the applicant, no pile-driving would be required during construction.

Noise generated by construction equipment, including earth movers, material handlers, and portable generators, can reach high levels. Typical noise levels associated with individual construction equipment are listed in **Table 8: Typical Construction Noise Levels**.

Table 8: Typical Construction Noise Levels	
Equipment	**Typical Noise Level (dBA) at 50 feet from Source**
Air Compressor	80
Backhoe	80
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, Mobile	83
Dozer	85
Generator	82
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	80
Paver	85
Pneumatic Tool	85
Pump	77
Roller	85
Saw	76
Scraper	85
Shovel	82
Truck	84
Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018.	

Per County General Plan Policy, NO-8, noise associated with construction activities shall adhere to the County code requirements. Pursuant to Sacramento County Code section 6.68.090(e), construction activities are exempt from the specified noise ordinance standards during the hours of 6:00 a.m. to 8:00 p.m. Monday through Friday, and Saturday and Sunday from 7:00 a.m. to 8:00 p.m. While the County establishes limits to the hours during which construction activity may take place, it does not identify specific noise level limits for construction noise levels. The City's permitted hours of construction are required in recognition that construction activities undertaken during daytime hours are a typical part of living in an urban environment. The project would adhere to the time of day restrictions in the Sacramento County Code which means construction noise would be exempt from noise ordinance standards. Thus, construction would be consistent with the County's General Plan and County Code requirements. Further, the contractor would equip all construction equipment, fixed and mobile, with properly operating and maintained noise mufflers, consistent with manufacturer's standards and as mandated by the State which would further reduce construction noise levels. The closest sensitive receptor is located approximately 400 feet away from the edge of the project site and more than 2,500 feet away from any building construction. At this distance, noise levels from construction would not be perceptible and noise impacts related to construction would be less than significant.

Construction Traffic Noise

Construction noise may be generated by large trucks moving materials to and from the project site. Large trucks would be necessary to deliver building materials as well as remove dump materials. Excavation and cut and fill would be required. Soil hauling would be required as approximately 54,500 cubic yards (cy) of soil would be imported. Based on the California Emissions Estimator Model (CalEEMod) default assumptions for this project, the project would generate the highest number of daily trips during the grading construction phase. The model estimates that the project would generate approximately 20 daily worker trips and 105 daily hauling trips during the grading phase. Because of the logarithmic nature of noise levels, a doubling of the traffic volume (assuming that the speed and vehicle mix do not also change) would result in a noise level increase of 3 dBA. Bayou Way, between Power Line Road and Metro Air Parkway, has an average daily traffic (ADT) volume of approximately 1,283 vehicles (**Table 6**). Therefore, project construction trips would not double the existing traffic volume per day. Construction related traffic noise would not be noticeable and would not create a significant noise impact.

California establishes noise limits for vehicles licensed to operate on public roads using a pass-by test procedure. Pass-by noise refers to the noise level produced by an individual vehicle as it travels past a fixed location. The pass-by procedure measures the total noise emissions of a moving vehicle with a microphone. When the vehicle reaches the microphone, the vehicle is at full throttle acceleration at an engine speed calculated for its displacement. For heavy trucks, the State pass-by standard is consistent with the federal limit of 80 dB. The State pass-by standard for light trucks and passenger cars (less than 4.5 tons gross vehicle rating) is also 80 dB at 15 meters from the centerline. According to the FHWA, dump trucks typically generate noise levels of 77 dBA and flatbed trucks typically generate noise levels of 74 dBA, at a distance of 50 feet from the truck (FHWA, Roadway Construction Noise Model, 2006).

Operations

Implementation of the proposed project would create new sources of noise in the project vicinity. The major noise sources associated with the project that would potentially impact existing and future nearby uses include the following:

- Off-site traffic noise;
- Mechanical equipment (i.e., trash compactors, air conditioners, etc.);
- Delivery trucks activities at the loading areas (i.e., maneuvering and idling trucks, loading/unloading, and equipment noise);
- Parking areas (i.e., car door slamming, car radios, engine start-up, and car pass-by); and
- Landscape maintenance activities.

Implementation of the project would create new sources of noise in the project vicinity from mechanical equipment, truck loading areas, parking lot noise, and landscape maintenance. **Table 9: Operational Noise Levels** shows the noise levels generated by various stationary noise sources and the resulting noise level at the nearest receiver. **Table 9** also show the project's compliance with the General Plan Policy NO-6. Each stationary source is discussed below.

Mechanical Equipment

Regarding mechanical equipment, the project would generate stationary-source noise associated with the Battery Energy Storage System (BESS) substation, heating, ventilation, and air conditioning (HVAC) units. The primary noise source associated with BESS operations would be the use of heating, ventilation, and air conditioning units (the BESS does not generate noise itself). HVAC units typically generate noise levels of approximately 52 dBA at 50 feet.[11] The HVAC noise generated would compound when multiple units are operating simultaneously. However, the closest sensitive receptor is located approximately 400 feet

[11] Elliott H. Berger, Rick Neitzel, and Cynthia A. Kladden, *Noise Navigator Sound Level Database with Over 1700 Measurement Values*, July 6, 2010.

away from the project boundary and even further from the on-site mechanical equipment. At these distances, the BESS and HVAC noise would not be significant. **Table 9** shows that mechanical equipment would not exceed the County's General Plan standards in Policy NO-6.

Loading Area Noise

The project is an EV charging lot with commercial development that may require infrequent deliveries. The primary noise associated with deliveries is the arrival and departure of trucks. Operations of the proposed project would potentially require a mixture of deliveries from vans, light trucks, and heavy-duty trucks. Normal deliveries typically occur during daytime hours. During loading and unloading activities, noise would be generated by the trucks' diesel engines, exhaust systems, and brakes during low gear shifting' braking activities; backing up toward the docks/loading areas; dropping down the dock ramps; and maneuvering away from the docks. Typically, heavy truck operations generate a noise level of 64 dBA at a distance of 50 feet.[12] **Table 9** shows that loading area noise would not exceed the County's General Plan standards in Policy NO-6.

Parking Lot and EV Charging Activities

The proposed project is intended to be primarily used for EV charging and would accommodate some parking for the commercial uses. Traffic associated with parking lots is typically not of sufficient volume to exceed community noise standards, which are based on a time-averaged scale such as the CNEL scale. Additionally, EV charging areas would also include similar noise sources as parking spaces, which would include vehicular circulation, car alarms, door slams, and human voices. The instantaneous maximum sound levels generated by a car door slamming, engine starting up, and car pass-bys range from 53 to 61 dBA at 50 feet.[13] Conversations in parking areas may also generate noise and typically range from 33 dBA at 50 feet for normal speech to 50 dBA at 50 feet for very loud speech.[14] It should be noted that parking lot noises are instantaneous noise levels compared to noise standards in the hourly L_{eq} metric, which are averaged over the entire duration of a time period. Actual noise levels over time resulting from parking lot and gas station activities would be far lower than the reference levels identified above. Parking lot noise would occur within the surface parking lot on-site. **Table 9** shows that parking lot and gas station activities noise would not exceed the County's General Plan standards in Policy NO-6.

Landscape Maintenance

Development and operation of the project includes new landscaping that would require periodic maintenance. Noise generated by a gasoline-powered lawnmower is estimated to be approximately 70 dBA at a distance of five feet.[15] Maintenance activities would operate during daytime hours for brief periods of time as allowed by the County Municipal Code and would not permanently increase ambient noise levels in the project vicinity and would be consistent with activities that currently occur at the surrounding uses. **Table 9** shows that landscape maintenance noise activities noise would not exceed the County's General Plan standards in Policy NO-6.

[12] Elliott H. Berger, Rick Neitzel, and Cynthia A. Kladden, *Noise Navigator Sound Level Database with Over 1700 Measurement Values*, July 6, 2010.
[13] Kariel, H. G., *Noise in Rural Recreational Environments*, Canadian Acoustics 19(5), 3-10, 1991.
[14] Elliott H. Berger, Rick Neitzel, and Cynthia A. Kladden. Noise Navigator Sound Level Database with Over 1700 Measurement Values, July 6, 2010.
[15] U.S. EPA, *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, 1971

Table 9: Operational Noise Levels

Nearest Land Use	Distance[1] (feet)	Reference Level at 50 ft (dBA)	General Plan Policy NO-6		
			Noise Level at Receiver	Exterior Noise Standard	Exceed Threshold
Mechanical Equipment					
Commercial (Northwest)	2,800	68 dBA[2,3]	33 dBA	60 dBA[6]	No
Single Family Residence (Southeast)	400		50 dBA	55 dBA[6]	No
Loading Area					
Commercial (Northwest)	2,800	64 dBA[2]	29 dBA	60 dBA[6]	No
Single Family Residence (Southeast)	400		46 dBA	55 dBA[6]	No
Parking Area/EV Charging Activities					
Commercial (Northwest)	2,800	61 dBA[4]	26 dBA	60 dBA[6]	No
Single Family Residence (Southeast)	400		43 dBA	55 dBA[6]	No
Landscape Maintenance					
Commercial (Northwest)	2,800	50 dBA[5]	15 dBA	60 dBA[6]	No
Single Family Residence (Southeast)	400		32 dBA	55 dBA[6]	No

1. The distance is from the location of the project property line to the sensitive receptor property line.
2. Elliott H. Berger, Rick Neitzel, and Cynthia A. Kladden, *Noise Navigator Sound Level Database with Over 1700 Measurement Values*, July 6, 2010.
3. Reference noise levels accounts for multiple HVAC units running simultaneously for the operation of the BESS.
4. Kariel, H. G., *Noise in Rural Recreational Environments*, Canadian Acoustics 19(5), 3-10, 1991.
5. U.S. EPA, *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, 1971.
6. County of Sacramento, *Noise Element: Table 2: Non-Transportation Noise Standards*, December, 13, 2017.

Summary

As shown in **Table 9**, stationary sources would not exceed the Policy NO-6 of the County's General Plan at the nearest commercial and residential uses. Additionally, noise levels would be further attenuated by intervening terrain and structures and were not accounted for in the noise calculations in **Table 9**. Therefore, operational noise impacts associated with on-site activities would be less than significant.

Off-Site Traffic Noise

Implementation of the project would generate increased traffic volumes along study roadway segments. The project is expected to generate 929 average daily trips, which would result in noise increases on project area roadways. In general, a traffic noise increase of less than 3 dBA is barely perceptible to people, while a 5-dBA increase is readily noticeable (Caltrans, 2013). Generally, traffic volumes on project area roadways would have to approximately double for the resulting traffic noise levels to increase by 3 dBA. Therefore, permanent increases in ambient noise levels of less than 3 dBA are considered to be less than significant.

Based on the General Plan Noise Element, when pre-project traffic noise levels are less than 60 dB, a 5+ dB increase is required before the change is significant. When pre-project noise levels are between 60 dB and 65 dB, an increase of 3+ dB is required before the change is significant. When pre-project noise levels are above 65 dB, an increase of 1.5+ dB is required before the change is considered significant.

As shown in **Table 10: Existing and Existing Plus Project Noise Levels**, the existing plus project traffic-generated noise level on project area roadways is between 52.1 dBA L_{dn} and 54.7 dBA L_{dn} at 100 feet from the centerline. As previously described, L_{dn} is 24-hour average noise level with a 10 dBA "weighting" added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the evening and nighttime, respectively.

Traffic noise levels for roadways primarily affected by the project were calculated using the FHWA's Highway Noise Prediction Model (FHWA-RD-77-108). Traffic noise modeling was conducted for conditions with and without the project, based on traffic volumes (Kimley-Horn, October 2023).

Table 10: Existing and Existing Plus Project Noise Levels

Roadway Segment	Existing		Existing Plus Cargo Facility		Change	Significant Impacts
	ADT	dBA L_{dn}[1]	ADT	dBA L_{dn}[1]		
Bayou Way						
Airport Boulevard and Power Line Road	2,155	52.7	3,430	54.7	2.0	No
Power Line Road and Metro Air Parkway	1,283	50.5	1,857	52.1	1.6	No

ADT = average daily trips; dBA = A-weighted decibels; L_{dn} = day-night average noise level.
1. dBA L_{dn} at 100 feet from the roadway centerline. The actual sound level at any receptor location is dependent upon such factors as the source-to-receptor distance and the presence of intervening structures, barriers, and topography.
Source: Based on traffic data within the *Traffic Evaluation*, prepared by Kimley-Horn, October 2023. Refer to **Appendix A** for traffic noise modeling assumptions and results.

As noted in **Table 10**, the project would have the highest increase of 2.0 dBA on Bayou Way, between Airport Boulevard and Power Line Road. However, the 2.1 dBA CNEL increase is under the perceptible 3.0 dBA and the 5+ dB increase per the County's General Plan Noise Element. Therefore, the project would not have a significant impact on existing traffic noise levels.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

Threshold 6.2 Would the Project expose persons to or generate excessive ground borne vibration or ground borne noise levels?

Construction

Increases in groundborne vibration levels attributable to the project would be primarily associated with construction-related activities. Construction on the project site would have the potential to result in varying degrees of temporary groundborne vibration, depending on the specific construction equipment used and the operations involved. Ground vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. The effect on buildings located in the vicinity of the construction site often varies depending on soil type, ground strata, and construction characteristics of the receiver building(s). The results from vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibration at moderate levels, to slight damage at the highest levels. Groundborne vibrations from construction activities rarely reach levels that damage structures.

The FTA has published standard vibration velocities for construction equipment operations. In general, depending on the building category of the nearest buildings adjacent to the potential pile driving area, the potential construction vibration damage criteria vary. For example, for a building constructed with reinforced concrete with no plaster, the FTA guidelines show that a vibration level of up to 0.50 inch per second (in/sec) peak particle velocity (PPV) is considered safe and would not result in any construction vibration damage. In general, the FTA architectural damage criterion for continuous vibrations (i.e. 0.2 in/sec) appears to be conservative. The types of construction vibration impacts include human annoyance and building damage. Human annoyance occurs when construction vibration rises significantly above the threshold of human perception for extended periods of time. Building damage can be cosmetic or structural. Ordinary buildings that are not particularly fragile would not experience cosmetic damage (e.g. plaster cracks) at distances beyond 30 feet. This distance can vary substantially depending on soil composition and underground geological layer between vibration source and receiver.

Table 11: Typical Construction Equipment Vibration Levels, lists vibration levels at 25 feet and 180 feet for typical construction equipment. Groundborne vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. As indicated in **Table 11**, based on FTA data, vibration velocities from typical heavy construction equipment operations that would be used during project construction range from 0.003 to 0.089 in/sec PPV at 25 feet from the source of activity. As shown in **Table 11** the highest vibration levels are achieved with the large bulldozer operations. This construction activity is expected to take place during grading. Project construction would be approximately 180 feet from the closest structure to the east. However, construction equipment vibration velocities would not exceed the FTA's 0.20 PPV threshold at the nearest structure. In general, other construction activities would occur throughout the project site and would not be concentrated at the point closest to the nearest structure. Therefore, vibration impacts associated with the project would be less than significant.

Table 11: Typical Construction Equipment Vibration Levels		
Equipment	**Peak Particle Velocity at 25 Feet (in/sec)**	**Peak Particle Velocity at 180 Feet (in/sec)[1]**
Large Bulldozer	0.089	0.005
Caisson Drilling	0.089	0.005
Loaded Trucks	0.076	0.004
Rock Breaker	0.059	0.003
Jackhammer	0.035	0.002
Small Bulldozer/Tractors	0.003	0.000
[1] Calculated using the following formula: $PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$, where: PPV_{equip} = the peak particle velocity in in/sec of the equipment adjusted for the distance; PPV_{ref} = the reference vibration level in in/sec from Table 7-4 of the Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018; D = the distance from the equipment to the receiver.		
Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018.		

Operations

The project would not generate groundborne vibration that could be felt at surrounding uses. Project operations would not involve railroads or substantial heavy truck operations, and therefore would not result in vibration impacts at surrounding uses. As a result, impacts from vibration associated with project operation would be less than significant.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

Threshold 6.3 For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

The nearest airport to the project site is the Sacramento International Airport located approximately 0.6 miles north of the project site. The project site lies within of the 70 to 75 dBA CNEL noise contours shown in the Sacramento International Airport Land Use Compatibility Plan adopted in December 2013.[16] The Land Use Compatibility Plan requires Vehicle Fueling and Transportation Terminals to maintain an interior noise level of 50 dBA CNEL, when exposed to 70 to 75 dBA CNEL of airport noise, to be an acceptable land use. Current building standards and practices allow for an exterior-to-interior noise reduction of 25 dBA when windows are closed.[17] With this reduction, interior noise would remain below 50 dBA CNEL on the project site and the project would not expose workers to excessive noise levels. Further, the project does not expose any residences to excessive airport noise levels. Therefore, the project would not expose people residing or working in the project area to excessive airport- or airstrip-related noise levels and no mitigation is required.

Mitigation Measures: No mitigation is required.

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[16] Sacramento Area Council of Governments, *Sacramento International Airport Land Use Compatibility Plan*, December 2013.
[17] United States Department of Housing and Urban Development, *Noise Guidebook*, 2009.

Level of Significance: Less than significant impact.

6.2 Cumulative Noise Impacts

Cumulative Construction Noise

The project's construction activities would not result in a substantial temporary increase in ambient noise levels. The project would be subject to the limitations imposed by the County regarding construction noise. Sacramento County does not permit construction activities between the hours of 8:00 p.m. and 6:00 a.m. on weekdays and Friday commencing at 8:00 p.m. through and including 7:00 a.m. on Saturday; Saturdays commencing at 8:00 p.m. through and including 7:00 a.m. on the next following Sunday and on Sunday after the hour of 8:00 p.m. There would be periodic, temporary, noise impacts that would cease upon completion of construction activities. The project would contribute to other proximate construction project noise impacts if construction activities were conducted concurrently. However, based on the noise analysis above, the project's construction-related noise impacts would be less than significant following compliance with the Sacramento County Code and General Plan. Therefore, would not create a significant cumulative impact from construction noise. In addition, project construction would not make a cumulatively considerable contribution to significant cumulative impacts, assuming such a cumulative impact existed, and impacts in this regard are not cumulatively considerable.

Cumulative Construction Vibration

The project's construction vibration levels would not exceed FTA thresholds therefore, the project's incremental contribution is not cumulatively considerable. Given that vibration propagates in waves through the soil, multiple pieces of equipment operating simultaneously would each produce vibration waves in different phases that typically would not increase the magnitude of the vibration. Furthermore, vibration is a localized phenomenon, and tends to dissipate to insignificant levels within dozens of feet, as discussed in Threshold 6.2. Thus, there would be no possibility for vibration associated with the project to combine with vibration from other projects because of their distances from the project site. Therefore, the cumulative vibration impacts would be cumulatively less than significant.

Cumulative Operational Noise

Cumulative noise impacts describe how much noise levels are projected to increase over existing conditions with the development of the project and other foreseeable projects. Cumulative noise impacts would occur primarily as a result of increased noise associated with the parking and EV charging operations, which include amplified speech, idling vehicles, vehicular circulation, car alarms, door slams, and human voices. Additionally, increased traffic on local roadways due to buildout of the project and other projects in the vicinity would also generate cumulative noise levels.

Stationary Noise

As discussed above, impacts from the project's operations would be less than significant. Due to site distance, intervening land uses, and the fact that noise dissipates as it travels away from its source, noise impacts from on-site activities and other stationary sources would be limited to the project site and vicinity. The surrounding area is anticipated to be built out with primarily industrial uses which would compound noise generated on-site. However, due to the distance between the project area and nearby receptors, cumulative operational noise would not reach levels exceeding General Plan Policy NO-6. Thus, cumulative operational noise impacts from related projects, in conjunction with project-specific noise impacts, would not be cumulatively significant.

Cumulative Off-Site Traffic Noise

A project's contribution to a cumulative traffic noise increase would be considered significant when the combined effect exceeds perception level (i.e., auditory level increase) threshold. Cumulative increases in traffic noise levels were estimated by comparing the Existing Plus Project and Cumulative scenarios to existing conditions.

The following criteria is used to evaluate the combined effect of the cumulative noise increase.

- Combined Effect. The cumulative with project noise level ("Cumulative Year With Project") would cause a significant cumulative impact if a 3.0 dB increase over "Existing" conditions occurs and the resulting noise level exceeds the applicable exterior standard at a sensitive use. Although there may be a significant noise increase due to the project in combination with other related projects (combined effects), it must also be demonstrated that the project has an incremental effect. In other words, a significant portion of the noise increase must be due to the project.

The following criteria have been used to evaluate the incremental effect of the cumulative noise increase.

- Incremental Effects. The "Cumulative Year With Project" causes a 1.0 dBA increase in noise over the "Cumulative Without Project" noise level.

A significant impact would result only if both the combined and incremental effects criteria have been exceeded. Noise by definition is a localized phenomenon and reduces as distance from the source increases. Consequently, only the project and growth due to occur in the general area would contribute to cumulative noise impacts. **Table 12: Cumulative Plus Project Predicted Traffic Noise Levels** identifies the traffic noise effects along roadway segments in the project vicinity for "Existing," "Cumulative Without Project," and "Cumulative With Project," conditions, including incremental and net cumulative impacts.

Table 12: Cumulative Plus Project Predicted Traffic Noise Levels

Roadway Segment	Existing (dBA L_{dn}[1])	Cumulative without Project (dBA L_{dn}[1])	Cumulative With Project (dBA L_{dn}[1])	Combined Effects	Incremental Effects	Cumulatively Significant Impacts
				dBA Difference: Existing and Cumulative with Project	dBA Difference: Cumulative and Cumulative with Project	
Bayou Way						
Airport Boulevard and Power Line Road	52.7	52.8	56.3	3.6	3.5	No[2]
Power Line Road and Metro Air Parkway	50.5	50.5	53.4	2.9	2.9	No

ADT = average daily trips; dBA = A-weighted decibels; L_{dn} = day-night average noise level.
1. dBA L_{dn} at 100 feet from the roadway centerline. The actual sound level at any receptor location is dependent upon such factors as the source-to-receptor distance and the presence of intervening structures, barriers, and topography.
2. Cumulative plus Project noise levels would remain below the 65 dBA L_{dn} traffic noise threshold for industrial receptors.
Source: Based on traffic data within the *Traffic Evaluation*, prepared by Kimley-Horn, October 2023. Refer to **Appendix A** for traffic noise modeling assumptions and results.

As shown in **Table 12**, there would be one segment, Bayou Way from Airport Boulevard to Power Line Road, that exceeds both the combined and incremental effects thresholds. However, the resulting "Cumulative Plus Project" traffic noise level would be approximately 56.3 dBA L_{dn} which is below the 65 dBA L_{dn} traffic noise threshold for industrial uses. Therefore, cumulative traffic noise would result in a less than significant impact.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

7 REFERENCES

1. California Department of Transportation, *California Vehicle Noise Emission Levels*, 1987.
2. California Department of Transportation, *Traffic Noise Analysis Protocol*, 2011.
3. California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, 2013.
4. California Department of Transportation, *Transportation and Construction Vibration Guidance Manual*, 2013.
5. County of Sacramento, Sacramento County Code, March 2020.
6. County of Sacramento, *General Plan*, 2017.
7. Sacramento Area Council of Governments, Sacramento International Airport Land Use Compatibility Plan, December 2013.
8. Cyril M. Harris, *Handbook of Noise Control*, 1979.
9. Elliott H. Berger, Rick Neitzel, and Cynthia A. Kladden, *Noise Navigator Sound Level Database with Over 1700 Measurement Values*, July 6, 2010.
10. Federal Highway Administration, *Noise Fundamentals*, 2017.
11. Federal Interagency Committee on Noise, *Federal Agency Review of Selected Airport Noise Analysis Issues*, 1992.
12. Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018.
13. James P. Cowan, *Handbook of Environmental Acoustics,* 1994.
14. Kariel, H. G., *Noise in Rural Recreational Environments*, Canadian Acoustics 19(5), 3-10, 1991.
15. Kimley-Horn, *WattEV Sacramento Local Transportation Analysis, Access, and Safety Evaluation*, October 2023.
16. United States Environmental Protection Agency, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, 1971.
17. United States Department of Housing and Urban Development, *Noise Guidebook*, 2009.

Appendix A

Noise Modeling Results

FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels

Project Name: SWIFT WattEV
Project Number:
Scenario: Existing
Ldn/CNEL: Ldn

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

								Vehicle Mix		Distance from Centerline of Roadway				
				Median	ADT	Speed	Alpha	Medium	Heavy	Ldn at	Distance to Contour			
#	Roadway	Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 Ldn	65 Ldn	60 Ldn	55 Ldn
1	Bayou Way	Airport Boulevard and Power Line Road	2	15	2,155	30	0	2.0%	1.0%	52.7	-	-	-	59
2	Bayou Way	Power Line Road and Metro Air Parkway	2	15	1,283	30	0	2.0%	1.0%	50.5	-	-	-	-

[1] Distance is from the centerline of the roadway segment to the receptor location.
"-" = contour is located within the roadway right-of-way.

FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels

Project Name: SWIFT WattEV
Project Number:
Scenario: Existing Plus Project
Ldn/CNEL: Ldn

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

								Vehicle Mix		Distance from Centerline of Roadway				
				Median	ADT	Speed	Alpha	Medium	Heavy	Ldn at	Distance to Contour			
#	Roadway	Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 Ldn	65 Ldn	60 Ldn	55 Ldn
1	Bayou Way	Airport Boulevard and Power Line Roa	2	15	3,430	30	0	2.0%	1.0%	54.7	-	-	-	94
2	Bayou Way	Power Line Road and Metro Air Parkw	2	15	1,857	30	0	2.0%	1.0%	52.1	-	-	-	51

[1] Distance is from the centerline of the roadway segment to the receptor location.
"-" = contour is located within the roadway right-of-way.

FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels

Project Name: SWIFT WattEV
Project Number:
Scenario: Horizon Year
Ldn/CNEL: Ldn

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

								Vehicle Mix		Distance from Centerline of Roadway				
				Median	ADT	Speed	Alpha	Medium	Heavy	Ldn at	Distance to Contour			
#	Roadway	Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 Ldn	65 Ldn	60 Ldn	55 Ldn
1	Bayou Way	Airport Boulevard and Power Line Roa	2	15	2,200	30	0	2.0%	1.0%	52.8	-	-	-	60
2	Bayou Way	Power Line Road and Metro Air Parkw	2	15	1,300	30	0	2.0%	1.0%	50.5	-	-	-	-

[1] Distance is from the centerline of the roadway segment to the receptor location.
"-" = contour is located within the roadway right-of-way.

FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels

Project Name: SWIFT WattEV
Project Number:
Scenario: Horizon Year Plus Project
Ldn/CNEL: Ldn

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

								Vehicle Mix		Distance from Centerline of Roadway				
				Median	ADT	Speed	Alpha	Medium	Heavy	Ldn at	Distance to Contour			
#	Roadway	Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 Ldn	65 Ldn	60 Ldn	55 Ldn
1	Bayou Way	Airport Boulevard and Power Line Roa	2	15	4,955	30	0	2.0%	1.0%	56.3	-	-	43	136
2	Bayou Way	Power Line Road and Metro Air Parkw	2	15	2,540	30	0	2.0%	1.0%	53.4	-	-	-	70

[1] Distance is from the centerline of the roadway segment to the receptor location.
"-" = contour is located within the roadway right-of-way.