Appendix E

Noise and Vibration Study

NOISE AND VIBRATION IMPACT ANALYSIS

SOLANO LANDING PROJECT

SOLANO COUNTY, CALIFORNIA

LSA

March 2023

NOISE AND VIBRATION IMPACT ANALYSIS

SOLANO LANDING PROJECT

SOLANO COUNTY, CALIFORNIA

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LIST OF ABBREVIATIONS AND ACRONYMS

County	County of Solano
CNEL	Community Noise Equivalent Level
dB	decibel(s)
dBA	A-weighted decibel(s)
FHWA	Federal Highway Administration
ft	foot/feet
FTA	Federal Transit Administration
FTA Manual	FTA *Transit Noise and Vibration Impact Assessment Manual*
in/sec	inch/inches per second
L_{dn}	day-night average noise level
L_{eq}	equivalent continuous sound level
L_{max}	maximum instantaneous sound level
PPV	peak particle velocity
project	Solano Landing Project
RMS	root-mean-square
sf	square feet
VdB	vibration velocity decibels

INTRODUCTION

This noise and vibration impact analysis has been prepared to evaluate the potential noise and vibration impacts and reduction measures associated with the proposed Solano Landing Project (project) in Solano County, California. This report is intended to satisfy the County of Solano's (County) requirement for a project-specific noise impact analysis by examining the impacts of the project site and evaluating noise reduction measures that the project may require.

PROJECT LOCATION AND DESCRIPTION

The 24.42-acre project site is at 2316 Rockville Road (Assessor's Parcel Number 0027-200-150), in Solano County, California. The project site is currently undeveloped and would be accessible via Suisun Valley Road and Rockville Road (see Figure 1, Regional Project Location, and Figure 2, Site Plan).

The proposed project would include the construction of a total of 32,141 square feet (sf) of development. The development of the property will be as follows.

- Boutique Market: The Market will be known as the "Icehouse Market". The market will help to preserve some of the history of the property through its name as well as the iconic red building that has been known as the "Icehouse". The market would be 5,496 sf, which would sell locally grown products, wines, and beers produced in the Suisun Valley and promoted on the property. The market would help celebrate and further the Suisun Valley's agricultural traditions and help satisfy the local regional demand for fresh locally grown food. The market would have a deli with a custom lunch menu including sandwiches, meats, salads, and other simple lunch items. The Market would also have a barista and assortment of coffee related items. The hours of operation for the market would be Monday through Sunday, 7:00 a.m. to 8:00 p.m.

- Tasting Rooms: There would be six stand-alone tasting rooms with each being 1,500 sf. Three of the six tasting rooms would feature wines from wineries and/or breweries that are locally vinted or brewed in Solano County. The remaining three tasting rooms would have high-quality wines from outside Solano County that would only enhance the Suisun Valley wines. Grapes would be locally sourced from on-site, Solano County, and bordering counties. Food and wine pairings are proposed for the tasting rooms, consistent with approval of similar requests and during agricultural promotional events. The hours of operation for the tasting rooms would be Thursday through Sunday, 10:00 a.m. to 5:00 p.m.

- Multi-Purpose/Dining Hall: The Multi-Purpose/Dining Hall will be 3,655 sf. This facility would host no more than 24 events per year and will host a maximum of 300 guests at one time. The Multi-Purpose/Dining Hall would support the hotel and other property-related events, as well as educational seminars related to agriculture, vineyards, and safety. The hours of operation of this facility would be event specific and no event would go past 10:00 p.m.

- Restaurant: The restaurant would be 7,462 sf. It would incorporate local produce, meats, and poultry into its menu. The restaurant would have a beer and wine license. The hours of

operation for the restaurant would be Wednesday through Monday (closed on Tuesday): 10:00 a.m.– 3:00 p.m. for lunch, and 5:30 p.m. – 10:00 p.m. for dinner.

- Hotel Concierge: The Hotel Concierge building would be 1,728 sf. This building would be used for administering the daily needs of the Boutique Hotel. The hours of operation for the hotel concierge would be Monday through Sunday, 24 hours per day.

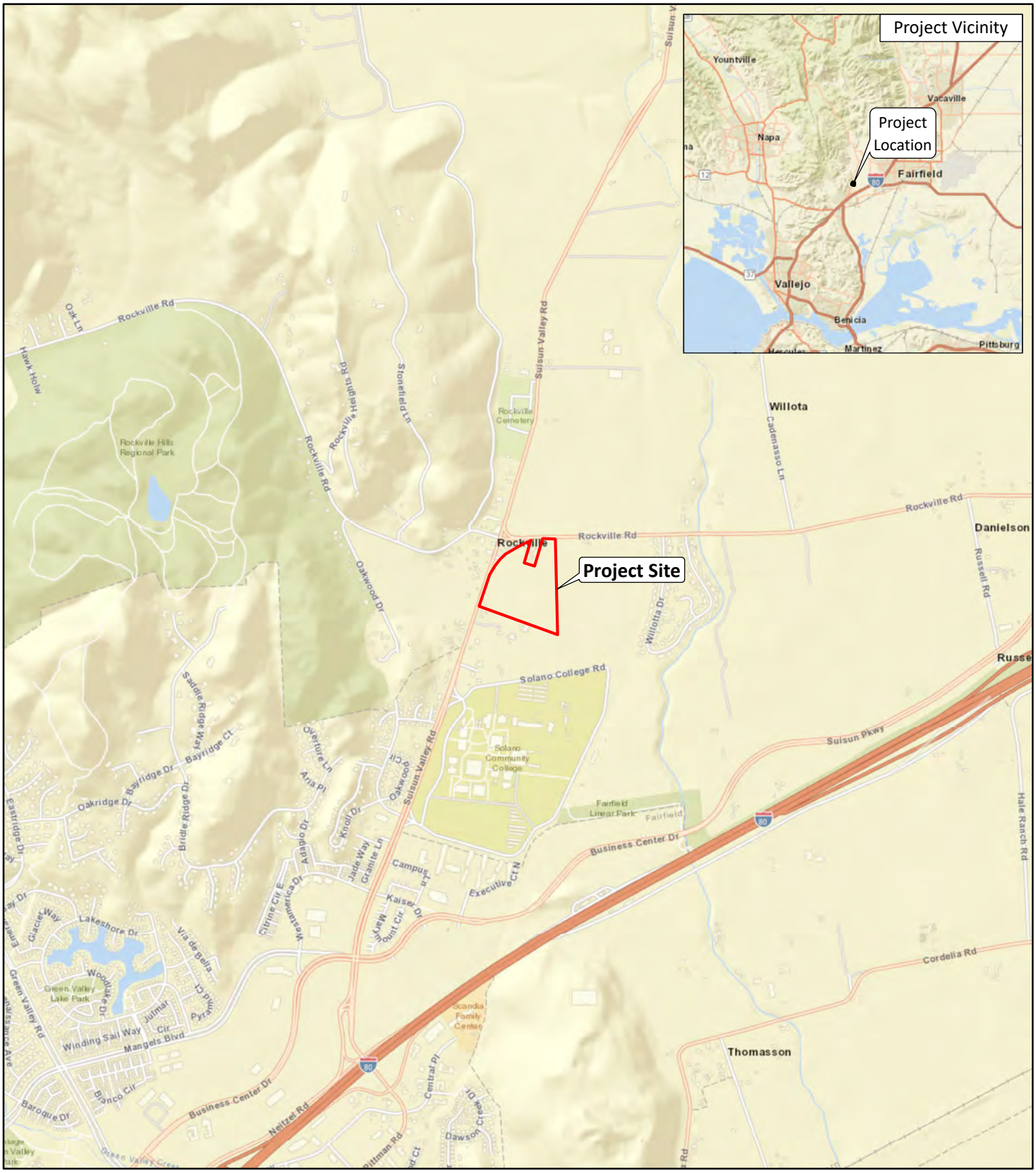
- Boutique Hotel: The Boutique hotel would consist of 10 prefabricated, standalone cottages with approximate square footage of 480 per unit for a total of 4,800 sf. The hotel would be owner/operated by the current landowners. The hours of operation for the hotel would be Monday through Sunday, 24 hours per day.

EXISTING LAND USES IN THE PROJECT AREA

The project site is surrounded primarily by residential uses. The areas adjacent to the project site include the following uses.

- **North:** Existing single-family residences and commercial uses
- **East:** Existing single-family residence along Rockville Road and undeveloped land
- **South:** Existing single-family residences
- **West:** Existing single-family residences along Suisun Valley Road

The closest sensitive receptors to the project site include single-family homes located immediately adjacent to the project site boundary, approximately 5 feet away.



LSA

LEGEND

Project Site

FIGURE 1

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Solano Landing Project
Fairfield, Solano County, California

Project Location

SOURCE: Esri World Street Map (2023).

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FIGURE 2

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SOURCE: Cleaver Design Associates

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Solano Landing Project
Fairfield, Solano County, California

Site Plan

NOISE AND VIBRATION FUNDAMENTALS

CHARACTERISTICS OF SOUND

Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a sound wave, which results in the tone's range from high to low. Loudness is the strength of a sound, and it describes a noisy or quiet environment; it is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity is the average rate of sound energy transmitted through a unit area perpendicular to the direction in which the sound waves are traveling. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

MEASUREMENT OF SOUND

Sound intensity is measured with the A-weighted decibel (dBA) scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound, similar to the human ear's de-emphasis of these frequencies. Decibels (dB), unlike the linear scale (e.g., inches or pounds), are measured on a logarithmic scale representing points on a sharply rising curve.

For example, 10 dB is 10 times more intense than 0 dB, 20 dB is 100 times more intense than 0 dB, and 30 dB is 1,000 times more intense than 0 dB. Thirty decibels (30 dB) represents 1,000 times as much acoustic energy as 0 dB. The decibel scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 dB. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10 dB increase in sound level is perceived by the human ear as only a doubling of the sound's loudness. Ambient sounds generally range from 30 dB (very quiet) to 100 dB (very loud).

Sound levels are generated from a source, and their decibel level decreases as the distance from that source increases. Sound levels dissipate exponentially with distance from their noise sources. For a single point source, sound levels decrease approximately 6 dB for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source (e.g., highway traffic or railroad operations), the sound decreases 3 dB for each doubling of distance in a hard site environment. Line-source sound levels decrease 4.5 dB for each doubling of distance in a relatively flat environment with absorptive vegetation.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. The equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and Community Noise Equivalent Level (CNEL) or the day-night average noise level (L_{dn}) based on A-weighted decibels. CNEL is the time-weighted average noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noises occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during relaxation hours. CNEL and L_{dn} are within 1 dBA of each other and are normally interchangeable. The County uses the CNEL noise scale for long-term traffic noise impact assessment.

Other noise rating scales of importance when assessing the annoyance factor include the maximum instantaneous noise level (L_{max}), which is the highest sound level that occurs during a stated time period. The noise environments discussed in this analysis for short-term noise impacts are specified in terms of maximum levels denoted by L_{max}, which reflects peak operating conditions and addresses the annoying aspects of intermittent noise. It is often used together with another noise scale, or noise standards in terms of percentile noise levels, in noise ordinances for enforcement purposes. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. Half the time the noise level exceeds this level, and half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

Noise impacts can be described in three categories. The first category includes audible impacts, which are increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3 dB or greater because this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1 dB and 3 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category includes changes in noise levels of less than 1 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure to sound levels higher than 85 dBA. Exposure to high sound levels affects the entire system, with prolonged sound exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and the nervous system. In comparison, extended periods of sound exposure above 90 dBA would result in permanent cell damage. When the sound level reaches 120 dBA, a tickling sensation occurs in the human ear, even with short-term exposure. This level of sound is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by a feeling of pain in the ear (i.e., the threshold of pain). A sound level of 160–165 dBA will result in dizziness or a

loss of equilibrium. The ambient or background noise problem is widespread and generally more concentrated in urban areas than in outlying, less developed areas.

Table A lists definitions of acoustical terms, and Table B shows common sound levels and their sources.

Table A: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit of sound measurement that denotes the ratio between two quantities that are proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in 1 second (i.e., the number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. 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. (All sound levels in this report are A-weighted unless reported otherwise.)
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels that are equaled or exceeded by a fluctuating sound level 1%, 10%, 50%, and 90% of a stated time period, respectively.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time-varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 dBA to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 dBA to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 dBA to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time. Usually a composite of sound from many sources from many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, and tonal or informational content, as well as the prevailing ambient noise level.

Source: *Handbook of Acoustical Measurements and Noise Control* (Harris 1991).

Table B: Common Sound Levels and Their Noise Sources

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Evaluations
Near Jet Engine	140	Deafening	128 times as loud
Civil Defense Siren	130	Threshold of Pain	64 times as loud
Hard Rock Band	120	Threshold of Feeling	32 times as loud
Accelerating Motorcycle at a Few Feet Away	110	Very Loud	16 times as loud
Pile Driver; Noisy Urban Street/ Heavy City Traffic	100	Very Loud	8 times as loud
Ambulance Siren; Food Blender	95	Very Loud	—
Garbage Disposal	90	Very Loud	4 times as loud
Freight Cars; Living Room Music	85	Loud	—
Pneumatic Drill; Vacuum Cleaner	80	Loud	2 times as loud
Busy Restaurant	75	Moderately Loud	—
Near Freeway Auto Traffic	70	Moderately Loud	Reference level
Average Office	60	Quiet	One-half as loud
Suburban Street	55	Quiet	—
Light Traffic; Soft Radio Music in Apartment	50	Quiet	One-quarter as loud
Large Transformer	45	Quiet	—
Average Residence without Stereo Playing	40	Faint	One-eighth as loud
Soft Whisper	30	Faint	—
Rustling Leaves	20	Very Faint	—
Human Breathing	10	Very Faint	Threshold of Hearing
—	0	Very Faint	—

Source: Compiled by LSA (2022).

FUNDAMENTALS OF VIBRATION

Vibration refers to ground-borne noise and perceptible motion. Ground-borne vibration is almost exclusively a concern inside buildings and is rarely perceived as a problem outdoors, where the motion may be discernible, but without the effects associated with the shaking of a building there is less adverse reaction. Vibration energy propagates from a source through intervening soil and rock layers to the foundations of nearby buildings. The vibration then propagates from the foundation throughout the remainder of the structure. Building vibration may be perceived by occupants as the motion of building surfaces, the rattling of items sitting on shelves or hanging on walls, or a low-frequency rumbling noise. The rumbling noise is caused by the vibration of walls, floors, and ceilings that radiate sound waves. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by 10 dB or less. This is an order of magnitude below the damage threshold for normal buildings.

Typical sources of ground-borne vibration are construction activities (e.g., blasting, pile-driving, and operating heavy-duty earthmoving equipment), steel-wheeled trains, and occasional traffic on rough roads. Problems with both ground-borne vibration and noise from these sources are usually localized to areas within approximately 100 feet (ft) from the vibration source, although there are examples of ground-borne vibration causing interference out to distances greater than 200 ft. When roadways are smooth, vibration from traffic, even heavy trucks, is rarely perceptible. It is assumed for most projects that the roadway surface will be smooth enough that ground-borne vibration from

street traffic will not exceed the impact criteria; however, construction of the project could result in ground-borne vibration that may be perceptible and annoying.

Ground-borne noise is not likely to be a problem because noise arriving via the normal airborne path will usually be greater than ground-borne noise.

Ground-borne vibration has the potential to disturb people and damage buildings. Although it is very rare for train-induced ground-borne vibration to cause even cosmetic building damage, it is not uncommon for construction processes such as blasting and pile-driving to cause vibration of sufficient amplitudes to damage nearby buildings. Ground-borne vibration is usually measured in terms of vibration velocity, either the root-mean-square (RMS) velocity or peak particle velocity (PPV). The RMS is best for characterizing human response to building vibration, and PPV is used to characterize the potential for damage. Decibel notation acts to compress the range of numbers required to describe vibration. Vibration velocity level in decibels is defined as:

$$L_v = 20 \log_{10} [V/V_{ref}]$$

where "L_v" is the vibration velocity in decibels (VdB), "V" is the RMS velocity amplitude, and "V_{ref}" is the reference velocity amplitude, or 1×10^{-6} inches/second (in/sec) used in the United States.

REGULATORY SETTING

APPLICABLE NOISE STANDARDS

The applicable noise standards governing the project site include the criteria in the California Code of Regulations and the Noise section of the Health and Safety Chapter of the County's General Plan.

California Code of Regulations

Interior noise levels for residential habitable rooms are regulated by Title 24 of the California Code of Regulations, California Noise Insulation Standards. Title 24, Chapter 12, Section 1206.4, of the 2019 California Building Code requires that interior noise levels attributable to exterior sources not exceed 45 CNEL in any habitable room. A habitable room is a room used for living, sleeping, eating, or cooking. Bathrooms, closets, hallways, utility spaces, and similar areas are not considered habitable rooms for this regulation (Title 24 California Code of Regulations, Chapter 12, Section 1206.4).

County of Solano

General Plan

The Solano County General Plan establishes acceptable noise level criteria for transportation and non-transportation (stationary) noise sources under Chapter 5, Health and Safety. Table C shows the acceptable noise levels for various land use categories and is used when determining a proposed project's noise impact. Table D provides acceptable outdoor and interior noise levels for land uses.

The Solano County General Plan states the following noise level performance criterion for new projects that are affected by or include non-transportation noise sources, such as those attributed to commercial uses: All uses of land and structures shall be conducted in a manner, and provide adequate controls and operational management to prevent noise that exceeds 65 dBA at any property line.

The project contractor(s) shall limit all noise producing construction related activities, including the operating of any tools or equipment used in construction, grading or demolition work, to between the hours of 7:00 a.m. and 7:00 p.m., Monday through Saturday. No activity shall take place on Sunday, except by written permission of the Director of Resource Management.

Table C: Land Use Noise Compatibility Guidelines

Land Use Category	Community Noise Exposure (L_{dn} or CNEL, dBA)			
	Normally Acceptable[1]	Conditionally Acceptable[2]	Normally Unacceptable[3]	Clearly Unacceptable[4]
Residential – Low Density Single Family, Duplex, Mobile Home	<60	55-70	70-75	75+
Residential – Multifamily	<65	60-70	70-75	75+
Transient Lodging – Motel, Hotel	<65	60-70	70-80	80+
Schools, libraries, Churches, Hospitals, Nursing Homes	<70	60-70	70-80	80+
Auditoriums, Concert Halls, Amphitheaters	-	<70	65+	-
Sports Arena, Outdoor Spectator Sports	-	<75	70+	-
Playgrounds, Neighborhood Parks	<70	-	67.5-75	72.5+
Gold Courses, Riding Stables, Water Recreation, Cemeteries	<75	-	70-80	80+
Office Building, Business Commercial, and Professional	<70	67.5-77.5	75+	-
Industrial, Manufacturing Utilities, Agriculture	<75	70-80	75+	-

Source: County of Solano (2015).

Notes:

1 Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

2 New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

3 New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. Outdoor areas must be shielded.

4 New construction or development should generally not be undertaken.

5 These standards are not applicable for development within the airport compatibility review area. Development in the airport compatibility review areas are subject to standards in the applicable airport land use plan.

CNEL = Community Noise Equivalent Level

dBA = A-Weighted decibel

L_{eq} = equivalent continuous sound level

L_{dn} = day-night average noise level

Table D: Noise Standard for New Uses Affected by Traffic and Railroad Noise

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

Source: County of Solano (2015).
Notes:
1 Interior-noise-level standards are applied within noise-sensitive areas of the various land uses, with windows and doors in the closed positions.
2 If these uses are affected by nighttime railroad passages, the potential for sleep disturbance shall be addressed.
3 Where there are no sensitive exterior spaces proposed for these uses, only the interior-noise-level standard shall apply.
4 Hospitals are often noise-generating uses. The exterior-noise-level standards for hospitals are applicable only at clearly identified areas designated for outdoor relaxation by either hospital staff or patients.
dBA = A-Weighted decibel
L_{dn} = day-night average noise level

Federal Transit Administration

Although the County does not have daytime construction noise level limits for activities that occur within the specified hours in Section 11.80.030(D)(7) to determine potential California Environmental Quality Act noise impacts, construction noise was assessed using criteria from the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018) (FTA Manual). Table E shows the Federal Transit Administration's (FTA) Detailed Assessment Construction Noise Criteria based on the composite noise levels per construction phase.

Table E: Detailed Assessment Daytime Construction Noise Criteria

Land Use	Daytime 8-hour L_{eq} (dBA)
Residential	80
Commercial	85
Industrial	90

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level

APPLICABLE VIBRATION STANDARDS

Federal Transit Administration

Vibration standards included in the FTA Manual are used in this analysis for ground-borne vibration impacts on human annoyance. The criteria for environmental impact from ground-borne vibration

and noise are based on the maximum levels for a single event. Table F provides the criteria for assessing the potential for interference or annoyance from vibration levels in a building.

Table G lists the potential vibration building damage criteria associated with construction activities, as suggested in the FTA Manual. FTA guidelines show that a vibration level of up to 0.5 in/sec in PPV is considered safe for buildings consisting of reinforced concrete, steel, or timber (no plaster) and would not result in any construction vibration damage. For non-engineered timber and masonry buildings, the construction building vibration damage criterion is 0.2 in/sec in PPV.

Table F: Interpretation of Vibration Criteria for Detailed Analysis

Land Use	Max L_v (VdB)[1]	Description of Use
Workshop	90	Vibration that is distinctly felt. Appropriate for workshops and similar areas not as sensitive to vibration.
Office	84	Vibration that can be felt. Appropriate for offices and similar areas not as sensitive to vibration.
Residential Day	78	Vibration that is barely felt. Adequate for computer equipment and low-power optical microscopes (up to 20×).
Residential Night and Operating Rooms	72	Vibration is not felt, but ground-borne noise may be audible inside quiet rooms. Suitable for medium-power microscopes (100×) and other equipment of low sensitivity.

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
[1] As measured in 1/3-octave bands of frequency over a frequency range of 8 to 80 Hertz.
FTA = Federal Transit Administration
Max = maximum
L_v = velocity in decibels
VdB = vibration velocity decibels

Table G: Construction Vibration Damage Criteria

Building Category	PPV (in/sec)
Reinforced concrete, steel, or timber (no plaster)	0.50
Engineered concrete and masonry (no plaster)	0.30
Non-engineered timber and masonry buildings	0.20
Buildings extremely susceptible to vibration damage	0.12

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
FTA = Federal Transit Administration
PPV = peak particle velocity
in/sec = inch/inches per second

OVERVIEW OF THE EXISTING NOISE ENVIRONMENT

The primary existing noise sources in the project area are transportation facilities. Local traffic on the roadways in the vicinity of the project (Suisun Valley Road and Rockville Road) is a steady source of ambient noise.

AMBIENT NOISE MEASUREMENTS

One long-term (24-hour) noise level measurement was conducted on February 9 and 10, 2023, using a Larson Davis Spark 706RC Dosimeter. Short-term (15-minute) noise level measurements were conducted on February 9, 2023, using a Larson Davis LxT. Table H provides a summary of the measured hourly noise levels from the long-term noise level measurements. Hourly noise levels at surrounding sensitive uses are as low as 31.1 dBA L_{eq} during nighttime hours and 44.0 dBA L_{eq} during daytime hours. Noise monitoring data results are provided in Appendix A. Figure 3 shows the noise monitoring locations.

Table H: Long-Term Ambient Noise Level Measurements

Location		Daytime Noise Levels[1] (dBA L_{eq})	Evening Noise Levels[2] (dBA L_{eq})	Nighttime Noise Levels[3] (dBA L_{eq})	Daily Noise levels (dBA CNEL)
LT-1	Near southwest corner of project site, on a tree, approximately 50 ft away from Suisun Valley Road centerline.	65.6 – 69.2	63.2 – 64.6	52.7 – 64.6	68.7
ST-1[4]	Near southeast corner of project site, approximately 1,200 ft away from Suisun Valley Road centerline.	44.0 – 47.6	41.6 – 43.0	31.1 – 43.0	47.1
ST-2[4]	Near northeast corner of project site, by powerline, south of Rockville Road, approximately 25 ft away from Rockville Rd centerline.	66.7 – 70.3	64.3 – 65.7	53.8 – 65.7	69.8
ST-3[4]	Near northwest boundary of project site, opposite Munson Construction office.	54.9 – 58.5	52.5 – 53.9	42.0 – 53.9	58.0

Source: Compiled by LSA (2023).
Note: Noise measurements were conducted from February 9 to February 10, 2023, starting at 3:00 p.m.
[1] Daytime Noise Levels = Noise levels during the hours from 7:00 a.m. to 7:00 p.m.
[2] Evening Noise Levels = Noise levels during the hours from 7:00 p.m. to 10:00 p.m.
[3] Nighttime Noise Levels = Noise levels during the hours from 10:00 p.m. to 7:00 a.m.
[4] Short-term measurement data estimated based on corresponding long-term.
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
ft = feet
L_{eq} = equivalent continuous sound level

EXISTING AIRCRAFT NOISE

Airport-related noise levels are primarily associated with aircraft engine noise made while aircraft are taking off, landing, or running their engines while still on the ground. The closest airports to the proposed project site are Napa County Airport and Travis Air Force Base, approximately 8.6 miles west and east of the project site, respectively. The project site is not within the 65 dBA CNEL noise

contour for the airports and is not within the vicinity of a private airstrip. Although aircraft-related noise may be audible on the project site, the proposed project would not expose people residing or working in the project area to excessive noise levels due to the proximity of a public airport. This impact would be less than significant.

LSA

FIGURE 3

LEGEND

Project Site

ST-1 Short-term Noise Monitoring Location

LT-1 Long-term Noise Monitoring Location

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FEET

Solano Landing Project

Fairfield, Solano County, California

Noise Monitoring Locations

SOURCE: Esri World Imagery (Vivid Advanced 06/2021).

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PROJECT IMPACT ANALYSIS

SHORT-TERM CONSTRUCTION NOISE IMPACTS

Two types of short-term noise impacts could occur during the construction of the proposed project. First, construction crew commutes and the transport of construction equipment and materials to the site for the proposed project would incrementally increase noise levels on access roads leading to the site. Although there would be a relatively high single-event noise-exposure potential causing intermittent noise nuisance (passing trucks at 50 ft would generate up to 84 dBA L_{max}), the effect on longer-term ambient noise levels would be small when compared to existing daily traffic volumes on roadways accessing the project site. Because construction-related vehicle trips would not approach existing daily traffic volumes, traffic noise would not increase by 3 dBA CNEL. A noise level increase of less than 3 dBA would not be perceptible to the human ear in an outdoor environment. Therefore, short-term, construction-related impacts associated with worker commute and equipment transport to the project site would be less than significant.

The second type of short-term noise impact is related to noise generated during construction, which includes site preparation, grading, building construction, paving, and architectural coating on the project site. Construction is completed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the site and, therefore, the noise levels surrounding the site as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table H lists typical construction equipment noise levels recommended for noise impact assessments, based on a distance of 50 ft between the equipment and a noise receptor, taken from the Federal Highway Administration (FHWA) *Roadway Construction Noise Model* (FHWA 2006).

In addition to the reference maximum noise level, the usage factor provided in Table I is used to calculate the hourly noise level impact for each piece of equipment based on the following equation:

$$L_{eq}(equip) = E.L. + 10\log(U.F.) - 20\log\left(\frac{D}{50}\right)$$

where: $L_{eq}(equip)$ = L_{eq} at a receiver resulting from the operation of a single piece of equipment over a specified time period.

E.L. = noise emission level of the particular piece of equipment at a reference distance of 50 ft.

U.F. = usage factor that accounts for the fraction of time that the equipment is in use over the specified period of time.

D = distance from the receiver to the piece of equipment.

Table I: Typical Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (%)[1]	Maximum Noise Level (L_{max}) at 50 Feet[2]
Auger Drill Rig	20	84
Backhoes	40	80
Compactor (ground)	20	80
Compressor	40	80
Cranes	16	85
Dozers	40	85
Dump Trucks	40	84
Excavators	40	85
Flat Bed Trucks	40	84
Forklift	20	85
Front-end Loaders	40	80
Graders	40	85
Impact Pile Drivers	20	95
Jackhammers	20	85
Paver	50	77
Pickup Truck	40	55
Pneumatic Tools	50	85
Pumps	50	77
Rock Drills	20	85
Rollers	20	85
Scrapers	40	85
Tractors	40	84
Trencher	50	80
Welder	40	73

Source: *FHWA Roadway Construction Noise Model User's Guide,* Table 1 (FHWA 2006).
Note: Noise levels reported in this table are rounded to the nearest whole number.
[1] Usage factor is the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power.
[2] Maximum noise levels were developed based on Specification 721.560 from the Central Artery/ Tunnel program to be consistent with the City of Boston's Noise Code for the "Big Dig" project.
FHWA = Federal Highway Administration
L_{max} = maximum instantaneous sound level

Each piece of construction equipment operates as an individual point source. Using the following equation, a composite noise level can be calculated when multiple sources of noise operate simultaneously:

$$Leq\ (composite) = 10 * \log_{10}\left(\sum_{1}^{n} 10^{\frac{Ln}{10}}\right)$$

Using the equations from the methodology above, the reference information in Table I, and the construction equipment list provided, LSA calculated the composite noise level of each construction phase. The project construction composite noise levels at a distance of 50 feet would range from 74 dBA L_{eq} to 88 dBA L_{eq}, with the highest noise levels occurring during the site preparation phase.

Once composite noise levels are calculated, reference noise levels can then be adjusted for distance using the following equation:

$$Leq\ (at\ distance\ X) = Leq\ (at\ 50\ feet) - 20 * \log_{10}\left(\frac{X}{50}\right)$$

In general, this equation shows that doubling the distance would decrease noise levels by 6 dBA, while halving the distance would increase noise levels by 6 dBA.

Table J shows the nearest sensitive uses to the project site, their distance from the center of construction activities, and composite noise levels expected during construction. These noise level projections do not consider intervening topography or barriers. Construction equipment calculations are provided in Appendix B.

Table J: Potential Construction Noise Impacts at Nearest Receptor

Receptor (Location)	Composite Noise Level (dBA L_{eq}) at 50 feet[1]	Distance (feet)	Composite Noise Level (dBA L_{eq})
Residences (North)	88	385	70
Residences (South and West)		590	66
Residences (East)		1100	61

Source: Compiled by LSA (2023).

[1] The composite construction noise level represents the site preparation phase, which is expected to result in the greatest noise level as compared to other phases.

dBA = A-weighted decibels

L_{eq} = equivalent continuous sound level

While construction noise will vary, it is expected that composite noise levels during construction at the nearest off-site sensitive residential use to the north would reach an average noise level of 70 dBA L_{eq} during daytime hours. These predicted noise levels would only occur when all construction equipment is operating simultaneously and, therefore, are assumed to be rather conservative in nature. While construction-related short-term noise levels have the potential to be higher than existing ambient noise levels in the project area under existing conditions, the noise impacts would no longer occur once project construction is completed.

As stated above, noise impacts associated with construction activities are regulated by the County's noise ordinance. The proposed project would comply with the construction hours specified in the County's General Plan, which states that construction activities are allowed between the hours of 7:00 a.m. and 7:00 p.m., Monday through Saturday. No activity shall take place on Sunday, except by written permission of the Director of Resource Management.

As it relates to off-site uses, construction-related noise impacts would remain below the 80 dBA L_{eq} construction noise level criteria, as established by the FTA for residential land uses for the average daily condition as modeled from the center of the project site and therefore would be considered less than significant. Best construction practices presented at the end of this analysis shall be implemented to minimize noise impacts to surrounding receptors.

SHORT-TERM CONSTRUCTION VIBRATION IMPACTS

This construction vibration impact analysis discusses the level of human annoyance using vibration levels in RMS (VdB) and assesses the potential for building damages using vibration levels in PPV (in/sec). This is because vibration levels calculated in RMS are best for characterizing human response to building vibration, while calculating vibration levels in PPV is best for characterizing the potential for damage.

Table K shows the PPV and VdB values at 25 ft from the construction vibration source. As shown in Table K, bulldozers and other heavy-tracked construction equipment (expected to be used for this project) generate approximately 0.089 PPV in/sec or 87 VdB of ground-borne vibration when measured at 25 ft, based on the FTA Manual. The distance to the nearest buildings for vibration impact analysis is measured between the nearest off-site buildings and the project construction boundary (assuming the construction equipment would be used at or near the project setback line).

Table K: Vibration Source Amplitudes for Construction Equipment

Equipment	Reference PPV/L_V at 25 ft	
	PPV (in/sec)	L_V (VdB)[1]
Pile Driver (Impact), Typical	0.644	104
Pile Driver (Sonic), Typical	0.170	93
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Large Bulldozer[2]	**0.089**	**87**
Caisson Drilling	0.089	87
Loaded Trucks[2]	**0.076**	**86**
Jackhammer	0.035	79
Small Bulldozer	0.003	58

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
[1] RMS vibration velocity in decibels (VdB) is 1 µin/sec.
[2] Equipment shown in **bold** is expected to be used on site.

µin/sec = microinches per second
ft = foot/feet
FTA = Federal Transit Administration
in/sec = inch/inches per second
L_V = velocity in decibels
PPV = peak particle velocity
RMS = root-mean-square
VdB = vibration velocity decibels

The formulae for vibration transmission are provided below, and Tables L and M provide a summary of off-site construction vibration levels.

$$L_vdB\ (D) = L_vdB\ (25\ ft) - 30\ Log\ (D/25)$$

$$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$$

As shown in Table F, above, the threshold at which vibration levels would result in annoyance would be 78 VdB for daytime residential uses. As shown in Table G, the FTA guidelines indicate that for a non-engineered timber and masonry building, the construction vibration damage criterion is 0.2 in/sec in PPV.

Table L: Potential Construction Vibration Annoyance Impacts at Nearest Receptor

Receptor (Location)	Reference Vibration Level (VdB) at 25 ft[1]	Distance (ft) [2]	Vibration Level (VdB)
Residences (North)	87	385	51
Residences (South and West)		590	46
Residences (East)		1,100	38

Source: Compiled by LSA (2023).
[1] The reference vibration level is associated with a large bulldozer, which is expected to be representative of the heavy equipment used during construction.
[2] The reference distance is associated with the average condition, identified by the distance from the center of construction activities to surrounding uses.
ft = foot/feet
VdB = vibration velocity decibels

Table M: Potential Construction Vibration Damage Impacts at Nearest Receptor

Receptor (Location)	Reference Vibration Level (PPV) at 25 ft[1]	Distance (ft)[2]	Vibration Level (PPV)
Residences (North)	0.089	5	0.995
Residences (South)		30	0.068
Residences (West)		100	0.011
Residences (East)		420	0.001

Source: Compiled by LSA (2023).
[1] The reference vibration level is associated with a large bulldozer, which is expected to be representative of the heavy equipment used during construction.
[2] The reference distance is associated with the peak condition, identified by the distance from the perimeter of construction activities to surrounding structures.
ft = foot/feet
PPV = peak particle velocity

Based on the information provided in Table L, vibration levels are expected to approach 51 VdB at the closest residential uses located immediately north of the project site, which is below the 78 VdB threshold for annoyance.

Based on the information provided in Table M, vibration levels are expected to approach 0.995 PPV in/sec at the nearest surrounding structures and would exceed the 0.2 PPV in/sec damage threshold considered safe for non-engineered timber and masonry buildings, which would result in a potentially significant impact. Vibration levels at all other buildings would be lower. Therefore, construction would not result in any vibration damage, and impacts would be less than significant with the incorporation of MM-NOI-1, as detailed below.

MM-NOI-1 Construction Vibration Damage. Due to the close proximity to surrounding structures, the County of Solano (County) Director of Community Development, or designee, shall verify prior to issuance of demolition or grading permits, that the approved plans require that the construction contractor shall implement the following mitigation measures during project construction activities to ensure that damage does not occur at surrounding structures:

- A 15-foot buffer between existing structures and the Project site area shall be clearly delineated with stakes, fencing or other conspicuous boundary markings, to outline the area in which the use of heavy equipment shall be avoided.

- The use of heavy construction shall be avoided within 15 feet of existing surrounding structures.

- However, if the use of heavy equipment is required within 15 feet of surrounding structures, the following measures should be employed:

    - Identify structures that are located within 15 feet (ft) of heavy construction activities and that have the potential to be affected by ground-borne vibration. This task shall be conducted by a qualified structural engineer as approved by the County's Director of Community Development, or designee.

    - Develop a vibration monitoring and construction contingency plan for approval by the Director of Community Development, or designee, to identify structures where monitoring would be conducted; set up a vibration monitoring schedule; define structure-specific vibration limits; and address the need to conduct photo, elevation, and crack surveys to document before and after construction conditions. Construction contingencies would be identified for when vibration levels approached the limits.

    - At a minimum, monitor vibration during initial demolition activities. Monitoring results may indicate the need for more or less intensive measurements.

    - When vibration levels approach limits, suspend construction and implement contingencies as identified in the approved vibration monitoring and construction contingency plan to either lower vibration levels or secure the affected structures.

LONG-TERM OFF-SITE TRAFFIC NOISE IMPACTS

The guidelines included in the FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77 108) were used to evaluate highway traffic-related noise conditions along roadway segments in the project vicinity. This model requires various parameters, including traffic volumes, vehicle mix, vehicle speed, and roadway geometry, to compute typical equivalent noise levels during daytime, evening, and nighttime hours. The resultant noise levels are weighted and summed over 24-hour periods to determine the CNEL values. Table L provides the traffic noise levels for the existing with and without project and opening year with and without project scenarios. These noise levels represent the worst-case scenario, which assumes no shielding is provided between the traffic and the location where the noise contours are drawn.

The without and with project scenario traffic volumes were obtained from the *Traffic Impact Analysis for Solano Landing Project* (KD Anderson & Associates, Inc. 2023). Appendix C provides the specific assumptions used in developing these noise levels and model printouts. Table N shows that the increase in project-related traffic noise would be no greater than 0.3 dBA. Noise level increases less than 1.0 dBA are not perceptible to the human ear. Therefore, traffic noise impacts from project-related traffic on off-site sensitive receptors would be less than significant and no mitigation measures are required.

STATIONARY OPERATIONAL NOISE IMPACTS TO OFF-SITE RECEIVERS

The proposed uses are expected to include heating, ventilation, and air conditioning equipment. It is expected that the equipment installed at each facility would comply with the County's noise standards presented in Table D. Additionally, Typical activities at the patios and amphitheater are not expected to generate excessive noise levels and would only occur during daytime hours. The closest outdoor patio would be approximately 235 feet from the closest sensitive receptor. To achieve compliance with the County's threshold of 65 dBA L_{eq} at nearby sensitive receptors, noise levels at the outdoor patios and amphitheater should not exceed 78 dBA at 50 feet.

LONG-TERM TRAFFIC-RELATED VIBRATION IMPACTS

The proposed project would not generate vibration levels related to on-site operations. In addition, vibration levels generated from project-related traffic on the adjacent roadways are unusual for on-road vehicles because the rubber tires and suspension systems of on-road vehicles provide vibration isolation. Vibration levels generated from project-related traffic on the adjacent roadways would be less than significant, and no mitigation measures are required.

Table N: Traffic Noise Levels Without and With Proposed Project

Roadway Segment	Existing		Existing With Project			Cumulative		Cumulative Plus Project		
	ADT	CNEL (dBA) 50 feet from Centerline of Nearest Lane	ADT	CNEL (dBA) 50 feet from Centerline of Nearest Lane	Increase from Existing Conditions (dBA)	ADT	CNEL (dBA) 50 feet from Centerline of Nearest Lane	ADT	CNEL (dBA) 50 feet from Centerline of Nearest Lane	Increase from Existing Conditions (dBA)
Rockville Road East of Suisun Valley Road	6,640	61.6	7,110	61.9	0.3	7,700	62.2	8,170	62.5	0.3
Rockville Road West of Suisun Valley Road	3,590	58.9	3,740	59.1	0.2	3,950	59.3	4,100	59.5	0.2
Suisun Valley Road North of Rockville Road	5,630	59.3	6,070	59.6	0.3	6,250	59.7	6,690	60.0	0.3
Suisun Valley Road South of Rockville Road	6,850	60.1	7,310	60.4	0.3	8,000	60.8	8,460	61.0	0.2

Source: Compiled by LSA (March 2023).
Note: Traffic noise within 50 feet of the roadway centerline should be evaluated with site-specific information.
Shaded cells indicate roadway segments adjacent to the project site.
ADT = average daily traffic
CNEL= Community Noise Equivalent Level
dBA = A-weighted decibels

LAND USE COMPATIBILITY

The dominant source of noise in the project vicinity is traffic noise from roadways in the vicinity of the project.

EXTERIOR NOISE ASSESSMENT

To assess exterior noise levels at the proposed uses at the project site, as shown in Table G, LSA gathered long-term noise level measurements. The daily noise levels show that noise levels at the project site approach 69 dBA CNEL closest to Suisun Valley Road. Considering the tasting rooms, market, dining hall, and restaurant as commercial uses, an exterior noise level of 70 dBA or less is acceptable, as specified above. Furthermore, the exterior areas for commercial uses are not considered as noise-sensitive areas. For the hotel and cottages, approximately 300 ft from Suisun Valley Road, the noise levels would approach 54 dBA CNEL after distance attenuation and would be within the normally acceptable range for transient lodging. Because exterior noise levels at the project site are considered acceptable, no exterior noise mitigation is required.

INTERIOR NOISE ASSESSMENT

As discussed above, per the California Code of Regulations, an interior noise level standard of 45 dBA CNEL or less is required for all noise-sensitive rooms. Based on the expected future exterior noise levels at the hotel and cottages approaching 54 dBA CNEL, a minimum noise reduction of 9 dBA would be required. As stated in Table D, an interior level standard of 50 dBA CNEL or less is required for commercial uses. Based on the expected future exterior noise levels at the tasting rooms approaching 69 dBA CNEL, a minimum noise reduction of 24 dBA would be required.

Based on reference information from transmission loss test reports for various Milgard windows (Milgard 2008), standard building construction along with standard windows, typically in the Sound Transmission Class 25–28 range, would achieve a reduction of 25 dBA or more. With a reduction of 25 dBA or more, interior noise levels would remain below the interior noise level standard of 50 dBA CNEL for commercial uses and 45 dBA CNEL for transient lodging.

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APPENDIX A

NOISE MONITORING DATA

Noise Measurement Survey – 24 HR

Project Number: 20230890
Project Name: Solano Landing

Test Personnel: Moe Abushanab
Equipment: Spark 706 RC (SN:18907)

Site Number: LT-1 Date: 2/9/2023

Time: From 3:00 p.m. To 3:00 p.m.

Site Location: Southwest corner of project site, on a tree

Primary Noise Sources: Road traffic on Suisun Valley Rd.
Animal sounds (cows, dogs, birds)

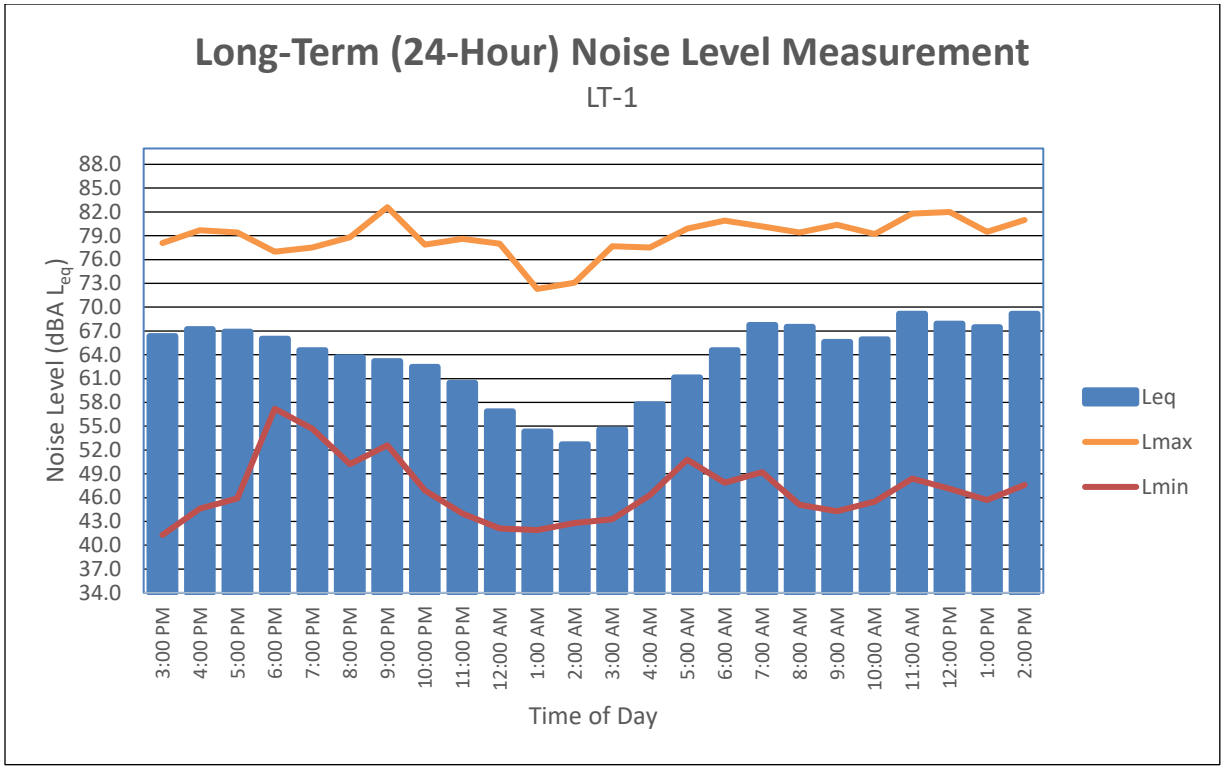
Comments:

Photo:

Long-Term (24-Hour) Noise Level Measurement Results at LT-1

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
3:00 PM	2/9/23	66.4	78.1	41.3
4:00 PM	2/9/23	67.2	79.7	44.6
5:00 PM	2/9/23	66.9	79.4	45.9
6:00 PM	2/9/23	66.0	77.0	57.2
7:00 PM	2/9/23	64.6	77.5	54.7
8:00 PM	2/9/23	63.7	78.8	50.2
9:00 PM	2/9/23	63.2	82.6	52.6
10:00 PM	2/9/23	62.5	77.9	46.9
11:00 PM	2/9/23	60.5	78.6	44.0
12:00 AM	2/10/23	56.9	78.0	42.1
1:00 AM	2/10/23	54.3	72.3	41.9
2:00 AM	2/10/23	52.7	73.1	42.8
3:00 AM	2/10/23	54.6	77.7	43.3
4:00 AM	2/10/23	57.7	77.5	46.3
5:00 AM	2/10/23	61.1	79.9	50.8
6:00 AM	2/10/23	64.6	80.9	47.9
7:00 AM	2/10/23	67.8	80.2	49.2
8:00 AM	2/10/23	67.5	79.4	45.1
9:00 AM	2/10/23	65.6	80.4	44.3
10:00 AM	2/10/23	65.9	79.2	45.5
11:00 AM	2/10/23	69.2	81.8	48.4
12:00 PM	2/10/23	67.9	82.0	47.1
1:00 PM	2/10/23	67.5	79.5	45.7
2:00 PM	2/10/23	69.2	81.0	47.6

Source: Compiled by LSA Associates, Inc. (2023).
dBA = A-weighted decibel
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level
L_{min} = minimum measured sound level


Long-Term (24-Hour) Noise Level Measurement
LT-1
Noise Level (dBA Leq)
88.0
85.0
82.0
79.0
76.0
73.0
70.0
67.0
64.0
61.0
58.0
55.0
52.0
49.0
46.0
43.0
40.0
37.0
34.0
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
Time of Day
Leq
Lmax
Lmin

Noise Measurement Survey

Project Number: 20230890
Project Name: Solano Landing
Test Personnel: Moe Abushanab
Equipment: Larson Davis LxT SE

Site Number: ST-1 Date: 2/9/23 Time: From 2:18 pm To 2:33 pm

Site Location: Southeast corner of project site

Primary Noise Sources: Mainly quiet
Background traffic

Measurement Results:

	dBA
L_{eq}	45.5
L_{max}	54.8
L_{min}	41.3
L_5	47.9
L_{10}	47.3
L_{33}	45.8
L_{50}	45.0
L_{90}	42.5

Atmospheric Conditions:

Maximum Wind Velocity (mph)	2.0
Average Wind Velocity (mph)	1.0
Temperature (F)	66
Relative Humidity (%)	45
Comments:	

Comments:

Location Photo:

Noise Measurement Survey

Project Number: 20230890 Test Personnel: Moe Abushanab
Project Name: Solano Landing Equipment: Larson Davis LxT SE

Site Number: ST-2 Date: 2/9/23 Time: From 2:39 pm To 2:54 pm

Site Location: Northeast corner of project site, by powerline , south of Rockville Rd, approximately 25 ft from Rockville centerline

Primary Noise Sources: Traffic on Rockville Rd
Infrequent buzzing sound from box at powerline pole

Measurement Results:

	dBA
L_{eq}	67.4
L_{max}	82.8
L_{min}	43.7
L_5	73.2
L_{10}	71.5
L_{33}	66.7
L_{50}	62.2
L_{90}	46.7

Atmospheric Conditions:

Maximum Wind Velocity (mph)	2.0
Average Wind Velocity (mph)	1.0
Temperature (F)	66
Relative Humidity (%)	45
Comments:	

Comments:

Location Photo:

Noise Measurement Survey

Project Number: 20230890
Project Name: Solano Landing
Test Personnel: Moe Abushanab
Equipment: Larson Davis LxT SE

Site Number: ST-3 Date: 2/9/23 Time: From 2:39 pm To 2:54 pm

Site Location: Northwest boundary of project site, opposite Munson Construction office

Primary Noise Sources: Traffic on intersection of Rockville Rd and Suisun Valley Rd

Measurement Results:

	dBA
L_{eq}	54.1
L_{max}	75.5
L_{min}	41.7
L_5	56.2
L_{10}	54.0
L_{33}	50.7
L_{50}	49.3
L_{90}	45.5

Atmospheric Conditions:

Maximum Wind Velocity (mph)	2.0
Average Wind Velocity (mph)	1.0
Temperature (F)	66
Relative Humidity (%)	45
Comments:	

Comments:

Location Photo:

APPENDIX B

CONSTRUCTION NOISE CALCULATIONS

Construction Calculations

Phase: Site Preparation

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Tractor	4	84	40	50	0.5	84	86
Dozer	3	82	40	50	0.5	82	83
					Combined at 50 feet	**86**	**88**
					Combined at Receptor 385 feet	**68**	**70**
					Combined at Receptor 590 feet	**65**	**66**
					Combined at Receptor 1100 feet	**59**	**61**

Phase: Grading

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Grader	1	85	40	50	0.5	85	81
Dozer	1	82	40	50	0.5	82	78
Tractor	3	84	40	50	0.5	84	85
Excavator	1	81	40	50	0.5	81	77
					Combined at 50 feet	**89**	**87**
					Combined at Receptor 385 feet	**72**	**70**

Phase:Building Construstion

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Crane	1	81	16	50	0.5	81	73
Man Lift	3	75	20	50	0.5	75	73
Generator	1	81	50	50	0.5	81	78
Tractor	3	84	40	50	0.5	84	85
Welder / Torch	1	74	40	50	0.5	74	70
					Combined at 50 feet	**87**	**86**
					Combined at Receptor 385 feet	**70**	**68**

Phase:Paving

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Paver	2	77	50	50	0.5	77	77
All Other Equipment > 5 HP	2	85	50	50	0.5	85	85
Roller	2	80	20	50	0.5	80	76
					Combined at 50 feet	**87**	**86**
					Combined at Receptor 385 feet	**69**	**68**

Phase:Architectural Coating

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Compressor (air)	1	78	40	50	0.5	78	74
					Combined at 50 feet	**78**	**74**
					Combined at Receptor 385 feet	**60**	**56**

Sources: RCNM

[1]- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

APPENDIX C

FHWA TRAFFIC MODEL PRINTOUTS

TABLE Existing -01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Rockville Road East of Suisun Valley Road
NOTES: Solano Landing Project - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 6640 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 61.58

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL	70 CNEL	65 CNEL	60 CNEL	55 CNEL
	0.0	0.0	81.9	174.2

TABLE Existing -02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Rockville Road West of Suisun Valley Road
NOTES: Solano Landing Project - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 3590 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 58.91

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	55.5	116.1

TABLE Existing -03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Suisun Valley Road North of Rockville Road
NOTES: Solano Landing Project - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 5630 SPEED (MPH): 30 GRADE: .5

	TRAFFIC DISTRIBUTION PERCENTAGES DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 59.25

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	58.3	122.3

TABLE Existing -04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Suisun Valley Road South of Rockville Road
NOTES: Solano Landing Project - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 6850 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 60.10

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	66.0	139.2

TABLE Existing Plus Project-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Rockville Road East of Suisun Valley Road
NOTES: Solano Landing Project - Existing Plus Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 7110 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 61.88

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	85.6	182.2

TABLE Existing Plus Project-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Rockville Road West of Suisun Valley Road
NOTES: Solano Landing Project - Existing Plus Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 3740 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 59.09

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	57.0	119.3

TABLE Existing Plus Project-03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Suisun Valley Road North of Rockville Road
NOTES: Solano Landing Project - Existing Plus Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 6070 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 59.58

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	61.1	128.6

TABLE Existing Plus Project-04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Suisun Valley Road South of Rockville Road
NOTES: Solano Landing Project - Existing Plus Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 7310 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 60.39

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	68.7	145.3

TABLE Cumulative (Year 2040)-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Rockville Road East of Suisun Valley Road
NOTES: Solano Landing Project - Cumulative (Year 2040)

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 7700 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 62.22

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	90.2	192.1

TABLE Cumulative (Year 2040)-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Rockville Road West of Suisun Valley Road
NOTES: Solano Landing Project - Cumulative (Year 2040)

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 3950 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 59.32

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	58.9	123.7

TABLE Cumulative (Year 2040)-03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Suisun Valley Road North of Rockville Road
NOTES: Solano Landing Project - Cumulative (Year 2040)

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 6250 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 59.71

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	62.3	131.0

TABLE Cumulative (Year 2040)-04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Suisun Valley Road South of Rockville Road
NOTES: Solano Landing Project - Cumulative (Year 2040)

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 8000 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 60.78

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	72.8	154.2

TABLE Cumulative Plus Project (Year 2040)-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Rockville Road East of Suisun Valley Road
NOTES: Solano Landing Project - Cumulative Plus Project (Year 2040)

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 8170 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 62.48

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	93.7	199.8

TABLE Cumulative Plus Project (Year 2040)-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Rockville Road West of Suisun Valley Road
NOTES: Solano Landing Project - Cumulative Plus Project (Year 2040)

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 4100 SPEED (MPH): 35 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 59.48

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	60.3	126.7

TABLE Cumulative Plus Project (Year 2040)-03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Suisun Valley Road North of Rockville Road
NOTES: Solano Landing Project - Cumulative Plus Project (Year 2040)

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 6690 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 60.00

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL			
70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	65.0	137.0

TABLE Cumulative Plus Project (Year 2040)-04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 03/03/2023
ROADWAY SEGMENT: Suisun Valley Road South of Rockville Road
NOTES: Solano Landing Project - Cumulative Plus Project (Year 2040)

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 8460 SPEED (MPH): 30 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 15 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 61.02

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	75.5	160.0
