

Environmental Noise Assessment

Oak + Vine Subdivision

Town of Yountville, California

July 28, 2023

Project #230617

Prepared for:



Acorn Environmental

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A blue ink signature of Luke Saxelby, written in a cursive style.

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INTRODUCTION

The Oak + Vine Subdivision project is located in the Town of Yountville, California. The applicant proposes to subdivide the parcel into nine parcels, construct eight additional single-family market-rate units with eight junior accessory dwelling units, relocate the historic single-family dwelling and convert it into a duplex with two low-income units. The project site is bordered by multifamily residential uses to the north and west of the project site as well as single-family residential uses to the south and east of the project.

Figure 1 shows the project site plan. **Figure 2** shows an aerial photo of the project site.

ENVIRONMENTAL SETTING

BACKGROUND INFORMATION ON NOISE

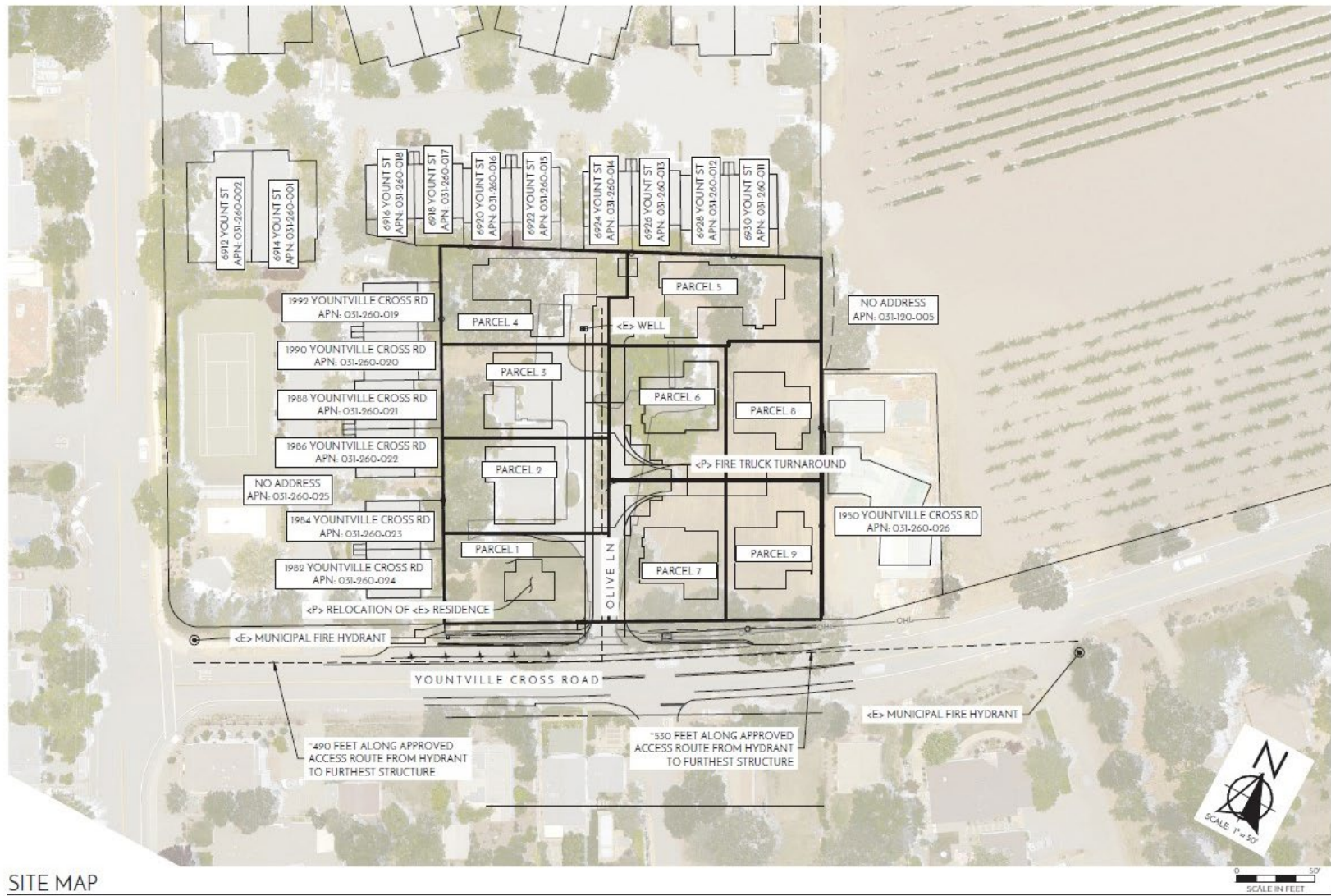
Fundamentals of Acoustics

Acoustics is the science of sound. Sound may be thought of as mechanical energy of a vibrating object transmitted by pressure waves through a medium to human (or animal) ears. If the pressure variations occur frequently enough (at least 20 times per second), then 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 a subjective reaction to different types of sounds. Noise is typically defined as (airborne) sound that is loud, unpleasant, unexpected or undesired, and may therefore be classified as a more specific group of sounds. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals), 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 decibel scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels (dB) correspond closely to human perception of relative loudness.

The perceived loudness of sounds is dependent upon 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 A-weighted sound levels. There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment.



SITE MAP

Oak + Vine Subdivision

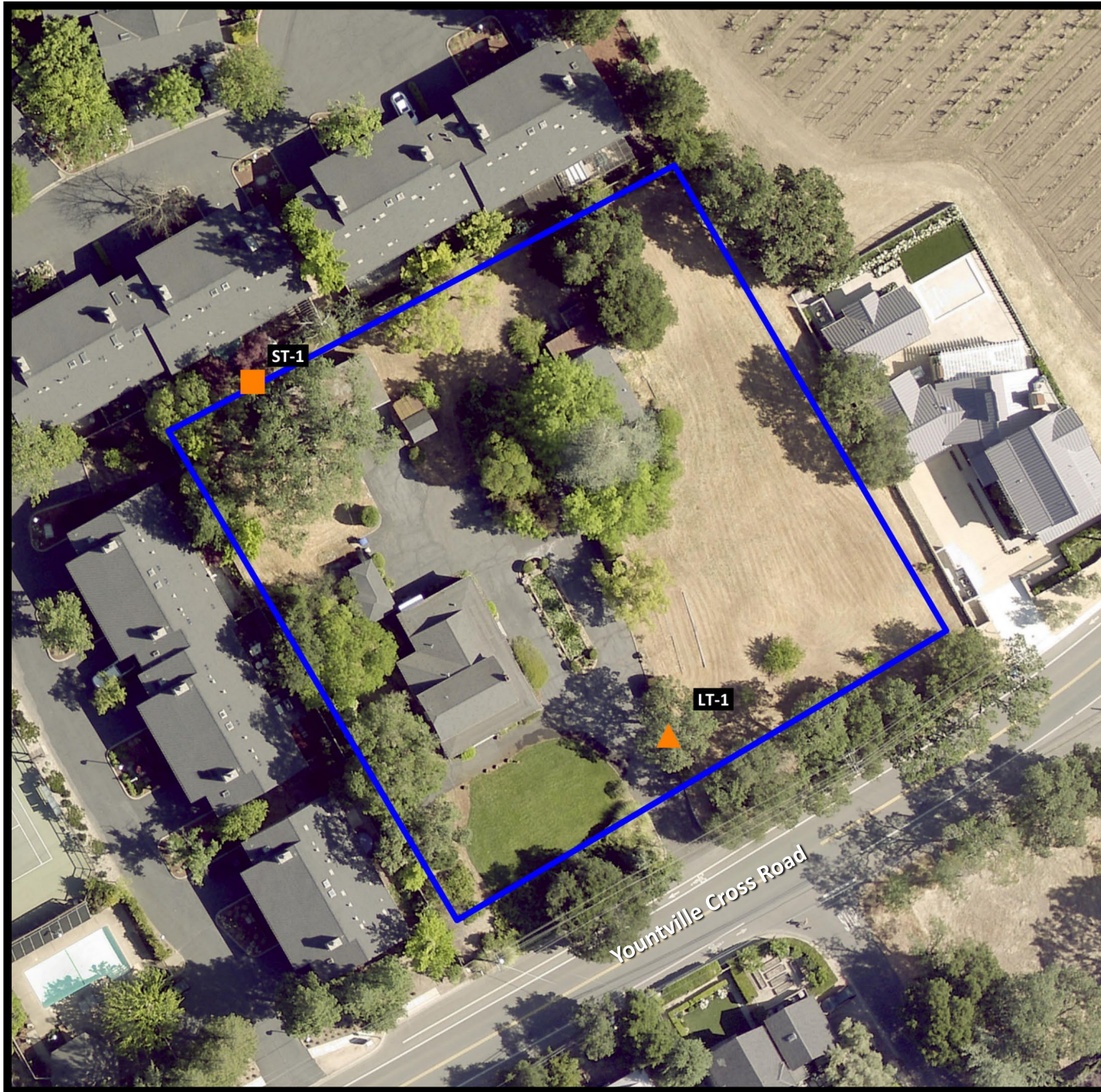
Town of Yountville, California

Figure 1

Project Site Plan

Project Location








Oak + Vine Subdivision

Town of Yountville, California

Figure 2

Noise Measurement Sites

Legend

-  Project Site
-  Noise Measurement Site - Long Term
-  Noise Measurement Site - Short Term



Projection: UTM Zone 10 / WGS84 / meters
Rev. Date: 07/13/2023



The decibel scale is logarithmic, not linear. In other words, two sound levels 10-dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel 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.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given environment. A common statistical tool is the average, or equivalent, sound level (L_{eq}), which corresponds to a steady-state A-weighted sound level containing the same total energy as a time varying signal over a given time period (usually one hour). The L_{eq} is the foundation of the composite noise descriptor, L_{dn} , and shows very good correlation with community response to noise.

The day/night average level (DNL or L_{dn}) is based upon the average noise level over a 24-hour day, with a +10-decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment.

Table 1 lists several examples of the noise levels associated with common situations. **Appendix A** provides a summary of acoustical terms used in this report.

TABLE 1: TYPICAL NOISE LEVELS

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet Fly-over at 300 m (1,000 ft.)	--100--	
Gas Lawn Mower at 1 m (3 ft.)	--90--	
Diesel Truck at 15 m (50 ft.), at 80 km/hr. (50 mph)	--80--	Food Blender at 1 m (3 ft.) Garbage Disposal at 1 m (3 ft.)
Noisy Urban Area, Daytime Gas Lawn Mower, 30 m (100 ft.)	--70--	Vacuum Cleaner at 3 m (10 ft.)
Commercial Area Heavy Traffic at 90 m (300 ft.)	--60--	Normal Speech at 1 m (3 ft.)
Quiet Urban Daytime	--50--	Large Business Office Dishwasher in Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	--30--	Library
Quiet Rural Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
	--10--	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing

Source: Caltrans, Technical Noise Supplement, Traffic Noise Analysis Protocol. September, 2013.

Effects of Noise on People

The effects of noise on people can be placed in three categories:

- Subjective effects of annoyance, nuisance, and dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as hearing loss or sudden startling

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation in individual thresholds of annoyance exists and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted: the so-called ambient noise level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it.

With regards to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of 1-dBA cannot be perceived;
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference;
- A change in level of at least 5-dBA is required before any noticeable change in human response would be expected; and
- A 10-dBA change is subjectively heard as approximately a doubling in loudness and can cause an adverse response.

Stationary point sources of noise – including stationary mobile sources such as idling vehicles – attenuate (lessen) at a rate of approximately 6-dB per doubling of distance from the source, depending on environmental conditions (i.e. atmospheric conditions and either vegetative or manufactured noise barriers, etc.). Widely distributed noises, such as a large industrial facility spread over many acres or a street with moving vehicles, would typically attenuate at a lower rate.

EXISTING NOISE AND VIBRATION ENVIRONMENTS

EXISTING NOISE RECEPTORS

Some land uses are considered more sensitive to noise than others. Land uses often associated with sensitive receptors generally include residences, schools, libraries, hospitals, and passive recreational areas. Sensitive noise receptors may also include threatened or endangered noise-sensitive biological species, although many jurisdictions have not adopted noise standards for wildlife areas. Noise sensitive land uses are typically given special attention in order to achieve protection from excessive noise.

Sensitivity is a function of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities involved. In the vicinity of the project site, sensitive land uses include existing multifamily residential uses to the north and west of the project site and single-family residential bordering the project site to the east and south.

EXISTING GENERAL AMBIENT NOISE LEVELS

The existing noise environment in the project area is primarily defined by traffic on Yountville Cross Road, which borders the southern project site boundary. To quantify the existing ambient noise environment in the project vicinity, Saxelby Acoustics conducted a continuous (24-hr.) at one location from Friday, June 30th to Monday, July 2nd and a short-term noise level measurement at one location on Thursday, June 29th on the project site. Noise measurement locations are shown on **Figure 2**. A summary of the noise level measurement survey results is provided in **Table 2**. **Appendix B** contains the complete results of the noise monitoring.

The sound level meters were programmed to record the maximum, median, and average noise levels at each site during the survey. The maximum value, denoted L_{max} , represents the highest noise level measured. The average value, denoted L_{eq} , represents the energy average of all the noise received by the sound level meter microphone during the monitoring period. The median value, denoted L_{50} , represents the sound level exceeded 50 percent of the time during the monitoring period.

Larson Davis Laboratories (LDL) model 820 and 831 precision integrating sound level meters were used for the ambient noise level measurement survey. The meters were calibrated before and after use with a CAL200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

TABLE 2: SUMMARY OF EXISTING BACKGROUND NOISE MEASUREMENT DATA

Location	Date	L _{dn}	Daytime L _{eq}	Daytime L ₅₀	Daytime L _{max}	Nighttime L _{eq}	Nighttime L ₅₀	Nighttime L _{max}
LT-1: 60 ft. to CL of Yountville Cross Rd.	6/30/2023	60	61	51	74	50	35	69
	7/1/2023	55	54	44	74	46	35	67
	7/2/2023	53	53	43	74	43	34	66
ST-1: 375 ft. to CL of Yountville Cross Rd.	6/29/2023	N/A	37	36	55	N/A	N/A	N/A

- All values shown in dBA
- Daytime hours: 7:00 a.m. to 10:00 p.m.
- Nighttime Hours: 10:00 p.m. to 7:00 a.m.
- Source: Saxelby Acoustics, 2023.

FUTURE TRAFFIC NOISE ENVIRONMENT AT OFF-SITE RECEPTORS

The proposed project is predicted to contribute a negligible amount of traffic on the local roadway network. Therefore, increased off-site traffic noise is not expected to be substantial and is not analyzed further in this study.

EVALUATION OF FUTURE TRANSPORTATION NOISE ON PROJECT SITE

Saxelby Acoustics used the SoundPLAN noise model to calculate traffic noise levels at the proposed residential uses due to traffic on Yountville Cross Road. Inputs to the SoundPLAN noise model include topography, existing structures, roadway elevations, and the proposed building pad elevations. It was estimated that existing noise levels would increase by +1 dBA based upon an assumed 1% per year increase in traffic volumes on Yountville Cross Road beginning at the project opening and forecasted for 20 years (2025 to 2045). The results of this analysis are shown graphically on **Figure 3**.



Oak + Vine Subdivision CEQA

Town of Yountville, California

Figure 3
Future (2045) Transportation Noise Levels (dB(A) Ldn)

- Legend**
- Project Building
 - Project Site
 - Facade Noise Level



CONSTRUCTION NOISE ENVIRONMENT

During the construction of the proposed project, noise from construction activities would temporarily add to the noise environment in the project vicinity. As shown in **Table 3**, activities involved in construction would generate maximum noise levels ranging from 76 to 90 dB at a distance of 50 feet.

TABLE 3: CONSTRUCTION EQUIPMENT NOISE

Type of Equipment	Maximum Level, dBA at 50 feet
Auger Drill Rig	84
Backhoe	78
Compactor	83
Compressor (air)	78
Concrete Saw	90
Dozer	82
Dump Truck	76
Excavator	81
Generator	81
Jackhammer	89
Pneumatic Tools	85

Source: Roadway Construction Noise Model User's Guide. Federal Highway Administration. FHWA-HEP-05-054. January 2006.

CONSTRUCTION VIBRATION ENVIRONMENT

The primary vibration-generating activities associated with the proposed project would occur during construction when activities such as grading, utilities placement, and parking lot construction occur. **Table 4** shows the typical vibration levels produced by construction equipment.

TABLE 4: VIBRATION LEVELS FOR VARIOUS CONSTRUCTION EQUIPMENT

Type of Equipment	Peak Particle Velocity at 25 feet (inches/second)	Peak Particle Velocity at 50 feet (inches/second)	Peak Particle Velocity at 100 feet (inches/second)
Large Bulldozer	0.089	0.031	0.011
Loaded Trucks	0.076	0.027	0.010
Small Bulldozer	0.003	0.001	0.000
Auger/drill Rigs	0.089	0.031	0.011
Jackhammer	0.035	0.012	0.004
Vibratory Hammer	0.070	0.025	0.009
Vibratory Compactor/roller	0.210 (Less than 0.30 at 20 feet)	0.074	0.026

Source: Transit Noise and Vibration Impact Assessment Guidelines. Federal Transit Administration. May 2006.

REGULATORY CONTEXT

FEDERAL

There are no federal regulations related to noise that apply to the Proposed Project.

STATE

California Environmental Quality Act

The California Environmental Quality Act (CEQA) Guidelines, Appendix G, indicate that a significant noise impact may occur if a project exposes persons to noise or vibration levels in excess of local general plans or noise ordinance standards, or cause a substantial permanent or temporary increase in ambient noise levels. CEQA standards are discussed more below under the Thresholds of Significance section.

LOCAL

Town of Yountville General Plan

The standards listed in Table NS-3 should be used to evaluate the compatibility between new land uses and future noise in Yountville. Table NS-3 should be used in combination with Figures NS-2 and NS-3 to determine whether a proposed development or land use is located in an area that exceeds the normally acceptable noise exposure for that type of development or land use and therefore requires an acoustical analysis and/or special noise mitigating measures. The State of California establishes minimum noise insulation performance standards for hotels, motels, dormitories, apartment houses, and dwellings other than detached single-family dwellings as set forth in the California Building Code. The noise limit established by this General Plan, in conformance with State law, is a maximum interior noise level of 45 dBA L_{dn} .

TABLE 5: LAND USE COMPATIBILITY STANDARDS

LAND USE CATEGORY	EXTERIOR NOISE EXPOSURE—DBA LDN							
	50	55	60	65	70	75	80	
Residential and hotels	Green	Green	Green	Green	Yellow	Yellow	Yellow	Red
Outdoor sports and recreation, neighborhood parks and playgrounds, golf courses, cemeteries	Green	Green	Green	Green	Yellow	Yellow	Yellow	Red
Schools, libraries, churches, hospitals, nursing homes, museums, meeting halls	Green	Green	Green	Yellow	Yellow	Yellow	Yellow	Red
Office buildings, business commercial and professional	Green	Green	Green	Green	Green	Yellow	Yellow	Yellow
Industrial, manufacturing, utilities, agriculture	Green	Green	Green	Green	Green	Yellow	Yellow	Yellow
Auditoriums, concert halls, amphitheaters, sports arenas	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Red
<div> <div>Green</div> Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements. </div> <div> <div>Yellow</div> Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. </div> <div> <div>Red</div> Unacceptable: New construction or development should generally not be undertaken because mitigation is usually not feasible. </div>								

Source: Town of Yountville Table NS-3

NS-1.2 Noise Impacts of Development. Prevent land use and new development that increase noise levels above acceptable standards as feasible.

NS-1.2a Land Use Compatibility Standards. Apply the Land Use Compatibility Standards in Table NS-3 in locating and designing new developments.

NS-1.2b Indoor Noise Standard. The maximum acceptable interior noise level for all new residential developments, including hotels, is 45 dBA L_{dn} . Include appropriate site and building design, building construction, and noise attenuation techniques in new development to meet this standard.

NS-1.2c Acoustical Compatibility Study. Require an acoustical study for all new residential and noise-sensitive projects with a future exterior noise exposure of 60 dBA L_{dn} or greater as shown on Figure NS-3 and incorporate mitigation measures to lower interior noise exposure to a maximum indoor noise level of 45 dBA L_{dn} .

NS-1.2d Noise Mitigation. Consider mitigation measures for new projects or land uses that would cause a substantial increase in noise (i.e., cause an increase above 60 dBA L_{dn} or cause an increase of 5 dBA L_{dn} or more in the ambient noise levels) in adjacent residential areas or in residential areas affected by traffic generated by the proposed project.

NS-1.2e Caltrans Noise Mitigation. Work with Caltrans to ensure that adequate noise studies are prepared and alternative noise mitigation measures are considered in State projects, and request that Caltrans obtain Town concurrence prior to initiating any noise mitigation project in Yountville.

NS-1.2f Construction Best Practices. During review of development, infrastructure, and other projects involving construction activities, determine if proposed construction projects could exceed the Town's Noise Ordinance standards at nearby residences and sensitive receptors and, if necessary, require mitigation measures in addition to the standard best practice controls.

NS-1.3 Vibration Impacts of Development. Reduce vibration impacts from demolition and construction projects.

NS-1.3a Vibration Mitigation. Require new development to minimize vibration impacts to adjacent uses during demolition and construction. For sensitive historic structures, a vibration limit of 0.08 in/sec PPV (peak particle velocity) will be used to minimize the potential for cosmetic damage to the building. A vibration limit of 0.30 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction.

Town of Yountville Municipal Code

8.04.020 General noise restriction.

A. It is unlawful for any person to willfully or negligently make or continue, or cause to be made or continued, any unnecessary, unusual or intrusive noise which disturbs the peace and quiet of any neighborhood or which causes any discomfort or annoyance to any reasonable person of normal sensitivity residing in the area.

B. The factors which shall be considered in determining whether a violation of the provisions of this section exists shall include, but not be limited to, the following:

1. The sound level of the objectionable noise;
2. The sound level of the ambient noise;
3. The proximity and timing of the noise in relation to residential sleeping facilities and normal sleeping hours;
4. The nature and zoning of the area within which the noise emanates;
5. The number of persons affected by the noise source;
6. The time of day or night the noise occurs;
7. The duration of the noise and its tonal quality;
8. Whether the noise is continuous, recurrent or intermittent;
9. Whether the noise is produced by a commercial or noncommercial activity.

(Ord. 299-00; Ord. 379-09)

8.04.026: Exterior noise standards.

A. **General Restriction.** It is unlawful for any person, at any location within the Town, to create any noise or to allow the creation of any noise on property leased, occupied, owned, or otherwise controlled by the person which does not comply with the provisions of this section, unless the provisions of **Section 8.04.040** (Exemptions to noise regulations), below have been met.

B. **Exterior Levels.** Exterior noise levels, when measured at any receiving church, commercial, public facility, residential or school property, do not conform to the provisions of this section when they exceed the noise level standards established by Table 8-04-1.

C. **Ambient Noise Level Adjustment.** In the event the measured ambient noise level exceeds the applicable noise level standard in any category above, the applicable standards shall be adjusted to equal the ambient noise level. For example, if the applicable noise level standard is 60 dB(A) and the ambient noise level is 63 dB(A), the applicable noise level standard would be adjusted to 63 dB(A).

D. **Intruding Noise Source.** If the intruding noise source is continuous and cannot reasonably be discontinued or stopped for a time period to allow measurement of the ambient noise level, the noise level measured while the intruding noise source is in operation shall be compared directly to the applicable noise level standards in Table 8-04-1.

TABLE 6: NOISE BY RECEIVING LAND USE (NOISE LEVEL STANDARDS, dB(A))

Cumulative number of minutes in any hour	Day: 8:00 a.m. to 9:00 p.m. ⁽²⁾	Night: 9:00 p.m. ⁽²⁾ to 8:00 a.m.
Hospital, Library, Religious Institution, Residential, or School Uses		
30 ⁽¹⁾	55	50
15	60	55
5	65	60
1	70	65
0	75	70
Commercial Uses		
30	65	60
15	70	65
5	75	70
1	80	75
0	85	80

Notes:

- (1) For example, this means the measured noise level may not exceed 55 dB(A) for more than 30 minutes out of any one-hour time period.
- (2) The start of day hours shall be 8:00 a.m. unless otherwise specified in this chapter; the start of night hours shall be seasonally adjusted in summer months (defined as June 1st to September 30th) to coincide with sunset and may extend to one hour past sunset but not later than 10:00 p.m.

Source: Town of Yountville General Plan Table 8-04-1

8.04.030: Specific types of noise prohibited.

B. Contracted Services. No person engaged in work as a contracted service shall operate or cause the operation of any tools or equipment, including petroleum or electrically powered equipment such that the sound therefrom creates intrusive noise across a residential or commercial real property boundary, except: (1) between the hours of 9:00 a.m. and 6:00 p.m., Monday through Friday (excluding holidays); (2) between the hours of 9:00 a.m. and 12:00 p.m. on Saturdays on the condition that a property owner or tenant is present; or (3) except by permit issued pursuant to Section **8.04.040(E)**.

F. Holidays Defined. As used in this section, the term “holiday” shall mean Dr. Martin Luther King’s Birthday, President’s Day, Memorial Day, 4th of July, Labor Day, Veteran’s Day, Thanksgiving, Friday following Thanksgiving, Christmas, and New Years Day. If any of the preceding holidays occur on a weekend day, then the prior Friday if on a Saturday or the following Monday if on a Sunday shall be defined as the holiday for the purposes of noise prohibition. (Ord. 299-00; Ord. 386-10; Ord. 16-451)

8.04.040 Exemptions to noise regulations.

E. Special Circumstances. The Town Manager may grant an exception to the provisions of this chapter upon written application if the Town Manager determines that: (1) the activity is otherwise permitted by this code; and (2) the benefit to be derived by the applicant from conducting such activity at the time and place specified in the application outweighs the detriment, if any, to the neighborhood in which the activity will be conducted.

CRITERIA FOR ACCEPTABLE VIBRATION

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that noise is generally considered to be pressure waves transmitted through air, whereas

vibration usually consists of the excitation of a structure or surface. As with noise, vibration consists of an amplitude and frequency. A person's perception to the vibration will depend on their individual sensitivity to vibration, as well as the amplitude and frequency of the source and the response of the system which is vibrating.

Vibration can be measured in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration measures in terms of peak particle velocities in inches per second. Standards pertaining to perception as well as damage to structures have been developed for vibration levels defined in terms of peak particle velocities.

Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. **Table 7**, which was developed by Caltrans, shows the vibration levels which would normally be required to result in damage to structures. The vibration levels are presented in terms of peak particle velocity in inches per second.

Policy NS-1.3a of the Town of Yountville General Plan establishes the acceptable limit for vibration as 0.30 in/sec PPV to minimize the potential for cosmetic damage at buildings of normal conventional construction.

TABLE 7: EFFECTS OF VIBRATION ON PEOPLE AND BUILDINGS

Peak Particle Velocity		Human Reaction	Effect on Buildings
mm/second	in/second		
0.15-0.30	0.006-0.019	Threshold of perception; possibility of intrusion	Vibrations unlikely to cause damage of any type
2.0	0.08	Vibrations readily perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
2.5	0.10	Level at which continuous vibrations begin to annoy people	Virtually no risk of "architectural" damage to normal buildings
5.0	0.20	Vibrations annoying to people in buildings (this agrees with the levels established for people standing on bridges and subjected to relative short periods of vibrations)	Threshold at which there is a risk of "architectural" damage to normal dwelling - houses with plastered walls and ceilings. Special types of finish such as lining of walls, flexible ceiling treatment, etc., would minimize "architectural" damage
10-15	0.4-0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possibly minor structural damage

Source: *Transportation Related Earthborne Vibrations*. Caltrans. TAV-02-01-R9601. February 20, 2002.

IMPACTS AND MITIGATION MEASURES

THRESHOLDS OF SIGNIFICANCE

Appendix G of the CEQA Guidelines states that a project would normally be considered to result in significant noise impacts if noise levels conflict with adopted environmental standards or plans or if noise generated by the project would substantially increase existing noise levels at sensitive receivers on a permanent or temporary basis. Significance criteria for noise impacts are drawn from CEQA Guidelines Appendix G (Items XI [a-c]).

Would the project:

- a. 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?
- b. Generate excessive groundborne vibration or groundborne noise levels?
- c. 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 proposed project is not located within two miles of a public or private airport, therefore item “c” is not discussed any further in this study.

Noise Level Increase Criteria for Long-Term Project-Related Noise Level Increases

The California Environmental Quality Act (CEQA) guidelines define a significant impact of a project if it “increases substantially the ambient noise levels for adjoining areas.” Generally, a project may have a significant effect on the environment if it will substantially increase the ambient noise levels for adjoining areas or expose people to severe noise levels. In practice, more specific professional standards have been developed. These standards state that a noise impact may be considered significant if it would generate noise that would conflict with local project criteria or ordinances, or substantially increase noise levels at noise sensitive land uses. The potential increase in traffic noise from the project is a factor in determining significance. Research into the human perception of changes in sound level indicates the following:

- A 3-dB change is barely perceptible,
- A 5-dB change is clearly perceptible, and
- A 10-dB change is perceived as being twice or half as loud.

A limitation of using a single noise level increase value to evaluate noise impacts is that it fails to account for pre-project noise conditions. **Table 8** is based upon recommendations made by the Federal Interagency Committee on Noise (FICON) to provide guidance in the assessment of changes in ambient noise levels resulting from aircraft operations. The recommendations are based upon studies that relate aircraft noise levels to the percentage of persons highly annoyed by the noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, it has been accepted that they are applicable to all sources of noise described in terms of cumulative noise exposure metrics such as the L_{dn} .

TABLE 8: SIGNIFICANCE OF CHANGES IN NOISE EXPOSURE

Ambient Noise Level Without Project, L_{dn}	Increase Required for Significant Impact
<60 dB	+5.0 dB or more
60-65 dB	+3.0 dB or more
>65 dB	+1.5 dB or more

Source: Federal Interagency Committee on Noise (FICON).

Based on the **Table 8** data, an increase in the traffic noise level of 5 dB or more would be significant where the pre-project noise levels are less than 60 dB L_{dn} , or 3 dB or more where existing noise levels are between 60 to 65 dB L_{dn} . Extending this concept to higher noise levels, an increase in the traffic noise level of 1.5 dB or more may be significant where the pre-project traffic noise level exceeds 65 dB L_{dn} . The rationale for the **Table 8** criteria is that, as ambient noise levels increase, a smaller increase in noise resulting from a project is sufficient to cause annoyance.

PROJECT-SPECIFIC IMPACTS AND MITIGATION MEASURES

Impact 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?*

Operational Noise at Existing Sensitive Receptors

The proposed project would include typical residential noise which would be compatible with the adjacent existing residential uses. Therefore, impacts resulting from project operational noise would be considered **less-than-significant**.

Construction Noise

During the construction phases of the project, noise from construction activities would add to the noise environment in the immediate project vicinity. As indicated in **Table 3**, activities involved in construction would generate maximum noise levels ranging from 76 to 90 dBA L_{max} at a distance of 50 feet. Construction activities would also be temporary in nature and are anticipated to occur during normal daytime working hours.

Noise would also be generated during the construction phase by increased truck traffic on area roadways. A project-generated noise source would be truck traffic associated with transport of heavy materials and equipment to and from the construction site. This noise increase would be of short duration and would occur during daytime hours.

Noise from localized point sources (such as construction sites) typically decreases by approximately 6 dBA with each doubling of distance from source to receptor. Construction noise is evaluated as occurring at the center of the site to represent average noise levels generated over the duration of construction across the project site. The nearest residential uses are located approximately 120 feet as measured from the center of the project site. At this distance, maximum construction noise levels would be up to 82 dBA if the project does not implement construction best management practice controls. As previously discussed, nearby noise-sensitive receptors consist predominantly of residential dwellings bordering the project site.

The Town of Yountville Municipal Code places limitations on the acceptable hours of construction. The Yountville Municipal Code section 8.04.020 also outlines factors which are used to determine a violation of the noise ordinance. During development of the proposed project, construction activities shall occur during the following acceptable hours of construction (excluding holidays):

- 9:00 a.m. to 6:00 p.m., Monday through Friday
- 9:00 a.m. to 12:00 p.m., Saturdays

Additionally, there are several residential uses directly bordering the project site which may be subject to construction noise. Implementation of the following best management practices, as required by General Plan policy NS-1.2f, would reduce construction generated noise:

Design Elements and Best Management Practices

- Construction should be limited to the following times (excluding holidays):
 - 9:00 a.m. to 6:00 p.m., Monday through Friday
 - 9:00 a.m. to 12:00 p.m., Saturdays
- All construction equipment powered by internal combustion engines shall be properly muffled and maintained.
- Quiet construction equipment, particularly air compressors, are to be selected whenever possible.
- All stationary noise-generating construction equipment such as generators or air compressors are to be located as far as is practical from existing residences. In addition, the project contractor shall place such stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.
- Unnecessary idling of internal combustion engines is prohibited.
- The construction contractor should, to the maximum extent practical, locate on-site equipment staging areas to maximize the distance between construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.
- Utilize temporary noise barriers to reduce construction noise levels at adjacent sensitive receptors.

Implementation of the above best management practices would help to reduce construction-generated noise levels. Construction would be short-term in nature and occur only during acceptable daytime hours. Therefore, this impact would be considered ***less-than-significant***.

Transportation Noise on Project Site (Non-CEQA Issue)

As shown on **Figure 3**, the proposed project falls within the “conditionally acceptable” noise level range of 60 dBA to 75 dBA of the Town of Yountville land use compatibility chart. Therefore, the Town requires an acoustical analysis to determine the required noise reduction to satisfy an interior noise level standard of 45 dBA L_{dn} .

Traffic noise levels are 62 dBA L_{dn} at the building façades closest to Yountville Cross Road. Based upon a typical 25 dB exterior-to-interior noise level reduction achieved by modern building construction¹, an interior noise

¹ Assumes a minimum STC of 29 for exterior window assemblies.

level of up to 37 dBA L_{dn} would be expected. This would meet the Town's 45 dB L_{dn} interior noise level standard. Therefore, no additional interior noise control measures would be required to achieve compliance with the Town's interior noise level standards.

Impact 2: *Would the project generate excessive groundborne vibration or groundborne noise levels?*

Construction vibration impacts include human annoyance and building structural damage. Human annoyance occurs when construction vibration rises significantly above the threshold of perception. Building damage can take the form of cosmetic or structural.

With the exception of vibratory compactors, **Table 4** data indicates that construction vibration levels anticipated for the project are less than the 0.3 in/sec threshold at distance of 20 feet. Therefore, use of vibratory compactors within 20 feet of the adjacent residential buildings could cause vibrations in excess of 0.3 in/sec. The following best management practice will ensure that this threshold is not exceeded:

Design Elements and Best Management Practices

- During project construction, any compaction which occurs within 20 feet of an adjacent structure will be achieved by using static drum rollers which use weight instead of vibrations to achieve soil compaction. Alternatively, pre-construction crack documentation and construction vibration monitoring could be conducted to ensure that construction vibrations do not cause damage to any adjacent structures.

Implementation of the above best management practice would help to reduce construction-generated vibration levels. Therefore, this impact would be considered ***less-than-significant***.

Impact 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?*

There are no airports within two miles of the project vicinity. Therefore, this impact is not applicable to the proposed project.

REFERENCES

- American National Standards Institute. (1998). *[Standard] ANSI S1.43-1997 (R2007): Specifications for integrating-averaging sound level meters*. New York: Acoustical Society of America.
- American Standard Testing Methods, *Standard Guide for Measurement of Outdoor A-Weighted Sound Levels, American Standard Testing Methods (ASTM) E1014-08*, 2008.
- ASTM E1014-12. *Standard Guide for Measurement of Outdoor A-Weighted Sound Levels*. ASTM International. West Conshohocken, PA. 2012.
- ASTM E1780-12. *Standard Guide for Measuring Outdoor Sound Received from a Nearby Fixed Source*. ASTM International. West Conshohocken, PA. 2012.
- Barry, T M. (1978). *FHWA highway traffic noise prediction model* (FHWA-RD-77-108). Washington, DC: U.S. Department of transportation, Federal highway administration, Office of research, Office of environmental policy.
- California Department of Transportation (Caltrans), *Technical Noise Supplement, Traffic Noise Analysis Protocol*, September 2013.
- California Department of Transportation (Caltrans), *Traffic Noise Analysis Protocol*, May 2011.
- Egan, M. D. (1988). *Architectural acoustics*. United States of America: McGraw-Hill Book Company.
- Federal Highway Administration. *FHWA Roadway Construction Noise Model User's Guide*. FHWA-HEP-05-054 DOT-VNTSC-FHWA-05-01. January 2006.
- Hanson, Carl E. (Carl Elmer). (2006). *Transit noise and vibration impact assessment*. Washington, DC: U.S. Department of Transportation, Federal Transit Administration, Office of Planning and Environment.
- International Electrotechnical Commission. Technical committee 29: Electroacoustics. International Organization of Legal Metrology. (2013). *Electroacoustics: Sound level meters*.
- International Organization for Standardization. (1996). *Acoustic - ISO 9613-2: Attenuation of sound during propagation outdoors. Part 2: General methods of calculation*. Geneva: I.S.O.
- Miller, L. N., Bolt, Beranek, & and Newman, Inc. (1981). *Noise control for buildings and manufacturing plants*. Cambridge, MA: Bolt, Beranek and Newman, Inc.
- SoundPLAN. SoundPLAN GmbH. Backnang, Germany. <http://www.soundplan.eu/english/>

Appendix A: Acoustical Terminology

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.
ASTC	Apparent Sound Transmission Class. Similar to STC but includes sound from flanking paths and correct for room reverberation. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.
Attenuation	The reduction of an acoustic signal.
A-Weighting	A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.
Decibel or dB	Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.
CNEL	Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by +5 dBA and nighttime hours weighted by +10 dBA.
DNL	See definition of Ldn.
IIC	Impact Insulation Class. An integer-number rating of how well a building floor attenuates impact sounds, such as footsteps. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz (Hz).
Ldn	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
Leq	Equivalent or energy-averaged sound level.
Lmax	The highest root-mean-square (RMS) sound level measured over a given period of time.
L(n)	The sound level exceeded a described percentile over a measurement period. For instance, an hourly L50 is the sound level exceeded 50% of the time during the one-hour period.
Loudness	A subjective term for the sensation of the magnitude of sound.
NIC	Noise Isolation Class. A rating of the noise reduction between two spaces. Similar to STC but includes sound from flanking paths and no correction for room reverberation.
NNIC	Normalized Noise Isolation Class. Similar to NIC but includes a correction for room reverberation.
Noise	Unwanted sound.
NRC	Noise Reduction Coefficient. NRC is a single-number rating of the sound-absorption of a material equal to the arithmetic mean of the sound-absorption coefficients in the 250, 500, 1000, and 2,000 Hz octave frequency bands rounded to the nearest multiple of 0.05. It is a representation of the amount of sound energy absorbed upon striking a particular surface. An NRC of 0 indicates perfect reflection; an NRC of 1 indicates perfect absorption.
RT60	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
Sabin	The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 Sabin.
SEL	Sound Exposure Level. SEL is a rating, in decibels, of a discrete event, such as an aircraft flyover or train pass by, that compresses the total sound energy into a one-second event.
SPC	Speech Privacy Class. SPC is a method of rating speech privacy in buildings. It is designed to measure the degree of speech privacy provided by a closed room, indicating the degree to which conversations occurring within are kept private from listeners outside the room.
STC	Sound Transmission Class. STC is an integer rating of how well a building partition attenuates airborne sound. It is widely used to rate interior partitions, ceilings/floors, doors, windows and exterior wall configurations. The STC rating is typically used to rate the sound transmission of a specific building element when tested in laboratory conditions where flanking paths around the assembly don't exist. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.
Threshold of Hearing	The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.
Threshold of Pain	Approximately 120 dB above the threshold of hearing.
Impulsive	Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.
Simple Tone	Any sound which can be judged as audible as a single pitch or set of single pitches.

Appendix B: Continuous and Short-Term Ambient Noise Measurement Results



Appendix B1a: Continuous Noise Monitoring Results

Site: LT-1

Project: Oak + Vine Subdivision

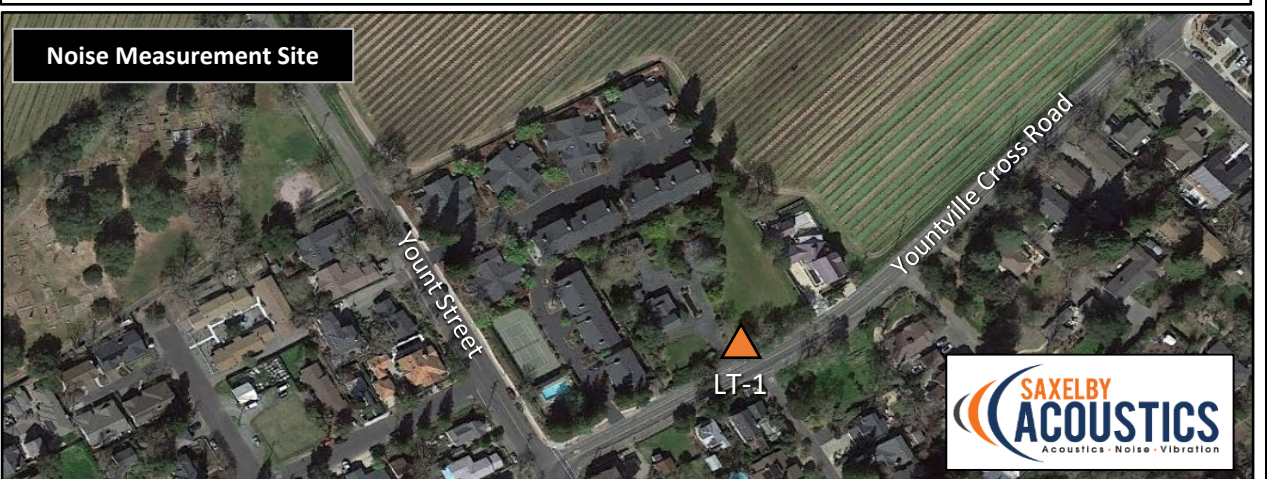
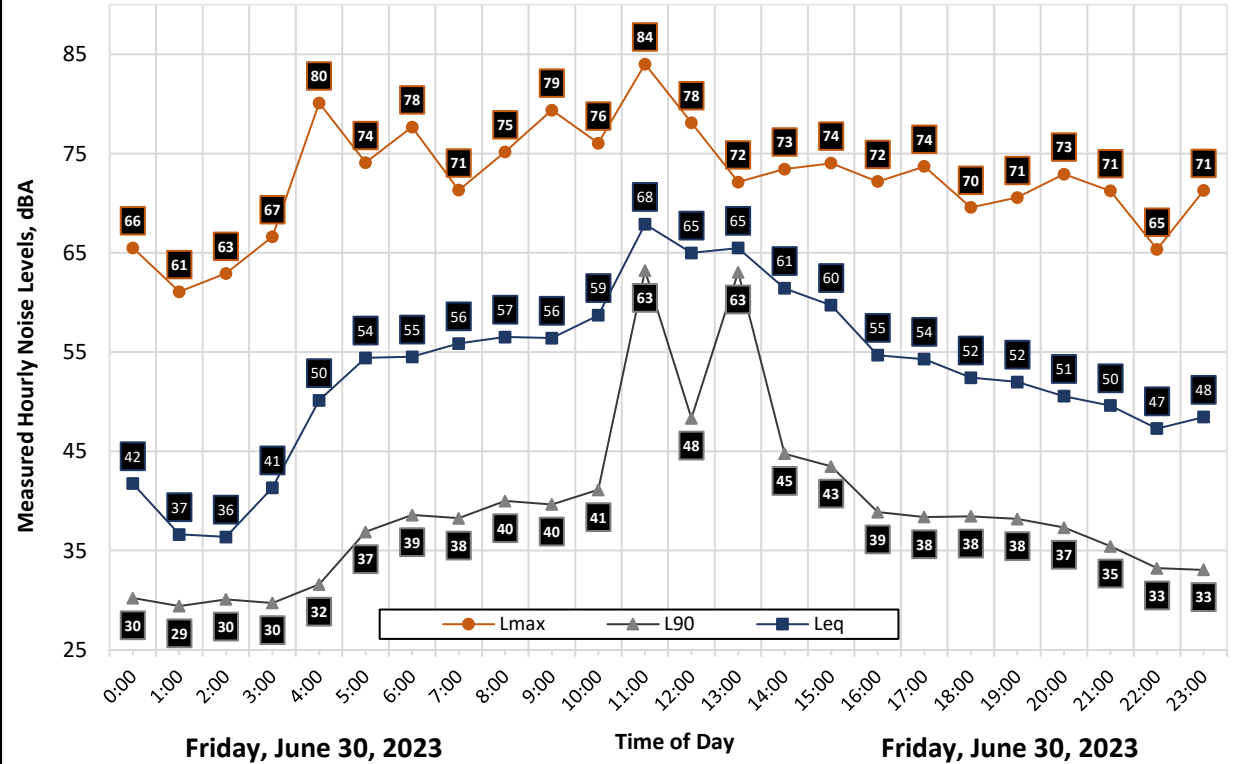
Meter: LDL 820-1

Location: Southern Project Boundary

Calibrator: CAL200

Coordinates: (38.4088937, -122.3643997)

Measured Ambient Noise Levels vs. Time of Day



Date	Time	Measured Level, dBA			
		L _{eq}	L _{max}	L ₅₀	L ₉₀
Friday, June 30, 2023	0:00	42	66	31	30
Friday, June 30, 2023	1:00	37	61	31	29
Friday, June 30, 2023	2:00	36	63	32	30
Friday, June 30, 2023	3:00	41	67	31	30
Friday, June 30, 2023	4:00	50	80	34	32
Friday, June 30, 2023	5:00	54	74	44	37
Friday, June 30, 2023	6:00	55	78	43	39
Friday, June 30, 2023	7:00	56	71	46	38
Friday, June 30, 2023	8:00	57	75	49	40
Friday, June 30, 2023	9:00	56	79	48	40
Friday, June 30, 2023	10:00	59	76	52	41
Friday, June 30, 2023	11:00	68	84	68	63
Friday, June 30, 2023	12:00	65	78	64	48
Friday, June 30, 2023	13:00	65	72	65	63
Friday, June 30, 2023	14:00	61	73	60	45
Friday, June 30, 2023	15:00	60	74	58	43
Friday, June 30, 2023	16:00	55	72	46	39
Friday, June 30, 2023	17:00	54	74	45	38
Friday, June 30, 2023	18:00	52	70	43	38
Friday, June 30, 2023	19:00	52	71	42	38
Friday, June 30, 2023	20:00	51	73	40	37
Friday, June 30, 2023	21:00	50	71	39	35
Friday, June 30, 2023	22:00	47	65	35	33
Friday, June 30, 2023	23:00	48	71	35	33

Statistics	Leq	Lmax	L50	L90
Day Average	61	74	51	43
Night Average	50	69	35	33
Day Low	50	70	39	35
Day High	68	84	68	63
Night Low	36	61	31	29
Night High	55	80	44	39
Ldn	60	Day %		96
CNEL	60	Night %		4

Appendix B1b: Continuous Noise Monitoring Results

Site: LT-1

Project: Oak + Vine Subdivision

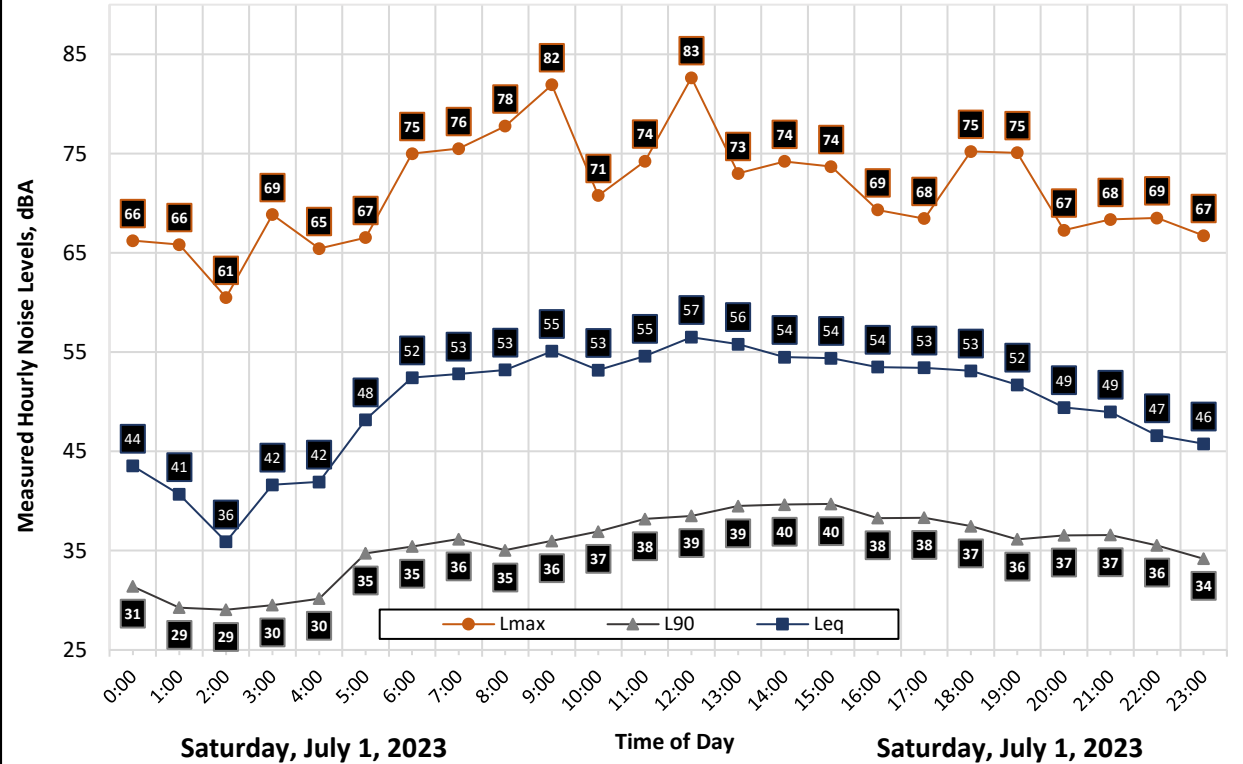
Meter: LDL 820-1

Location: Southern Project Boundary

Calibrator: CAL200

Coordinates: (38.4088937, -122.3643997)

Measured Ambient Noise Levels vs. Time of Day



Noise Measurement Site



Date	Time	Measured Level, dBA			
		L _{eq}	L _{max}	L ₅₀	L ₉₀
Saturday, July 1, 2023	0:00	44	66	33	31
Saturday, July 1, 2023	1:00	41	66	31	29
Saturday, July 1, 2023	2:00	36	61	30	29
Saturday, July 1, 2023	3:00	42	69	31	30
Saturday, July 1, 2023	4:00	42	65	33	30
Saturday, July 1, 2023	5:00	48	67	39	35
Saturday, July 1, 2023	6:00	52	75	40	35
Saturday, July 1, 2023	7:00	53	76	41	36
Saturday, July 1, 2023	8:00	53	78	41	35
Saturday, July 1, 2023	9:00	55	82	44	36
Saturday, July 1, 2023	10:00	53	71	44	37
Saturday, July 1, 2023	11:00	55	74	47	38
Saturday, July 1, 2023	12:00	57	83	46	39
Saturday, July 1, 2023	13:00	56	73	50	39
Saturday, July 1, 2023	14:00	54	74	47	40
Saturday, July 1, 2023	15:00	54	74	47	40
Saturday, July 1, 2023	16:00	54	69	46	38
Saturday, July 1, 2023	17:00	53	68	45	38
Saturday, July 1, 2023	18:00	53	75	42	37
Saturday, July 1, 2023	19:00	52	75	41	36
Saturday, July 1, 2023	20:00	49	67	40	37
Saturday, July 1, 2023	21:00	49	68	39	37
Saturday, July 1, 2023	22:00	47	69	38	36
Saturday, July 1, 2023	23:00	46	67	36	34

Statistics	Leq	Lmax	L50	L90
Day Average	54	74	44	38
Night Average	46	67	35	32
Day Low	49	67	39	35
Day High	57	83	50	40
Night Low	36	61	30	29
Night High	52	75	40	36
Ldn	55	Day %		91
CNEL	55	Night %		9

Appendix B1c: Continuous Noise Monitoring Results

Site: LT-1

Project: Oak + Vine Subdivision

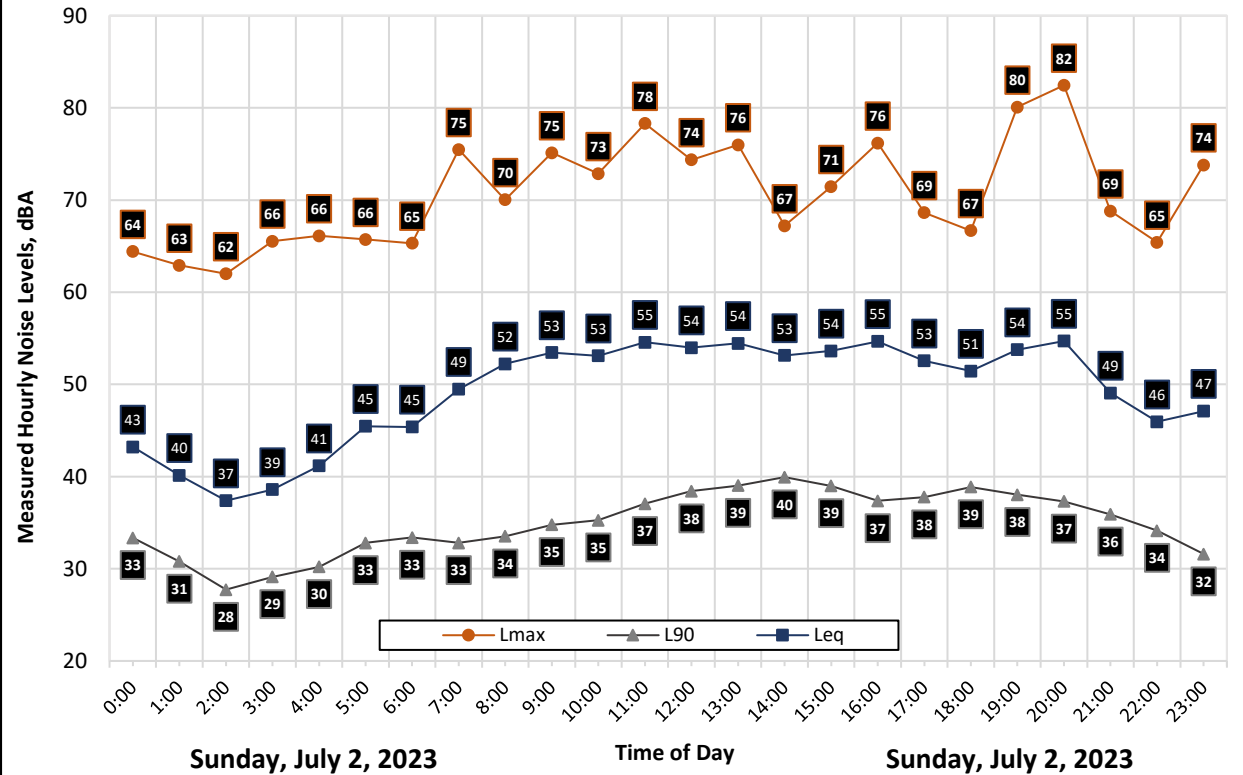
Meter: LDL 820-1

Location: Southern Project Boundary

Calibrator: CAL200

Coordinates: (38.4088937, -122.3643997)

Measured Ambient Noise Levels vs. Time of Day



Sunday, July 2, 2023

Time of Day

Sunday, July 2, 2023

Noise Measurement Site



Date	Time	Measured Level, dBA			
		L _{eq}	L _{max}	L ₅₀	L ₉₀
Sunday, July 2, 2023	0:00	43	64	35	33
Sunday, July 2, 2023	1:00	40	63	33	31
Sunday, July 2, 2023	2:00	37	62	31	28
Sunday, July 2, 2023	3:00	39	66	31	29
Sunday, July 2, 2023	4:00	41	66	32	30
Sunday, July 2, 2023	5:00	45	66	37	33
Sunday, July 2, 2023	6:00	45	65	37	33
Sunday, July 2, 2023	7:00	49	75	38	33
Sunday, July 2, 2023	8:00	52	70	40	34
Sunday, July 2, 2023	9:00	53	75	44	35
Sunday, July 2, 2023	10:00	53	73	44	35
Sunday, July 2, 2023	11:00	55	78	45	37
Sunday, July 2, 2023	12:00	54	74	46	38
Sunday, July 2, 2023	13:00	54	76	46	39
Sunday, July 2, 2023	14:00	53	67	47	40
Sunday, July 2, 2023	15:00	54	71	46	39
Sunday, July 2, 2023	16:00	55	76	44	37
Sunday, July 2, 2023	17:00	53	69	43	38
Sunday, July 2, 2023	18:00	51	67	43	39
Sunday, July 2, 2023	19:00	54	80	42	38
Sunday, July 2, 2023	20:00	55	82	42	37
Sunday, July 2, 2023	21:00	49	69	38	36
Sunday, July 2, 2023	22:00	46	65	36	34
Sunday, July 2, 2023	23:00	47	74	34	32

Statistics

	Leq	Lmax	L50	L90
Day Average	53	74	43	37
Night Average	43	66	34	31
Day Low	49	67	38	33
Day High	55	82	47	40
Night Low	37	62	31	28
Night High	47	74	37	34
Ldn	53	Day %		95
CNEL	54	Night %		5

Appendix B2 : Short Term Noise Monitoring Results

Site: ST-1

Project: Oak + Vine Subdivision

Location: Northern Boundary of Project Site

Coordinates: (38.4092801, -122.3649700)

Meter: LDL 831-5

Calibrator: CAL200

Start: 2023-06-29 12:46:45

Stop: 2023-06-29 12:56:48

SLM: Model 831

Serial: 2658

Measurement Results, dBA

Duration: 0:10

L_{eq} : 37

L_{max} : 55

L_{min} : 31

L_{50} : 36

L_{90} : 33

Notes

Primary noise source was distant traffic noise from Yountville Cross Road. Secondary noise sources include intermittent construction noise.

