3E Noise and Vibration

3E.1 Introduction

This section provides an overview of the existing noise environment at the proposed project site and surrounding area, the regulatory framework, an analysis of potential noise impacts that would result from implementation of the proposed project, and mitigation measures where appropriate.

3E.2 Environmental Setting

Noise Principles and Descriptors

Noise is defined as unwanted sound. Sound, traveling in the form of waves from a source, exerts a sound pressure level (referred to as sound level) which is measured in decibels (dB), with zero dB corresponding roughly to the threshold of human hearing, and 120 to 140 dB corresponding to the threshold of pain. Pressure waves traveling through air exert a force registered by the human ear as sound.

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude (sound power). When all the audible frequencies of a sound are measured, a sound spectrum is plotted consisting of a range of frequency spanning 20 to 20,000 Hz. The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the sound frequency/sound power level spectrum.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ears decreased sensitivity to low and extremely high frequencies instead of the frequency mid-range. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA). Frequency A-weighting follows an international standard methodology of frequency de-emphasis and is typically applied to community noise measurements.

Noise Exposure and Community Noise

An individual's noise exposure is a measure of noise over a period of time. A noise level is a measure of noise at a given instant in time. Many measured noise levels are representative of noise at a given instant in time (e.g. passing truck, airplane), however, they rarely persist consistently over a long period of time. Rather, community noise varies continuously over a period of time with respect to the contributing sound sources of the community noise environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources such as traffic and atmospheric conditions. What makes

community noise constantly variable throughout a day, besides the slowly changing background noise, is the addition of short duration single event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual.

These successive additions of sound to the community noise environment varies the community noise level from instant to instant requiring the measurement of noise exposure over a period of time to legitimately characterize a community noise environment and evaluate cumulative noise impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below:

L_{eq}: the equivalent sound level is used to describe noise over a specified period of time, typically one hour, in terms of a single numerical value. The L_{eq} is the constant sound level which would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).

L_{max}: the instantaneous maximum noise level for a specified period of time.

L50: the noise level that is equaled or exceeded 50 percent of the specified time period. The L50 represents the median sound level.

L90: the noise level that is equaled or exceeded 90 percent of the specified time period. The L90 is sometimes used to represent the background sound level.

DNL: 24-hour day and night A-weighted noise exposure level which accounts for the greater sensitivity of most people to nighttime noise by weighting noise levels at night ("penalizing" nighttime noises). Noise between 10:00 p.m. and 7:00 a.m. is weighted (penalized) by adding 10 dBA to take into account the greater annoyance of nighttime noises.

CNEL: similar to the DNL the Community Noise Equivalent Level (CNEL) adds a 5-dBA "penalty" for the evening hours between 7:00 p.m. and 10:00 p.m. in addition to a 10-dBA penalty between the hours of 10:00 p.m. and 7:00 a.m.

As a general rule, in areas where the noise environment is dominated by traffic, the L_{eq} during the peak-hour is generally equivalent to the DNL at that location (Caltrans, 1998).

Effects of Noise on People

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

- subjective effects of annoyance, nuisance, dissatisfaction;
- interference with activities such as speech, sleep, learning; and
- 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 complete 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 regard 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 adverse response.

These relationships occur in part because of the logarithmic nature of sound and the decibel system. The human ear perceives sound in a non-linear fashion; hence the decibel scale was developed. Because the decibel scale is based on logarithms, two noise sources do not combine in a simple additive fashion, rather logarithmically. For example, if two identical noise sources produce noise levels of 50 dBA the combined sound level would be 53 dBA, not 100 dBA.

Noise Attenuation

Stationary point sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate between 6 dBA for hard sites and 7.5 dBA for soft sites for each doubling of distance from the reference measurement. Hard sites are those with a reflective surface between the source and the receiver such as parking lots or smooth bodies of water. No excess ground attenuation is assumed for hard sites and the changes in noise levels with distance (drop-off rate) is simply the geometric spreading of the noise from the source. Soft sites have an absorptive ground surface such as soft dirt, grass or scattered bushes and trees. In addition to geometric spreading, an excess ground attenuation value of 1.5 dBA (per doubling distance) is normally assumed for soft sites. Line sources (such at traffic noise from vehicles) attenuate at a rate between 3 dBA for hard sites and 4.5 dBA for soft sites for each doubling of distance from the reference measurement (Caltrans, 1998).

Fundamentals of Vibration

As described in the Federal Transit Administration's Transit Noise and Vibration Impact Assessment (FTA, 2006), ground-borne vibration can be a serious concern for nearby neighbors of a transit system route or maintenance facility, causing buildings to shake and rumbling sounds to be heard. In contrast to airborne noise, ground-borne vibration is not a common environmental problem. It is unusual for vibration from sources such as buses and trucks to be perceptible, even

in locations close to major roads. Some common sources of ground-borne vibration are trains, buses on rough roads, and construction activities such as blasting, pile-driving and operating heavy earth-moving equipment.

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings. The root mean square (RMS) amplitude is most frequently used to describe the affect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (Vdb) is commonly used to measure RMS. The decibel notation acts to compress the range of numbers required to describe vibration. Typically, ground-borne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receptors for vibration include structures (especially older masonry structures), people (especially residents, the elderly and sick), and vibration sensitive equipment.

The effects of ground-borne vibration include movement of the building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. In extreme cases, the vibration can cause damage to buildings. Building damage is not a factor for most projects, with the occasional exception of blasting and pile-driving during construction. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by only a small margin. A vibration level that causes annoyance will be well below the damage threshold for normal buildings. The FTA measure of the threshold of architectural damage for conventional sensitive structures is 0.2 in/sec PPV and the FTA threshold of human annoyance to ground-borne vibration is 80 RMS (FTA, 2006).

Sensitive Receptors

Some land uses are considered more sensitive to ambient noise levels than others because of the amount of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities typically involved. Residences, hotels, schools, rest homes, and hospitals are generally more sensitive to noise than commercial and industrial land uses. Residential uses surround the project site.

3E.3 Applicable Regulations

Federal

Federal regulations establish noise limits for medium and heavy trucks (more than 4.5 tons, gross vehicle weight rating) under 40 Code of Federal Regulations (CFR), Part 205, Subpart B. The federal truck pass-by noise standard is 80 dBA at 15 meters from the vehicle pathway centerline. These controls are implemented through regulatory controls on truck manufacturers.

State

California Code of Regulations has guidelines for evaluating the compatibility of various land uses as a function of community noise exposure, as shown in **Figure 3E-1** below. The State of California also establishes noise limits for vehicles licensed to operate on public roads. For heavy trucks, the State pass-by standard is consistent with the federal limit of 80 dB. The State pass-by standard for light trucks and passenger cars (less than 4.5 tons, gross vehicle rating) is also 80 dBA at 15 meters from the centerline. These standards are implemented through controls on vehicle manufacturers and by legal sanction of vehicle operators by state and local law enforcement officials.

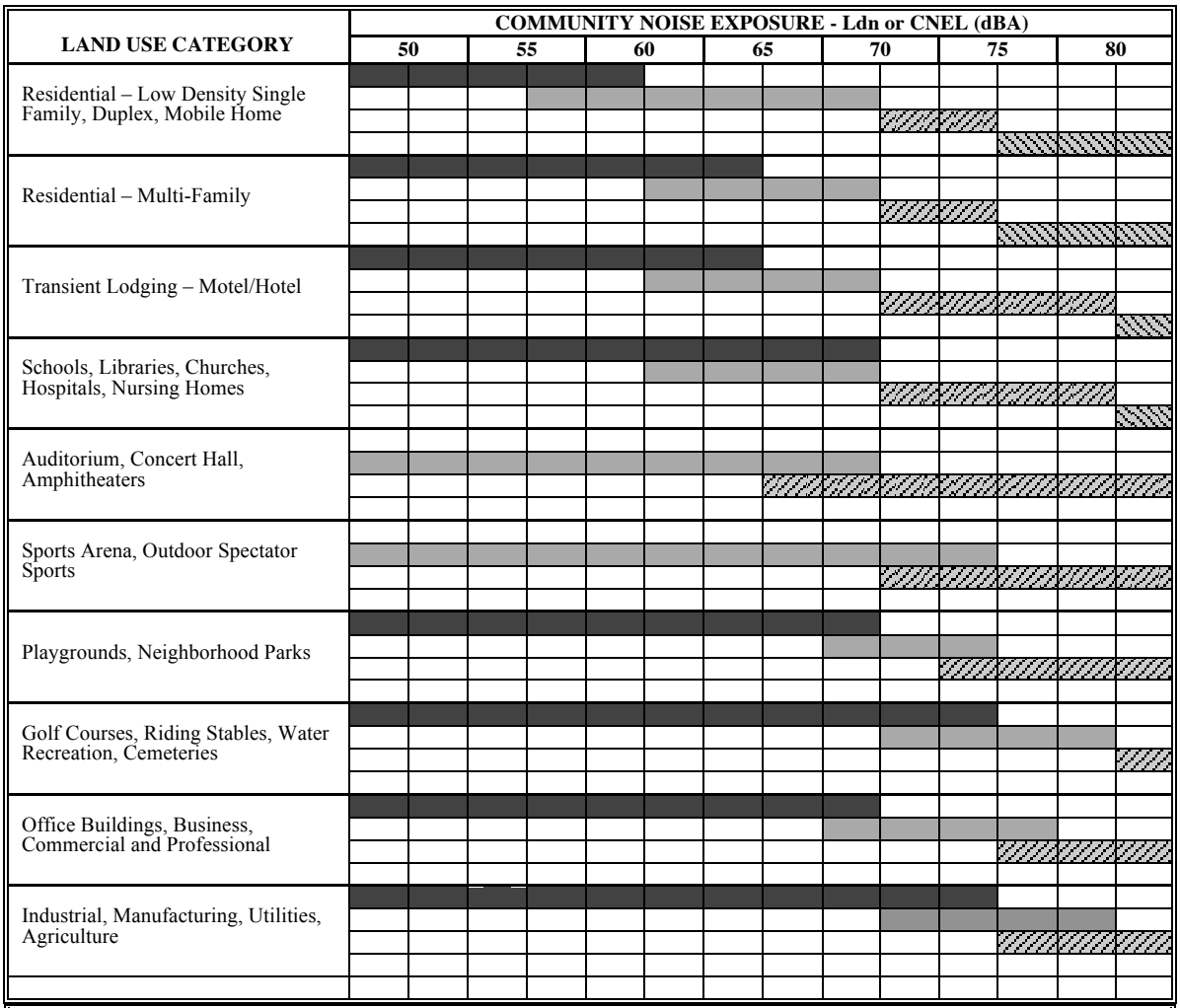
The State has also established noise insulation standards for new multi-family residential units, hotels, and motels that would be subject to relatively high levels of transportation-related noise. These requirements are collectively known as the California Noise Insulation Standards (Title 24, California Code of Regulations). The noise insulation standards set forth an interior standard of DNL 45 dBA in any habitable room. They require an acoustical analysis demonstrating how dwelling units have been designed to meet this interior standard where such units are proposed in areas subject to noise levels greater than DNL 60 dBA. Title 24 standards are typically enforced by local jurisdictions through the building permit application process.

Local

Noise Element for the City of Los Angeles General Plan

The project would be required to comply with all City of Los Angeles policies and regulations concerning noise. The Noise Element of the General Plan identifies compatible noise environments for different types of land uses in the City. **Table 3E-1** contains the noise/land use compatibility guidelines for different types of land uses. These guidelines are to be used when evaluating the noise impacts of a proposed project.

FIGURE 3E-1
LAND USE COMPATIBILITY FOR COMMUNITY NOISE ENVIRONMENT



	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.
	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. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
	Normally Unacceptable	New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirement must be made and needed noise insulation features included in the design.
	Clearly Unacceptable	New construction or development generally should not be undertaken.

SOURCE: State of California, Governor's Office of Planning and Research, 1998. *General Plan Guidelines*.

TABLE 3E-1
CITY OF LOS ANGELES GUIDELINES FOR NOISE COMPATIBLE LAND USE

	Day-Night Average Exterior Sound Level (CNEL dBA)		
Land Use Category	**Acceptable[a]**	**Conditionally Acceptable[b]**	**Normally Unacceptable and Unacceptable[c]**
Residential	Up to 50	Up to 65	Above 70
Transient Lodging, Hotel, Motel	Up to 55	Up to 65	Above 70
School, Library, Church, Hospital, Nursing Home	Up to 55	Up to 65	Above 70
Playgrounds, Neighborhood Parks	Up to 65	Up to 65	Above 65
Office Buildings, Business, Commercial, Professional	Up to 65	Up to 75	Above 75

a. Specified land use is satisfactory. No noise mitigation measures are required.
b. Use should be permitted only after careful study and inclusion of protective measures as needed for intended use and to satisfy policies of the Noise Element.
c. Development is not feasible in accordance with the Noise Element. Use is prohibited.

Source: *Los Angeles Department of City Planning, Noise Element of the Los Angeles City General Plan, February 3, 1999.*

City of Los Angeles Noise Ordinance

A noise ordinance was adopted by the City of Los Angeles to control any unnecessary, excessive, and annoying noise in the City; this Noise Ordinance is found in Sections 111.00 through 116.01 and 41.40 of the LAMC. The City's noise ordinance prohibits the following:

- construction activities or repair work that disturb persons occupying sleeping quarters within any residential zone of the City, between 9:00 p.m. and 7:00 a.m. of the following day;

- construction activities or repair work of any kind upon, or any earth grading for, any building or structure located on land developed with residential buildings or perform such work within 500 feet of land so occupied, before 8:00 a.m. or after 6:00 p.m. on any Saturday or national holiday nor at any time on any Sunday. In addition, the operation, repair, or servicing of construction equipment and the job-site delivering of construction materials in such areas shall be prohibited on Saturdays and on Sundays during the hours herein specified.

- the use of loud machinery, equipment, pump, fan, air-conditioning apparatus, and similar devices, which would cause the noise level at the property line to exceed the ambient

noise level by more than five decibels; and exceeding noise levels of 75 dBA at a distance of 50 feet through the use of construction and industrial machinery, except where technically infeasible. The burden of proving that compliance is technically infeasible shall be upon the person or persons charged with violation of this section. Technical infeasibility shall mean that said noise limitations cannot be complied with despite the use of mufflers, shields, sound barriers and/or any other noise reduction device or technique during the operation of the equipment.[1]

3E.4 Significance Criteria

Based on the *CEQA Guidelines,* a project may be deemed to have a significant effect on the environment with respect to noise and/or ground-borne vibration if it would result in:

- Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels;
- A substantial permanent increase in ambient noise levels in the proposed project vicinity above levels existing without the proposed project; A substantial temporary or periodic increase in ambient noise levels in the proposed project vicinity above levels existing without the proposed project;
- Exposure of people residing or working in the proposed project area to excessive noise levels (for a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport); or
- Exposure of people residing or working in the proposed project area to excessive noise levels (for a project within the vicinity of a private airstrip).

Some guidance as to the significance of changes in ambient noise levels is provided by the 1992 findings of the Federal Interagency Committee on Noise (FICON), which assessed the annoyance effects 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. Annoyance is a summary measure of the general adverse reaction of people to noise that generates speech interference, sleep disturbance, or interference with the desire for a tranquil environment. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, it has been asserted that they are applicable to all sources of noise described in terms of cumulative noise exposure metrics such as the Ldn, as shown in **Table 3E-2**

[1] City of Los Angeles, *Building Code*.

TABLE 3E-2
MEASURES OF SUBSTANTIAL INCREASE FOR NOISE EXPOSURE

Ambient Noise Level Without Project (Ldn)	Significant Impact Assumed to Occur if the Project Increases Ambient Noise Levels By:
<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), 1992.

The rationale for the Table 3E-2 criteria is that, as ambient noise levels increase, the noise resulting from a project is sufficient to cause significant annoyance. The quieter the ambient noise level is, the more increase of noise is allowable before it may cause significant annoyance.

The proposed project would result in significant noise impacts if it would generate noise or vibration levels in excess of the following thresholds.

Construction Noise. The project would result in a significant construction impact if construction activity would occur outside of the daytime hours permitted by the City's noise ordinance.

Vibration. The project would result in a significant vibration impact if buildings would be exposed to the FTA building damage ground-borne vibration threshold level of 0.2 PPV or if sensitive individuals would be exposed to the FTA human annoyance response ground-borne vibration threshold level of 80 RMS.

Stationary Noise. The project would result in a significant operational noise impact if the ambient noise level at the property line of the sensitive receptor raises 5 dBA.

Traffic Noise. As described in Table 3E-2 above, the project would result in a significant traffic noise impact if mobile noise would result in increased noise levels of 1.5 dBA Ldn or more in an ambient noise environment greater than 65 dBA Ldn; or increased noise of 3 dBA Ldn or more in an ambient noise environment between 60 and 65 dBA Ldn; or increased noise of 5 dBA Ldn or more in an ambient environment of less than 60 dBA Ldn.

Regarding ground-borne vibration levels, the significance threshold for structural damage of buildings is 0.2 PPV and the significance threshold for the human annoyance response is 80 RMS.

3E.5 Impacts and Mitigation

Methodology

Noise impacts are assessed based on a comparative analysis of the noise levels resulting from the alternative and the noise levels under existing conditions. Analysis of temporary construction noise effects is based on typical construction phases and equipment noise levels and attenuation

of those noise levels due to distances between the construction activity and the sensitive receptors near the sources of construction noise.

Vibration from construction can be evaluated for potential impacts at sensitive receptors. Typical activities evaluated for potential building damage due to construction vibration include demolition, pile driving, and drilling or excavation in close proximity to structures. The ground-borne vibration can also be evaluated for perception to eliminate annoyance. Vibration propagates according to the following expression, based on point sources with normal propagation conditions:

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

Where PPV (equip) is the peak particle velocity in in/sec of the equipment adjusted for distance, PPV (ref) is the reference vibration level in in/sec at 25 feet, and D is the distance from the equipment to the receiver. The peak particle velocity (PPV) is defined as the maximum instantaneous positive or negative peak of the vibration and is often used in monitoring of vibration because it is related to the stresses experienced by structures.

In order to determine potential for annoyance, the RMS vibration level (Lv) at any distance (D) shall be estimated based on the following equation:

$$L_v(D) = L_v(25 \text{ ft}) - 30\log(D/25)$$

Impact 3E-1: Project construction would temporarily expose persons to noise levels in excess of standards established in the General Plans and noise ordinance, however only one new house is proposed for construction and effects would be of short duration and less than significant. (Less than significant.)

As is typical of construction sites, construction activity noise levels would fluctuate depending on the particular type, number, and duration of uses of various pieces of construction equipment. Construction-related soil export and material haul trips would raise ambient noise levels along haul routes, depending on the number of haul trips made and types of vehicles used. In addition, certain types of construction equipment generate impulsive noises (such as pile driving), which can be particularly annoying. Pile driving, however, is not proposed for the proposed project development. **Table 3E-3** shows typical noise levels during different construction stages. **Table 3E-4** shows typical noise levels produced by various types of construction equipment.

TABLE 3E-3
TYPICAL CONSTRUCTION NOISE LEVELS

Construction Phase	Noise Level (dBA, Leq) [a]
Ground Clearing	84
Excavation	89
Foundations	78
Erection	85
Finishing	89

NOTE: a. Average noise levels correspond to a distance of 50 feet from the noisiest piece of equipment associated with a given phase of construction and 200 feet from the rest of the equipment associated with that phase.

SOURCE: U.S. Environmental Protection Agency, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, 1971.

TABLE 3E-4
TYPICAL NOISE LEVELS FROM CONSTRUCTION EQUIPMENT

Construction Equipment	Noise Level (dBA, Leq at 50 feet)
Dump Truck	88
Portable Air Compressor	81
Concrete Mixer (Truck)	85
Scraper	88
Jack Hammer	88
Dozer	87
Paver	89
Generator	76
Pile Driver	101
Backhoe	85

SOURCE: Cunniff, Environmental Noise Pollution, 1977.

Construction of the one new house on the site would generate noise corresponding to the phase of construction shown in Table 3E-3 and the noise generating equipment used during those phases. Sensitive receptors surround the new home site, several homes are located about 25 to 50 feet from the home site and would experience noise levels approximating those shown in these tables; homes further away would experience incrementally less noise. Homes along the haul route (including homes above the haul route) would be exposed to truck noise for the duration of soil export activities (about 3 weeks). Noise from construction activities generally attenuates at a rate of 4.5 to 7.5 dBA per doubling of distance. Construction noise is assumed to attenuate at a rate of 6 dBA, because most of the loudest construction activities will attenuate at a rate similar to a point source. Noise from construction trucks would attenuate at a rate of about 3 dBA since trucks arriving and leaving the site would have the characteristics of a line source. The canyon walls can serve to intensify the noise impacts and result in homes further away experiencing noise levels greater than would be predicted with standard noise attenuation with distance. Construction noise at the nearest sensitive receptor would be approximately 89 dBA. Howver since only one home would be built construction noise levels would be less intense than with multipl home construction and of relatively short duration. Mitigation measures are recommended to reduce noise levels in the vicinity of construction activities.

Mitigation Measures

Mitigation Measure 3E-1: Avoid Noise Sensitive Hours: in order to avoid noise-sensitive hours of the day and night, construction contractors shall comply with the following: Construction activities shall be limited to between 7:00 a.m. and 7:00 p.m., Monday through Friday, from 8:00 a.m. to 5:00 p.m. on Saturday, and not permitted Sundays and Federal holidays.

Mitigation Measure 3E-2: Prior to construction, the contractor shall erect an eight-foot temporary sound barrier between the one new home site and nearby homes on Thames, as feasible and necessary to block line of sight and noise to adjacent residences.

Mitigation Measure 3E-3: During construction, the contractor shall outfit all equipment, fixed or mobile, with properly operating and maintained noise mufflers, consistent with manufactures' standards.

Mitigation Measure 3E-4: During construction, the contractor shall use sound blankets on all equipment for which use of sound blankets is appropriate.

Mitigation Measure 3E-5: Stationary noise sources shall be located as far from adjacent receptors as possible, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or other measures to the extent feasible.

Mitigation Measure 3E-6: During construction, the contractor shall locate all equipment staging areas in the central most portion of the project site to create the greatest distance between construction related noise sources and sensitive receptors, while not damaging the central portion of the site proposed for dedication as permanent open space..

Mitigation Measure 3E-7: Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible; this could achieve a reduction of 5 dBA. Quieter procedures, such as use of drills rather than impact tools, shall be used whenever feasible.

Mitigation Measure 3E-8: Signs shall be posted at the construction sites that include permitted construction days and hours, a day and evening contact number for the job site, and a contact number for the appropriate agency with jurisdiction in the event of problems.

Mitigation Measure 3E-9: An onsite complaint and enforcement manager shall respond to and track complaints and questions related to noise.

Significance after Mitigation: Less than significant.

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Impact 3E-2: Project operation would not expose persons to, or generate noise levels or vibration in excess of standards established in the local general plans or noise ordinances, or applicable standards of other agencies. (Less than significant.)

Traffic Noise

The project would result in an increase of 90 net new weekday vehicle trips, 10.2 peak hour trips. The additional trips would not be perceived as an increase in activity in the area. A significant increase in traffic noise is usually defined as an increase of at least 3 dBA and an increase in noise of 3 dBA requires a doubling of traffic (a 100 percent increase).[2] The project would not double traffic along existing routes and the project impact would be less-than-significant without mitigation.

Stationary Sources

Building heating and ventilation equipment would not generate substantial noise compared to similar existing homes in the area.

Mitigation:

The following measures are recommended:

> **Mitigation Measure 3E.10:** Power yard maintenance equipment (including leaf blowers) shall be operated only between the hours of 8 am to 7 pm Monday through Saturday, and 10 am to 7 pm Sundays and holidays.
>
> **Mitigation Measure 3E.11:** Building equipment (e.g., HVAC units) shall be located away from nearby residences, and properly shielded for example within an enclosure that effectively blocks the line of site of the source from the nearest receptors.

Impact 3E-3: Construction of the one new home could adjacent residents to ground-borne vibration or ground-borne noise levels. However such vibration would be of relatively short term on and less than significant. (Less than significant.)

As shown in **Table 3E-5**, use of heavy equipment for project construction generates vibration levels of up to 0.089 PPV or 87 RMS (large bulldozer) at a distance of 25 feet. Ground-borne vibration levels, at the nearest sensitive receptor would be below the threshold for structural damage of buildings (0.2 PPV) however, given the close proximity of existing homes and the narrow and windy streets in the area, with homes immediately adjacent to the right-of-way, heavy equipment and trucks on local streets would be above the significance threshold for the human annoyance response (80 RMS), however the vibration would be of relatively short duration (about 3 weeks of excavation)since only one house is being constructed) and would therefore be less than significant.

[2] Caltrans, Technical Noise Supplement, 1998

TABLE 3E-5
VIBRATION VELOCITIES FOR CONSTRUCTION EQUIPMENT

Equipment Activity	PPV at 25 Feet (inches/second)[a]	RMS at 25 Feet (VDB)[b]
Large Bulldozer	0.089	87
Loaded Trucks	0.076	86
Jackhammer	0.035	79

NOTES:
a. Buildings can be exposed to ground-borne vibration levels of 0.2 PPV without experiencing structural damage.
b. The human annoyance response level is 80 RMS.

SOURCE: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006.

Mitigation: See mitigation measures above for construction noise.

Significance after Mitigation: Less than significant.

Impact 3E.4: Construction and operation of the project would not result in significant cumulative noise and vibration impacts. (Less than significant.)

Cumulative development in the area is limited to remodeling of homes and construction of a limited number of individual homes (two on Bulwer); construction noise is not anticipated to substantially contribute to sensitive receptors. Truck traffic on Willow Glen near Laurel Canyon and along Laurel Canyon could be slightly greater if construction periods overlap. Operational noise would be minor because of the limited number of homes involved. The increase in noise would generally not be detectable compared to existing noise levels in the area. A general increase in activity along local roads might be perceptible.

Mitigation: See mitigation measures above for construction noise.

Significance after Mitigation: Less than significant.

References - Noise

Caltrans, Technical Noise Supplement, 1998

Caltrans, Transportation Related Earthborne Vibrations, 2002.

Cunnif, Patrick, Environmental Noise Pollution. John Wiley & Sons, New York. 1977.

U.S. Environmental Protection Agency, 1971. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances.