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## Noise

This section describes ambient-noise conditions, identifies applicable regulations related to noise and vibration, the methods used for assessment, and the potential direct and indirect impacts of program implementation related to noise. Additional data are provided in Appendix NOI-1, “Noise Measurement Data and Noise Modeling Calculations.”

No comments received on the Notice of Preparation were related to noise and vibration (see Appendix A).

### Environmental Setting

#### Acoustic Fundamentals

The following provides background information about sound, noise, vibration, and common noise descriptors to give context to and a better understanding of the technical terms used throughout this section.

##### Sound, Noise, and Acoustics

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

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

##### Frequency

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

##### Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (mPa). One mPa is approximately one hundred billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this large range of values, sound is rarely expressed in terms of mPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of decibels (dB).

##### Addition of Decibels

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

##### A-Weighted Decibels

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

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

The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgment correlates well with the A-scale sound levels of those sounds. Thus, noise levels are typically reported in terms of A‑weighted decibels. All sound levels discussed in this section are expressed in A-weighted decibels. Table 3.13-1 describes typical A-weighted noise levels for various noise sources.

Table 3.13-1 Typical A-Weighted Noise Levels

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

Source: Caltrans 2013: Table 2-5.

All sound levels are expressed in dB in this Program EIR are A-weighted sound levels, unless noted otherwise.

##### Human Response to Changes in Noise Levels

The doubling of sound energy results in a 3-dB increase in the sound level. However, given a sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different from what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear can discern 1-dB changes in sound levels when exposed to steady, single-frequency (“pure-tone”) signals in the mid-frequency (1,000–8,000 Hz) range. In general, the healthy human ear is most sensitive to sounds between 1,000 and 5,000 Hz and perceives both higher and lower frequency sounds of the same magnitude with less intensity (Caltrans 2013:2-18). In typical noisy environments, changes in noise of 1–2 dB are generally not perceptible. However, it is widely accepted that people can begin to detect sound level increases of 3 dB in typical noisy environments. Further, a 5‑dB increase is generally perceived as a distinctly noticeable increase, and a 10-dB increase is generally perceived as a doubling of loudness (Caltrans 2013:2-10). Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3-dB increase in sound would generally be perceived as barely detectable.

##### Vibration

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

Typical outdoor sources of perceptible ground vibration are construction equipment, steel-wheeled trains, and traffic on rough roads (assuming a receptor is near enough to the road to feel the vibration). If a roadway is smooth, the ground vibration is rarely perceptible. Vibrations generated by construction activity can be transient, random, or continuous. Transient construction vibrations are typically generated by more vibration-intensive construction activities and equipment such as blasting, impact pile driving, and wrecking balls. Continuous vibrations are typically generated by more vibration-intensive construction activities and equipment such as vibratory pile drivers, large pumps, and compressors. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment.

Table 3.13-2 summarizes the general human response to different ground vibration-velocity levels.

Table 3.13-2 Human Response to Different Levels of Ground Noise and Vibration

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

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

Source: FTA 2006:7-8.

##### Common Noise Descriptors

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

**Equivalent Continuous Sound Level (Leq):** Leq represents an average of the sound energy occurring over a specified period. In effect, Leq is the steady-state sound level containing the same acoustical energy as the time-varying sound level that occurs during the same period (Caltrans 2013:2-48). For instance, the 1-hour equivalent sound level, also referred to as the hourly Leq, is the energy average of sound levels occurring during a 1-hour period and is the basis for noise abatement criteria used by California Department of Transportation (Caltrans) and Federal Transit Administration (FTA) (Caltrans 2013:2-47, FTA 2006:2-19).

**Percentile-Exceeded Sound Level (LX):** LX represents the sound level exceeded for a given percentage of a specified period (e.g., L10 is the sound level exceeded 10 percent of the time, and L90 is the sound level exceeded 90 percent of the time) (Caltrans 2013:2-16).

**Maximum Sound Level (Lmax):** Lmax is the highest instantaneous sound level measured during a specified period (Caltrans 2013:2-48; FTA 2006:2-16).

**Community Noise Equivalent Level (CNEL):** CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to sound levels occurring during the nighttime hours between 10 p.m. and 7 a.m. and a 5-dB penalty applied to the sound levels occurring during evening hours between 7 p.m. and 10 p.m. (Caltrans 2013:2-48).

**Single Event [Impulsive] Noise Level (SENL):** The SENL describes a receiver’s cumulative noise exposure from a single impulsive noise event (e.g., an automobile passing by or an aircraft flying overhead), which is defined as an acoustical event of short duration and involves a change in sound pressure above some reference value. SENLs typically represent the noise events used to calculate the Leq, Ldn, and CNEL.

##### Sound Propagation

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

###### Geometric Spreading

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

###### Ground Absorption

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

###### Atmospheric Effects

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

###### Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receiver attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction (Caltrans 2013:2-41, FTA 2006:5-6, 6-25). Barriers higher than the line of sight provide increased noise reduction (FTA 2006:2-12). Vegetation between the source and receiver is rarely effective in reducing noise because it does not create a solid barrier unless there are multiple rows of vegetation (FTA 2006:2-11).

#### Existing Noise Environment

Because of the varied characteristics across the treatable landscape, the existing noise environment is described by developed and undeveloped areas.

##### Existing Noise-Sensitive Land Uses

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels, and because of the potential for nighttime noise to result in sleep disruption. Additional land uses such as schools, transient lodging, historic sites, cemeteries, and places of worship are also generally considered sensitive to increases in noise levels. These land use types are also considered vibration-sensitive land uses, as are commercial and industrial buildings where vibration would interfere with operations within the building, including levels that may be well below those associated with human annoyance.

Portions of the treatable landscape are adjacent to developed areas, including residential communities, commercial and industrial parks, roadways, and freeways and highways. Residences and other buildings are present in some more developed areas of the treatable landscape. Therefore, the likelihood is high that noise-sensitive receptors could be in close proximity to vegetation treatments.

Most of the treatable landscape is undeveloped and rural. These areas are composed of dense forests, grasslands, and other vegetation and generally have little urban intrusion. Because these undeveloped areas are primarily on private lands, no public access is permitted, and few trails or roadways are present. Scattered residences also exist in the rural areas of the treatable landscape.

##### Existing Noise Sources and Ambient Levels

In developed areas near treatable landscape areas, typical noise sources include those associated with residential communities, commercial and industrial parks, roadways, and freeways and highways. The ambient noise environment in developed areas would be primarily influenced by vehicle traffic along nearby roadway, freeways, and highways. Most of the treatable landscape is undeveloped and rural. The noise sources in the areas where there is little development typically consist of natural sounds. The ambient noise environment of rural and undeveloped areas within the treatable landscape varies based on nearby noise sources; however, as shown in Table 3.13-1 quiet rural nighttime noise levels are typically approximately 20 dB.

Vegetation treatments are currently implemented within the treatable landscape by CAL FIRE and result in temporary increases in noise. Noise sources from current vegetation treatments (i.e., prescribed burning and manual and mechanical treatments) include masticators, chippers, bulldozers, skid steers, excavators, and chainsaws. As described in Chapter 1, “Introduction,” and Section 2.3.1, “Past and Current Treatments,” vegetation treatment currently occurs around the state under several other wildfire risk reduction programs implemented by various federal, state, and local agencies. In 2017–2018, CAL FIRE treated approximately 33,000 acres in California using the same treatment activities as proposed under the CalVTP. Vegetation treatments occur in undeveloped areas but can also occur near development.

### Regulatory Setting

#### Federal

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

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

#### State

##### California General Plan Guidelines for Noise Elements

The State of California General Plan Guidelines 2017, published by the California Governor’s Office of Planning and Research (2017), provides guidance for the compatibility of projects within areas of specific noise exposure. Acceptable and unacceptable community noise exposure limits for various land use categories have been determined to help guide new land use decisions in California communities. In many local jurisdictions, these guidelines are used to derive local noise standards and guidance. These guidelines are presented in Table 3.13-3. Citing EPA materials and the State Sound Transmissions Control Standards, the State’s general plan guidelines recommend interior and exterior CNEL of 45 and 60 dB for residential units, respectively (OPR 2017:378). For commercial land uses, the guidelines recommend an exterior CNEL of up to 65 dB for multi-family residential building and hotels, 70 dB for office buildings, schools, libraries and churches, and 75 dB for industrial, agricultural and recreational land uses.

Table 3.13-3 General Plan Community Noise Exposure Guidance by Land Use

| Land Use Category | Noise Exposure Ranges (dB CNEL) Normally Acceptable 1 | Noise Exposure Ranges (dB CNEL) Conditionally Acceptable 2 | Noise Exposure Ranges (dB CNEL) Normally Unacceptable 3 | Noise Exposure Ranges (dB CNEL) Clearly Unacceptable 4 |
| --- | --- | --- | --- | --- |
| Single-family residential, duplexes, mobile homes | <60 | 55-70 | 70-75 | >75 |
| Multi-family residential  | <65 | 60-70 | 70-75 | >75 |
| Hotels and motels | <65 | 60-70 | 70-80 | >80 |
| Schools, Libraries, Churches, Hospitals, Nursing Homes | <70 | 60-70 | 70-80 | >80 |
| Playgrounds, Neighborhood Parks | <70 | 67-75 | >73 | Undefined |
| Office Buildings | <70 | 67-77  | >75 | Undefined |
| Industrial & Manufacturing | <75 | 70-80 | >75 | Undefined |

Notes: CNEL = Community Noise Equivalent Level; dB = decibels.

1. For conventional construction, without any special noise insulation design features.

2. For construction with noise reduction features and/or conventional construction with permanently closed windows.

3. Unacceptable unless noise insulation features have been included in the design and noise reduction requirements in place.

4. Incompatible with construction and development.

Source: OPR 2017

##### California Building Standards Code

The 24, Part 2, Section 1207 of the California Building Standards Code establishes a uniform minimum noise insulation performance standard to protect persons within hotels, motels, dormitories, apartment houses, and dwellings other than detached single-family dwellings from the effects of excessive noise, including hearing loss or impairment and interference with speech and sleep. Title 24 states that interior noise levels attributable to exterior sources are not to exceed 45 dB in any habitable room (California Building Code 2016). The noise metric must be either the Ldn or CNEL, consistent with standards in the noise element of the local general plan.

Under California Public Resources Code Section 25402.1(g), all cities and counties in the state are required to enforce the adopted California Building Standards Code, including these noise insulation performance standards.

#### Local

When state agencies, including CAL FIRE, are conducting governmental activities under the authority of state law or the State Constitution, in this case, treatments implemented under the proposed CalVTP, they are exempt from local government plans, policies, and ordinances (unless a constitutional provision or statute directs otherwise). Nonetheless, CAL FIRE voluntarily seeks to operate consistently with local governance to the extent feasible. Given its statewide extent and the possible number of local and regional responsible agencies, this PEIR does not identify potentially applicable local government plans, policies, and ordinances.

Cities and counties establish general plan noise elements and/or noise ordinance standards that provide land use compatibility guidelines and locally acceptable standards to reduce noise conflicts between land uses. The State of California General Plan Guidelines 2017 described in the previous subsection are used as a guide for local government when developing these thresholds.

This PEIR assumes that any vegetation treatments proposed by local or regional agencies under the CalVTP would be consistent with local plans, policies, and ordinances, as required by SPR AD-3.

### Impact Analysis and Mitigation Measures

#### Analysis Methodology

The analysis of noise impacts focuses on the potential for nearby noise-sensitive receptors to experience a substantial temporary or permanent increase in ambient noise levels as a result of treatment implementation. Significance determinations account for the influence of relevant SPRs, which are incorporated into treatment design and listed below.

* **SPR AD-3 Consistency with Local Plans, Policies, and Ordinances**: The project proponent will design and implement the treatment in a manner that is consistent with applicable local plans (e.g., general plans, Community Wildfire Protection Plans, CAL FIRE Unit Fire Plans), policies, and ordinances to the extent the project is subject to them. This SPR applies to all treatment activities and treatment types, including treatment maintenance.
* **SPR NOI-1** **Limit Heavy Equipment Use to Daytime Hours:** The project proponent will require that operation of heavy equipment associated with treatment activities (heavy off-road equipment, tools, and delivery of equipment and materials) will occur during daytime hours if such noise would be audible to receptors (e.g., residential land uses, schools, hospitals, places of worship). Cities and counties in the treatable landscape typically restrict construction-noise (which would apply to vegetation treatment noise) to particular daytime hours. If the project proponent is subject to local noise ordinance, it will adhere to those to the extent the project is subject to them. If the applicable jurisdiction does not have a noise ordinance or policy restricting the time-of-day when noise-generating activity can occur noise-generating vegetation treatment activity will be limited to the hours of 7:00 a.m. to 6:00 p.m., Monday through Saturday, and between 9:00 a.m. and 6:00 p.m. on Sunday and federal holidays. If the project proponent is not subject to local ordinances (e.g., CAL FIRE), it will adhere to the restrictions stated above or may elect to adhere to the restrictions identified by the local ordinance encompassing the treatment area. This SPR applies to all treatment activities and treatment types, including treatment maintenance.
* **SPR NOI-2 Equipment Maintenance:** The project proponent will require that all powered treatment equipment and power tools will be used and maintained according to manufacturer specifications. All diesel- and gasoline-powered treatment equipment will be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers’ recommendations. This SPR applies to all treatment activities and all treatment types, including treatment maintenance.
* **SPR NOI-3 Engine Shroud Closure:** The project proponent will require that engine shrouds be closed during equipment operation. This SPR applies only to mechanical treatment activities and all treatment types, including treatment maintenance.
* **SPR NOI-4 Locate Staging Areas Away from Noise-Sensitive Land Uses:** The project proponent will locate treatment activities, equipment, and equipment staging areas away from nearby noise-sensitive land uses (e.g., residential land uses, schools, hospitals, places of worship), to the extent feasible, to minimize noise exposure. This SPR applies to all treatment activities and treatment types, including treatment maintenance.
* **SPR NOI-5 Restrict Equipment Idle Time:** The project proponent will require that all motorized equipment be shut down when not in use. Idling of equipment and haul trucks will be limited to 5 minutes. This SPR applies to all treatment activities and all treatment types, including treatment maintenance.
* **SPR NOI-6 Notify Nearby Off-Site Noise-Sensitive Receptors:** For treatment activities utilizing heavy equipment, the project proponent will notify noise-sensitive receptors (e.g., residential land uses, schools, hospitals, places of worship) located within 1,500 feet of the treatment activity. Notification will include anticipated dates and hours during which treatment activities are anticipated to occur and contact information, including a daytime telephone number, of the project representative. Recommendations to assist noise-sensitive land uses in reducing interior noise levels (e.g., closing windows and doors) will also be included in the notification. This SPR applies only to mechanical treatment activities and all treatment types, including treatment maintenance.

To assess treatment-related noise, sensitive receptors that have the potential to be impacted and their relative exposure were identified based on public and private land uses in the treatable landscape. Reference noise levels for specific equipment and treatment activities are well documented and application of reference noise levels is a common practice in the field of acoustics. Treatment-generated noise levels were determined based on methodologies, reference noise levels, and usage factors from FTA’s *Guide on Transit Noise and Vibration Impact Assessment* (FTA 2006). See Appendix NOI-1 for detailed calculations of treatment-generated noise levels.

The SENL describes a receiver’s cumulative noise exposure from a single impulsive noise event (e.g., a passing truck, a truck downshifting to engine brake, or an aircraft flying overhead), which is a rating of a discrete noise event that compresses the total sound energy of the event into a 1-second period, measured in decibels (Caltrans 2011). These noise events can be more startling to receptors if they occur when ambient noise levels are quieter, such as during nighttime hours.

Many studies have been conducted regarding the effects of single-event noise on sleep disturbance, but due to the wide variation in the reactions of test subjects to SENLs of various levels, no definitive consensus has been reached with respect to a universal criterion to apply. Based on its review of studies about sleep disturbance and SENLs, Federal Interagency Committee on Aviation Noise (FICAN) provided estimates of the percentage of people expected to be awakened when exposed to specific SENLs inside a home (FICAN 1997). According to FICAN’s review, 10 percent of the population is estimated to be awakened when the SENL interior noise level is 81 dB. An estimated 5 to 10 percent of the population is affected when the SENL interior noise level is between 65 and 81 dB, and few sleep awakenings (less than 5 percent) are predicted if the interior SENL is less than 65 dB. The SENL analysis is based on reference noise levels published by EPA.

#### Thresholds of Significance

Thresholds of significance are based on Appendix G of the State CEQA Guidelines and professional judgment. A treatment implemented under the proposed CalVTP would result in a significant noise-related impact if it would:

* generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
* expose noise-sensitive residential receptors to sleep disturbance resulting from noise generated by treatment activity, including SENLs generated by trucks at night;
* generate excessive groundborne vibration or groundborne noise levels; or
* for project areas 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 of public use airport, expose people residing or working in the project area to excessive noise.

#### Issues Not Evaluated Further

Implementation of treatments under the CalVTP would not result in the long-term operation of any source of ground vibration, such as pile driving, drilling, boring, or rock blasting. Thus, treatments under the CalVTP would not result in the exposure of sensitive receptors to levels of excessive vibration or groundborne noise levels. Groundborne vibration and groundborne noise are not discussed further.

Implementation of treatments under the CalVTP would not result in the long-term operation of any stationary noise sources, result in a permanent increase in noise-generating vehicle trips or other long-term or permanent noise-generating activity. Therefore, implementation of the CalVTP would not result in a permanent increase in ambient noise levels anywhere in the treatable landscape. Permanent increase in ambient noise is not discussed further.

Implementation of treatments under the CalVTP would not result in the siting of noise-sensitive land uses or receptors in the vicinity of a private airstrip, airport land use plan, or within two miles of a public airport. Airport noise exposure is not discussed further.

#### Impact Analysis

Impact NOI-1: Result in a Substantial Short-Term Increase in Exterior Ambient Noise Levels During Treatment Implementation

Vegetation treatment activities implemented under the CalVTP would adhere to the SPRs that require consistency with local noise policies and ordinances to the extent the project is subject to them, limit vegetation treatment activities to daytime hours, ensure proper notification of nearby sensitive receptors, and locate treatment activities and staging areas away from sensitive receptors to minimize noise exposure. Additionally, any increase in noise exposure at nearby receptors would be temporary and periodic. Therefore, implementation of the CalVTP would not result in the exposure of noise-sensitive receptors to a substantial temporary increase in ambient noise levels. This impact would be **less than** **significant**.

Treatment activities would typically be applied in combination to implement a treatment type. Vegetation treatment types would vary across the treatable landscape based on the fuel type being treated, site topography, accessibility, ecological conditions, and other factors. The most noise-intensive vegetation treatment activities are prescribed burning, mechanical vegetation treatment, and manual vegetation treatment. Prescribed herbivory and herbicide application would not require the use of heavy off-road equipment; noise generated by these treatment types would be negligible and they are not further discussed. The typical equipment used for each noise-generating treatment activity, as described in Section 2.5.2 of Chapter 2, “Program Description,” is summarized in Table 3.13-4.

Table 3.13-4 Equipment by Treatment Activity

| Treatment Activity | Equipment Types |
| --- | --- |
| Prescribed Burn | Fire Engines (2 to 10 engines)Bulldozers (up to 2)Masticators or Track ChippersWater TruckHelicopter1 |
| Mechanical Vegetation Treatment | DozersExcavatorsMasticatorsChippersSkid SteerFire Engines (at least 1) |
| Manual Vegetation Treatment | Chainsaws (4 to 8)MasticatorsChippers (only used occasionally) Fire Engine |

Notes: 1 A helicopter carrying a helitorch may be used in prescribed burns that involve large areas or in terrain with limited accessibility by ground vehicles and equipment.

Reference noise levels for individual equipment used in treatment activities are summarized in Table 3.13-5.

Table 3.13-5 Noise Levels from Treatment Equipment Types

| Equipment Type | Typical Noise Level (dB) at 50 Feet1 |
| --- | --- |
| Chain Saw | 85 |
| Dozer | 85 |
| Shears (on Backhoe) | 85 |
| Excavator | 85 |
| Flat Bed Trucks | 84 |
| Wood Chipper | 752 |
| Helicopter | 87.9 |

Notes: Assumes all equipment is fitted with a properly maintained and operational noise control device, per manufacturer specifications. Noise levels listed are manufacture-specified noise levels for each piece of equipment.

Sources:

1  reference noise levels from FTA 2006 except where indicated otherwise

2  Berger et. al. 2010

As shown in Table 3.13-5, noise levels generated by individual equipment range from 77 to 87.9 dB at 50 feet from the noise source. Though multiple pieces of equipment would be operated simultaneously to implement a treatment they would typically be spread out (i.e., usually more than 100 feet apart) rather than operating next to each other. This is particularly true of larger, heavy-duty off-road equipment such as masticators, chippers, bulldozers, skid steers, and excavators. This helps ensure worker safety and maximizes efficiency.

Although all pieces of heavy equipment could operate simultaneously for vegetation treatment activities under CalVTP, because of the size of the vegetation treatment sites and the spatial operational constraints of heavy equipment (only so many could operate in close proximity to one another because of function and size) it is unlikely that all pieces of equipment would operate in close proximity to each other near the boundaries of the project site. Therefore, it is unlikely that noise from multiple pieces of equipment would combine to affect any noise-sensitive receptor for an extended period. However, this analysis conservatively assumes that four of the highest noise-generating pieces of equipment could operate simultaneously in close proximity to each other near the boundaries of the treatment site (i.e., locations nearest to where noise-sensitive receptors could be located). This assumption is used because the estimated combined noise level for four pieces of equipment would not be noticeable higher if a fifth piece of equipment were also operating 100 feet from the nearest affected receptor. This is the case because noise levels from point sources attenuates at a rate of 7.5 dB per doubling of distance and because the logarithmic nature of adding noise levels.

Table 3.13-6 shows the combined noise level at 50 feet from the source for each noise-generating treatment activity, assuming four of the loudest pieces of equipment listed in Table 3.13-4 are operated next to each other. See Appendix NOI-1 for the specific equipment assumed to be operated under each treatment activity and the associated noise calculations.

Table 3.13-6 Noise Levels from Treatment Activities

| Treatment Activity | Noise Level (Leq dB) at 50 feet | Noise Level (Lmax dB) at 50 feet |
| --- | --- | --- |
| Prescribed Burning (including heliotorching) | 86.8/89.9 | 90.8/91.8 |
| Mechanical Vegetation Treatment | 87.0 | 91.0 |
| Manual Vegetation Treatment | 87.0 | 91.0 |

Notes: dB = decibels; Leq = Equivalent Continuous Sound Level

Assumes all equipment is fitted with a properly maintained and operational noise control device, per manufacturer specifications. Noise levels listed are manufacture-specified noise levels for each piece of heavy construction equipment.

Source: FTA 2006

As shown in Table 3.13-6, the highest noise-generating pieces of equipment used for each of the treatment activities produce similar noise levels; and thus, the combined noise levels of the four of the highest noise-generating pieces of equipment for each treatment activity are similar.

In developed areas the likelihood is high that noise-sensitive receptors could be located in close proximity to vegetation treatments. Additionally, although less likely, noise-sensitive receptors could be located in close proximity to vegetation treatments in undeveloped areas as well. The specific location of any such noise-sensitive receptors relative to later treatment activities are unknown at this time, because neither has been identified. It is assumed that noise-sensitive receptors near treatment activity sites could experience elevated noise levels. However, any increase in ambient noise levels exposure at nearby receptors would be temporary and periodic.

###### Helicopter Noise

In addition to typical land-based equipment used during vegetation treatment activities, a helicopter with a helitorch may be used when a large area needs to be burned or an area is not easily accessible by ground equipment. Due to the inherently remote nature of the treatable landscape within which prescribed burning by helitorch would be utilized, it is assumed that noise-sensitive receptors would not be located in close proximity to the vegetation treatment site. However, noise-sensitive receptors could be exposed to helicopter noise during approach and takeoff procedures.

The helicopter and helitorch would only be used to ignite the prescribed burn; and thus, total helicopter usage for individual vegetation treatment sites would be limited to one helicopter trip over the span of one day. Additionally, for safety and visibility reasons, helicopters would be used only during the day. Therefore, overall any exposure of sensitive receptors to noise generated by helicopter activity would be brief, infrequent, and pursuant to SPR NOI-1 would not occur during noise-sensitive evening and nighttime hours.

##### Conclusion

Qualifying projects under the proposed CalVTP would integrate various SPRs into treatment design to reduce exposure to noise generated by vegetation treatment activities. SPR AD-3 requires that treatments are designed and implemented in a manner that is consistent with applicable local plans (e.g., general plans), policies, and ordinances to the extent the project is subject to them. An example of how compliance with local noise ordinance would avoid and minimize increased noise levels and exposure to noise for qualifying treatments implemented by local agencies is presented for Humboldt County, which is the county with the greatest number of total acres within the treatable landscape. The Humboldt County Code does not contain any noise standards or noise-exemption time periods related to construction activity, which would also apply to vegetation treatment activities. In the absence of standards for construction noise, the county’s land use/noise compatibility interior standards would be applied, which limit interior noise to 45 dB Ldn for noise sensitive receptors. With implementation of SPR AD-3, noise levels associated with vegetation treatment activities under the CalVTP would not exceed local land use/noise compatibility standards. and noise exposure attributed to vegetation treatment activities under the CalVTP would not generate a substantial temporary increase in ambient noise levels in the vicinity of the project in excess of local standards when local standards are applicable.

Other SPRs that avoid and minimize noise exposure are SPRs NOI-1, NOI-4, and NOI-6. SPR NOI-1 restricts vegetation treatment activities to daytime hours. SPR NOI-4 would require vegetation treatment activities and staging areas be located away from sensitive receptors to the extent feasible to minimize noise exposure. Additionally, SPR NOI-6 requires notification be provided to nearby sensitive receptors when heavy equipment would be used for a treatment.

SPRs to reduce noise levels during treatment would also be integrated into treatment design. SPR NOI-2 requires all equipment to be maintained appropriately and equipped with the proper intake and exhaust shrouds. SPR NOI-3 requires all equipment engine shrouds to be closed during operation. SPR NOI-5 restricts equipment idling time.

Each vegetation treatment activity under the CalVTP would be required to adhere to the applicable SPRs identified above that avoid and minimize exposure to noise and reduce noise levels during treatment. Any increase in noise exposure at nearby receptors would only occur during daytime hours; thus, avoiding the potential to cause sleep disturbance to residents during the more noise-sensitive evening and nighttime hours. Although noise-sensitive receptors near vegetation treatment sites could experience a temporary increase in ambient noise levels, this increase would not be substantial with implementation of SPRs. This impact would be **less than significant**.

##### Mitigation Measures

No mitigation is required for this impact.

Impact NOI-2: Result in a Substantial Short-Term Increase in Truck-Generated SENL’s During Treatment Activities

Because vegetation treatment activities under the CalVTP would be required to adhere to SPR NOI-1, which limits vegetation treatment activities to daytime hours, SENLs generated by associated haul truck trips would not have the potential to result in sleep disturbance during noise-sensitive evening and nighttime hours. For this reason, implementation of the CalVTP would not result in a substantial temporary increase in SENL’s during vegetation treatment activities. This impact would be **less than significant**.

Treatment activities implemented under the CalVTP would involve large trucks hauling heavy equipment, crews, and/or livestock to the treatment sites. Many of these haul truck trips would use roads that would pass by residential receptors and the event of each truck passing by could generate a SENL that could be noticeable to residents. Reference SENLs for heavy truck passbys were measured by Bollard Acoustical Consultants and reported in an EIR for a proposed commercial center (City of Ceres 2010). The results of the outdoor measurements indicated that SENLs generated by heavy truck passbys range from 77 to 85 dB SENL, with a mean of 83 dB SEL at a reference distance of 50 feet. It is assumed that SELs from engine braking (a.k.a., Jake braking) are is at least as loud.

As described above, the SENL describes a receiver’s cumulative noise exposure from a single impulsive noise event, which is a rating of a discrete noise event that compresses the total sound energy of the event into a 1-second period, measured in decibels (Caltrans 2011). These noise events can be more startling to receptors if they occur when ambient noise levels are quieter, such as during nighttime hours. Assuming the average exterior-to-interior noise level reduction of 20 dB provided by wood frame buildings with the windows closed (Caltrans 2011), the highest SENL in the interior of rooms located closer than 50 feet from a passing truck would exceed 65 dB SEL. Because some houses along routes used by haul trucks could have inhabitable rooms located closer than 50 feet to the roadway, these rooms would experience SENLs that exceed the criterion of 65 dB and, therefore, the percentage of people expected to be awakened when inside the affected homes would exceed 5 percent. However, SPR NOI-1 restricts hauling of equipment to daytime hours; and thus, the haul truck passbys associated with treatment activity would not occur during more noise-sensitive evening and nighttime hours. Also, the increase in SENL-generating haul truck passbys associated with treatment activity at any particulate treatment site would be temporary. Therefore, for these reasons, this impact would be **less than significant**.

##### Mitigation Measures

No mitigation is required for this impact.