3.13 Noise and Vibration

This section identifies and evaluates issues related to Noise and Vibration in the context of the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment. The information and analysis presented in this section are based in part on data provided in **Appendix G**, *Noise and Vibration*. The County independently reviewed this and other materials prepared by or on behalf of the Applicant and determined them to be suitable for reliance on (in combination with other materials included in the formal record) in the preparation of this EIR.

In response to its notice of intention to prepare this Draft EIR, the County received scoping input about residents in Moose Camp who could be affected by increased noise and vibration during the Project's construction, operation, and maintenance. Comments suggested that noise could result from additional vehicles traveling along the main road proposed between the two substations (which would abut residential property) and along the three roads that surround Moose Camp's fence line, from heavy equipment and from the proposed concrete batch plant; from operation of the turbines (including low-frequency sonic and infrasonic noise caused by the blades combined with the creaking and groaning of the structures) and from operation of the power lines (described in scoping comments as the "hissing sound," "constant buzz" and "sizzle and pop" audible in winter or when it is cold or moist). Vibration, scoping comments suggested, could be caused by operation of the turbines. All scoping input received, including regarding noise and vibration, is provided in Section 4.1 of the Scoping Report, a copy of which is provided in **Appendix J**, *Scoping Report*.

3.13.1 Setting

3.13.1.1 Study Area

The study area for evaluation of noise and vibration impacts from construction and decommissioning activities encompasses the Project Site and the nearest potentially affected sensitive receptors to the proposed work. A maximum potential impact distance of 5,000 feet (approximately 1 mile) without mitigation was established based on maximum noise level potential as described in Section 3.13.3, *Direct and Indirect Effects*. The study area for evaluation of construction vibration impacts was established by considering a worst-case daytime construction vibration level from blasting and the most restrictive threshold applicable to historic structures, which results in a distance of 4,000 feet without mitigation.

The study area for evaluation of operational noise and vibration impacts encompasses the Project Site and receptors up to 2 miles away from proposed turbines as well as receptors within 500 feet of roadways used to access the Project Site based on the attenuation of traffic noise with distance to background levels.

3.13.1.2 Environmental Setting

Technical Background

Sound is mechanical energy transmitted by pressure waves through a medium such as air. Noise is defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level has become the most common descriptor used to characterize the "loudness" of an ambient sound level. Sound pressure level is measured in decibels (dB), with 0 dB corresponding roughly to the threshold of human hearing, and 120 to 140 dB corresponding to the threshold of pain.

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). 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 ear's decreased sensitivity to low and extremely high frequencies. This method of frequency weighting is referred to as A-weighting and is expressed in units of decibels (dBA).[1] Frequency A-weighting follows an international standard methodology of frequency de-emphasis and is typically applied to community noise measurements.

Some representative noise sources and their corresponding A-weighted noise levels are shown in **Table 3.13-1**. Alternatively, the *C-weighted sound level (dBC)* also follows the frequency sensitivity of the human ear, but at much higher noise levels. This results in a flatter curve giving more emphasis to low frequency sounds. C-weighting is only used in special cases when low frequency noise is of particular importance.

TABLE 3.13-1
TYPICAL NOISE LEVELS

Noise Level (dBA)	Outdoor Activity	Indoor Activity
90+	Gas lawn mower at 3 feet, jet flyover at 1,000 feet	Rock Band
80-90	Diesel truck at 50 feet	Loud television at 3 feet
70-80	Gas lawn mower at 100 feet, noisy urban area	Garbage disposal at 3 feet, vacuum cleaner at 10 feet
60-70	Commercial area	Normal speech at 3 feet
40-60	Quiet urban daytime, traffic at 300 feet	Large business office, dishwasher next room
20-40	Quiet rural, suburban nighttime	Concert hall (background), library, bedroom at night
10-20	Remote open space	Broadcast / recording studio
0	Lowest threshold of human hearing	Lowest threshold of human hearing

SOURCE: Modified from Caltrans, 2013a

1 All noise levels reported herein reflect A-weighted decibels unless otherwise stated.

Noise Exposure and Community Noise

An individual's noise exposure is a measure of the noise experienced by the individual over a period of time. A noise level is a measure of noise at a given instant in time. The noise levels presented in Table 4.11-1 represent noise measured at a given instant in time; however, noise levels rarely persist consistently over a long period of time. Rather, community noise varies continuously over time because of 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, 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 wind. 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 accurately 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 1 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.

L_{dn}: The Day/Night Average Sound Level is the 24-hour day and night A-weighed noise exposure level, which accounts for the greater sensitivity of most people to nighttime noise by weighting noise levels at night. 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 from nighttime noise. (Also referred to as "DNL.")

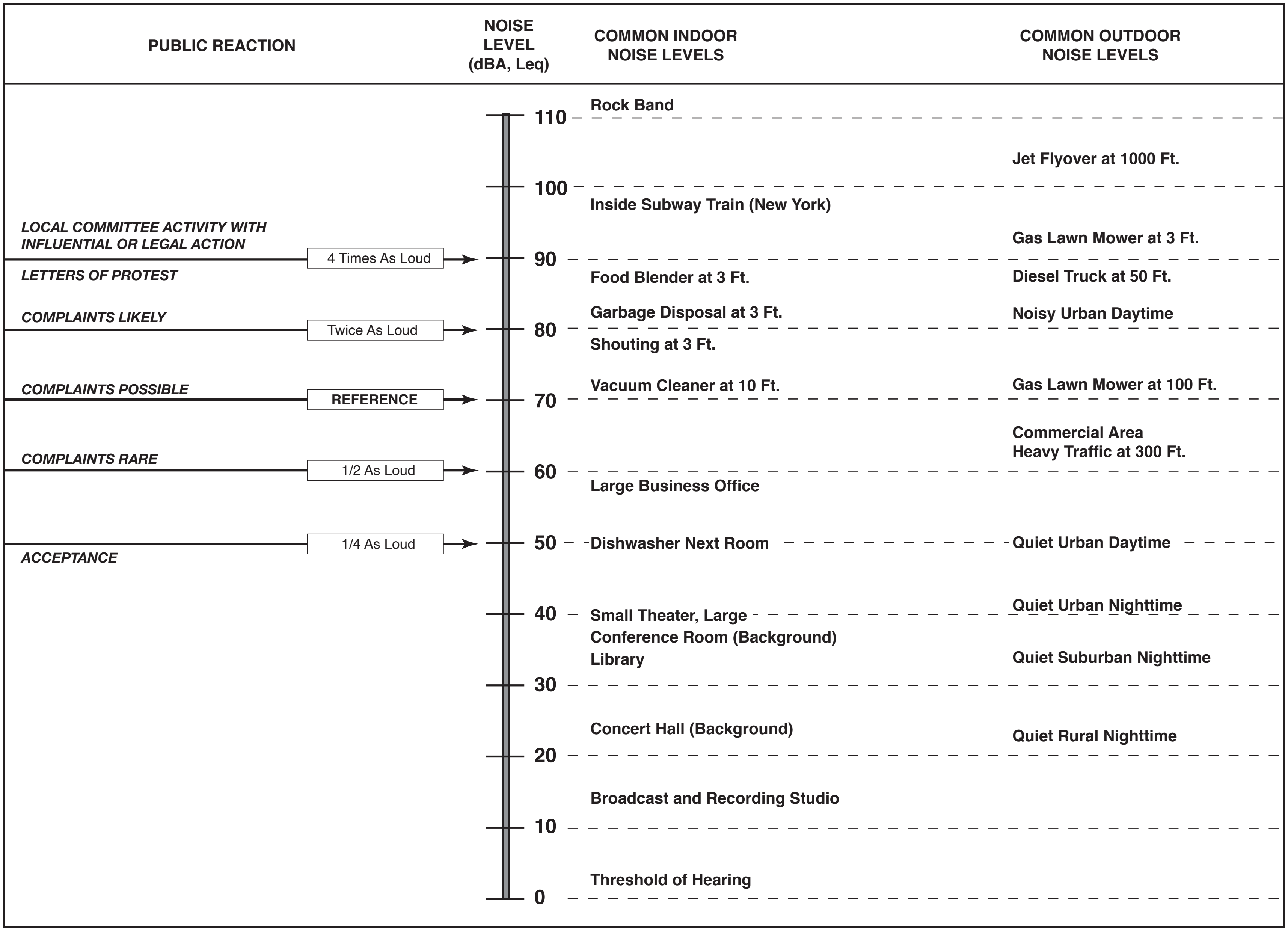
CNEL: Similar to the L_{dn}, the Community Noise Equivalent Level (CNEL) adds a 5-dBA "penalty" for the evening hours between 7:00 p.m. and 10:00 p.m. in addition to a 10-dBA penalty between the hours of 10:00 p.m. and 7:00 a.m.

Effects of Noise on People

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

1. Subjective effects of annoyance, nuisance, dissatisfaction;
2. Interference with activities such as speech, sleep, learning; and
3. Physiological effects such as hearing loss or sudden startling.

Environmental noise typically produces effects in the first two categories (see **Figure 3.13-1**, *Effects of Noise on People*). Workers in industrial plants generally 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 exists in the individual



SOURCE: Caltrans Transportation Laboratory Noise Manual, 1982; and modification by ESA

Fountain Wind

Figure 3.13-1
Effects of Noise on People

thresholds of annoyance, 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 (Caltrans, 2013):

- Under controlled conditions in an acoustics laboratory, the trained healthy human ear is able to discern changes in sound levels of 1 dBA.
- Outside these controlled conditions, the trained ear can detect changes of 2 dBA in normal environmental noise.
- It is widely accepted that the average healthy ear, however, can barely perceive changes in the noise level of 3 dBA.
- A change in level of 5 dBA is a readily perceptible increase in noise level.
- A 10 dBA change is recognized as twice as loud as the original source.

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 they combine logarithmically. For example, if two identical noise sources produce noise levels of 50 dBA, then 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 of 6 to 7.5 dBA per doubling of distance from the source, depending on the topography of the area and environmental conditions (atmospheric conditions and noise barriers, vegetative or manufactured, etc.). Widely distributed noise, such as a large industrial facility spread over many acres or a street with moving vehicles (known as a "line" source), would typically attenuate at a lower rate, approximately 3 to 4.5 dBA each time the distance doubles from the source, which also depends on environmental conditions (Caltrans, 2009). Noise from large construction sites would exhibit characteristics of both "point" and "line" sources, and attenuation therefore generally will range between 4.5 and 7.5 dBA each time the distance doubles.

Health Effects of Noise

The consequences of exposure of people to excessive noise can include annoyance and disturbance of human activities, and, as a result of, frequent, lengthy, and/or high level exposure, effects on human health. The following discussion is provided so that the health implications of noise exposure are fully understood.

Exposure to high levels of noise can cause permanent hearing impairment. The levels at which noise exposure can lead to hearing loss (140 dB) or pain (120 dB) is a common method of measuring health effects or impacts of noise. The federal Occupational Safety and Health Administration (OSHA) has established an occupational noise exposure program which includes hearing conservation standards for long-term noise exposure. Employers are required to measure noise levels; provide free annual hearing exams, hearing protection, and training; and conduct evaluations of the adequacy of the hearing protection in use where noise environments exceed 85 dBA for an 8-hour daily exposure.

Due to the cessation of U.S. Environmental Protection Agency involvement in the development of noise control guidance related to health impacts and, in the absence of any federal or state regulatory guidance on the health effects of noise outside of workplace exposure, this analysis acknowledges the World Health Organization (WHO) as a noted source of current knowledge regarding the health effects of noise impacts because European nations have continued to study noise and its health effects. According to WHO, sleep disturbance can occur when intermittent interior noise levels reach 45 dBA, particularly if background noise is low. WHO also notes that maintaining noise levels within the recommended levels during the first part of the night is believed to be effective for the ability of people to initially fall asleep (WHO, 1999). Excessive noise during sleep periods can result in difficulty falling asleep, awakenings, and alterations in sleep stages and depth (e.g., a reduction in proportion of rapid eye movement [REM] sleep). Exposure to high levels of noise during sleep can also result in increased blood pressure, increased heart rate, increased finger pulse amplitude, vasoconstriction, changes in respiration, cardiac arrhythmia, and an increase in body movements. Secondary physiological effects of exposure to excessive noise during sleep can occur the following day, including reduced perception of quality sleep, increased fatigue, depressed mood or well-being, and decreased performance of cognitive tasks.

Other potential health effects of noise identified by WHO include decreased performance for complex cognitive tasks, such as reading, attention span, problem solving, and memorization; physiological effects such as hypertension and heart disease (after many years of constant exposure, often by workers, to high noise levels); and hearing impairment (again, generally after long-term occupational exposure, although shorter-term exposure to very high noise levels, for example, exposure several times a year to concert noise at 100 dBA, can also damage hearing). Finally, noise can cause annoyance and can trigger emotional reactions like anger, depression, and anxiety. WHO reports that, during daytime hours, few people are seriously annoyed by activities with noise levels at or below 55 dBA.

In 2019, the Health Officer of San Diego County produced a Position Statement regarding the potential health impacts of wind turbines, including potential health impacts from noise (County of San Diego, 2019). The Position Statement acknowledges that noise from wind turbines may cause annoyance and that annoyance is subjectively experienced by a minority of people. Following a comprehensive literature review of studies of the impacts of noise from wind turbines, San Diego County's 2019 Position Statement concludes that "the weight of the evidence suggests that, when sited properly, wind turbines are not related to adverse health effects."

Vehicle traffic and continuous sources of machinery and mechanical noise contribute to ambient noise levels. Short-term noise sources, such as truck backup beepers, the crashing of material being loaded or unloaded, contribute very little to 24-hour noise levels but are capable of causing sleep disturbance and annoyance. The importance of noise to receptors depends on both time and context. For example, long-term high noise levels from large traffic volumes can make conversation at a normal voice level difficult or impossible, while short-term peak noise levels, if they occur at night, can disturb sleep.

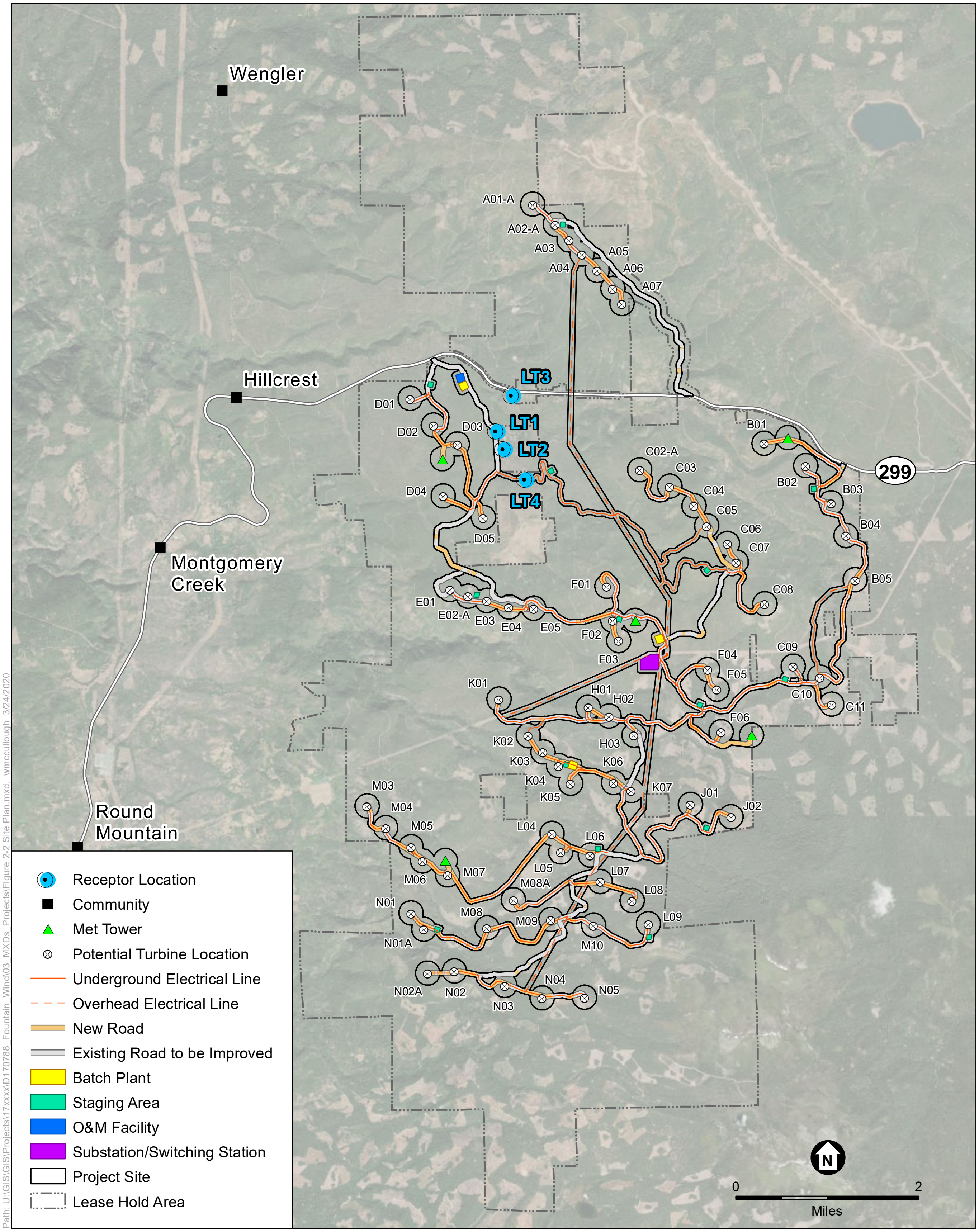
Noise Sources and Levels

The Project Site is located in an unincorporated area of eastern Shasta County, approximately 1 mile west of the existing Hatchet Ridge Wind Project and 6 miles west of Burney. State Route (SR) 299 bisects the Project Site. The private recreational facility and community of Moose Camp is located south of SR 299 and is surrounded by the Project Site. Other surrounding lands are privately owned; many are used for timber harvesting purposes.

Traffic on SR 299 is the primary noise source in the vicinity of the roadway. In areas further from SR 299, the noise environment is primarily comprised of natural sounds, such as wind rustling the leaves of foliage, insects, and birds. The existing noise environment in the area can be characterized by its population density, as population density and ambient noise levels tend to be closely correlated. Areas that are not urbanized are relatively quiet, while areas that are more urbanized are subjected to higher noise levels associated with roadway traffic, industrial activities, and other human activities.

To characterize the noise environment within the Project Site and surrounding area, long-term (24 hours per day over a period of 8 days) noise monitoring was conducted as part of the noise technical report (presented in Appendix G). Long-term noise monitoring was conducted at residential receptor locations nearest to the Project Site in the community of Moose Camp.

Long-term, unattended noise measurements were collected at four locations in the vicinity of the Project Site at locations indicated as LT-1, LT-2, LT- 3, and LT-4 in **Figure 3.13-2**, *Noise Measurement Locations*. Measurements were conducted over an 8-day period from Sunday, August 19, 2018, to Monday, August 27, 2018. The monitoring locations were selected to represent the closest residences to construction/decommissioning and operational elements of the Project. Sites LT-1, LT-2, and LT-3 were selected at distances of about 100 feet from the closest residences, in the worst-case location relative to the proposed turbines. Due to the inaccessibility of the residence to the south (represented by LT-4), measurements were not attempted on this property, but rather were taken adjacently, to be representative of the residence. The long-term noise levels were measured with Larson-Davis 820 Type 1 sound level meters calibrated before and after the surveys. **Table 3.13-2** presents a summary of the noise data collected during the noise monitoring effort.



SOURCE: Stantec

Fountain Wind Project

Figure 3.13-2
Noise Measurement Locations

ESA

TABLE 3.13-2
MONITORED NOISE ENVIRONMENTS WITHIN THE PROJECT AREA

Location	Time Period	Hourly L_{eq}		L_{dn}, dBA
		Average, dBA	Range, dBA	
LT-1	Daytime	40	28-49	43-45
	Nighttime	36	32-45	
LT-2	Daytime	38	28-50	42-44
	Nighttime	34	28-42	
LT-3	Daytime	47	39-53	53-54
	Nighttime	46	40-53	
LT-4	Daytime	42	38-49	47-50
	Nighttime	42	38-48	

Ambient noise levels in Table 3.13-2 are presented in the hourly L_{eq} as this is the primary metric utilized in Shasta County noise regulations. As indicated in the data, there is considerable variation in noise levels between test days and times of day at each site. The average hourly L_{eq} values for the daytime hours (7:00 a.m. to 10:00 p.m.) and the nighttime hours (10:00 p.m. to 7:00 a.m.) are shown in Table 3.13-2 along with the average L_{dn} levels for each long-term measurement. At all sites and on all measurement days, noise levels increased substantially (15 to 20 dB) around 8:00 p.m. and then dropped off slowly between 8:00 p.m. and 11:00 p.m. These elevated noise levels occurring between approximately 7:00 p.m. and 11:00 p.m. are thought to be attributable to insects and other natural sounds.

Monitored daytime noise levels were about 4 dBA greater than nighttime noise levels at locations LT-1 and LT-2, but were similar between daytime and nighttime periods at LT-3 and LT-4. The noise environment at LT-1, LT-2, and LT-4 is primarily comprised of natural sounds, such as wind rustling the leaves of foliage, insects, and birds, and vehicular traffic on local logging roads. Noise from occasional traffic on SR 299 is the primary noise source at LT-3, along with evening insect noise.

Infrasound

Scoping comments enquired about and suggested potential impacts of infrasound (i.e., sound waves with frequencies below the lower limit of 20 Hz) and the potential it may have to cause neurological and physiological disorders resulting in feelings of sea sickness, annoyance, fatigue, pressure or tinnitus (ear ringing), sleep disturbance or sleeplessness, headaches, or vibroacoustic disease (Appendix J).

The two aspects of sound that allow for its recognition and perception are frequency or pitch (measured in Hz), and pressure or loudness (measured in dB). Wind turbines make mechanical sounds from their component parts (e.g., the gearbox) and aerodynamic sound (e.g., from air flow around the blades and turbine tower), which is variable and depends on atmospheric and other conditions (Roberts and Roberts, 2013). "Infrasound" is generally inaudible sound with a frequency of less than 20 Hz, which is the "normal" limit of human hearing. Because hearing becomes gradually less sensitive as frequency decreases, the sound pressure must be sufficiently high for humans to perceive infrasound.

Vibration Background

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. Several different methods 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 physical vibration impacts on buildings. Typically, groundborne vibration generated by human activities attenuates rapidly with distance from the source of the vibration. Sensitive receptors to vibration include people (especially residents, the elderly, and sick people), structures (especially older masonry structures), and vibration-sensitive equipment.

Another useful vibration descriptor is known as vibration decibels or VdB. VdB generally are used when evaluating human response to vibration, as opposed to structural damage (for which PPV is the more commonly used descriptor). Vibration decibels are established relative to a reference quantity, typically 1×10^{-6} inches per second (FTA, 2018). There are no substantial existing sources of vibration in the study area.

Human Annoyance from Vibration

Caltrans has published and developed a summary of criteria relating to human perception that correlates the potential for perception and annoyance from groundborne vibration. Such human responses are dependent on whether a vibration source is continuous or transient. Transient sources create a single isolated vibration event, such as blasting. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, vibratory pile drivers, and vibratory compaction equipment. **Table 3.13-3** presents a summary of human response to vibration for both continuous and transient sources.

TABLE 3.13-3
HUMAN ANNOYANCE AND BUILDING DAMAGE POTENTIAL FROM VIBRATION

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure.
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected.
0.1	Strongly perceptible	Threshold at which there is a risk of damage to fragile buildings with no risk of damage to most buildings.
0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to historic and some old buildings.
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential structures.
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to new residential and modern commercial/industrial structures.

SOURCE: Caltrans, 2013b

Blasting-Induced Vibration

When explosive charges are detonated in rock, the blast has been designed so that most of the energy is used in breaking and displacing the rock mass. However, some of the energy also can be released in the form of transient stress waves, which in turn cause temporary ground vibration. Detonating charges also create rock movement and the release of high-pressure gas, which in turn, induces air-overpressure (blast noise).

The average person is quite sensitive to ground motion, and vibration levels as low as 0.01 inches/second (in/sec) can be detected by the human body. Frequency of motion or cycles per second is a measure of how many times a particle of ground moves back and forth (or up and down) in 1 second. Frequency is expressed in units of Hz.

Noise from blasting or "blast noise" is composed primarily of sound pressures at frequencies below the threshold-of-hearing for humans (16 to 20 Hz). Hence, the common industry term for blast-induced noise is "air-overpressure." As its name implies, air-overpressure is a measure of the transient pressure changes above and below ambient atmospheric pressure.

Air-overpressure measurements are typically expressed in dB units, and when the scale is linear, the unit designation is "dB(L)." Regular acoustical noise measurements taken for the purpose of monitoring compliance with local noise ordinances almost always use weighted scales that discriminate against low frequency noise. Thus, for a similar noise source, A-weighted and C-weighted scales will usually record significantly lower levels of noise.

The regulatory limit defined by the former U.S. Department of the Interior, Bureau of Mines (U.S. Bureau of Mines) for air-overpressure measured with 2-Hz response seismographs is 133 dB(L) (USDI, 2000). Damage to old or poorly glazed windows does not occur until air-overpressure reaches approximately 150 dB(L). Because the decibel scale is a logarithmic ratio, the actual overpressure at the 133 dB(L) limit, is over seven times lower than the threshold damage level at 150 dB(L).

When blasting occurs at large distances from sensitive structures, the primary concern is damage to structures. Structural damage can be classified as cosmetic, such as paint flaking or minimal extension of cracks in building surfaces; minor, including limited surface cracking; or major, that may threaten the structural integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher. The damage criteria presented in Table 3.13-3 include several categories for ancient, fragile, and historic structures, the types of structures most at risk to damage. Most buildings are included within the categories ranging from "Historic and some old buildings" to "Modern industrial/commercial buildings." Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

The annoyance levels shown in Table 3.13-3 should be interpreted with care since vibration may be found to be annoying at lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to an elevated human reaction, even though there is very little risk of actual structural damage.

Sensitive Receptors

Human response to noise varies considerably from one individual to another. Effects of noise at various levels can include interference with sleep, concentration, and communication; physiological and psychological stress; and hearing loss. Given these effects, some land uses are considered more sensitive to ambient noise levels than others. In general, residences, schools, hotels, hospitals, and nursing homes are considered to be the most sensitive to noise. Commercial and industrial uses are considered the least noise-sensitive. The primary sensitive receptors near the Project Site are residential dwellings in the private Moose Camp recreational area (Figure 3.13-2). The closest residences are located about 2,200 feet from the nearest proposed turbines and more than 2,000 feet from the proposed transmission lines, Roadway construction activities could occur as close as 580 feet from receptor LT-2, the nearest residence. The closest residence to the west access road (represented by LT-1) is located about 300 feet from the center of the road. The closest existing residential areas to the proposed substation location are 1.5 miles to the northwest and southwest.

3.13.1.3 Regulatory Setting

Federal

There are no federal plans, policies, regulations, or laws related to noise that are directly applicable to the Project. However, guidelines have been established to address the potential for groundborne vibration to cause structural damage to buildings. For fragile structures, a maximum limit of 0.25 in/sec PPV is recommended (FTA, 2018).

State

The State of California General Plan Guidelines, published by the Governor's Office of Planning and Research, provide guidance for evaluating the compatibility of a given noise environment for proposed land uses. These land use compatibility standards are developed in terms of the CNEL/L_{dn} metric. Generally, residential uses are considered acceptable in areas where exterior noise levels do not exceed 60 dBA CNEL/L_{dn}. Hospitals are normally acceptable in areas up to 70 dBA CNEL/L_{dn} and normally unacceptable in areas exceeding 70 dBA CNEL/L_{dn}. The guidelines also present adjustment factors that may be used to arrive at noise-acceptability standards reflecting the particular community's noise-control goals, noise sensitivity, and assessment of the relative importance of noise issues.

With respect to vibration, Caltrans recommends use of thresholds that consider the human response to vibration for both continuous and transient sources shown above in Table 3.13-3.

Local

Shasta County General Plan

The Noise Element of the Shasta County General Plan establishes Objective N-1 to protect County residents from the harmful and annoying effects of exposure to excessive noise. The General Plan considers siting of new residential land uses to be "generally acceptable" in noise environments of 60 dBA L_{dn} or less and "conditionally acceptable" in noise environments between 60 to 70 dBA L_{dn}.

Specific policies of the Noise Element that apply to the Project are summarized below:

> **Policy N-b:** Noise likely to be created by a proposed non-transportation land use shall be mitigated so as not to exceed the noise level standards of an hourly L_{eq} of 55 dBA during daytime hours (7 a.m. to 10 p.m.) and 50 dBA during nighttime hours (10 p.m. to 7 a.m.) as measured immediately within the property line of adjacent lands designated as noise-sensitive.
>
> The noise levels specified above shall be lowered by 5 dB for simple tone noises[2], noises consisting primarily of speech or music, or for recurring impulsive noises. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings). The County can impose noise level standards, which are more restrictive than those specified above based upon determination of existing low ambient noise levels.
>
> In rural areas where large lots exist, the exterior noise level standard shall be applied at a point 100 feet away from the residence. Industrial, light industrial, commercial, and public service facilities which have the potential for producing objectionable noise levels at nearby noise-sensitive uses are dispersed throughout the County. Fixed-noise sources which are typically of concern include, but are not limited to, the following: HVAC Systems; Pump stations, emergency generators, steam valves, generators, air compressors, conveyor systems, pile drivers, drill rigs, welders, outdoor speakers, cooling towers/evaporative condensers, lift stations, boilers, steam turbines, fans, heavy equipment, transformers, grinders, gas or diesel motors, cutting equipment and blowers. The types of uses which may typically produce the noise sources described above include, but are not limited to: industrial facilities including lumber mills, trucking operations, tire shops, auto maintenance shops, metal fabricating shops, shopping centers, drive-up windows, car washes, loading docks, public works projects, batch plants, bottling and canning plants, recycling centers, electric generating stations, race tracks, landfills, sand and gravel operations, and athletic fields. For the purposes of the Noise Element, transportation noise sources are defined as traffic on public roadways, railroad line operations, and aircraft in flight. Control of noise from these sources is preempted by Federal and State regulations. Other noise sources are presumed to be subject to local regulations, such as a noise control ordinance. Non-transportation noise sources may include industrial operations, outdoor recreation facilities, HVAC units, loading docks, etc.
>
> **Policy N-c:** Where proposed non-residential land uses are likely to produce noise levels exceeding the performance standards of Policy N-b upon existing or planned noise-sensitive uses, an acoustical analysis shall be required as part of the environmental review process so that appropriate noise mitigation may be included in the project design. The requirements for the content of an acoustical analysis are:

---

2 Tone, in acoustics, is sound that can be recognized by its regularity of vibration. A simple tone has only one frequency, although its intensity may vary. Because wind turbines generate sound across a spectrum of frequencies, they would not be considered to generate simple tone noise.

A. Be the financial responsibility of the applicant.

B. Be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics.

C. Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions and the predominant noise sources.

D. Estimate existing and projected cumulative (20 years) noise levels in terms of L_{dn} or CNEL and/or the standards of [General Plan] Table I, and compare those levels to the adopted policies of the Noise Element.

E. Recommend appropriate mitigation to achieve compliance with the adopted policies and standards of the Noise Element, giving preference to proper site planning and design over mitigation measures which require the construction of noise barriers or structural modifications to buildings which contain noise-sensitive land uses.

F. Estimate the noise exposure after the prescribed mitigation measures have been implemented.

G. Describe a post-project assessment program which could be used to evaluate the effectiveness of the proposed mitigation measures.

Policy N-g: Existing noise-sensitive uses may be exposed to increased noise levels due to future roadway improvement projects as a result of increased traffic capacity and volumes and increases in travel speeds. In these instances, it may not be practical to reduce increased traffic noise levels consistent with those applicable to residential land uses which are specified to be 60 dBA, L_{dn} for outdoor activity areas and 45 dBA, L_{dn} for interior spaces. Therefore, as an alternative, the following criteria may be used as a test of significance for increases in the ambient outdoor activity areas of the noise level of noise-sensitive uses created as a result of a new roadway improvement project:

- Where existing traffic noise levels are less than 60 dB L_{dn}, a +5 dB L_{dn} increase will be considered significant.
- Where existing traffic noise levels range between 60 and 65 dB L_{dn}, a +3 dB L_{dn} increase will be considered significant.
- Where existing traffic noise levels are greater than 65 dB L_{dn}, a + 1.5 dB L_{dn} increase will be considered significant.

Policy N-i: Where noise mitigation measures are required to achieve the standards of Policies N-b and N-g, the emphasis of such measures shall be placed upon site planning and project design. The use of noise barriers shall be considered a means of achieving compliance with the noise standards only after all other practical design-related noise mitigation measures have been integrated into the project.

Shasta County Code

Section 17.88.035 of the Shasta County Code addresses small wind energy systems and allows for them to be permitted with an approved administrative permit, subject to specific requirements, including the noise restrictions of the General Plan Noise Element. Because the Project would not meet the specified requirements defining a "small" wind energy system, this section of the code is not applicable to the Project. The Shasta County Code does not establish quantitative noise standards and defers to the standards contained within the Shasta County General Plan Noise Element.

3.13.2 Significance Criteria

CEQA Guidelines Appendix G Section XIII identifies considerations relating to noise. See Section 3.1.4, *Environmental Considerations Unaffected by the Project or Not Present in the Project Area*, as it relates to the County's analysis of the potential noise impacts of this Project. Otherwise, for purposes of this analysis, a project would result in a significant impact to noise or vibration if it would result in:

a) Generation of 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; or

b) Generation of excessive groundborne vibration or groundborne noise levels.

Criterion a) examines whether project construction and/or operations would generate noise in excess of established noise standards, which are assessed for stationary, mobile, and construction noise sources. The evaluation of the Project relative to this criterion focuses first on contributions in ambient noise levels from stationary sources during Project operation and their relationship to the standards of General Plan Policy N-b. A significant noise impact would be identified if Project stationary sources would result in a noise level that would exceed 55 dBA during daytime hours (7:00 a.m. to 10:00 p.m.) and 50 dBA during nighttime hours (10:00 p.m. to 7:00 a.m.)

Additionally, a noise impact would be identified if operational traffic noise generated specifically by roadway improvements of the Project[3] would substantially increase noise levels at sensitive receivers in the vicinity. Shasta County General Plan Policy N-g defines noise level increases of 5 dB L_{dn} where existing traffic noise levels are less than 60 dB L_{dn}, where existing traffic noise levels range between 60 and 65 dB L_{dn}, a 3 dB L_{dn} increase would be significant and where existing traffic noise levels are greater than 65 dB L_{dn}, a 1.5 dB L_{dn} increase would be significant.

Assessment of operational low frequency noise impacts from turbines applies a threshold for concern for low frequency noise. A significant impact would occur if the C-weighted level exceeds the A-weighted level by 20 dB or more (as applied in the Project-specific traffic study included in **Appendix**) or if the 1/3rd octave band thresholds discussed in Section 3.13.3.1, *Methodology*, are exceeded (Kern County, 2006).

The contribution of the Project to localized increases in traffic-generated noise along roadways improved as part of the Project or roadways used to access the Project Site is considered relative to published measures of substantial increase in transportation noise, as defined General Plan Policy N-g.

3 No offsite roadway improvements are proposed as part of the Project. Therefore, this analysis pertains only to operational traffic on roads proposed for improvement within the Project Site.

Neither Shasta County nor the State of California specifies a quantitative threshold of significance for the impact of temporary increases in noise due to construction. In lieu of any regulatory guidance, this evaluation uses speech interference as an indicator that construction noise could cause a substantial adverse impact on daytime and evening activities, and sleep interference as an indicator that construction noise could cause a substantial adverse impact on nighttime activities. The speech and sleep interference criteria are based on objective research of speech and sleep interference (as opposed to subjective surveys of annoyance) and can be used to evaluate a project's noise impacts. The speech and sleep interference criteria used in this EIR are defined below:

- **Speech Interference.** A speech interference threshold, in the context of impact duration and time of day, is used to identify substantial increases in noise from temporary construction activities. This analysis assumes noise peaks generated by construction equipment could result in speech interference in adjacent buildings if the noise level in the interior of the buildings exceeds 45 dBA. A typical building can reduce noise levels by approximately 25 dBA with the windows closed[4] (USEPA, 1974). This noise reduction could be maintained only on a temporary basis in some cases, since it assumes windows must remain closed at all times. Assuming a 25 dBA reduction with the windows closed, an exterior noise level of 70 dBA L_{eq} would maintain an acceptable interior noise environment of 45 dBA during the day and evening hours. Noise levels would vary depending on the phase of construction and the types of construction equipment being used.

  In addition to the decibel level of noise, the duration of exposure at any given noise-sensitive receptor is an important factor in determining an impact's significance. Generally, temporary construction noise that occurs during the day for a relatively short period of time would not be significant because most people of average sensitivity who live in suburban or rural agricultural environments are accustomed to a certain amount of construction activity or heavy equipment noise from time to time. The loudest construction-related noise levels would be sporadic rather than continuous because different types of construction equipment would be used throughout the construction process. Therefore, an exterior noise level that exceeds 70 dBA L_{eq} during the daytime is used as the threshold for substantial construction noise where the duration of construction noise exceeds two weeks.

- **Sleep Interference.** Based on available sleep data, an interior nighttime level of 35 dBA is considered acceptable for sleeping (USEPA, 1974). Assuming a 25 dBA reduction with the windows closed, an exterior noise level of 60 dBA would maintain an acceptable interior noise environment of 35 dBA at night. Therefore, a significant impact would occur if the proposed project were to generate exterior noise levels above the 60 dBA L_{eq} sleep interference threshold for one or more nights.

Construction-related vibration from potential blasting activities are assessed based on available reference monitoring data from blasting activities and the California Department of Transportation's recommended vibration limits to avoid structural damage of nearby structures.

4 Because these estimates were developed in 1974, it is reasonably assumed that older single-paned windows were considered in these attenuation estimates and that greater reductions could be realized with more modern double-paned windows.

3.13.3 Direct and Indirect Effects

3.13.3.1 Methodology

The information and analysis presented in this section are (as noted above) based in part on data provided in Appendix G. The study area for evaluation of noise and vibration impacts from construction consists of a distance of 5,000 feet (approximately 1 mile) without mitigation for the reasons explained in Section 3.13.1.1, *Study Area*.

Stationary Source Operational Noise Impacts

Noise Assessment for Wind Turbines

Shasta County regulations do not specifically address the operational characteristics of large-scale wind turbines. Wind turbines only operate when the wind exceeds a “cut-in” speed, which is typically about 4 meters/second (8.9 miles/hour [mph]). As a result, they do not produce noise continuously. For Shasta County, the noise limits established in Policy N-b of the Noise Element are interpreted to be not-to-exceed levels, or essentially steady-state levels. Because wind turbines may operate day or night, the nighttime limit (50 dBA as measured immediately within the property line of adjacent lands designated as noise-sensitive) is considered as the appropriate level with which to compare the estimated noise levels produced by the Project. As explained in Section 3.13.1.3, the proposed turbines would operate at multiple frequencies and would not generate simple tone noises,[5] nor would their noise consist of speech or music, or recurring impulsive noises. Therefore, no additional adjustments to these standards are required. As shown in Table 3.13-2, hourly average noise levels can reach 50 dBA at the nearest receptors and imposition of noise level standards more restrictive than those specified above would not be warranted.

The closest residences are located approximately 2,200 feet from the nearest turbine sites. Given the long propagation distances and mountainous terrain between the turbines and the closest receptors, turbine sound would be subject to additional attenuation by shielding from intervening terrain, atmospheric absorption, and ground absorption. Three-dimensional modeling (using SoundPLAN Version 8.1) was conducted to account for topography, atmospheric and ground absorption, and the spectral characteristics of the noise sources. Neutral environmental conditions are assessed for CEQA purposes (i.e., no wind or temperature gradients). Turbines would be unlikely to operate during temperature gradients, such as an inversion, which occur during periods of atmospheric stability.[6] The model was run assuming a worst-case condition with simultaneous operation of all wind turbines.

5 Tone, in acoustics, is sound that can be recognized by its regularity of vibration. A simple tone has only one frequency, although its intensity may vary. Because wind turbine generate sound across a spectrum of frequencies, they would not be considered to generate simple tone noise.

6 An air temperature inversion is a reversal of the typical daytime air temperature in the layer of atmosphere closest to the ground. Usually, the temperature of the air during the day decreases as altitude increases. However, with the presence of an atmospheric inversion, there is an increase of air temperature with the increase in altitude, meaning there is warmer, lighter air aloft with a cooler, heavier layer of air next to the ground. When there is little to no wind present, these two air masses will not mix, resulting in a distinct temperature inversion.

Infrasonic Turbine Noise

Neither the State of California nor Shasta County specifically address low frequency noise and infrasonic noise from wind energy or other projects. However, low frequency noise and infrasonic noise from wind energy projects should be explored as part of a complete noise assessment (Waye, 2009). Other criteria can be considered to determine if the Project would exhibit high infrasonic noise generation potential. In general, low frequency noise has been associated with older generation, downwind turbines. For these older turbines, the wake of the tower interacts with the passing blades to generate pulses at the rate the blades pass the tower. Low frequency noise typically is minimized with upwind turbines. Objective sound pressure level guidelines have been inferred from several different sources as described below.

One source of low frequency criteria is the Alameda County Standard Conditions of Permit Approval for Windfarms (Alameda County, 1998). This document uses 70 dBC L_{dn} as the threshold for considering "reasonable complaints." Another source of low frequency criteria within the state is the Kern County Code (Kern County, 2006). Under these criteria, the low frequency noise levels at 50 feet from a residence are given below for 1/3 octave bands centered at 2 to 125 Hz as shown in **Table 3.13-4**. In the infrasonic range (below 20 Hz), the Table 3.13-4 criteria are actually lower than the established threshold of hearing at each frequency by 18 to 37 dB (USEPA, 1973). As a result, achieving the values shown for the Kern County criteria would assure that any infrasonic noise generated by the Project would be sufficiently low in level to avoid any noise impact.

TABLE 3.13-4
KERN COUNTY LOW FREQUENCY NOISE CRITERIA

1/3 Octave Band Center Frequency, Hz	Noise Level Limit, dB
2 to 16	70
20	68
25	67
31.5	65
40	62
50	60
63	57
80	55
100	52
125	50

SOURCE: Kern County, 2006

Onsite Collector Substation and Switching Station Noise

An onsite collector substation and switching station (substation) would increase the voltage of the electricity from the collection system to match the voltage of the existing PG&E line that would transmit the electricity from the Project Site. The basic elements of the substation facilities include a control house, a bank of one or two main transformers, outdoor breakers, capacitor banks, relaying equipment, high-voltage bus work, steel support structures, an underground grounding grid, and overhead lightning-suppression conductors. The primary operational noise sources proposed at the substation are anticipated to be transformers.

Noise impacts from the substation were estimated using reference noise levels for transformers, the number of transformers proposed, and equations predicting unobstructed noise attenuation with distance. Predicted noise levels are then compared to the noise limits established in Policy N-b of the County's General Plan Noise Element.

Corona Noise

The Project would include overhead collector lines at 34.5 kV and a transmission line at 230 kV to match the voltage of the existing PG&E 230 kV line. The short 230 kV line interconnection to the existing PG&E electricity grid system would be installed from the substation. The 34.5 kV collector line would run north to south within the Project Site. The localized electric field near an energized conductor can be sufficiently concentrated to produce a small electric discharge, which can ionize air close to the conductors. This effect is called "corona," and it is associated with all energized electric power lines. Corona can result in the production of small amounts of sound. Corona noise typically is characterized as a hissing or crackling sound, which may be accompanied by a 120-hertz hum. Slight irregularities or water droplets on the conductor and/or insulator surface accentuate the electric field strength near the conductor surface, making corona discharge and the associated audible noise more likely. Therefore, audible noise levels from transmission and collector lines would generally be higher during wet weather conditions.

Noise levels from corona effects were estimated using computer modeling software developed by the Bonneville Power Administration. Resulting corona noise estimates are then compared to the noise limits established in Policy N-b of the Noise Element.

Noise from Operation and Maintenance Activities

Operation and maintenance activities generally would occur during normal workday hours from Monday to Saturday. While turbines would be monitored and controlled using a remote off-site monitoring system, routine on-site maintenance activities would be required and are expected to include verification of torque on tower bolts and anchors and checks for cracks and other signs of stress on the turbine tower and components; and inspection for leakage of lubricants and hydraulic fluids and repainting. Each turbine also would be serviced twice a year, or as needed. Turbine servicing would require maintenance staff to climb towers and service turbine parts by performing activities such as removing the turbine rotor and replacing generators and bearings. Scheduled maintenance may require the use of a crane within the 65- to 95-foot diameter areas around the turbines.

The post-construction scenario would be equivalent to existing conditions, as it includes only a minimal number of 12 employees accessing the Project Site for maintenance and operations.

Maintenance noise levels were calculated using the Federal Highway Administration (FHWA) software (the Roadway Construction Noise Model [RCNM]), assuming operation of a crane and the distance to the nearest sensitive receptors, and not taking into account any noise reduction from intervening shielding by structures or terrain. Resulting noise estimates then were compared to speech interference thresholds cited above for construction noise impacts.

Construction, Decommissioning, and Site Reclamation Noise and Vibration Impacts

During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary by stage and vary within stages, based on the amount of equipment in operation and the location at which the equipment is operating. Typical construction noise levels at 50 feet for equipment likely to be used in the construction of the Project are shown in **Table 3.13-5**, *Typical Noise Levels from Construction Equipment*. Most construction activities at a wind turbine facility generate noise levels in the range of 80 to 85 dBA L_{max} at 50 feet from the source (Appendix G). Hourly average noise levels would also be in the range of 80 to 85 dBA L_{eq} during periods of heavy construction. The types of noise sources that would be associated with construction of the Project are described below. For the purposes of this analysis, it is assumed that Project decommissioning and site reclamation activities would result in similar noise levels as would occur during construction.

TABLE 3.13-5
TYPICAL NOISE LEVELS FROM CONSTRUCTION EQUIPMENT

Construction Equipment	Noise Level (dBA, L_{max} at 50 feet)
Backhoe	80
Concrete mixer	85
Concrete Pump	82
Concrete batch plant	83
Crane	85
Dozer	85
Excavator	85
Air Compressor	78
Front End Loader	80
Grader	85
Paver	85
Rock Drill	85
Scraper	85
Slurry Trenching Machine	82
Soil Mixing Drill Rig	80
Truck (Dump, Delivery)	84
Vibratory Compactor	80
Al other equipment with engines larger than 5 horsepower	85

SOURCE: National Cooperative Highway Research Program, 1999.

Noise from Construction Equipment

Noise levels from construction are estimated based on the reference noise levels presented in Table 3.13-5 and attenuation accounted for using sound level propagation equations. The resultant noise levels were compared to standards identified in the Shasta County General Plan Policy N-b.

Predicted noise levels from helicopter operations also are compared to speech interference thresholds published by the USEPA. Noise generated by construction equipment could result in speech interference in adjacent nearby buildings if the noise level in the interior of the buildings exceeds 45 dBA. Assuming a 25 dBA reduction with the windows closed, an exterior noise level of 70 dBA L_{eq} would maintain an acceptable interior noise environment of 45 dBA during the day and evening hours.

Noise from Construction Trucks

Construction and post-construction traffic volume estimates are provided in the Project's traffic study (**Appendix H**, *Transportation*). Over the up to 24-month construction period, the total number of all trips, including worker commute truck trips and heavy haul truck trips, is estimated to be approximately 93,088 trips (see Section 3.14, *Transportation*). The increase in traffic noise is calculated for both SR 299 as well as for the west, north, and east access roads. Predicted truck traffic noise then is compared to the County's 3 dBA L_{dn} increase or 5 dBA L_{dn} increase thresholds depending on the existing noise levels.

Blasting Noise

Assessment of the noise impact from Project blasting activities uses empirical measurements conducted by Illingworth & Rodkin, Inc. (Appendix G), at a reference distance to estimate the resulting noise levels that would occur at Project-specific distances to residential receptors, and then the estimated noise levels at the residential receptors are compared to the regulatory limit defined by the former U.S. Bureau of Mines for air-overpressure of 133 dB(L).

Helicopter Noise

Noise levels from helicopters that may be used to string the overhead collector lines and the transmission line connection are estimated based on the reference noise level of 100 dBA at a distance of 100 feet (FICON, 1992) and equations to predict unobstructed noise attenuation at the nearest residences for comparison with noise levels documented to result in speech interference outdoors and sleep disturbance indoors, assuming a 15 dBA exterior-to-interior noise reduction with windows partially open.

Blasting Vibration

When blasting occurs at large distances from sensitive structures, the primary concern is cosmetic damage to the structures. Cosmetic damage (e.g., minor cracking in plastered walls) can occur as a result of ground-borne vibration or acoustic overpressures. Vibration from blasting events on the Project Site were calculated using methods established by the former U.S. Bureau of Mines. The U.S. Bureau of Mines studies indicate no observations of "threshold damage" (referred to as cosmetic damage elsewhere in this report), "minor damage" or "major damage" at vibration levels of 0.4 in/sec PPV or less (Siskind et al., 1980). Caltrans recommends a vibration limit of 0.5 in/sec PPV for structurally sound buildings designed to modern engineering standards, and 0.3 in/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern. The more conservative limit (0.3 in/sec PPV) is used in this analysis.

3.13.3.2 Direct and Indirect Effects of the Project

a) Whether the Project would result in the generation of 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.

Impact 3.13-1: Operation of the Project could result in the generation of a substantial permanent increase in ambient noise levels in the vicinity of the Project in excess of standards established in the Shasta County General Plan or the applicable standards of other agencies. (*Less-than-Significant Impact*)

Summary of Operational Noise Impacts from All Sources

Operational noise from Project operations would be generated by a number of different sources, some of which would be predominant while others would be intermittent. The predominant noise would be generated by the operation of turbines, which are analyzed below assuming 24-hour per day operation of all turbines simultaneously. Additionally, there would be intermittent noise from operations of the substation, the potential for corona noise from overhead connector and transmission lines during wet weather conditions, and intermittent noise from operations and maintenance activities of up to 12 employees during daytime hours. Noise from each of these sources is analyzed individually below.

Table 3.13-6, *Predicted Contributions of Operational Noise Sources*, tabulates the contribution of each of these sources at the nearest noise sensitive receptors where long-term noise measurements were collected, as analyzed below; totals their contributions into an overall operational contribution; and compares the logarithmically summed total to the noise standards established by General Plan Policy N-b. Note that maintenance activities would only occur during daytime hours and, hence, there are separate totals for daytime noise levels and nighttime noise levels as there are also separate standards for daytime and nighttime noise established by Policy N-b.

While operational noise may, at times, be perceptible to the nearest receptor during the quietest nighttime hours, worst-case operational noise levels would be less than County General Plan standards and the Project would have a less-than-significant impact with respect to generation of a 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.

Wind Turbines

The proposed 72-turbine layout is shown in Figure 2-2*, Site Plan*. Based on preliminary design, the Nordex N163/5.X turbine was selected as the worst-case, loudest turbine that could be used at the Project Site. This turbine has a maximum sound power level[7] of 109.2 dBA and a hub height of 118 meters (387 feet).

7 Sound power level is an engineering specification and is a separate metric from sound pressure level use elsewhere in this analysis. Sound power level is independent of the distance a receiver is from the source and is a property of the source alone. Knowing the sound power level of an idealized source and its distance from a receiver, the sound pressure level at the receiver point can be calculated based on geometrical spreading of sound from the source.

TABLE 3.13-6
PREDICTED CONTRIBUTIONS OF OPERATIONAL NOISE SOURCES

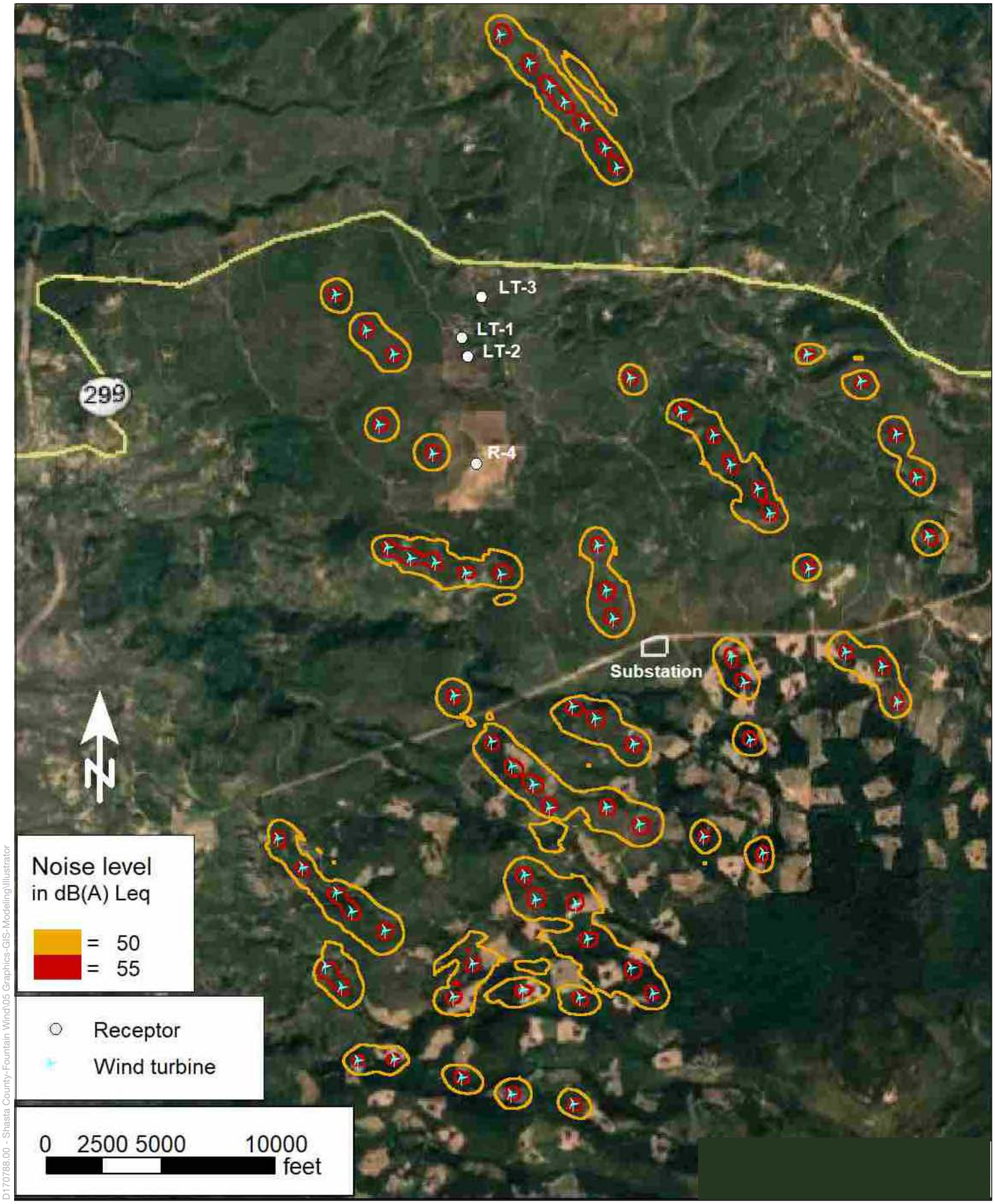
Source	Predicted Noise Level (dBA L_{eq})			
	Receptor LT-1	Receptor LT-2	Receptor LT-3	Receptor R-4
Existing hourly average noise level (daytime / nighttime)	40/36	38/34	47/46	42/42
Wind Turbine Operations[1]	40	40	38	43
Substation Noise[1]	13	13	13	13
Corona Noise[1]	21	21	21	21
Maintenance Activities[2]	38	38	36	41
Total Operational Noise During Nighttime Hours	40	40	38	43
Existing plus Total Operational Contribution During Nighttime Hours	41	41	47	46
Nighttime Standard	50	50	50	50
Total Operational Noise During Daytime Hours	42	42	40	45
Existing plus Total Operational Contribution During Daytime Hours	44	43	48	47
Daytime Standard	55	55	55	55

NOTES:
1 Source operates during daytime and nighttime hours.
2 Source operates during daytime hours only.

SOURCE: Appendix H

The closest residences to any single turbine are located about 2,200 feet away. Given the long propagation distances and terrain between the turbines and the closest receptors, turbine sound would be subject to additional attenuation by shielding from intervening terrain, atmospheric absorption, ground absorption, and variations in temperature and wind.

Three-dimensional modeling was conducted to account for site characteristics and topography assuming a worst-case condition with operation of all wind turbines simultaneously. The results of this modeling effort are shown in the noise level contours presented in **Figure 3.13-3**, *Noise Contours for Turbine Operations*. These contours represent the predicted 50 dBA L_{eq} and 55 dBA L_{eq} sound levels surrounding each turbine or group of turbines. Receptor locations were placed within the model to be representative of the residences facing the closest turbine at a distance of 100 feet from the residential structure, consistent with General Plan Policy N-b. For Receptors LT-1, LT-2, and LT-3, these locations are the same as the ambient measurement locations. The fourth receptor (R-4) is a location representative of the receptor to the south of monitoring location LT-4.



SOURCE: Illingworth & Rodkin, Inc.

Fountain Wind

Figure 3.13-3
Noise Contours for Turbine Operations

ESA

The calculated noise levels at each of the nearest existing noise sensitive receptors under this same worst-case scenario are shown in **Table 3.13-7**, *Predicted Sound Pressure Levels at Residential Locations Near Proposed Turbine Sites*, which shows the predicted A-Weighted L_{eq} and L_{dn} levels for each receptor location are indicated in Figure 3.13-2.

TABLE 3.13-7
PREDICTED SOUND PRESSURE LEVELS AT RESIDENTIAL LOCATIONS NEAR PROPOSED TURBINE SITES

Receiver Location	Existing Noise Level L_{eq}, dBA	Predicted Turbine Contribution L_{eq}, dBA	Resultant Nighttime Noise Level L_{eq}, dBA	Shasta County Nighttime Standard (L_{eq})
LT-1	36	40	41	50
LT-2	34	40	41	50
LT-3	46	38	47	50
R-4	42	43	46	50

NOTE: 1. 24-hour L_{dn} metric assumes continuous, simultaneous operation of all turbines 24 hours per day.
SOURCE: Illingworth and Rodkin, 2019.

As indicated in Table 3.13-7, worst-case wind turbine operation would contribute L_{eq} noise levels less than the 50 dBA nighttime noise standard of the Shasta County General Plan at all four of the nearest residential receptor locations.

While noise levels would be consistent with the standards established by the General Plan, turbine operations would result in modest increases over existing average ambient nighttime noise at the nearest receptors, given the relatively low existing nighttime noise levels. However, noise increases at all receptors would range from 1 to 8 dBA L_{eq}, assuming 100 percent operations during nighttime hours. This increase in nighttime ambient noise would be perceptible (5 dBA or greater) at receptor LT-1 and LT-2. More likely assumptions, for example, assuming 50 to 85 percent operations during the 24-hour period, would result in lower Project generated nighttime L_{eq} levels and thus lower noise level increases at residences. Likewise, selection of a turbine with a lower noise level would result in lower Project generated nighttime L_{eq} levels and thus lower noise level increases at residences.

While turbine noise may be perceptible to the nearest receptor during the quietest nighttime hours, worst-case turbine operations would generate noise levels less than County General Plan standards; and therefore the Project would result in a less-than-significant impact with respect to generation of a permanent increase in ambient noise levels near the Project in excess of County General Plan standards.

Infrasonic Turbine Noise Impacts

Operation of wind turbines also can produce low-frequency infrasonic noise. As discussed in Section 3.13.3.1, *Methodology*, while Shasta County has not established exposure standards for ultrasonic noise, an available source of low frequency criteria within the State of California is found within the Kern County Code (Kern County, 2006). Under this criteria, the low frequency noise levels at 50 feet from a residence are shown in Table 3.13-4. In the infrasonic range (below

20 Hz), the Kern County criteria are actually lower than the established threshold of hearing by 18 to 37 dB (USEPA, 1973). As a result, achieving the values shown for the Kern County criteria would assure that any infrasonic noise generated by the Project would be sufficiently low in level to avoid any infrasonic noise impact.

Spectral data for the worst-case wind turbine scenario were used to determine the differences between the A-Weighted and C-Weighted levels at each receptor location as presented in **Table 3.13-8**, *Difference Between A-weighted and C-weighted Predicted Noise Levels*. As shown in the table, the difference between the A-Weighted and C-Weighted levels are anticipated to be 17.7 to 19.5 dB. These differences are below the 20 dB threshold of concern for low frequency noise relative to A-weighted levels. Levels are also 5 dB or more below the Kern County thresholds shown in Table 3.13-4 and the standard condition of approval that has been used in Alameda County (70 dBA, dBC). As a result, low frequency noise that would be generated from the turbines is predicted to be below any of these three available regulations or guidelines, based on the predicted A-weighted sound level limits.

TABLE 3.13-8
DIFFERENCE BETWEEN A-WEIGHTED AND C-WEIGHTED PREDICTED NOISE LEVELS

Receiver	A-Weighted L_{eq}, dBA	C-Weighted L_{eq}, dBC	L_{dn}[1], dBA	L_{dn}[1], dBC	dBC – dBA dB
LT-1	39.5	58.4	46	65	18.9
LT-2	39.5	58.5	46	65	19.0
LT-3	38.2	57.7	45	64	19.5
R-4	43.3	61.0	50	67	17.7

NOTES:
1 Assumes continuous simultaneous operation of all turbines, 24-hr/day.
2 Results were rounded to the nearest decibel. In some cases, this can result in relative changes that may not appear intuitive. For example, the difference between 64.4 (64) and 64.5 (65) is 0.1 (0), not 1.

SOURCE: Illingworth and Rodkin, 2019.

Substation and Switching Station

An onsite collector substation and switching station would increase the voltage of the electricity from the collection system's 34.5 kV to 230 kV to match the voltage of the existing PG&E 230 kV line that would be connected to the substation. The closest existing residential areas (R-4) are 1.5 miles to the northwest from the substation location (see Figure 3.13-3). The basic elements of the substation facilities include a control house, a bank of one or two main transformers, outdoor breakers, capacitor banks, relaying equipment, and overhead lightning-suppression conductors.

The primary operational noise sources proposed at the substation are anticipated to be transformers. A typical transformer is estimated to generate a noise level of 72 dB at a distance of 6 feet during full load with fans and pumps running (Appendix G). With two transformers running simultaneously, the noise level would be 3 dB higher, at 75 dB. Based on noise measurements made at the Bridgeville 115 kV Substation in Humboldt County, California, steady state noise levels in the range of 47 to 54 dBA L_{eq} would be anticipated at the fence line of the substation. These levels are consistent with those modeled for 230 kV substations (SDGE, 2016). Equipment-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain can provide an additional 5 to 10 dBA or more noise reduction at distant receptors. At a distance of 1.5 miles, substation noise would be less than 15 dBA and inaudible even at the quietest nighttime hours. There would be no impact associated with the generation of substation transformer noise.

Corona Noise

The Project would include 34.5 kV overhead collection lines and a 230 kV transmission connection line. The short 230 kV line interconnection to the existing PG&E 230 kV system would be installed from the substation. The 34.5 kV collection lines would run north to south within the Project Site. Computer modeling software developed by the Bonneville Power Administration was used to calculate audible noise that would be associated with transmission line corona activity. This modeling indicates that, during wet-weather conditions, audible noise levels of up to 46 dBA would occur within the right-of-way for a transmission line operating at 230 kV. Corona noise from the lower voltage collection lines would be lower.

At the closest residence, located more than 2,000 feet from the proposed lines, noise levels from the 230 kV lines would be 25 to 35 dBA lower than the levels within the right-of-way, resulting in levels that would be well below ambient noise levels, and inaudible even at the quietest nighttime hours. There would be no impact associated with the generation of corona noise.

Operation and Maintenance Activities

Operation and maintenance activities generally would occur during normal workday hours from Monday to Saturday and would require up to 12 full time employees. Scheduled maintenance may require the use of a crane within a 95-foot diameter area around the turbines. Permanent access roads would be periodically graded and compacted in order to minimize erosion. Catch basins, roadway ditches, and culverts would be cleaned and maintained regularly.

The addition of 12 vehicles spread throughout the existing logging roadway network within and near the Project Site would not be anticipated to measurably change the noise environment (increase would be less than 1 dBA L_{dn}). Maintenance operations would be located as close as 2,000 feet from existing residences. Maintenance noise levels were calculated using the Federal Highway Administration's Roadway Construction Noise Model. A crane is calculated to generate a maximum instantaneous noise level of 49 dBA L_{max} and 41 dBA L_{eq} at a distance of 2,000 feet, not taking into account any noise reduction from intervening shielding by structures or terrain. Maintenance operations would be occasional at each individual turbine, with servicing occurring only twice a year. Although maintenance operations may occasionally be audible during quiet daytime ambient conditions when located nearest noise sensitive locations, ambient noise levels would not be affected on an hourly or daily average basis. The noise impact from operational and maintenance impacts would be less than significant.

Mitigation: None required.

Impact 3.13-2: Construction, decommissioning, and site reclamation of the Project could result in the generation of a substantial temporary increase in ambient noise levels on and near the Project Site in excess of standards established in the Shasta County General Plan or the applicable standards of other agencies. (*Less than Significant with Mitigation Incorporated*)

The Project construction period would last up to 24 months. Proposed decommissioning of existing facilities and infrastructure and reclamation of the Project Site also would require up to 24 months and conservatively is assumed to generate the same noise levels as during construction. Construction generally would be conducted during daytime hours, typically from 7:00 a.m. to 5:00 p.m. However, there may be circumstances where construction hours would need to be extended earlier or later, such as during the delivery of unusually large loads, and nighttime construction may occur to avoid traffic, adjust for high winds during daylight hours, and/or to stay on schedule. The construction workforce is estimated to include up to 400 construction workers at any given time.

Project construction activities would include timber clearance and harvesting, site grading, widening of existing roads and construction of new access roads, transportation of turbine components, clearing of laydown areas, construction of turbine foundations, assembly and erection of turbines, construction of the substation and O&M Building, installation of the underground and overhead collection system, and installation of the transmission line connection. Helicopters may be used to string the overhead collector and transmission connection lines.

As described in Section 2.4.5.1, *Site Preparation*, blasting may be required in advance of excavation for the installation of trenches, for example, depending on the subsurface conditions. If blasting is necessary, the Applicant would prepare a Blasting Plan that identifies the locations where blasting would be anticipated to be needed and all applicable regulations for blasting procedures. The Blasting Plan also would specify the times and distances where explosives would be permitted to avoid impacts on sensitive environmental receptors and the human environment. This EIR assumes that the Applicant's contractor(s) would comply with the most stringent provisions of applicable federal, State, and local laws governing explosives, and that the plan would address safety measures that avoid or minimize impacts to nearby residents (e.g., from vibration or noise).

While the initial phases of construction would include timber clearance and harvesting, the potential for these activities is part of the existing baseline condition, since the current use of the Project Site is managed forest land. Thus, this activity would not represent a new noise source. The main sources of construction noise that would be associated with the Project are described below.

Off-Road Construction Equipment

During each stage of construction, there would be a different mix of equipment operating and noise levels generated at a given receptor would vary by stage and vary within stages, based on the amount of equipment in operation and the location where the equipment would be operating. Typical construction noise levels at 50 feet for equipment likely to be used in the construction of the Project are shown in Table 3.13-5. Most construction activities at a wind turbine facility generate noise levels in the range of 80 to 85 dBA L_{max} at 50 feet from the source. Hourly average noise levels would also be in the range of 80 to 85 dBA L_{eq} during periods of heavy construction. Construction-generated noise levels attenuate at a rate of approximately 6 dBA per doubling of the distance between the source and receptor. Shielding by terrain can provide further reductions of up to 20 dBA at distant receptor locations.

The closest residences to Project work areas are located approximately 2,000 feet from turbine construction areas. At this distance, hourly average noise levels from heavy construction activities would be in the range of 48 to 53 dBA L_{eq}, not taking into account any shielding from intervening terrain. These noise levels could, at times, be audible at receptors, particularly if nighttime construction activities are required, but would not be anticipated to cause sleep or speech interference or substantially affect the overall ambient noise levels at these locations. Construction activities at any individual turbine location would be limited to a relatively short period of time as construction proceeds from one turbine site to another throughout the Project Site.

Because substation and O&M Building construction would be located approximately 0.6 mile from the nearest existing receptors on Moose Camp Road (LT-3), construction noise levels from construction of these Project elements would be approximately 45 dBA L_{eq} and would not be distinguishable from average ambient daytime noise levels (47 dBA L_{eq}).

Roadway construction activities could occur as close as 580 feet and 1,170 feet from the nearest residences, LT-2 and R-4, respectively. At a distance of 580 feet, noise from heavy construction activities would be in the range of 59 to 64 dBA L_{eq}, not taking into account any shielding from intervening terrain. At 1,170 feet, noise from heavy construction activities would be in the range of 53 to 58 dBA L_{eq}. Given that nighttime construction may occur to avoid traffic, the potential for nighttime roadway construction would primarily occur at the two SR 299 access points which are over 2,500 feet from the nearest receptor. Roadway construction typically would occur for relatively short periods of time at any specific location as construction proceeds along the roadway. Although construction activities that would be located nearest to the residences would not be expected to cause sleep or speech interferences, noise levels could exceed ambient levels by as much as 20 dBA at LT-2 when construction occurs at the closest point.

Construction Truck Trips

Construction traffic entering the Project Site would include vehicle trips by construction workers, and truck trips for material delivery, removal of harvested timber, and equipment delivery. All traffic would reach the site using SR 299. Three access roads are proposed to coincide with existing logging roads at the intersections with SR 299. Based on the available traffic volumes from Caltrans, SR 299 has an existing peak hour traffic volume of about 320 vehicles per hour with a truck percentage of over 13 percent.

During construction, the Project would employ an estimated 400 construction workers, Project management staff, equipment operators, survey staff, and delivery vehicle drivers during the peak period, with the average number of workers on-site in the range of 325 workers. The material delivery vehicle trips would be spread out throughout the day. The maximum number of aggregate deliveries per day would be approximately 90 deliveries (180 trips), constrained by the loading and unloading times. The maximum number of concrete deliveries per day would be approximately

50 deliveries (100 one-way trips), constrained by the rate that ready mix plants can batch concrete, and the rate the contractor can unload trucks. The estimated total number of construction trips occurring over the up to 24-month construction period is projected to be 93,088 trips.

Construction traffic volumes were provided in the Project's transportation study (Appendix H), which were used to calculate an estimated Project construction-related traffic noise increase of about 2 dBA L_{dn} on SR 299 in the vicinity of the Project Site (Appendix H). This increase would be below the County's 3 dBA L_{dn} and 5 dBA L_{dn} thresholds for noise increases due to permanent Project operations.

Construction traffic peak hour volumes on the existing logging roads are anticipated to increase from 24 to 40 trips on the west access road, 12 to 128 trips on the north access road, and 12 to 273 trips on the east access road which would occur during daytime hours when primary aggregate transport would occur. Assuming a worst-case analysis with 50 percent of these vehicles (both existing and Project construction vehicles) being heavy trucks, the calculated noise levels at a distance of 50 feet from the center of the road would be 58 dBA L_{eq} on the west access road, 63 dBA L_{eq} on the north access road, and 66 dBA L_{eq} on the east access road.

Existing ambient noise levels at receptors along local access roads are below 60 dBA L_{dn}; therefore, the 5 dBA increase threshold established by General Plan Policy N-g would apply. The closest residence to the west access road (represented by LT-1) is located about 300 feet from the center of the road. At this distance, the peak hour noise level generated by the Project's 28 construction-related trips (14 light vehicles and 14 heavy trucks) would be 44 dBA L_{eq}. The existing daytime peak hour noise level at this residence ranges from 43 to 49 dBA Leq (see Appendix G). The resulting peak hour noise levels with combined ambient and Project construction traffic noise levels would be 47 to 50 dBA L_{eq}. This would equate to a 1 to 4 dBA L_{eq} noise increase above existing ambient levels, which would be below the 5 dBA L_{dn} threshold and therefore less than significant.

If construction activities were required during nighttime hours when existing traffic levels are lower, the resulting combined nighttime ambient and Project construction traffic noise level would exceed the ambient nighttime noise level at the closest residence (average of 36 dBA L_{eq}; see Table 3.13-2) by more than the 5 dBA L_{dn} threshold, which would be a significant impact. Construction traffic could be redirected from the west access road to use alternative access routes such as the north and east access roads to avoid construction-related noise near residential uses. There are no noise sensitive receptors adjacent to the north and east access roads, therefore use of these roads, even during night time hours, would not exceed ambient noise standards for residential uses. **Mitigation Measure 3.13-2** (Noise-Reducing Construction Practices) identifies alternative truck routes to reduce noise impacts to receptors located along the west access road to address this potential roadway noise increase.

Helicopter Noise

Helicopters may be used to string overhead collector lines. Helicopter overflights could generate noise levels of up to 100 dBA at a distance of 100 feet. Helicopter overflights and activities would be intermittent and would not be located at a single location for any extended period. Noise levels, would be approximately 74 dBA at 2,000 feet. This noise level would be anticipated to cause speech interference outdoors (exceed 70 dBA L_{eq}) and sleep disturbance indoors, assuming a 15 dBA exterior-to-interior noise reduction with windows partially open. Therefore, temporary noise from helicopters is identified as a potential significant impact if required for stringing of collector lines. **Mitigation Measure 3.13-2** (Noise-Reducing Construction Practices) identifies restrictions on helicopter operations to reduce this potential significant construction-related impact to a less-than-significant level.

Blasting Noise

Controlled blasting could generate noise levels of up to 94 dBA (L_{max}) at a distance of 50 feet for an event of less than 20 seconds in duration. Blasting events typically occur between one and ten times per day and each blast would be preceded by drilling noise for up to one hour. At the closest residences to the nearest potential blasting location, 2,000 feet from the nearest wind turbine construction area, peak overpressures of about 117 dB(L) would be anticipated, which are well below the 133 dB(L) criteria to avoid damage. Peak overpressure is controlled by charge confinement. The standard procedure for confining the charge is to place the explosives deep in the drilled blast hole and then to backfill the remainder of the hole with crushed rock. Assuming standard blast confinement techniques are used, Project-related damage from acoustic overpressures is not expected for any residence. Although these low frequency overpressures could potentially be audible, the Shasta County noise criteria do not apply to this type of impulsive noise and that is why the 133 dB(L) criteria of the regulatory limit defined by the former US Bureau of Mines is applied. While residents may occasionally hear sounds from blasting events, these sounds would occur on an infrequent basis during construction. These brief intermittent events would not be expected to substantially increase hourly average or daily average noise levels. While blasting typically is conducted during daytime activities, **Mitigation Measure 3.13-2** (Noise-Reducing Construction Practices) identifies restrictions on blasting activities to ensure that they are only conducted during daytime hours,

Impact Summary

In summary, Project construction would result in a potential significant impact if truck delivery of construction materials occurred during nighttime hours via the west access road and, separately, as a result of the proposed use of helicopters to string overhead collector. The implementation of Mitigation Measure 3.13-2 (Noise-Reducing Construction Practices) would reduce this potential significant impact to a less-than-significant level.

Mitigation Measure 3.13-2: Noise-Reducing Construction Practices.

The Project Applicant shall ensure that the following measures are implemented during construction, decommissioning, and site reclamation activities to avoid and minimize construction noise effects on sensitive receptors:

a) Construction vehicle routes shall be located at the most distant point feasible from noise-sensitive receptors.

b) All heavy trucks shall be properly maintained and equipped with noise-control (e.g., muffler) devices, in accordance with manufacturers' specifications, at each work site during Project construction, decommissioning, and site reclamation to minimize heavy truck traffic noise effects on sensitive receptors.

c) Haul trucks and delivery trucks shall prioritize use of the east access road, if available, over the west access road, and shall avoid use of the west access road during nighttime hours.

d) Helicopter use shall be limited to a period of 2 weeks or less such that receptors are not impacted for a substantial period of time.

e) Limit construction operations located within 2,500 feet of residences to daytime hours only.

f) Residences within 2,000 feet of helicopter activity shall be notified of the timeline of proposed operations at least 2 weeks` prior to line stringing operations.

g) Nighttime (10 p.m. to 7 a.m.) helicopter use and blasting shall be prohibited.

Significance after Mitigation: The above construction noise reduction measures would reduce potential impacts related to truck noise along the west access road, reduce the severity of noise from helicopter operations, and would represent best management practices to reduce construction-related noise, in general.

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b) Whether the Project would result in the generation of excessive groundborne vibration or groundborne noise levels.

Impact 14.3-3: Construction, decommissioning, and site reclamation of the Project could generate groundborne vibration. (*Less than Significant with Mitigation Incorporated*)

When blasting occurs at large distances from sensitive structures, the primary concern is the potential for cosmetic damage to structures. Cosmetic damage (e.g., minor cracking in plastered walls) can occur as a result of ground-borne vibration or acoustic overpressures. Vibration from blasting events on the Project Site were calculated using methods established by the former U.S. Bureau of Mines and are presented in **Table 3.13-9**, *Ground Vibration Levels Generated by Blasting*. As discussed in Section 3.13.3.1, *Methodology*, predicted vibrations levels are compared to more conservative limit of 0.3 in/sec PPV published by Caltrans.

TABLE 3.13-9
GROUND VIBRATION LEVELS GENERATED BY BLASTING

Distance (feet)	Blasting Level (in/sec PPV) for Various Explosive Charge Weights per Delay (lbs)		
	175 lbs	350 lbs	700 lbs
2,000	0.098	0.170	0.296
3,000	0.051	0.089	0.155
4,000	0.032	0.056	0.098

Blasting could occur as close as 2,000 feet from existing residential areas. Calculated ground vibration levels are summarized in Table 3.13-9 for a variety of charge weights and distances. Receptors located further from blasting activities would experience lower vibration levels.

As shown in Table 3.13-9, blasting, using a charge weight of 700 lbs/delay[8] within 2,000 feet of sensitive structures, could generate groundborne vibration levels as high as 0.296 in/sec PPV, which would be just below the 0.3 in/sec PPV Caltrans threshold. Consequently, use of charge weights in excess of 700 pounds per delay could result in significant vibration impacts.

Mitigation Measure 3.13-3: Charge Weight Limits on Blasting Activities.

The Project Applicant shall ensure that blasting contractors restrict charge weight per delay such that a performance standard of less than 0.3 in/sec PPV would result at any structures in the vicinity of the blasting area. This performance standard shall be established as a condition of contract and implemented by a licensed blasting contractor in possession of a Federal Explosives License/Permit, issued by the Bureau of Alcohol, Tobacco, and Firearm.

Significance after Mitigation: Structures closest to potential blast areas would be unlikely to experience any level of cosmetic or structural damage, assuming a maximum vibration level of less than 0.3 in/sec PPV. Vibration levels would be lower at locations further from blasting or when lower charge weights are used. Consequently, with the application of Mitigation Measure 3.13-3, blasting activities associated with construction of the Project would have a less-than-significant impact with respect to generation of groundborne vibration that would exceed the criteria established by Caltrans.

3.13.3.3 PG&E Interconnection Infrastructure

As described above in Impact 3.13-1, the onsite collector substation and switching station where the PG&E transmission line interconnect would be located would be approximately 1.5 miles from the closest existing residential area (R-4). The primary operational noise source that would be associated with the proposed transmission line connection at the substation would be corona noise, which would be up to 46 dBA within the transmission line connection right-of-way. At 1.5 miles, the corona noise level associated with the transmission line connection would not be audible. Consequently, there would be no operational impact of the PG&E interconnection infrastructure.

Similarly, the substantial distance between the transmission line connection from the nearest receptor would serve to attenuate construction-related noise and noise from decommissioning and site reclamation. Impact 3.13-2, above, assess potential impacts occurring from construction activities at the nearest receptor located approximately 2,000 feet away. Given that the transmission line connection would be on the order of 7,900 feet away, noise levels from construction, decommissioning, and site reclamation would be expected to be approximately 12 dBA, which would be inaudible. With regard to traffic noise levels along the west access road, the daily truck trips that would be required to deliver the materials for the four to six new transmission poles and associated conductor would not be expected to result in a traffic noise level that would exceed the ambient nighttime noise level at the closest residence by more than

[8] The maximum quantity of explosive charge detonated on one interval (delay) within a blast.

the 5 dBA L_{dn} threshold. The construction impact associated with the PG&E interconnection infrastructure would be less than significant.

3.13.3.4 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Under Alternative 1, the Project would be constructed, operated and maintained, and ultimately decommissioned as proposed south of SR 299, but none of the up to seven turbines proposed to the north of SR 299 or their related infrastructure would be developed. These seven northerly turbines would have been located over 5,000 feet from the nearest receptor (LT-3) and, as indicated in Figure 3.13-3, would contribute substantially less than 50 dBA to the nearest receptors during operations. Given that the primary contributors to both construction-related and operational noise and vibration impacts would be related to turbine locations south of SR 299, both construction-related noise and vibration impacts, and operational noise and vibration impacts of Alternative 1 would be the same as those identified above for the Project, less than significant with implementation of Mitigation Measure 3.13-2 (Noise-Reducing Construction Practices).

Alternative 2: Increased Setbacks

Under Alternative 2, proposed setbacks would be increased relative to the Project to preclude turbine construction within 2,037 feet of a residential property line and within 1,018.5 feet of SR 299, any other publicly-maintained public highway or street, and of Supan Road or Terry Mill Road. Implementation of these setbacks would preclude construction of proposed turbines M03, D05, and B01 based on the residential property line setback, and would preclude construction of turbine KO2 based on the roadway setback. The effect of eliminating these turbines, in particular turbine D05, would reduce the operational and construction-related noise levels at receptor location R-4 compared to those identified for the Project. Impacts would be the same as those identified above for the Project, less than significant with implementation of Mitigation Measure 3.13-2 (Noise-Reducing Construction Practices).

No Project Alternative

If the No Project Alternative is implemented, none of the proposed wind turbines and associated transformers or other infrastructure, facilities or structures would be constructed, operated and maintained, or decommissioned on the Project Site. The proposed overhead electrical lines would not be developed; and the onsite collector substation, switching station, and operation and maintenance (O&M) facility would not be constructed, visited pursuant to operations and maintenance activities, or demolished and removed from the Project Site. Laydown areas would not be cleared, no new access roads would be constructed, and no existing roads would be improved or traveled. The Project Site would continue to be operated as managed forest timberlands. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to noise or vibration.

The Project Site is zoned for timber production. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs.

§897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to result in a significant adverse individual or cumulative effect relating to noise or vibration. CAL FIRE would review any future timber harvesting proposal to evaluate any potential project-specific, site-specific environmental impacts.

3.13.4 Cumulative Analysis

The above Project-level analysis indicates that beyond a distance of approximately 3,000 feet, construction-related noise and vibration impacts would be attenuated to ambient levels. Therefore, this distance is also applied to the perimeters of the turbine locations and receptors to determine the geographic scope of potential cumulative impacts. There are six timber harvest plans within the leasehold area that are active or in preparation, but all six of these harvest plans are more than 5,000 feet from the nearest receptor and so are outside of the geographic scope of potential cumulative impacts.

Additionally, there is a Caltrans roadway improvement project on SR 299 scheduled for 2021, approximately 3,000 feet from the nearest turbine and 300 feet from the nearest receptor (LT-3). Construction activities of this Caltrans project could occur simultaneously with the earliest stages of Project construction and, as a linear construction project, may occur proximate to a given roadside receptor for a period of 1 to 2 weeks. As discussed above, construction equipment involved with the Project would generate noise levels of 48 to 53 dBA L_{eq} at 2,000 feet, not taking into account any shielding from intervening terrain and would result in a less-than-significant impact. Receptor LT-3 is located approximately 4,000 feet from the nearest turbine construction areas and would experience noise levels of 42 to 47 dBA L_{eq}. Construction work associated with the Caltrans project at a distance of 300 feet would be expected to generate noise levels of 65 to 70 dBA L_{eq}. Using the upper end of these estimates, the cumulative combination of 47 dBA and 70 dBA L_{eq} would result in a noise level of 70.4 dBA L_{eq}. Therefore, the Project would not contribute considerably to the noise generated by the Caltrans project, regardless if occurring during daytime or nighttime hours. With regard to vibration, the vibration levels that would be associated with construction of the Caltrans project would not be expected to be perceived at a distance of 300 feet. Therefore, the vibration levels that would be associated with the Project blasting activities would not combine with those of the Caltrans project to result in a significant cumulative impact because the cumulative noise and vibration increases would be well below the level of human perception. No significant cumulative effects would result. The cumulative impact would be less than significant.

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