# 3.23 NOISE

This section addresses the potential noise impacts on the human environment and alternatives from the construction, operations, and decommissioning of the Proposed Action. The effect of construction and operation noise on wildlife is discussed in Sections 3.10 – General Wildlife and Fish and Section 3.11 – Special Status Wildlife and Fish Species. The effect of transmission line audible noise is also discussed in Section 3.21 – Electrical Environment.

## 3.23.1 Affected Environment

The following subsections include a discussion of the Analysis Area considered for environmental impacts by the Project, the issues that have driven the analysis, and the existing conditions across the Proposed Route and Route Alternatives in Wyoming, Idaho, and Nevada.

### 3.23.1.1 Analysis Area

The Analysis Area included potential noise sensitive areas (NSAs) including residences, schools and day care facilities, hospitals, long-term care facilities, places of worship, libraries, and parks and recreational areas specifically known for their solitude and tranquility such as wilderness areas. Generally, the Analysis Area was less than 1,000 feet from the proposed edge of the ROW, or from the boundary fence of the substations.

### 3.23.1.2 Issues to be Analyzed

The following noise-related issues were identified by the public during the public scoping (Tetra Tech 2009a), were raised by federal and state agencies during scoping and agency discussions, or are issues that must be considered as stipulated in law or regulation.

- Exposure of persons to or generation of noise levels in excess of standards as established within existing regulations, ordinances, and standards;
- Substantial temporary or permanent increase in ambient noise levels in the Project vicinity above levels existing prior to Project construction and operation; and
- Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels.

### 3.23.1.3 Regulatory Framework

A review of existing federal, state, county, and local noise regulations, ordinances, and guidelines was conducted and used to establish significance criteria for assessing Project compliance at identified noise sensitive areas (e.g., residences, schools, hospitals). The Project acoustic study area traverses three states, numerous counties, and several municipalities. With exception of the United States Occupational Health and Safety Administration regulations that describe worker health and safety limits for noise exposure, there are no other overarching federal or state noise regulations or requirements specific to this Project or to transmission line operation in Idaho, Wyoming, or Nevada. Furthermore, there are no standardized regulatory impact criteria for the assessment of construction noise and vibration directly applicable to this Project. If new dBA limitations and hours of operation are developed as a part of the special use permitting process and found to be applicable to the Project, the Project would address these requirements at that time. The regulatory framework at the federal, state, and local levels is presented below.

## Federal

The USEPA has developed widely accepted recommendations for long-term exposure to environmental noise with the goal of protecting public health and safety. Noise guidelines for similar linear construction projects have been developed by the USDOT.

### *U.S. Environmental Protection Agency*

In 1974, the USEPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (USEPA 1974). This report represents the only published study that includes a large database of community reaction to noise to which a proposed project can be readily compared. This publication evaluates the effects of environmental noise with respect to health and safety, and provides information for state and local governments to use in developing their own ambient noise standards.

For outdoor residential areas and other locations in which “quiet” is a basis for use, the recommended USEPA guideline is an $L_{dn}$ of 55 dBA. Provided that Project operations meet this criterion, adjacent NSAs would regard the noise levels as generally acceptable. The USEPA also suggests an $L_{eq}$ of 70 dBA (24-hour) limit to avoid adverse effects on public health and safety at publicly accessible property lines or extents of work areas where extended public exposure is possible. The USEPA criteria are summarized in Table 3.23-1, which identifies levels of environmental noise below which there is no evidence that the general population would be at risk to USEPA identified health effects.

**Table 3.23-1.** Summary of USEPA Noise Levels

| Location | Level | Effect |
|---|---|---|
| All public accessible areas with prolonged exposure | 70 dBA $L_{eq\ (24h)}$ | Safety/hearing loss concerns |
| Outdoor at residential structure and other NSAs where a large amount of time is spent | 55 dBA $L_{dn}$ | Protection against annoyance and activity interference |
| Outdoor areas where limited amounts of time are spent, i.e., park areas, school yards, golf courses, etc. | 55 dBA $L_{eq\ (24h)}$ | |
| Indoor residential areas | 45 dBA $L_{dn}$ | |
| Indoor non-residential areas | 45 dBA $L_{eq\ (24h)}$ | |

$L_{eq}$ = equivalent sound level

### *U.S. Department of Transportation*

The USDOT has identified criteria for the assessment of short- and long-term construction activities for both stationary and mobile projects, and specifically for linear projects. The Federal Highway Administration recommends abatement of construction noise that exceeds maximum levels at NSAs. These Project construction noise criteria take into account the diurnal pattern of construction activities, the absolute noise levels during construction activities, the duration of the construction, and the adjacent land use. While these criteria were not developed to specifically address construction noise impact for power transmission line projects, the guidelines shown in Table 3.23-2 provide reasonable criteria for noise assessment. If these criteria are exceeded, adverse community reaction may result.

**Table 3.23-2** Summary of USDOT Short Duration Construction Noise Guidelines

| Location | Daytime | Nighttime |
|---|---|---|
| **Short Duration Noise Guidelines** | | |
| NSAs (Residences) | 90 dBA $L_{eq\ (8h)}$ | 80 dBA $L_{eq\ (8h)}$ |
| Commercial | 100 dBA $L_{eq\ (8h)}$ | 100 dBA $L_{eq\ (8h)}$ |
| Industrial | 100 dBA $L_{eq\ (8h)}$ | 100 dBA $L_{eq\ (8h)}$ |
| **Moderate Duration Noise Guidelines** | | |
| NSAs (Residences) | 80 dBA $L_{eq\ (8h)}$ | 70 dBA $L_{eq\ (8h)}$ |
| Commercial | 85 dBA $L_{eq\ (8h)}$ | 85 dBA $L_{eq\ (8h)}$ |
| Industrial | 90 dBA $L_{eq\ (8h)}$ | 90 dBA $L_{eq\ (8h)}$ |

The USDOT has also established guidelines for vibration levels for estimating the potential for vibration impacts from construction activities. These criteria are reported in peak particle velocity for describing the threshold for damage. Annoyance or interference with vibration-sensitive equipment is typically reported in velocity decibels referenced to 1 micro-inch per second. Typical levels from construction do not have the potential for any structural damage. Specific construction activities, such as pile driving and blasting, may produce vibration levels that have the potential to damage vibration-sensitive structures if performed within 100 feet of the structure. The USDOT recommends that the maximum peak particle velocity levels remain below 0.2 inch per second at the nearest structures. Vibration levels above 0.2 inch per second have the potential to cause architectural damage to normal dwellings. The USDOT also states that vibration levels above 0.015 inch per second may be perceptible to people. Table 3.23-3 summarizes the levels of vibration and the usual effect on people and buildings.

**Table 3.23-3.** Summary of Vibration Impact Guidelines

| Effects on Humans | Effects on Buildings | Vibration Level (ppv) inch/sec |
|---|---|---|
| Imperceptible | No effect | <0.005 |
| Barely perceptible | No effect | 0.005 to 0.015 |
| Level at which continuous vibrations begin to annoy in buildings | No effect | 0.02 to 0.05 |
| Vibrations considered unacceptable for people exposed to continuous or long-term vibration | Minimal potential for damage to weak or sensitive structures | 0.12 to 0.2 |
| Vibrations considered bothersome by most people, however tolerable if short-term in length | Threshold at which there is a risk of architectural damage to buildings with plastered ceilings and walls. | 0.2 to 1.0 |
| Vibrations considered unpleasant by most people | U.S. Bureau of Mines data indicate that blasting vibration in this range will not harm most buildings. Most construction vibration limits are in this range. | 1.0 to 2.0 |
| Vibration is unpleasant | Potential for architectural damage and possible minor structural damage | >3.0 |

ppv = peak particle velocity

## State

The States of Wyoming, Idaho, and Nevada do not have environmental noise regulations with numerical decibel limits directly applicable to the Project. The only noise regulations or statutes provided by the WDEQ and the IDEQ are related to noise nuisance complaints and are not applicable to the proposed Project.

## County and Local Ordinances and Bylaws

Of the 22 counties and the one municipality crossed by the Proposed Route and Route Alternatives, 19 have no relevant noise ordinances, relying instead upon the state noise nuisance regulations. Ordinances and standards for the remaining counties are described in Table 3.23-4. County noise ordinances, where they exist, are focused on permanent site development, which would include substations and transmission line operations only. Typically, daytime construction is exempt from local noise ordinances and standards. However, nighttime construction noise may also be subject to regulatory requirements or noise nuisance clauses enforceable under state or local penal code. The City of Kuna has noise abatement ordinances applicable to highway construction.

**Table 3.23-4.** Applicable County Noise Ordinances and Standards

| County | Ordinances and Standards | Description |
|---|---|---|
| Oneida, ID | Oneida County Development Code (Appendix C) | Operating developments can generate a maximum of 70 dBA at the property boundary in commercial/industrial areas and either 50 dBA (10:00 p.m. to 7:00 a.m.) or 60 dBA (7:00 a.m. 10:00 p.m.) in residential areas. Temporary construction noise is exempt from this standard during the daytime hours of 7:00 a.m. to 10:00 p.m. |
| Franklin, ID | Franklin County Development Code | Operating developments can generate a maximum of 70 dBA at the property boundary in commercial/industrial areas and either 50 dBA (10:00 p.m. to 7:00 a.m.) or 60 dBA (7:00 a.m. 10:00 p.m.) in residential areas. Temporary construction noise is exempt from this standard during the daytime hours of 7:00 a.m. to 10:00 p.m. |
| Sweetwater, WY | Sweetwater County Nuisance Regulations | Operating developments can generate a maximum of 70 dBA at the property boundary in commercial/industrial areas and 60 dBA in residential areas. Temporary construction noise is exempt from this standard during daytime the hours of 7:00 a.m. to 10:00 p.m. |

### 3.23.1.4 Methods

Sound is described as a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure creating a sound wave. Sound energy is characterized by the properties of sound waves, which include frequency, wave length, period, amplitude, and velocity. Noise is highly subjective and defined as unwanted sound. It is largely dependent on the magnitude or intensity of noise, the duration of the Project, the proximity of noise-sensitive land use to noise source, and the time of day the incidence noise occurs (i.e., higher sensitivities would be expected during the quieter overnight periods).

The range of frequencies that humans hear can span from 20 to 20,000 Hz; however, humans have varying sensitivities to noise at different frequencies, even though the energy content is the same. The amplitude of a sound wave is measured in terms of its sound pressure level where a logarithmic decibel scale is used. To reflect the sensitivity of the human ear across the audio spectrum, the sound pressure level readings are based on the “A-weighted scale”, which is a standard weighting system that accounts for human hearing response. The measurements used for the “A-weighted scale” are decibels, and are designated as dBA.

To take into account sound fluctuations, environmental noise is commonly described in terms of equivalent sound level ($L_{eq}$). The $L_{eq}$ value, conventionally expressed in dBA, is the energy-averaged, A-weighted sound level for the complete time period. It is defined as the steady, continuous sound level, over a specified time, which has the same acoustic energy as the actual varying sound levels over that same time. Another common noise descriptor used when assessing environmental noise is the day-night sound level ($L_{dn}$), which is calculated by averaging the 24-hour hourly $L_{eq}$ levels at a given location and adding 10 dB to noise emitted during the nighttime period (10:00 p.m. to 7:00 a.m.) to account for the increased sensitivity of people to noises that occur at night. The $L_{max}$ is the maximum instantaneous sound level as measured during a specified time period. It can also be used to quantify the time-varying maximum instantaneous sound pressure level (as generated by equipment or an activity) or a manufacturer maximum source emission level.

The analysis conducted for activities associated with construction and operation of the proposed Project was evaluated using criteria and guidelines discussed in the previous section. The analysis methods included determining a critical distance from Project construction and operations for both the Proposed Route and Route Alternatives, where an NSA may experience received sound levels in excess of the selected criteria. Critical distances would vary greatly depending on what Project activity is being considered. For instance, during the construction phase, heightened received sound levels would result from use of heavy equipment and helicopters, whereas noise associated with transmission line operation (termed corona discharge) would be substantially lower. Critical distances were also assessed for operation of the new Project electrical substations. Transformers generally are the major sources of audible noise within a substation. In all cases, after analysis of impacts was complete and where impacts were identified, Proponent-proposed measures to reduce impacts were reviewed for sufficiency. Where those measures were determined to be insufficient, additional measures were identified.

#### 3.23.1.5 Existing Conditions

A wide range of noise settings occur within the Project acoustic area. Variations in acoustic environment are due in part to existing land uses, population density, and proximity to transportation corridors. Elevated existing ambient noise levels in the region occur near major transportation corridors (i.e., I-84, I-86, I-15, and I-80) and in areas with higher population densities (i.e., Casper, Boise, Pocatello, and Twin Falls). There are also 21 rural airstrips and small airports (10 public, 10 private, and 1 proposed), located within 3 miles of the Project transmission line route, which also contribute to ambient noise levels in both surrounding urban and rural areas. The unincorporated areas and communities that would intersect the proposed transmission line are predominantly open land or rural in nature, and have comparatively lower ambient sound levels. Ambient noise levels are also low in BLM-managed and NFS lands and other open areas. These lands range from very quiet with natural sounds such as birds, insects, and wind dominating to noisy in localized areas during periods of off-road recreational use, shooting, oil and gas, and other outdoor activities.

### 3.23.2 Direct and Indirect Effects

This section is organized to present construction, operation, and decommissioning effects from the proposed Project. Route Alternatives are analyzed in detail in Section 3.23.2.3. The Design Variation involves the use of two single-circuit structures proposed by the Proponent for Segments 2, 3, and 4 (see Section 2.2 for details), which is analyzed in Section 3.23.2.4. The Proponents have also proposed a Schedule Variation (see Section 3.23.2.5) in which one of the two single circuits to be constructed in Segments 2, 3, and 4 and a portion of Segment 1W would be built on an extended schedule, with construction beginning approximately 2.5 years after completion of the initial construction.

Mitigation measures or EPMs are presented in detail within this section only if it is the first time they have been discussed in Chapter 3; all other measures are referenced or summarized. A comprehensive list of all Proponent-proposed EPMs and Agency-required mitigation measures can be found in Table 2.7-1 of Chapter 2.

**Plan Amendments**

Proposed amendments are summarized in Table 2.2-1 of Chapter 2 and detailed in Appendices F and G. Amendments are needed to permit the Project to cross various areas of BLM-managed and NFS lands. Effects described for areas requiring an amendment in order for the Project to be built would only occur if the amendment were approved. Amendments that alter land management designations could change future use of these areas. No amendments specific to noise are proposed for the Project and no impacts to noise resulting from approving the amendments beyond the impacts of the Project are anticipated.

#### 3.23.2.1 No Action Alternative

Under the No Action Alternative, the proposed Project would not be constructed or operated. Therefore, no Project impacts related to noise would occur.

#### 3.23.2.2 Effects Common to All Action Alternatives

**Construction**

Construction of Project transmission lines would be completed in five stages: site access and preparation; installation of structure foundations; erecting of support structures; stringing of conductors, shield wire and fiber optic ground wire; and cleanup and site reclamation. Transmission line construction would occur as a series of sequential events distributed over several miles along the Project route at any one time. Twelve substations would be constructed or modified.

The Project construction phase would produce noise as heavy equipment would be required to build the proposed transmission line routes and electrical substations. Short-term use of equipment such as backhoes, cranes, front-end loaders, bulldozers, graders, excavators, compressors, generators, and various trucks would be needed for mobilizing crew, transporting and use of materials, line work, and site clearing and preparation. Use of drill rigs, large augers, and rock drills would be required for the poured-in-place foundations at each tower location. It is not expected that pile driving would be needed during construction. Spur roads and access roads would require use of earthmoving equipment such as bulldozers and graders. Construction noise is usually made up of intermittent peaks and continuous lower levels of noise from equipment cycling through use. Noise levels associated with individual pieces of equipment would generally range between 70 and 90 dBA (USDOT 2006). Maximum instantaneous construction noise levels would range from 80 to 90 dBA at 50 feet from any work site. Table 3.23-5 provides typical noise level data for construction equipment potentially used during Project construction of the transmission line and electrical substations.

**Table 3.23-5.** Typical Noise Levels from Construction Equipment

| Equipment Type | Measured $L_{max}$ Noise Level at 50 feet (dBA) |
|---|---|
| Crane | 88 |
| Backhoe | 85 |
| Pan Loader | 87 |
| Bulldozer | 89 |
| Fuel Truck | 88 |
| Water Truck | 88 |
| Grader | 85 |
| Roller | 80 |
| Mechanic Truck | 88 |
| Flat Bed Truck | 88 |
| Dump Truck | 88 |
| Tractor | 80 |
| Concrete Truck | 86 |
| Concrete Pump | 82 |
| Front End Loader | 83 |
| Scraper | 87 |
| Air Compressor | 82 |
| Average Construction Site | 85 |

Noise would be generated along the Project route, access roads, structure sites, pull sites, staging and maintenance areas, fly yards, and substation sites. Additional noise sources may include commuting workers, and trucks and helicopters moving material to and from the work sites.

The noise impacts at NSAs from construction would depend on the type of equipment used, the mode of operation of the equipment, the length of time the equipment is in use, the amount of equipment used simultaneously, and the distance between the sound source and NSA. All of these factors are expected to vary regularly throughout the construction period, making the calculation of a specific received sound level value at each NSA location difficult. The critical distances corresponding to the USEPA noise guidelines and other criteria developed by the Project to assess construction noise impacts were calculated. Sound generation was modeled according to the grouping of construction equipment provided in Table 3.23-5. The results of the modeling determined the distance from the construction site where sound levels would attenuate to the criteria levels. These distances included the following:

- A critical distance of 407 feet corresponding to the USEPA 70 dBA $L_{eq\ (24h)}$ guideline, and

- A critical distance of 280 feet corresponding to the USDOT 80 dBA $L_{eq\ (8h)}$ guideline.

Thus, NSAs situated within these critical distances may experience a short-term impact as a result of Project construction noise. While Project construction would generate unavoidable noise impacts at some NSAs, impacts would be temporary and intermittent.

Construction activities at the substations could last from several weeks to several months on an intermittent schedule. Construction equipment would be operated on an as-needed basis during this period and activities would occur for limited lengths of daytime hours at a specific location to minimize impacts at NSAs. In addition, the majority of construction activities would occur away from population centers; therefore, the potential for the Project to result in a substantial temporary or periodic increase in ambient noise levels in the acoustic environment surrounding the Project would be low. The Proponents would comply with all established noise ordinances and suggested noise guidelines; therefore, the potential for adverse noise impacts at NSAs resulting from Project construction would be minimized. The subsequent sections discuss specific construction techniques that the Project may use, including blasting and rock breaking, implosive devices during conductor stringing, and helicopter operations.

The Agencies have identified measures during construction that would substantially reduce impact in the vicinity of NSAs:

NOISE-1 Provide notice by mail prior to construction to all sensitive receptors and residences within 300 feet of construction sites, staging areas, and access roads. The announcement will state specifically where and when construction will occur in the area.

NOISE-2 Identify and provide a public liaison person before and during construction to respond to concerns of neighboring receptors, including residents, about noise construction disturbance.

NOISE-3 Establish a toll-free telephone number for receiving questions or complaints during construction and develop procedures for responding to callers.

### *Blasting and Rock Breaking*

Modern blasting techniques include electronically controlled ignition of multiple small explosive charges in an area of rock 8/1000ths of a second apart resulting in a total event duration of approximately 3/10ths of a second. The detonations are timed so that the energy from individual detonations destructively interferes with each other, which is called wave canceling. As a result, very little of the kinetic energy is wasted as ground vibration and audible noise. Impulse (instantaneous) noise from blasts could reach up to 140 dBA at the blast location or over 90 dBA for NSAs within 500 feet.

Blasting may be required during Project construction if hard rock is encountered that cannot be loosened or fractured by other means. Blasting locations would not be identified until an investigative geotechnical survey study area is conducted during the detailed design. However, areas where blasting may potentially take place have been identified on a geologic basis. As described in Section 3.14 – Geologic Hazards, areas of shallow bedrock exist along the Proposed Route and Route Alternatives. Depth to bedrock varies considerably along the routes, ranging from 1 to 4 feet below ground to greater than 12 feet below ground. Table 3.23-6 shows the number of NSAs along the Proposed Route and Route Alternatives that are located in areas of shallow bedrock and therefore may potentially be subjected to blasting during Project construction. The number of potentially impacted NSAs is directly related to the critical distance determined from the blasting criteria described in Section 3.23.3. These distances include the following:

- A critical distance of 131 feet corresponding to the USDOT vibration threshold for the potential for minor architectural damage, and
- A critical distance of 377 feet corresponding to the USDOT vibration threshold for annoyance.

Though noise generated during blasting can cause concern among nearby NSAs, blasting is a relatively short duration event compared to rock removal methods such as using track rig drills, rock breakers, jack hammers, rotary percussion drills, core barrels, and/or rotary rock drills. The Proponents intend to prepare a site-specific Blasting Plan prior to construction that covers blasting procedures, use of qualified blasters, site control and protection measures, and compensation for repair of damage (see EPMs BLA-1 through BLA-5, Appendix C-1, Attachment E)

#### *Implosive Devices*

Compression or implosive devices are used to make connections between conductors, which is the current industry-preferred method in contrast to previously used conventional hydraulic compression fittings. Use of implosive devices would vary depending on what segment of the transmission line is under construction and the number of conductors per bundle. A three-conductor bundle (see Appendix B, Figure B-3) is used for each phase and there are three phases per 500-kV circuit. At each single-circuit 500-kV dead-end structure and at in line sections where reel ends need to be connected, 18 implosive dead-end sleeves (six per phase, one for each of the three subconductors on each of the three phases, and on each side of the structure) would be required. Additionally, 18 compression or implosive sleeves would be required to fabricate and install the jumpers that connect the conductors from one side of the dead-end structure to the other, for a total of 36 sleeves for each single-circuit dead-end structure. Each double-circuit 500-kV dead-end structure would require twice as many sleeves as the single-circuit structure would because there are twice as many conductors to dead-end and jumpers to be fabricated, for a total of 72 sleeves for each double-circuit dead-end structure. The 230-kV single-circuit lines would require a two conductor bundle. Each 230-kV dead-end structure would require 12 implosive or compression type sleeves to dead-end the conductors and 12 sleeves to fabricate the jumpers, for a total of 24 sleeves at each dead-end structure.

Implo Technologies is a company that manufactures the implosive dead-end and sleeve compression connectors comparable to technologies that would be used during construction. They reported an average sound level measurement between 118 and 122 dBA at an approximate distance of 200 feet. The duration of sound emitted from detonation of an implosive device is short, ranging from approximately 210 to 360 milliseconds. Since the potential for noise "startle" effects at NSAs at these distances exists, the use of implosive devices would be limited to daytime periods.

#### *Helicopter Operations*

To allow the construction contractor flexibility in the construction methods that may be used, the Project construction specification would be written to allow the contractor the option of using ground-based or helicopter construction methods, or a combination thereof for single-circuit structure erection. In particular, helicopters would be used in areas where access is limited or where there are environmental constraints to accessing the Project area with standard construction vehicles or equipment. Project activities that would be facilitated by helicopters include delivery of construction laborers, equipment and materials to structure sites, structure placement (except tubular steel poles), hardware installation, and wire stringing operations. When helicopter construction methods are employed, activities would be based at a fly yard, which is a Project-material staging area. The fly yards would be approximately 10 to 15 acres and would be sited at locations to permit a maximum fly time of 4 to 8 minutes to reach structure locations, typically at about 5-mile intervals.

Helicopters generally fly at low altitudes; therefore, potential temporary increases to ambient sound levels would occur in the area where helicopters are operating as well as along their flight path. Typically, helicopters may generate noise levels of 89 to 99 dBA at 50 feet when in flight at 200 feet. Light-duty helicopters would also be used during the stringing phase of construction. It is anticipated that helicopter stringing activities would proceed at a rate of approximately 2,000 feet per day using 4-hour days. Light-duty helicopters would generate noise levels of approximately 80 dBA at 200 feet.

Worst-case sound emissions generated from helicopter use during Project construction were assessed along the proposed transmission line route by segment. Under the Proposed Action developed by the Proponents, helicopter operations would be a contractor option for all segments except 2, 3, and 4. Segments 2, 3, and 4 could not effectively use helicopters for structure transportation and installation because the double-circuit structures proposed for these segments are too heavy for helicopters to manage. The critical distance where noise impacts were assessed for helicopter noise include the following:

- A critical distance of 90 feet corresponding to the USDOT 90 dBA $L_{eq\ (24h)}$ guideline for short-term construction activities,
- A critical distance of 280 feet corresponding to the USDOT 80 dBA $L_{eq\ (24h)}$ guideline for moderate-term construction activities, and
- A critical distance of 890 feet corresponding to the USEPA 70 dBA $L_{eq\ (24h)}$ guideline for public accessible areas with prolonged exposure.

At any one location along the Proposed Route and Route Alternatives, helicopter operations would occur for short periods several times per day. Therefore, the USDOT 90 dBA one-hour $L_{eq\ (1h)}$ is the most appropriate criteria to assess the potential for adverse noise impacts. Operations would be limited to daytime working hours only and would be fairly short-term in nature. Therefore, short-term construction noise impacts from helicopter operations would be minor.

## Operations

### *Transmission Line*

Transmission lines have the potential to emit environmental noise under certain operating and environmental conditions. Transmission line noise (also called corona noise) is caused by the partial electrical breakdown of the insulating properties of air around the electrical conductors and overhead power lines (see Section 3.21 – Electrical Environment). When audible, corona-generated noise is often described as a raspy hum or buzz. Corona noise is primarily affected by weather and (to a lesser degree) by altitude and temperature. It is generated when the atmosphere ionizes near isolated irregularities (i.e., nicks, scrapes, and insects) on the conductor surface of operating transmission lines. Modern transmission lines are designed, constructed, and maintained to minimize corona-related noise during dry conditions. During precipitation events, corona humming noise is predominantly at the frequency of 120 Hz.

Modern transmission lines (such as those used for the Project) are designed, constructed, and maintained so that during dry conditions they would operate below the corona inception voltage. During dry weather conditions, noise from the proposed transmission lines would be generally indistinguishable from background sound levels at locations beyond the edge of the ROW. During rainfall events or high humidity, the noise level at the edge of the ROW would remain at a low level, but elevated when compared to dry conditions.

Sound levels emitted from transmission lines are related to line voltage. A 230-kV single-circuit transmission line would typically result in a worst-case sound pressure level of approximately 40 dBA at a distance of 90 feet. A 500-kV single-circuit line would produce a maximum sound pressure level of approximately 51 dBA at 90 feet. Using standard sound propagation calculation methodologies and representative sound source levels for transmission line operation, the number of potentially impacted NSAs were determined based on the following critical distances, corresponding to the 55 $L_{dn}$ USEPA guideline criteria protective of health and human welfare (see Table 3.23-6).

**Table 3.23-6.** Critical Distances by Project Transmission Line Voltage

| Line Voltage/Structure | Critical Distance 55 $L_{dn}$ dBA USEPA Guideline (feet) |
|---|---|
| 230-kV Single Circuit | 20 |
| 500-kV Single Circuit | 135 |
| 500/230-kV Double Circuit | 144 |
| 500-kV Double Circuit | 225 |

### *Substations*

Typical equipment that would be installed at the Project substations would include circuit breakers, switches, bus supports, controls, reactors and series capacitors, and transformers. The principal noise sources in the substations are the transformers. Only the Windstar, Aeolus, Difficulty, Bridger, Anticline, Populus, Borah, Midpoint, and Hemingway Substations would have transformers. Transformer noise would propagate and attenuate at different rates depending on the transformer size, voltage rating, and design. Transformer noise is principally a result of core vibration and is a function of the surface area, whether the transformer is air-filled or oil-filled, and the power rating. In addition to core vibration noise, transformer cooling fans and oil pumps at larger transformer stations generate broadband noise, but are limited to periods when additional cooling is required. The fan noise is relatively low and is generally considered secondary to the core vibration noise source.

For purposes of estimating potential impacts, it was assumed that each new substation included 500-kV transformers rated at 78 dBA by the National Electrical Manufacturers Association. The actual number of transformers and actual National Electrical Manufacturers Association rating would be confirmed during final Project design.

The Agencies have identified the following measure to be followed during operations that would substantially reduce impact in the vicinity of NSAs:

NOISE-4 Implement and maintain a noise complaint review process to deal with residents' or other potential queries and complaints as they arise. Such complaints would be logged and investigated on an individual basis to facilitate resolution of the issue of concern.

## Decommissioning

Decommissioning noise impacts would be generally shorter term and lower than construction impacts. For instance, no blasting or rock breaking would be required.

### 3.23.2.3 Proposed Route and Alternatives by Segment

## Construction

Table 3.23-7 shows the number of potentially impacted receptors that may exceed the USDOT and USEPA guidelines for helicopter construction, general construction, and blasting in areas with shallow bedrock at substations and along the proposed transmission line route and alternatives.

**Table 3.23-7.** Noise Sensitive Areas within Construction Analysis Area of Proposed Route and Route Alternatives

| Segment Number | Proposed Route and Alternatives | Length (miles) | Number of NSAs and Distance from Centerline For General and Helicopter Construction (feet) | | | | Number of NSAs within Potential Blasting Vibration Architectural Damage Zone (131 feet) | Number of NSAs within Blasting Vibration Annoyance Zone (377 feet) |
|---|---|---|---|---|---|---|---|---|
| | | | 90 | 280 | 407 | 890 | | |
| 1E | Proposed – Total Length | 100.6 | – | – | – | 8 | – | – |
| | Comparison Portion for Alternative 1E-A | 17.6 | – | – | – | 7 | – | – |
| | Alternative 1E-A | 16.1 | – | 1 | 2 | 4 | – | 1 |
| | Comparison Portion for Alternative 1E-B | 37.9 | – | – | – | 1 | – | – |
| | Alternative 1E-B | 59.3 | – | – | 1 | 2 | – | – |
| | Comparison Portion for Alternative 1E-C | 75.4 | – | – | – | 1 | – | – |
| | Alternative 1E-C | 48.6 | – | – | – | 1 | – | – |

**Table 3.23-7.** Noise Sensitive Areas within Construction Analysis Area of Proposed Route and Route Alternatives (continued)

| Segment Number | Proposed Route and Alternatives | Length (miles) | Number of NSAs and Distance from Centerline For General and Helicopter Construction (feet) | | | | Number of NSAs within Potential Blasting Vibration Architectural Damage Zone (131 feet) | Number of NSAs within Blasting Vibration Annoyance Zone (377 feet) |
|---|---|---|---|---|---|---|---|---|
| | | | 90 | 280 | 407 | 890 | | |
| 1W(a) | Proposed – Total Length | 76.5 | – | 1 | 1 | 5 | – | 1 |
| | Comparison Portion for Alternative 1W-A | 20.3 | – | 1 | 1 | 5 | – | 1 |
| | Alternative 1W-A | 16.2 | – | – | – | 2 | | |
| 1W(c) | Proposed – Total Length | 70.6 | 2 | 5 | 11 | 23 | 2 | 10 |
| 2 | Proposed – Total Length | 96.7 | – | – | – | – | – | – |
| | Proposed – Comparison Portion for Alternative 2A | 28.8 | – | – | – | – | – | – |
| | Alternative 2A | 28.4 | – | – | – | – | – | – |
| | Proposed – Comparison Portion for Alternative 2B | 7.0 | – | – | – | – | – | – |
| | Alternative 2B | 6.2 | – | 1 | 1 | 5 | – | 1 |
| | Proposed – Comparison Portion for Alternative 2C | 28.4 | – | – | – | – | – | – |
| | Alternative 2C | 24.4 | – | – | – | – | – | – |
| 3 | Proposed – Total Length | 46.6 | – | – | – | – | – | – |
| | Proposed, from Creston to Anticline Substation | 46.6 | – | – | – | – | – | – |
| | 230-kV Line between Anticline and Bridger Substations | 4.3 | – | – | – | – | – | – |
| | 345-kV Line between Anticline and Bridger Substations | 5.5 | – | – | – | – | – | – |
| 4 | Proposed – Total Length | 203.0 | 2 | 4 | 4 | 10 | 2 | 4 |
| | Comparison Portion for Alternative 4A, B,C, D,E | 90.2 | | 1 | 1 | 3 | – | 1 |
| | Alternative 4A | 85.2 | – | – | – | 2 | – | – |
| | Alternative 4B | 100.2 | – | – | – | | – | – |
| | Alternative 4C | 101.6 | – | – | 1 | 1 | – | 1 |
| | Alternative 4D | 100.8 | – | – | – | – | – | |
| | Alternative 4E | 102.2 | – | – | 1 | 1 | – | 1 |
| | Alternative 4F | 87.5 | – | – | 1 | 3 | – | 1 |
| 5 | Proposed – Total Length | 54.6 | – | 2 | 2 | 20 | – | – |
| | Comparison Portion for Alternative 5A,B | 25.3 | – | 1 | 1 | 8 | – | – |
| | Alternative 5A | 33.7 | – | 1 | | 3 | – | 1 |
| | Alternative 5B | 44.4 | – | 2 | | 4 | – | 2 |
| | Comparison Portion for Alternative 5C | 33.2 | – | – | – | 2 | – | – |
| | Alternative 5C | 26.1 | – | – | – | – | – | – |
| | Comparison Portion for Alternative 5D | 19.4 | – | – | – | 8 | – | – |
| | Alternative 5D | 17.5 | – | 2 | 6 | 18 | – | 5 |
| | Comparison Portion for Alternative 5E | 5.8 | – | – | – | 8 | – | – |
| | Alternative 5E | 5.3 | – | – | – | 2 | – | – |

**Table 3.23-7.** Noise Sensitive Areas within Construction Analysis Area of Proposed Route and Route Alternatives (continued)

| Segment Number | Proposed Route and Alternatives | Length (miles) | Number of NSAs and Distance from Centerline For General and Helicopter Construction (feet) | | | | Number of NSAs within Potential Blasting Vibration Architectural Damage Zone (131 feet) | Number of NSAs within Blasting Vibration Annoyance Zone (377 feet) |
|---|---|---|---|---|---|---|---|---|
| | | | 90 | 280 | 407 | 890 | | |
| 6 | Proposed – Total Length | 0.5 | – | – | – | – | – | – |
| 7 | Proposed – Total Length | 118.1 | – | 6 | 8 | 18 | – | 7 |
| | Proposed – Comparison Portion for Alternatives 7A,B | 35.2 | – | 1 | 1 | 3 | | 1 |
| | Alternative 7A | 38.0 | – | – | – | 2 | – | – |
| | Alternative 7B | 46.4 | – | 1 | 1 | 3 | – | 1 |
| | Proposed – Comparison Portion for Alternative 7C | 20.1 | – | | | | – | |
| | Alternative 7C | 20.3 | – | – | – | 2 | | |
| | Proposed – Comparison Portion for Alternative 7D | 6.2 | – | – | – | – | – | – |
| | Alternative 7D | 6.8 | – | – | – | – | – | – |
| | Proposed – Comparison Portion for Alternative 7E | 3.8 | | 1 | 1 | 6 | – | 1 |
| | Alternative 7E | 4.5 | – | 1 | 1 | 3 | – | 1 |
| | Proposed – Comparison Portion for Alternative 7F | 10.5 | – | 1 | 1 | 6 | – | 1 |
| | Alternative 7F | 10.8 | – | – | – | – | – | – |
| | Proposed – Comparison Portion for Alternative 7G | 3.1 | – | – | – | – | – | – |
| | Alternative 7G | 3.2 | – | 1 | 1 | 1 | – | 1 |
| | Proposed – Comparison Portion for Alternative 7H, I | 118.1 | – | 6 | 8 | 18 | – | 7 |
| | Alternative 7H | 127.5 | – | 1 | 3 | 5 | – | 2 |
| | Alternative 7I | 173.3 | – | 2 | 5 | 6 | – | 4 |
| | Proposed – Comparison Portion 7/9 for Alt. 7J[1/] | 143.9 | – | 7 | 9 | 20 | – | 8 |
| | Alternative 7J[1/] | 202.1 | – | 2 | 5 | 7 | – | 4 |
| 8 | Proposed – Total Length | 131.0 | – | 4 | 8 | 22 | – | 8 |
| | Proposed – Comparison Portion for Alternative 8A | 51.4 | – | 2 | 5 | 12 | – | 5 |
| | Alternative 8A | 53.6 | 2 | 6 | 19 | 40 | 2 | 17 |
| | Proposed – Comparison Portion for Alternative 8B | 45.3 | – | 1 | 2 | 9 | – | 2 |
| | Alternative 8B | 45.8 | 9 | 22 | 30 | 51 | 11 | 28 |
| | Alternative B-Comparison Portion for Alternative 8C | 6.5 | – | – | – | – | – | – |
| | Alternative 8C | 6.4 | – | – | – | 1 | – | – |
| | Proposed – Comparison Portion for Alternative 8D | 6.9 | – | – | – | – | – | – |
| | Alternative 8D | 8.1 | – | 1 | 1 | 1 | -- | 1 |
| | Proposed – Comparison Portion for Alternative 8E | 7.0 | – | – | – | – | – | – |
| | Alternative 8E | 18.5 | – | – | – | – | – | – |

**Table 3.23-7.** Noise Sensitive Areas within Construction Analysis Area of Proposed Route and Route Alternatives (continued)

| Segment Number | Proposed Route and Alternatives | Length (miles) | Number of NSAs and Distance from Centerline For General and Helicopter Construction (feet) | | | | Number of NSAs within Potential Blasting Vibration Architectural Damage Zone (131 feet) | Number of NSAs within Blasting Vibration Annoyance Zone (377 feet) |
|---|---|---|---|---|---|---|---|---|
| | | | 90 | 280 | 407 | 890 | | |
| 9 | Proposed – Total Length | 161.7 | 2 | 9 | 10 | 20 | 4 | 10 |
| | Proposed – Comparison Portion for Alternative 9A | 7.8 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Alternative 9A | 7.7 | – | – | 1 | 1 | – | 1 |
| | Proposed – Comparison Portion for Alternative 9B | 49.5 | – | – | – | – | – | – |
| | Alternative 9B | 53.2 | 1 | 1 | 1 | 5 | 1 | 1 |
| | Proposed – Comparison Portion for Alternative 9C | 14.7 | – | – | – | – | – | – |
| | Alternative 9C | 15.3 | 1 | 1 | 2 | 4 | 1 | 2 |
| | Proposed – Comparison Portion for Alternatives 9D, E, F, G, H | 57.2 | 1 | 6 | 7 | 9 | 3 | 7 |
| | Alternative 9D | 58.4 | – | – | – | – | – | – |
| | Alternative 9E | 68.7 | – | – | – | – | – | – |
| | Alternative 9F | 62.9 | – | 2 | 3 | 5 | 1 | 3 |
| | Alternative 9G | 56.4 | – | – | – | – | – | – |
| | Alternative 9H | 61.0 | – | 2 | 3 | 5 | 1 | 3 |
| 10 | Proposed – Total Length | 33.6 | 3 | 6 | 7 | 19 | 3 | 7 |

1/ Alternative 7J connects with Segment 9 approximately 25.8 miles west of the proposed Cedar Hill Substation, which is the western terminus of Segment 7 and the beginning point for Segment 9. The table above compares 7J (202 miles) with the corresponding portion of Segment 7/9 (118.1 miles of Segment 7 and 25.8 miles of Segment 9, for a total of 143.9 miles). All other Segment 7 alternatives are compared to Segment 7 of the Proposed Route (118.1 miles) only.

The number of potential NSAs at the various construction distance zones is very small. Noise impacts would range from none to a minor inconvenience, given the measures proposed by the Proponents and additional measures identified by the Agencies.

## Operations

The permanent noise sources associated with the Project consist of low-level noise due to transmission line corona effects and noise generated from electrical substations, as described in Section 3.23.5.2. Table 3.23-8 lists NSAs in the operation Analysis Area.

**Table 3.23-8.** Noise Sensitive Areas within Operation Analysis Area of Proposed Route and Route Alternatives

| Segment Number | Proposed Route and Alternatives | Length (miles) | NSAs from Centerline of 230-kV Single-Circuit ROW (20 Feet) | NSAs from Centerline of 500-kV Single-Circuit ROW (135 feet) | NSAs from Centerline of 500-kV Double Circuit ROW (225 feet) |
|---|---|---|---|---|---|
| 1E | Proposed – Total Length | 100.6 | – | – | – |
| | Comparison Portion for Alternative 1E-A | 17.6 | – | – | – |
| | Alternative 1E-A | 16.1 | – | – | – |
| | Comparison Portion for Alternative 1E-B | 37.9 | – | – | – |

**Table 3.23-8.** Noise Sensitive Areas within Operation Analysis Area of Proposed Route and Route Alternatives (continued)

| Segment Number | Proposed Route and Alternatives | Length (miles) | NSAs from Centerline of 230-kV Single-Circuit ROW (20 Feet) | NSAs from Centerline of 500-kV Single-Circuit ROW (135 feet) | NSAs from Centerline of 500-kV Double Circuit ROW (225 feet) |
|---|---|---|---|---|---|
| 1E (cont.) | Alternative 1E-B | 59.3 | – | – | – |
| | Comparison Portion for Alternative 1E-C | 75.4 | – | – | – |
| | Alternative 1E-C | 48.6 | – | – | – |
| 1W(a) | Proposed – Total Length | 76.5 | – | – | – |
| | Comparison Portion for Alternative 1W-A | 20.3 | – | – | – |
| | Alternative 1W-A | 16.2 | – | – | – |
| 1W(c) | Proposed – Total Length | 70.6 | – | – | – |
| 2 | Proposed – Total Length | 96.7 | – | – | – |
| | Proposed – Comparison Portion for Alternative 2A | 28.8 | – | – | – |
| | Alternative 2A | 28.4 | – | – | – |
| | Proposed – Comparison Portion for Alternative 2B | 7.0 | – | – | – |
| | Alternative 2B | 6.2 | – | – | – |
| | Proposed – Comparison Portion for Alternative 2C | 28.4 | – | – | – |
| | Alternative 2C | 24.4 | – | – | – |
| 3 | Proposed – Total Length | 46.6 | – | – | – |
| | Proposed, from Creston to Anticline Substation | 46.6 | – | – | – |
| | 230-kV Line between Anticline and Bridger Substations | 4.3 | – | – | – |
| | 345-kV Line between Anticline and Bridger Substations | 5.5 | – | – | – |
| 4 | Proposed – Total Length | 203.0 | – | – | 3 |
| | Comparison Portion for Alternative 4A, B,C, D,E | 90.2 | – | – | 1 |
| | Alternative 4A | 85.2 | – | – | – |
| | Alternative 4C | 100.2 | – | – | – |
| | Alternative 4D | 101.6 | – | – | – |
| | Alternative 4E | 100.8 | – | – | – |
| | Alternative 4F | 102.2 | – | – | – |
| 5 | Proposed – Total Length | 87.5 | – | – | – |
| | Comparison Portion for Alternative 5A,B | 25.3 | – | – | – |
| | Alternative 5A | 33.7 | – | – | – |
| | Alternative 5B | 44.4 | – | – | – |
| | Comparison Portion for Alternative 5C | 33.2 | – | – | – |
| | Alternative 5C | 26.1 | – | – | – |
| | Comparison Portion for Alternative 5D | 19.4 | – | – | – |
| | Alternative 5D | 17.5 | – | – | – |
| | Comparison Portion for Alternative 5E | 5.8 | – | – | – |
| | Alternative 5E | 5.3 | – | – | – |

**Table 3.23-8.** Noise Sensitive Areas within Operation Analysis Area of Proposed Action and Route Alternatives (continued)

| Segment Number | Proposed Action and Alternatives | Length (miles) | NSAs from Centerline of 230-kV Single-Circuit ROW (20 Feet) | NSAs from Centerline of 500-kV Single-Circuit ROW (135 feet) | NSAs from Centerline of 500-kV Double Circuit ROW (225 feet) |
|---|---|---|---|---|---|
| 6 | Proposed – Total Length | 0.5 | – | – | – |
| 7 | Proposed – Total Length | 118.1 | – | 1 | – |
| | Proposed – Comparison Portion for Alternatives 7A,B | 35.2 | – | – | – |
| | Alternative 7A | 38.0 | – | – | – |
| | Alternative 7B | 46.4 | – | – | – |
| | Proposed – Comparison Portion for Alternative 7C | 20.1 | – | – | – |
| | Alternative 7C | 20.3 | – | – | – |
| | Proposed- Comparison Portion for Alternative 7D | 6.2 | – | – | – |
| | Alternative 7D | 6.8 | – | – | – |
| | Proposed – Comparison Portion for Alternative 7E | 3.8 | – | – | – |
| | Alternative 7E | 4.5 | – | 1 | – |
| | Proposed – Comparison Portion for Alternative 7F | 10.5 | – | – | – |
| | Alternative 7F | 10.8 | – | – | – |
| | Proposed – Comparison Portion for Alternative 7G | 3.1 | – | – | – |
| | Alternative 7G | 3.2 | – | – | – |
| | Proposed – Comparison Portion for Alternative 7H, I | 118.1 | – | 1 | – |
| | Alternative 7H | 127.5 | – | – | – |
| | Alternative 7I | 173.3 | – | – | 1 |
| | Proposed – Comparison Portion 7/9 for Alt. 7J[1/] | 143.9 | – | 1 | |
| | Alternative 7J[1/] | 202.1 | – | – | – |
| 8 | Proposed – Total Length | 131.0 | – | – | – |
| | Proposed – Comparison Portion for Alternative 8A | 51.4 | – | – | – |
| | Alternative 8A | 53.6 | – | 2 | – |
| | Proposed – Comparison Portion for Alternative 8B | 45.3 | – | – | – |
| | Alternative 8B | 45.8 | – | 12 | – |
| | Alternative B –Comparison Portion for Alternative 8C | 6.5 | – | – | – |
| | Alternative 8C | 6.4 | – | – | – |
| | Proposed- Comparison Portion for Alternative 8D | 6.9 | – | – | – |
| | Alternative 8D | 8.1 | – | – | – |
| | Proposed – Comparison Portion for Alternative 8E | 7.0 | – | – | – |
| | Alternative 8E | 18.5 | – | – | – |
| 9 | Proposed – Total Length | 161.7 | – | 5 | – |
| | Proposed – Comparison Portion for Alternative 9A | 7.8 | – | 1 | – |
| | Alternative 9A | 7.7 | – | – | – |

**Table 3.23-8.** Noise Sensitive Areas within Operation Analysis Area of Proposed Action and Route Alternatives (continued)

| Segment Number | Proposed Action and Alternatives | Length (miles) | NSAs from Centerline of 230-kV Single-Circuit ROW (20 Feet) | NSAs from Centerline of 500-kV Single-Circuit ROW (135 feet) | NSAs from Centerline of 500-kV Double Circuit ROW (225 feet) |
|---|---|---|---|---|---|
| 9 (cont.) | Proposed – Comparison Portion for Alternative 9B | 49.5 | – | – | – |
| | Alternative 9B | 53.2 | – | 1 | – |
| | Proposed – Comparison Portion for Alternative 9C | 14.7 | – | – | – |
| | Alternative 9C | 15.3 | – | 1 | – |
| | Proposed – Comparison Portion for Alternative 9D, E, F, G, H | 57.2 | – | 3 | – |
| | Alternative 9D | 58.4 | – | – | – |
| | Alternative 9E | 68.7 | – | – | – |
| | Alternative 9F | 62.9 | – | 1 | – |
| | Alternative 9G | 56.4 | – | – | – |
| | Alternative 9H | 61.0 | – | 1 | – |
| 10 | Proposed – Total Length | 33.6 | – | 3 | – |

1/ Alternative 7J connects with Segment 9 approximately 25.8 miles west of the proposed Cedar Hill Substation, which is the western terminus of Segment 7 and the beginning point for Segment 9. The table above compares 7J (202 miles) with the corresponding portion of Segment 7/9 (118.1 miles of Segment 7 and 25.8 miles of Segment 9, for a total of 143.9 miles). All other Segment 7 alternatives are compared to Segment 7 of the Proposed Route (118.1 miles) only.

Noise levels from the eight substation expansions are expected to remain consistent (±3 dB) with existing present equipment noise emission levels. Three new substations are proposed for the Creston, Anticline, and Cedar Hill sites. Each would have circuit breakers, transformers, and other equipment common to substations.

The proposed Creston Substation would be located approximately 4 miles south of Wamsutter, Wyoming. Accompanying the substation itself, approximately 13 acres would be developed in an open undeveloped area with the closest NSA approximately 37 miles away. The proposed Anticline Substation would be located within proximity to the existing Jim Bridger Power Plant and substations. There are no NSAs within approximately 29 miles of the proposed station. No significant new noise would be created as a result of operations at this station. The proposed Cedar Hill Substation would be located approximately 20 miles southeast of Twin Falls, Idaho. An area of 45 acres would be developed for substation facilities. The closest NSA is approximately 1,400 feet from the proposed facility fence line. The critical distance corresponding to the USEPA 55 dBA $L_{dn}$ guideline is 330 feet from the substation fence line. There are no NSAs located within the critical distance identified for noise generated during substation operation.

### 3.23.2.4 Design Variation

A Design Variation is being considered that would consist of constructing two single-circuit lines in Segments 2 through 4 instead of a single double-circuit line (which is the design assessed above). The disturbance footprint of the two single-circuit towers is greater than that of the double-circuit tower, in part because the requested ROW would be wider, but also because helicopter-assisted construction could be implemented in these areas due to the lighter weight of the towers, which would require additional fly yards. The additional ROW space and the fly yards would cause additional temporary disturbance during construction. Across Segments 2, 3, and 4, the additional disturbance of the single-circuit tower alternative ranges from 25 to 30 percent greater than the comparable portions of the double-circuit tower disturbance under the proposed design. The two single circuits require more ground disturbance, but would be designed and constructed to the same standards as the Proposed Action.

The only disadvantage of this variation is an increase in the ROW width where the distance to NSAs from the edge of the ROW would be slightly reduced. This would be an insignificant change in terms of construction noise levels. The two single-circuit ROW configuration would also have a slightly reduced operations noise level.

#### 3.23.2.5 Structure Variation

The proposed guyed structure variation would add four guy wires about 140 feet long from a point about 100 feet up in each tower to four guy anchors spaced in a square around the tower (Appendix B, Figure B-6). This would not change the amount of disturbance during construction or operation appreciably. The conductors would be at about the same spacing and distance above ground on cross-arms approximately the same height as for the self-supporting lattice towers. Therefore, there is no appreciable difference in impact on noise from the use of this Structural Variation when compared to the use of self-supporting lattice towers.

#### 3.23.2.6 Schedule Variation

The Schedule Variation uses the two single-circuit design variation described above but extends construction over a longer timeframe. Initially only one of the eventual two single-circuit lines would be constructed with the second to be constructed at a later date. The Schedule Variation proposes that the first single-circuit transmission line in Segments 2, 3, and 4 would be built as soon as a ROW grant is issued, but that the second line would not begin construction until late 2018. This would mean nearly 2 years between the end of construction for the first line and beginning of construction for the second line. Any staging areas and fly yards that had been used for the first stage would have been revegetated after construction was complete and would have to be cleared again. There would be two sets of construction disturbances adding movement, noise, and dust to the area of construction in two instances in any given area.

In the short term, the interim overall impacts on NSAs would be reduced when compared to the Proposed Action and Design Variation due to the single smaller tower used and the greater distance to NSAs. However, in the future any short-term reduction in noise impacts would be lost with construction of the second line.

### 3.23.3 Mitigation Measures

The following mitigation measures identified by the Agencies are required on federally managed lands. The Agencies recommend that the Proponents incorporate the measure into their EPMs and apply them Project-wide.

NOISE-1 Provide notice by mail prior to construction to all sensitive receptors and residences within 300 feet of construction sites, staging areas, and access roads. The announcement will state specifically where and when construction will occur in the area.

The Proponents have accepted the following Agency-proposed mitigation measures:

NOISE-2 Identify and provide a public liaison person before and during construction to respond to concerns of neighboring receptors, including residents, about noise construction disturbance.

NOISE-3 Establish a toll-free telephone number for receiving questions or complaints during construction and develop procedures for responding to callers.

NOISE-4 Implement and maintain a noise complaint review process to deal with residents' or other potential queries and complaints as they arise. Such complaints would be logged and investigated on an individual basis to facilitate resolution of the issue of concern.