4.11 NOISE AND VIBRATION

This section provides a description of the existing ambient noise environment for the study area and describes applicable Federal, State, and local regulations (Section 4.11.1). Potential noise or vibration impacts associated with the project-related facilities, as described in Chapter 3.0, are considered in Section 4.11.2 and, if necessary, mitigation is proposed based on the anticipated level of significance. Section 4.11.3 concludes by describing significant residential impacts following the application of mitigation, if any.

4.11.1 Environmental Setting

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

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. Consequently, when assessing potential noise impacts, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 hertz (Hz) and above 5,000 Hz to imitate the human ear's decreased sensitivity to low and extremely high frequencies. This emulation of the human ear's frequency sensitivity is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA). Frequency A weighting follows an international standard method of frequency de-emphasis and is typically applied to community noise measurements. In practice, the specific sound level from a source is measured using a meter incorporating an electrical filter corresponding to the A-weighting curve. All noise levels reported are A-weighted unless otherwise stated.

Noise Exposure and Community Noise

Community noise varies continuously over a period of time with respect to the sound sources contributing to the community noise environment. Community noise is primarily the product of many distant noise sources that constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources such as traffic and atmospheric conditions. Community noise is constantly changing throughout the day due to short duration single event noise sources, such as aircraft flyovers, vehicle passbys, and sirens. These successive additions of sound to the community noise environment vary the community noise level from instant to instant. This requires the measurement of noise exposure over a period of time to legitimately characterize a community noise environment and evaluate cumulative noise impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below (Caltrans 1998):

- L_{eq}: the equivalent sound level is used to describe noise over a specified period of time, typically one hour, in terms of a single numerical value. The L_{eq} is the constant sound level which would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).
- L_{max}: the instantaneous maximum noise level for a specified period of time.
- L_{dn}: 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 ("penalizing" nighttime noises). Noise between 10:00 PM and 7:00 AM is weighted (penalized) by adding 10 dB to take into account the greater annoyance of nighttime noises. Similar to L_{dn}, Community Noise Equivalent Level (CNEL) adds a 5 dBA "penalty" for the evening hours between 7 PM and 10 PM in addition to a 10 dBA penalty between the hours of 10 PM and 7 AM

Effects of Noise on People

The effects of noise on people can be placed in 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. Workers in industrial settings can experience noise in the last category. A satisfactory method for measuring the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction does not exist. However, a wide variation in individual thresholds of annoyance does exist, and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted; i.e., the "ambient noise" level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise would be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships occur (Caltrans 1998):

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

These relationships occur in part because of the logarithmic nature of sound and the decibel system. The human ear perceives sound in a nonlinear 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 dB, the combined sound level would be 53 dB, not 100 dB. Because of this sound characteristic, if there are two noise emission sources, one producing a noise level greater than 9 dB than the other, the contribution of the quieter noise source is negligible and the sum of the noise sources is that of the louder noise source.

Noise Attenuation

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

The study area is characterized by an agricultural landscape and, therefore, soft surfaces are generally present throughout.

4.11.1.1 Regulatory Setting

This section presents federal, state, and local laws, plans, and regulations governing noise levels and allowable limits applicable to the projects.

Federal

Federal regulations establish noise limits for medium and heavy trucks (more than 4.5 tons, gross vehicle weight rating) under 40 Code of Federal Regulations (CFR), Part 205, Subpart B. The federal truck passby noise standard is 80 dB at 15 meters from the vehicle pathway centerline. These controls are implemented through regulatory controls on truck manufacturers. In addition to noise standards for individual vehicles, under regulations established by the U.S. Department of Transportation's Federal Highway Administration (FHA), noise abatement must be considered for certain federal or federally-funded projects. Abatement is an issue for new highways or significant modification of an existing freeway. The agency must determine if the project would create a substantial increase in noise or if the predicted noise levels approach or exceed the Noise Abatement Criteria.

State

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

The State of California General Plan Guidelines, published by the Governor's Office of Planning and Research (OPR) in 1998, also provides guidance for the acceptability of projects within specific CNEL/L_{dn} contours. The guidelines also present adjustment factors that may be used in order to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution. The County of Imperial has utilized the adjustment factors provided and has modified the state's Land Use Compatibility standards for the purpose of implementing the Noise Element of its General Plan. Table 4.11-1 summarizes the acceptable and unacceptable community noise exposure limits for various land use categories as currently defined by the State of California. These community noise exposure limits are also incorporated into the County of Imperial's General Plan, Noise Element.

Local

County of Imperial General Plan

The County of Imperial General Plan Noise Element identifies and defines existing and future environmental noise levels from sources of noise within or adjacent to the County of Imperial; establishes goals and objectives to address these impacts, and provides Implementation Programs to implement these goals and objectives. Table 4.11-2 summarizes the projects' consistency with the applicable General Plan noise policies. While this Environmental Impact Report (EIR) analyzes the projects' consistency with the General Plan pursuant to State California Environmental Quality Act (CEQA) Guidelines Section 15125(d), the Imperial County Board of Supervisors ultimately determines consistency with the General Plan.

Noise Impact Zones. A Noise Impact Zone is an area that is likely to be exposed to significant noise. The County of Imperial defines a Noise Impact Zone as an area which may be exposed to noise greater than 60 dB CNEL or 75 dB $L_{eq}(1)$.

TABLE 4.11-1. LAND USE COMPATIBILITY FOR COMMUNITY NOISE ENVIRONMENTS

Land Use Category	Community Noise Exposure – L_{dn} or CNEL (dBA)													
	50		55		60		65		70		75		80	
Residential														
Transient Lodging – Motel, Hotel														
Schools, Libraries, Churches, Hospitals, Nursing Homes														
Auditorium, Concert Hall, Amphitheaters														
Sports Arena, Outdoor Spectator Sports														
Playgrounds, Neighborhood Parks														
Golf Courses, Riding Stables, Water Recreation, Cemeteries														
Office Buildings, Business, Commercial and Professional														
Industrial, Manufacturing, Utilities, Agriculture														

	Normally Acceptable	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
	Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design.
	Normally Unacceptable	New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirement must be made and needed noise insulation features included in the design.
	Clearly Unacceptable	New construction or development generally should not be undertaken.

Source: OPR 1998; Imperial County General Plan 2008, as amended.

TABLE 4.11-2. PROJECT CONSISTENCY WITH APPLICABLE GENERAL PLAN NOISE POLICIES

General Plan Policies	Consistency with General Plan	Analysis
Acoustical Analysis of proposed projects. The County shall require the analysis of proposed discretionary projects, which may generate excessive noise, or which may be impacted by existing excessive noise levels.	Consistent	Under existing conditions, the ambient noise environment is characterized as relatively quiet with peak noise levels influenced by border patrol activities and agricultural operations. Eastern portions of the study area are also influenced by airport operations out of Calexico International Airport. Given that the projects are not characterized as a sensitive land use, project facilities would be unaffected by existing noise levels. The project facilities would be constructed within areas zoned for agricultural use with noise levels up to 70 dBA identified as normally acceptable. Project operations are expected to produce noise levels that would not exceed County standards and, hence impacts are expected to be less than significant. Although a formal noise study has not been completed for the projects, this EIR provides an analysis of the potential short- and long-term noise impacts of the projects. As discussed, short-term and long-term noise levels were found to be less than significant.
Noise/Land Use Compatibility. Where acoustical analysis of a proposed project is required, the County shall identify and evaluate potential noise/land use conflicts that could result from the implementation of the project. Projects which may result in noise levels that exceed the "Normally Acceptable" criteria of the Noise/Land Use Compatibility Guidelines shall include mitigation measures to eliminate or reduce the adverse noise impacts to an acceptable level.	Consistent	Noise levels associated with project operations are unlikely to exceed noise limits for the A-2, A-2-R, and A-3 zones. See Section 4.11.1.2 for additional discussion.
Interior Noise Environment. Where acoustical analysis of a proposed project is required, the County shall identify and evaluate projects to ensure compliance to the California (Title 24) interior noise standards and the additional requirements of this Element.	Consistent	As described under General Plan Noise Policy 1, short-term and long-term noise impacts would be minimized through the implementation of the prescribed mitigation. Noise levels associated with project operations would be unlikely to exceed noise limits for the A-2, A-2-R, and A-3 zones.
New Noise Generating projects. The County shall identify and evaluate projects which have the potential to generate noise in excess of the Property Line Noise Limits. An acoustical analysis must be submitted which demonstrates the project's compliance.	Consistent	As described under General Plan Noise Policy 1, short-term and long-term noise impacts would be minimized through the implementation of the prescribed mitigation. Noise levels associated with project operations would be unlikely to exceed noise limits for the A-2, A-2-R, and A-3 zones.

General Plan Policies	Consistency with General Plan	Analysis
Projects Which Generate Off-site Traffic Noise. The acoustical analysis shall identify and evaluate projects which will generate traffic and increase noise levels on off-site roadways. If the project site has the potential to cause a significant noise impact to sensitive receptors along those roadways, the acoustical analysis report shall consider noise reduction measures to reduce the impact to a level less than significant.	Consistent	As described in Chapter 3, the projects would involve a minimal number of operational related vehicle trips and therefore, is unlikely to produce any increase in traffic noise levels on local roadways.

Source: Imperial County General Plan, as amended through 2008.

The County of Imperial has established the following interior noise standards to be considered in acoustical analyses:

- The interior noise standard for detached single family dwellings shall be 45 dB CNEL; and
- The interior noise standard for schools, libraries, offices and other noise-sensitive areas where the occupancy is normally only in the day time, shall be 50 dB averaged over a one-hour period ($L_{eq}(1)$).

Construction Noise Standards

Construction noise, from a single piece of equipment or a combination of equipment, shall not exceed 75 dB L_{eq} when averaged over an eight (8) hour period, and measured at the nearest sensitive receptor. This standard assumes a construction period, relative to an individual receptor of days or weeks.

Construction equipment operation shall be limited to the hours of 7 AM to 7 PM, Monday through Friday, and 9 AM to 5 PM Saturday. No commercial construction operations are permitted on Sundays or holidays.

County of Imperial Noise Ordinance

Noise generating sources in Imperial County are regulated under the County of Imperial Codified Ordinances, Title 9, Division 7 (Noise Abatement and Control). Noise limits are established in Chapter 2 of this ordinance. Under Section 90702.00 of this rule, 70 dB is the normally acceptable limit for the Industrial, Manufacturing, Utilities, and Agricultural category of land use.

Imperial County Right-to-Farm Ordinance

In recognition of the role of agriculture in the county, the County of Imperial has adopted a “right-to-farm” ordinance (County of Imperial Codified Ordinances, Division 2, Title 6: Right to Farm). A “right-to-farm” ordinance creates a legal presumption that ongoing standard farming practices are not a nuisance to adjoining residences and requires a disclosure to land owners near agricultural land operations or areas zoned for agricultural purposes. The disclosure advises persons regarding potential discomfort and inconvenience that may occur from operating machinery as a result of conforming and accepted agricultural operations.

4.11.1.2 Existing Conditions

The predominant sources of noise in the study area include vehicular traffic on local roads and highways and agricultural operations; and to a lesser extent airport operations out of Calexico International Airport. Activities involving the use of heavy-duty equipment such as front-end loaders, forklifts, and diesel-

powered trucks are common noise sources typically associated with agricultural uses. Noise typically associated with agricultural operations, including the use of heavy-duty equipment, can reach maximum levels of approximately 85 dBA at 50 feet (Caltrans 1998). With the soft surfaces characterizing the agricultural landscape, these noise levels attenuate to ~60 dBA at distances over 800 feet. Based on field observations of the study area, the existing noise environment is generally influenced by the noise produced from the following sources:

- Vehicle traffic along major roadways including Anza Road, Brockman Road, Ferrell Road, Clark Road, Rockwood Road, Dogwood Road, and State Route (SR) 98;
- Flight operations out of Calexico International Airport;
- Crop dusting operations based out of Johnson Brothers Private Airstrip;
- Border patrol operations along the U.S./Mexico border; and
- Agricultural operations throughout the study area including the operation of heavy equipment and vehicles.

A formal noise study has not been prepared for the projects to characterize ambient noise levels within the study area. However, based on the availability of a previously prepared noise study in conjunction with a recently approved Imperial Solar Energy Center South Project (Imperial County 2011) adjacent and to the east of the study area, the proximity of the measurements, and timing in which the data was collected (2010), the previously-acquired noise measurements are considered to be representative of existing conditions and appropriate for use in this EIR. Further, based on the location of the sampling along Pulliam Road approximately 0.75 miles south of SR 98, which depicts the eastern perimeter of the study area (or Mount Signal Solar Farm 1 (MSSF1)), these noise measurements provide representative measurements for the quietest portions of the study area and farthest in proximity from Calexico International Airport and Johnson Brothers Private Airstrip. Based on this circumstance, these measures were used to characterize ambient noise conditions for MSSF1, Calexico Solar Farm 1 Phase A (CSF1(A)), Calexico Solar Farm 1 Phase B (CSF1(B)), Calexico Solar Farm 2 Phase A (CSF2(A)), Calexico Solar Farm 2 Phase B (CSF2(B)), and the off-site transmission line facilities (OTF)).

The ambient noise levels within the study area are generally representative of a rural agricultural setting with quiet ambient noise levels of 43.3 dBA L_{eq} and periodic peak noise levels of 66.8 L_{max} from far-field agricultural operations (Imperial County 2011). These noise levels were slightly more elevated in closer proximity to the U.S./Mexico border with the increase attributed to the infrequent movement of U.S. Border Patrol units with ambient noise levels of 44.2 dBA L_{eq} and periodic peak noise levels of 78.8 L_{max} (Imperial County 2011). In addition to site-specific ambient noise sampling, the EIR prepared for the Imperial Solar Energy Center South Project included traffic modeling of the local roadway network. The existing (2010) traffic noise levels in the eastern portion of the study area were established in terms of the CNEL metric by modeling the roadway for the current traffic and speed characteristics. In general, the 60 CNEL contour for all roadways within the study area, including SR 98, extends 70 feet or less from the roadway centerline (see Imperial Solar Energy Center South Final Environmental Impact Report/Environmental Assessment (EIR/EA), Section 3.8, page 3.8-9).

Sensitive Receptors

Although noise pollution can affect all segments of the population, certain groups and land uses are considered more sensitive to ambient noise levels than others, sensitivity being a function of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities involved. Children, the elderly, and the chronically or acutely ill are the most sensitive population groups. Mount Signal School is the closet sensitive land use and is located one-half mile north of the study area or CSF1(A).

Residential land uses are also generally more sensitive to noise than commercial and industrial land uses. Sensitive residential uses within 100 to 200 feet of the study area are shown on Figure 4.3-1, Residence Locations, include the following:

- MSSF1. Immediately north of Parcel 1 of SR 98 and within the site boundary at the intersection of Anza Road and a private access road within Parcel 2.
- CSF1(A). Adjacent to the northwest and northeastern corners of the site along SR 98.
- CSF1(B). Immediately south along Anza Road and within the site boundary Rockwood Road.
- CSF2(A). Adjacent to the northeast corner on SR 98, within the site boundary along SR 98, at the intersection of Hammers Road, and adjacent to the southwest corner along Anza Road within MSSF1, Parcel 2.
- CSF2(B). Adjacent to the northeast boundary along Ferrell Road and adjacent to the southwest boundary along SR 98.
- OTF. Corridor crosses residential site at the southwest corner along Anza Road within MSSF1, Parcel 2.

Groundborne Vibration

Groundborne vibration consists of rapidly fluctuating motions or waves, which are also measured in decibels. Construction activities, train operations, and street traffic are some of the most common external sources of vibration that can be perceptible inside structures. Differences in subsurface geologic conditions and distance from the source of vibration will result in different vibration levels characterized by different frequencies and intensities. In all cases, vibration amplitudes will decrease with increasing distance. High frequency vibrations reduce much more rapidly than low frequencies, so that low frequencies tend to dominate the spectrum at large distances from the source. Discontinuities in the soil strata can also cause diffractions or channeling effects that affect the propagation of vibration over long distances.

Human response to vibration is difficult to quantify. Vibration can be felt or heard well below the levels that produce any damage to structures. The duration of the event has an effect on human response, as does frequency. Generally, as the duration and vibration frequency increase, the potential for adverse human response increases. While people have varying sensitivities to vibrations at different frequencies, in general they are most sensitive to low-frequency vibration. Vibration in buildings may be perceived as motion of building surfaces or rattling of windows, items on shelves, and pictures hanging on walls. Vibration of building components can also take the form of an audible low-frequency rumbling noise, which is referred to as groundborne noise.

Groundborne noise is usually only a problem when the originating vibration spectrum is dominated by frequencies in the upper end of the range (60 to 200 Hz), or when the structure and the source of vibration are connected by foundations or utilities, such as sewer and water pipes. To assess a project's vibration impacts, Caltrans has prepared a publication concerning vibration impact assessment, entitled the "Transportation and Construction-Induced Vibration Guidance Manual," which was prepared in 2004. The guidance manual uses peak particle velocity (PPV) to quantify vibration amplitude. Peak particle velocity is defined as the maximum instantaneous peak of the vibratory motion (Caltrans 2004). Table 4.11-3 identifies acceptable vibration limits for transportation and construction projects based on guidelines prepared by Caltrans.

TABLE 4.11-3. TYPICAL GROUNDBORNE VIBRATION THRESHOLDS

Structure and Condition	Transient Sources PPV at 25 feet (in/sec)	Continuous/Frequent Intermittent Sources PPV at 25 feet (in/sec)
Extremely fragile historic buildings, ruins, and ancient monuments	0.12	0.08
Fragile buildings	0.20	0.10
New residential structures with gypsum board walls/ceilings	1.00	0.50
Modern Industrial/commercial buildings	2.00	0.50
Strongly perceptible	0.90	0.10

Source: Caltrans 2004.
Notes: PPV = Peak particle velocity
In/sec = Inches per second

4.11.2 Impacts and Mitigation Measures

The section presents an evaluation of the projects' impacts to the existing ambient noise environment, an assessment of any vibration-related impacts, and the associated criteria and methodology applied in determining project significance. Mitigation is presented, if required.

4.11.2.1 Thresholds of Significance

Based on CEQA Guidelines Appendix G, project-related noise and vibration impacts would be considered significant if any of the following occurs:

- Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Expose persons to or generate excessive groundborne vibration or groundborne noise levels;
- Create a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- Create a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels; or
- For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels.

4.11.2.2 Methodology

The significance of project-related noise impacts was determined by comparing estimated project-related noise levels, based on published literature, to existing noise levels within the study area as described in other recently-prepared environmental documents for other projects within or near the study area including the Imperial Solar Energy Center South EIR/EA (Imperial County 2011). For the purposes of analysis, an increase of at least 3 dBA is usually required before most people will perceive a change in noise levels, and an increase of 5 dBA is required before the change will be clearly noticeable. Based on the County's criteria, exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance would occur if:

(1) Post-project noise levels will be greater than the "conditionally acceptable," "normally acceptable," or "clearly acceptable" noise levels as shown in Table 4.11-3 for Industrial, Manufacturing, Utilities and Agriculture Uses (or generally greater than 70 dB); or

(2) Construction noise will be greater than 75 dB L_{eq} over an eight-hour period from the nearest sensitive receptor (see Figure 4.3-1).

Conceptual site plans provided in Figures 3.0-3 through 3.0-6 and 3.0-9 through 3.0-13 for the projects were used in considering distances from sensitive receptor locations. Given the agricultural landscape of the study area, noise attenuation was assumed to be 7.5 dBA for stationary sources and 4 dBA for line sources (e.g. vehicles). As provided in Chapter 3, Project Description, the projects would generate a low volume of daily vehicle trips under project operations and these trips would be distributed throughout the study area. Based on this circumstance and experience with projects of similar land use and development intensity, project-related increases traffic noise levels on off-site roadways were assumed to be less than 3.0 dBA as measured from residential receptor locations illustrated in Figure 4.3-1.

4.11.2.3 Impact Analysis

IMPACT 4.11-1	Temporary, Short-Term Exposure of Sensitive Receptors to Increased Equipment Noise from Project Construction. The projects could expose persons to or generate noise levels in excess of applicable County standards.

MSSF1, CSF1(A), CSF1(B), CSF2(A), CSF2(B), OTF-Private, OTF-BLM Lands

Construction of the projects would occur in rural portions of southern Imperial County. Over the entire span of the 4,228-acre study area, there are approximately 23 rural residences that would be located within 100 to 200 feet of project construction. Construction activities would generally involve grading, earth movement, stockpiling, steel work, and truck hauling. Similar activities would occur upon site decommissioning. These activities would generate temporary and intermittent noise at and near the conveyance pipeline alignment during the approximately 24-month construction schedule. Noise levels would fluctuate depending on the particular type, number, and duration of use of various pieces of construction equipment. In addition, construction-related material haul trips would raise ambient noise levels along haul routes depending on the number of haul trips and the types of vehicles used. These activities would be more pronounced at the operation and maintenance (O&M) and substation sites where construction activities would occur for an extended time period. Table 4.11-4 shows typical noise levels produced by various types of construction equipment at a distance of 50 feet.

In addition to actual solar array grid installation, staging areas would be located at various points throughout the study area and directed out of a more centralized location, such as the O&M sites (see Figure 3.0-3). These areas would be used to store PV panels, equipment, and other construction related material. In some cases, staging areas would be used for the duration of project construction. In other cases, the area would be moved to another location within the study area to minimize the hauling distances and avoid disrupting any one area for an extended period of time. Staging areas could be noticeable sources of noise, particularly if equipment is accessed and moved during evening hours when individuals are more sensitive to intrusive noise.

TABLE 4.11-4. TYPICAL NOISE LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment	Typical Noise Levels (dBA, at 50 feet)	Equipment	Typical Noise Levels (dBA, at 50 feet)
Front loaders	85	Forklifts	76-82
Backhoes, excavators	80-85	Pumps	76
Tractors, dozers	83-89	Generators	81
Graders, scrapers	85-89	Compressors	83
Trucks	88	Pneumatic tools	85
Concrete pumps, mixers	82-85	Jack hammers, rock drills	98
Cranes (movable)	83	Pavers	89
Cranes (derrick)	88	Compactors	82
Pipelayers	83-88	Drill rigs	70-85

Source: Adapted from U.S. Department of Transportation, Federal Transit Administration, Noise and Vibration Impact Assessment Guidelines 2006.

Based on the noise levels provided in Table 4.11-4 and assuming conservative rates of attenuation, noise levels generated during project construction could range from 74 to 79 dBA at the nearest receptor locations (e.g. 100 feet) depending on the types of equipment in operation. Additionally, back-up beepers (in order to be discernable and protect construction worker safety as required by Occupational Safety and Health Administration (OSHA) (29 CFR 1926.601 and 29 CFR 1926.602)) associated with trucks and equipment used for material loading and unloading at the staging areas would generate significantly increased noise levels over the ambient noise environment. The Noise Element of the Imperial County General Plan identifies sensitive receptors as areas of habitation and may also be non-human species (i.e., sensitive bird species). As shown, noise associated with construction equipment could exceed the 75 dB L_{eq} threshold identified in the County of Imperial Noise Element; thus the noise could disturb potential adjacent sensitive receptors (areas of habitation) per the requirements by the County of Imperial.

In addition and as discussed in Chapter 4.4 of this EIR, burrowing owls and other sensitive birds were observed within the study area. Chapter 4.4 provides a detailed discussion on the potential impacts to burrowing owls and other sensitive bird species (non-human sensitive receptor) and mitigation measures that will avoid, minimize, or mitigate potential impacts to these species.

Because existing daytime noise levels in the vicinity of the project construction are generally less than 50 to 60 dBA, daytime construction work associated with the projects would significantly affect the noise environment of residences in proximity to construction activities by increasing ambient noise levels by five dBA or more and peak noise levels of 84 to 89 dBA. While construction activities would occur when a majority of people are at work, retired persons, people who work at home, and people caring for their children in their homes could be significantly affected, although temporarily, by noise when construction activities are occurring in the immediate vicinity. This temporary and short-term impact is considered **significant**.

Mitigation Measure(s)

The following mitigation measure is required for MSSF1, CSF1(A), CSF1(B), CSF2(A), CSF2(B), OTF-Private, and OTF-BLM Lands.

4.11-1a Limit Construction Hours. Construction and decommissioning activities shall be limited to daylight hours between 7 AM and 7 PM Monday through Friday, and 9 AM and 5 PM on Saturday. No construction shall be allowed on Sundays or holidays.

4.11-1b Minimize Noise from Construction Equipment and Staging. Construction equipment noise shall be minimized during project construction and decommissioning by muffling and shielding intakes and exhaust on construction equipment (per the manufacturer's specifications) and by shrouding or shielding impact tools, where used. The project applicant's construction specifications shall also require that the contractor select staging areas as far as feasibly possible from sensitive receptors. All contractor specifications shall include a requirement that equipment located within 2,500 feet of noise-sensitive receptors shall be equipped with noise reducing engine housings or other noise reducing technology such that noise levels are no more 85 dBA at 50 feet. If necessary the line of sight between the equipment and nearby sensitive receptors shall be blocked by portable acoustic barriers and/or shields to reduce noise levels.

4.11-1c Maximize the Use of Noise Barriers. Construction and decommissioning contractors shall locate fixed construction equipment (such as compressors and generators) as far as possible from nearby residences. If feasible, noise barriers shall be used at the construction site and staging area. Temporary walls, stockpiles of excavated materials, or moveable sound barrier curtains would be appropriate in instances where construction noise would exceed 85 dBA and occur within less than 200 feet from a sensitive receptor. The final selection of noise barriers shall be subject to the project applicant's approval and shall provide a minimum 5 dBA reduction in construction noise levels, where noise levels would exceed 85 dBA without the barrier.

4.11-1d Prohibit Non-Essential Noise Sources During Construction. No amplified sources (e.g., stereo "boom boxes") shall be used in the vicinity of residences during project construction or decommissioning.

4.11-1e Provide a Mechanism for Filing Noise Complaints. The project applicant shall provide a mechanism for residents, businesses, and agencies to register complaints with the County if construction noise levels are overly intrusive or construction occurs outside the required hours.

Significance After Mitigation

Implementation of the above mitigation measures would reduce construction noise, so that construction and decommissioning-related noise levels would not exceed the Imperial County standards regarding construction noise. Mitigation would reduce temporary, short-term construction and decommissioning impacts-related impacts to a less than significant level.

IMPACT 4.11-2	Exposure to and/or Generation of Groundborne Vibration. The projects would not expose persons to or generate excessive groundborne vibration or groundborne noise levels.

MSSF1, CSF1(A), CSF1(B), CSF2(A), CSF2(B), OTF-Private, OTF-BLM Lands

Construction and site decommissioning activities associated with the projects would result in groundborne vibration, with the primary sources including solar array installation, grading activities, and other construction vehicle movements. In addressing the range of potential issues associated with ground vibration, there are generally two forms of impacts that should be addressed: (1) annoyance to individuals or the community; and (2) damage to buildings. Vibration from typical construction activities is typically below the threshold of perception when the activity is more than about 50 feet from the receiver. However, given that construction activities would not encroach within 100 feet of existing residential structures, the level of vibration impact at these receptors would be **less than significant**.

In relation to the potential for structural damage at adjacent residential and agricultural structures, PPV is the maximum instantaneous positive or negative peak of the vibration signal, measured as a distance per time (such as millimeters or inches per second). The PPV measurement has been used historically to evaluate shock-wave type vibrations from actions like blasting, pile driving, and mining activities, and their relationship to building damage.

As provided in Table 4.11-3, the level of potential impact resulting from project construction is generally contingent on the structural composition of the buildings potentially affected. As shown in Table 4.11-3, new residential structures with gypsum board walls/ceilings have a PPV threshold of 1.0 inches per second (in/sec), respectively and would be the types of structures most likely to be impacted by project construction activities. No historical structures are presented within or adjacent to the study area. Given that construction activities would employ the use of equipment similar to those identified in Table 4.11-5, would not involve the use of blasting, and would be situated 100 feet or more from existing structures, project construction is unlikely to generate vibration levels in excess of the thresholds identified in Table 4.11-3. For this reason, groundborne vibration-related impacts during construction and site decommissioning are expected to be **less than significant**.

TABLE 4.11-5. CONSTRUCTION EQUIPMENT VIBRATION LEVELS

Equipment PPV at 25 feet (in/sec)	Equipment PPV at 25 feet (in/sec)
Blasting	1.13
Vibratory roller	0.210
Large bulldozer	0.089
Caisson drilling	0.089
Loaded trucks	0.076
Jackhammer	0.035
Small bulldozer	0.003

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

Mitigation Measure(s)

No mitigation measures are required.

IMPACT 4.11-3	Permanent Increase in Ambient Noise Levels. The projects could create a substantial permanent increase in ambient noise levels in the vicinity of new O&M and substation facilities.

CSF1(A), OTF-Private

As described in Section 3.1.1.2, the ambient noise environment within the study area ranges from 42 to 45 dBA with peak noise measurements of up to 77 dBA (Imperial County 2011). The principle long-term, operational noise impacts resulting from the projects would include light duty vehicle traffic for security patrols, maintenance operations, including solar panel washing, central operations at O&M facilities, including stationary mechanical equipment (e.g., HVAC), and low level of noise from high voltage transmission lines and transformers. Additionally, based on measurements provided by the project applicant, noise levels associated with a tracker mounting system were measured at 45 dBA at 100 feet. The on-site water storage tanks would require associated pumping and would operate intermittently. The level of noise generated by these combined sources would depend on: characteristics of the noise source, number of noise sources clustered together, type and effectiveness of building enclosure, and operational characteristics. Based on the noisiest pieces of equipment expected to be present (i.e., pumps) and applying a noise attenuation rate of 4.5 dBA per doubling distance with the assumption of hard surfaces under the post-project conditions, the combined noise levels from the electrical, vehicle

traffic, pumping facilities and, if required on-site generator(s) at 100 feet could be expected to be greater than 70 dBA at 100 feet without mitigation.

Operation of the O&M facilities, substations, and electrical distribution facilities would result in a minor increase in the use of motor vehicles, primarily associated with employees traveling to and from these facilities and routine maintenance and inspection activities. It is expected that no more than 30 staff personnel would be on site at any one time for typical operation and maintenance of these facilities, most during typical working hours, 7 AM to 5 PM. Assuming an average of two trips per employee, operation of the proposed facilities would result in approximately 60 one-way daily employee trips. Additionally, these trips would be distributed through the roadway network. Due to the relatively low volume of project-generated traffic, operation of the proposed facilities would not result in noticeable changes in the traffic noise along area roadways in relation to existing and projected roadway traffic volumes. As a result, long-term increases in traffic noise levels would be **less than significant**.

The projects would be required to comply with the County of Imperial Codified Ordinances Division 7 Noise Abatement and Control. This ordinance governs fixed operational noise within the study area. The 1-hour average sound level limit for the A-2, A-2-R, and A-3 zones is 75 dBA and noise levels up to 70 dBA L_{dn} are identified as normally acceptable (see Table 4.11-1). As described above, the noise generated during these collective operations could exceed 70 dBA at certain times and, more importantly, could raise the ambient noise levels above noise standards contained in the County's Noise Ordinance. Based on the noise levels described above, noise levels generated by these combined activities in close proximity to existing residences, such as those located adjacent to the northwestern corner of CSF1(A)(see Figure 4.3-1), could increase ambient noise level by up to 10 dBA in limited circumstances. This would be a **significant** impact that would require mitigation.

MSSF1, CSF1(B), CSF2(A), CSF2(B), OTF-BLM Lands

Development of the project facilities at these site locations would entail the placement and operation of the same facilities as described above. However, unlike the above facility sites, these facilities would result in the placement of the O&M and substation facilities at distances of greater than 1,000 feet from the nearest residential receptor. Although portions of these sites are located in proximity to existing residences, the major noise generating operations for these site locations would be located a sufficient distance to where any increase in ambient noise levels would be unnoticeable at the nearest sensitive receptor. Based on these considerations, long term impacts to the ambient noise environment at these site locations would be **less than significant**.

Mitigation Measure(s)

The following mitigation measure is required for CSF1(A) and OTF-Private. No mitigation measures are required for MSSF1, CSF1(A), CSF1(B), CSF2(A), CSF2(B) and OTF-BLM Lands.

4.11-3 Implement Operational Noise Minimization Measures. The following mitigation measures shall be implemented for the design of the well, pump station(s), and storage tanks to ensure that operational noise levels at the property line do not exceed the County standards:

- Shielding and other specified measures as deemed appropriate and effective by the design engineer shall be incorporated into the design in order to comply with performance standards.
- Pumps located underground shall be shielded from nearby sensitive receptors.
- Project equipment shall be outfitted and maintained with noise-reduction devices such as equipment closures, fan silencers, mufflers, acoustical louvers, noise barriers, and acoustical panels to minimize operational noise.

- Particularly noisy equipment shall be located as far away as feasibly possible from nearby sensitive receptors.
- The orientation of acoustical exits shall always be facing away from nearby sensitive receptors.
- Buildings and landscaping shall be incorporated, where possible, to absorb or redirect noise away from nearby sensitive receptors.

Significance After Mitigation

Implementation of the above mitigation measures are expected to reduce potential impacts to levels at or below standards and would reduce the impacts to less than significant levels.

IMPACT 4.11-4	Airport Noise. The projects could result in the exposure of people residing or working in the study area to excessive noise levels from public and private airport operations.

MSSF1, CSF1(A), CSF1(B), CSFA(B), CSF2(B), OTF-Private, OTF-BLM Lands

The projects would not involve the construction of sensitive land uses. No O&M facilities would be constructed within two miles of a public airport and, therefore, would not expose people to excessive airport noise levels. The project facilities would be located within proximity to the Johnson Brothers private airstrip; however, based on the frequency and limited number of planes using this private facility, noise levels are considered **less than significant**.

Mitigation Measure(s)

No mitigation measures are required.

4.11.3 Residual Impacts

After implementation of feasible mitigation, construction and decommissioning noise impacts would be less than significant. The operational noise impacts associated with the projects in proximity to existing residential receptors would be mitigated to a less than significant level through the incorporation of buffering requirements for O&M, transformer facilities, and storage tank pumps. The projects are situated at a sufficient distance where the effects of construction related vibration would not impact adjacent receptors.

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