5.12 NOISE

Noise is generally defined as a loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity and that interferes with or disrupts normal activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise; the perceived importance of the noise, and its appropriateness in the setting; the time of day and the type of activity during which the noise occurs; and the sensitivity of the individual.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Sound is generally characterized by several variables, including frequency and intensity. Frequency describes the pitch of the sound and is measured in Hertz (Hz), while intensity describes the sound's loudness and is measured in decibels (dB). Decibels are measured using a logarithmic scale. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above approximately 110 dB begin to be felt inside the human ear as discomfort and eventually pain at 120 dB and higher levels. The minimum change in the sound level of individual events that an average human ear can detect is about 1 to 2 dB. A 3 to 5 dB change is readily perceived. A change in sound level of about 10 dB is usually perceived by the average person as a doubling or a halving of the sound's loudness.

Due to the logarithmic nature of the dB unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically; however, some simple rules are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example: 60 dB + 60 dB = 63 dB, and 80 dB + 80 dB = 83 dB.

Sound level is usually expressed by reference to a known standard. This report refers to sound pressure level. In expressing sound pressure on a logarithmic scale, the sound pressure is compared to a reference value of 20 micropascals. Sound pressure level depends not only on the power of the source, but also on the distance from the source and on the acoustical characteristics of the space surrounding the source.

Hz is a measure of how many times each second the crest of a sound pressure wave passes a fixed point. For example, when a drummer beats a drum, the skin of the drum vibrates a number of times per second. When the drum skin vibrates 100 times per second it generates a sound pressure wave that is oscillating at 100 Hz, and this pressure oscillation is perceived by the ear/brain as a tonal pitch of 100 Hz. Sound frequencies between 20 and 20,000 Hz are within the range of sensitivity of the best human ear.

Sound from a tuning fork contains a single frequency (a pure tone), but most sounds one hears in the environment do not consist of a single frequency but rather a broad band of frequencies differing in sound level. The method commonly used to quantify environmental sounds consists of evaluating all frequencies of a sound according to a weighting system that reflects that human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This is called "A weighting," and the dB level measured is called the A-weighted decibel (dBA). In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve.

Although the dBA may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a mixture of noise from distant sources that creates a relatively steady background noise in which no particular source is identifiable. A single descriptor called the equivalent sound level (L_{eq}) may be used to describe sound that is changing in the level. L_{eq} is the energy-mean dBA during a measured time interval. It is the "equivalent" constant sound level that would have to be produced by a given source to equal the acoustic energy contained in the fluctuating sound level measured. In addition to the energy-average level, it is often desirable to know the acoustic range of the noise source being measured. This is accomplished through the maximum L_{eq} (L_{max}) and minimum L_{eq} (L_{min}) indicators that represent the root-mean-square maximum and minimum noise levels measured during the monitoring interval. The L_{min} value obtained for a particular monitoring location is often called the acoustic floor for that location.

To describe time-varying character of environmental noise, the statistical noise descriptors L_{10}, L_{50}, and L_{90} are commonly used. They are the noise levels equaled or exceeded by 10 percent, 50 percent, and 90 percent of the measured time interval. Sound levels associated with the L_{10} typically describe transient or short-term events, half of the sounds during the measurement interval are softer than L_{50} and half are louder, while levels associated with L_{90} often describe background noise conditions and/or continuous, steady-state sound sources.

Finally, another sound measure known as the community noise equivalent level (CNEL) is defined as the A-weighted average sound level for a 24-hour day. It is calculated by adding a 5 dB penalty to sound levels during the evening period (1900 to 2200) and a 10 dB penalty to sound levels during the night period (2200 to 0700) to compensate for the increased sensitivity to noise during the quieter evening and nighttime hours. The day/night average sound level (L_{dn}) also represents the average sound level for a 24-hour day and is calculated by adding a 10 dB penalty only to sound levels during the night period. The CNEL and L_{dn} are typically used to define acceptable land use compatibility with respect to noise. Because of the time-of-day penalties associated with the CNEL and L_{dn} descriptors, the L_{eq} for a continuously operating sound source during a 24-hour period will be numerically less. Thus, for a power plant operating continuously for periods of 24 hours, the L_{eq} will be 6 dB lower than the L_{dn} value and 7 dB lower than the CNEL value.

But, for a facility that only operates during daytime hours, with evening and nighttime background sound levels being significantly quieter, L_{eq} can closely approach the corresponding L_{dn} and CNEL values over the same 24-hour period. Sound levels of typical noise sources and environments are provided in Table 5.12-1, Sound Levels of Typical Noise Sources and Noise Environments, to provide a frame of reference.

Table 5.12-1
Sound Levels of Typical Noise Sources and Noise Environments

Noise Source (at a given distance)	Scale of A-Weighted Sound Level in Decibels	Noise Environment	Human Judgment of Noise Loudness
Military jet take-off with after-burner (50 feet), civil-defense siren (100 feet)	140, 130	Aircraft carrier flight deck	
Commercial jet take-off (200 feet)	120	Thunderclap	Threshold of pain 32 times as loud[1]
Pile driver (50 feet)	110	Rock music concert	Average human ear discomfort 16 times as loud[1]
Ambulance siren (100 feet), newspaper press (5 feet), power lawn mower (3 feet)	100		Very loud 8 times as loud[1]
Motorcycle (25 feet), propeller plane flyover (1,000 feet), diesel truck, 40 miles per hour (50 feet)	90	Boiler room printing press plant	Likely damage, 8-hour exposure 4 times as loud[1]
Garbage disposal (3 feet)	80		Possible damage, 8-hour exposure 2 times as loud[1]
Passenger car, 65 miles per hour (25 feet), vacuum cleaner (10 feet)	70	Data processing center, department store	Reference loudness moderately loud[1]
Normal conversation (5 feet), air conditioning unit (100 feet)	60	Private business office, restaurant	1/2 as loud[1]
Light traffic (100 feet)	50	Lower limit of daytime urban ambient sound	1/4 as loud[1]
Bird calls (distant)	40	Quiet urban nighttime	1/8 as loud[1]
Soft whisper (5 feet)	30	Recording studio, library	Very quiet 1/16 as loud[1]
	20	Whistling, rustling leaves	Just audible 1/32 as loud[1]
	10	Breathing	Barely audible 1/64 as loud
	0		Threshold of hearing 1/128 as loud[1]

Source: URS Corporation, 2007.
Note:
[1]Relative to a reference loudness of 70 decibels.

5.12.1 Affected Environment

In accordance with California Energy Commission (CEC) regulations, this section describes the existing noise environment on-site and within a 2-mile-radius of the SES Solar Two, LLC (Solar Two or Applicant), Project and ancillary facilities (Project). Noise-sensitive receivers that may be affected are identified, as well as the laws, ordinances, regulations, and standards (LORS) that regulate noise levels at those receivers and along Project property boundaries (a.k.a., property lines).

5.12.1.1 Project Site

The Solar Two Project is located in Imperial County in southeastern California, approximately 100 miles east of San Diego and 14 miles west of El Centro, California. Nearby communities include Ocotillo and Coyote Wells. The major noise-producing Project components are located within an approximate 6,500-acre project area (as shown in Figure 5.12-1, Noise Survey Locations). The elevation of the area is relatively flat with some areas of varying topography (see Section 3.0, Project Description and Location, for more details on topography). Just south of the Main Services Complex, an approximate 11-acre construction laydown area will be built that includes three SunCatcher assembly buildings. In addition, a 100-acre laydown area will be sited just east of Dunaway Road. The United States Gypsum Corporation's Plaster City Gypsum Wallboard Manufacturing Facility (USG) is located on Evan Hewes Highway approximately 3 miles west of the intersection of Dunaway Road and Evan Hewes Highway.

Some land uses are considered sensitive to noise. Based on CEC guidelines, residences, hospitals, libraries, schools, places of worship, or other facilities where quiet is an important attribute of the environment are considered to be noise-sensitive land uses. The community of Ocotillo is approximately 4 miles west of the western border of the Project Site. The town of El Centro is approximately 14 miles east of the eastern border of the site.

Trailer residences are located as close as approximately 3,200 feet north-west of the northwestern corner of the Project property line along Painted Gorge Road. These trailers, estimated to number as many as 30, are arranged in clusters of various sizes and are located behind a tall ridge that totally occludes sight lines between these residences and the Project. The trailers are individual noise-sensitive receivers; however, given that the clusters share the commonality of distance to the Project, each cluster is modeled as one receiver in the prediction model. Five single-family residences and two trailers are located 1.2 miles to the west of the western Project boundary. The closest residential development to the east of the Project Site, Imperial Lakes, is approximately 10,400 feet from the easternmost corner of the Project boundary at 2828 Evan Hewes Highway. This gated community is estimated to have up to 25 homes within it. These residences are surrounded by a grove of trees but otherwise have a direct line of sight to the Project area. The land north and west of the Project and the USG plant, immediately adjacent to the Project, is barren and often used as a recreation area by off-road driving enthusiasts.

5.12.1.2 Transmission Line

The proposed 230-kilovolt (kV) interconnection transmission line will originate at a future on-site Project substation within the boundaries of the Project Site, approximately 5,085 feet north of I-8, and will extend (in parallel with an existing transmission line right-of-way) approximately 10.30 miles southeast to the existing San Diego Gas & Electric (SDG&E) Imperial Valley Substation. The land is relatively flat with little fluctuations in topography and is covered by native vegetation. As a result of the flat topography, there is an unobstructed line of sight from this existing substation to the Project Site. An unpaved service road accessible by Dunaway Road (I-8 exit number 101) provides access to the existing SDG&E transmission line and substation. One single-family residence is located approximately 4,000 feet north of this existing substation. No other developments are known to exist in the vicinity (i.e., within a 1-mile radial distance) of this existing transmission line and substation.

5.12.1.3 Water Supply Pipeline

A 6-inch-diameter water supply pipeline that is approximately 7.17 miles long will be constructed from the Imperial Irrigation District Westside Main Canal to the Project Site. The planned pipeline run is approximately 1,000 feet south of Evan Hewes Highway. Eight single-family and six trailer homes (totaling 14 residential-type structures, assuming each trailer is one residence) are located on Evan Hewes Highway within approximately 1,500 feet of the termination of the water supply pipeline. There is an unobstructed line-of-sight from the pipeline termination point to the solar field.

5.12.1.4 Ambient Noise Measurements

A series of long- and short-term sound level measurements were conducted during two Project Site surveys (from 29 to 31 January and 5 to 6 February 2008) to characterize the existing noise environment near the Project. The measurement locations ML1 through ML5 include the short- and long-term measurements in proximity of the Project. ML6 includes measurements conducted at the eastern terminus of the Water Pipeline. ML7 through ML9 indicate the measurements along the proposed transmission line right-of-way and near the existing substation.

All sound level meters were equipped with windscreens and set for slow time-response and usage of the dBA scale. The instruments were field-calibrated before and after each measurement period with acoustic calibrators. All sound level measurements conducted by URS were in accordance with the International Standards Organization (1996a, 1996b, 1996c).

During both survey periods, weather conditions were mild with clear skies and no precipitation. The measured air temperature readings ranged from 52 to 76 degrees Fahrenheit, with 27 to 60 percent relative humidity. Winds were intermittent and gusty with averages ranging from 0 to 11 miles per hour.

The short-term measurements were conducted with a Larson Davis Model 820 American National Standards Institute Type 1 Sound Level Meter (serial number 1324). The meter was mounted on a tripod roughly 5 feet above the ground to simulate the average height of the human ear above grade. Measurement intervals that included intermittent noise sources considered abnormal or non-indicative of accurate background activity were omitted from analysis. Table 5.12-2, Short-Term Noise Measurement Data Summary, summarizes the results from the short-term measurements taken at the indicated ambient measurement locations.

Table 5.12-2
Short-Term Noise Measurement Data Summary

Site ID	Measurement Location	Measurement Period			25-hour Measurement Results (dBA)				
		Start Time	End Time	Duration (hh:mm)	L_{eq}	L_{10}	L_{50}	L_{90}	CNEL
ML2	Northwest corner of solar field, Project boundary	1540	1605	00:25	67	69	39	30	78
		0425	0445	00:20	46	48	42	36	
ML3	Southwest property line, USG Plaster City Plant	1635	1700	00:25	50	57	42	36	*55*
		0455	0505	00:10	48	52	47	44	
ML4	Dunaway Road, eastern boundary of solar field	1440	1505	00:25	57	63	50	43	*62*
		0525	0535	00:10	55	60	52	45	
ML6	Water pipeline terminus	1735	1750	00:15	44	50	42	38	*55*
		0645	0700	00:15	49	53	47	43	
ML7	Transmission line along substation service road	1300	1315	00:15	44	50	38	35	51
ML8	SDG&E Imperial Valley Substation	1210	1230	00:20	55	61	45	43	62
		0600	0615	00:15	52	55	51	48	

Source: URS Corporation, 2008.

Notes:

CNEL = Community Noise Equivalent Level
dBA = A-weighted decibel
hh = hours
ID = identification
L_{10} = noise level equal to or exceeds 10 percent
L_{50} = noise level equal to or exceeds 50 percent
L_{90} = noise level equal to or exceeds 90 percent
L_{eq} = equivalent sound level
mm = minutes
SDG&E = San Diego Gas & Electric
USG = United States Gypsum Corporation

The long-term measurements were conducted using three Larson Davis American National Standards Institute Type 2 integrating sound level meters: two Model 720 meters (serial numbers 0395 and 0436) and one Model 712 meter (serial number 0418). With only the microphones and windscreens exposed to the outdoor environment, the meters were placed in a locked, weather-resistant case. The long-term measurements consisted of consecutive 15 minute averages in excess of 25 hours. The instruments were checked for calibration and adjusted as needed in the field before and after each measurement period with acoustic calibrators (CAL 150B serial number 2233 and CAL 150 serial number 0377). Table 5.12-3, Long-Term Noise Measurement Data Summary, summarizes the results from the synchronous long-term measurements taken at the indicated ambient measurement locations.

Table 5.12-3
Long-Term Noise Measurement Data Summary

Site ID	Measurement Location	Measurement Period			25-hour Measurement Results (dBA)				
		Start Date	Start Time	Duration (hh:mm)	L_{eq}	L_{10}	L_{50}	L_{90}	CNEL (from L_{eq})
ML1	426 Evan Hewes Highway	5 February 2008	1600	25:00	48	49	38	35	51
ML2	Northwest corner of solar field property line	29 January 2008	1000	25:00	69	78	63	36	78
ML5	Imperial Lakes property	5 February 2008	1300	25:00	55	60	40	36	60
ML8	SDG&E Imperial Valley Substation (northeast property line)	29 January 2008	1200	25:00	57	65	47	42	62
ML9	Residence 1 (Libert Road and Mandrapa Road)	30 January 2008	1600	25:00	55	58	50	49	60

Source: URS Corporation, 2008.

Notes:

Data was truncated in the beginning and end of the measurement periods to adhere to the required survey period and eliminate noise generated by noise personnel during equipment handling.

CNEL = Community Noise Equivalent Level
dBA = A-weighted decibel
hh = hours
ID = identification
L_{10} = noise level equal to or exceeds 10 percent
L_{50} = noise level equal to or exceeds 50 percent
L_{90} = noise level equal to or exceeds 90 percent
L_{eq} = equivalent sound level
mm = minutes
SDG&E = San Diego Gas & Electric

Project Site

ML1

This measurement location was in the yard of 426 Evan Hewes Highway with the permission of the homeowner. There was no defined fence or any other property line indicator. The meter was approximately 100 feet from this stationary single-family residence. This residence stands, approximately, at a distance of 1,600 feet from the entrance into the private driveway from Evan Hewes Highway. Measurement setup is shown in photos 1 through 3 of Appendix CC, Noise Measurements.

Only an unattended long-term measurement was conducted at this location. Noise sources witnessed while setting up the sound monitor included military jet noise, helicopters, distant road noise (Evan Hewes Highway), household activity, and vehicle operation associated with arriving at and departing from the residence. The long-term measurement was taken from 1500 on 5 February to 1600 on 6 February 2008 and is summarized in Table 5.12-3, Long-Term Noise Measurement Data Summary. The CNEL for this period was 51.

ML2

This measurement location was on the northwestern border of the Solar Field as indicated by the proposed site plans that were current as of the measurement date. Short-term, daytime and nighttime, and long-term measurements were conducted at this location. The meter was approximately 4.3 miles east of the intersection of Evan Hewes Highway and Imperial Highway, 230 feet south of Evans Hewes Highway, and 41 feet south of an inactive rail line. Measurement setup is shown in photos 4 through 6 of Appendix CC, Noise Measurements.

The daytime short-term measurement was conducted between 1540 and 1605 on 29 January 2008. Daytime noise sources included wind gusts, wind-induced vegetation noise, bird vocalization, commercial and unidentifiable jet planes (distant and close), propeller-driven aircraft, helicopters, and distant traffic noise contribution from I-8. The nighttime short-term measurement was conducted between 0425 and 0445 on 30 January 2008. The nighttime noise sources include light wind noise, a faint tone coming from the direction of the USG facility, and an automobile passing on Evan Hewes Highway. The daytime and the nighttime L_{eq} levels are shown in Table 5.12-2, Short-Term Noise Measurement Data Summary. The long-term measurement was taken from 1000 29 January to 1100 on 30 January 2008 and is summarized in Table 5.12-3, Long-Term Noise Measurement Data Summary. The calculated CNEL for this time period is 78. Noise sources for the long-term measurements are consistent with the short term.

ML3

This measurement location was at the fence line near the southwestern corner of the USG Plaster City facility. Short-term daytime and nighttime measurements were conducted at this location, approximately 0.5 mile and 2,100 feet south of Evan Hewes Highway and the inactive rail line, respectively. Measurement setup is shown in photos 7 through 10 of Appendix CC, Noise Measurements.

The daytime short-term measurement was conducted between 1635 and 1700 on 29 January 2008. Daytime noise sources included wind gusts; wind-induced brush noise; bird vocalization; commercial, military, and unidentifiable jet planes (distant and close); propeller planes; and helicopters. Additional steady noise sources included distant traffic noise contribution from I-8 and the operational noise coming from the USG facility. The nighttime short-term measurement was conducted between 0455 and 0505 on 30 January 2008. The nighttime noise was dominated by wind noise but included traffic noise from I-8. An additional steady noise source was an unidentifiable, localized “hollow” noise coming from the direction of, but was distinctly and audibly different from, traffic noise. The daytime and the nighttime L_{eq} levels are shown in Table 5.12-2, Short-Term Noise Measurement Data Summary. Assuming conditions consistent to the short-term measurement periods, the calculated CNEL is 55.

ML4

This measurement location was near the eastern boundary of the Solar Field. Measurements were conducted at this location, approximately 3,700 feet south of Evan Hewes Highway and 48 feet west of Dunaway Road. Measurement setup is shown in photos 11 through 14 of Appendix CC, Noise Measurements.

Short-term daytime and nighttime measurements were conducted at this location. The daytime short-term measurement was conducted between 1440 and 1505 on 29 January 2008. Daytime noise sources included bird and insect vocalization, traffic noise from Dunaway Road; and commercial, military, and unidentifiable jet planes (distant and close). The nighttime short-term measurement was conducted between 0525 and 0535 on 30 January 2008. The nighttime noise was dominated by wind noise, but included wind-induced sound through vegetation and noise from vehicles traveling on Dunaway Road and I-8. A consistent squeaking noise, similar to a squeaky hinge and assumed to be associated with wildlife (e.g., rodents), was coming from an unidentifiable source in the direction of the Project. The daytime L_{eq} levels are shown in Table 5.12-2, Short-Term Noise Measurement Data Summary. Assuming conditions consistent to the short-term measurement periods, the calculated CNEL is 62.

ML5

This measurement location was on the western property line of the Imperial Lakes residence community at 2828 Even Hewes Highway. A long-term measurement was conducted approximately 2,650 feet east of Dunaway Road and 142 feet north of Evan Hewes Highway. The long-term measurement was conducted, unattended, from 1300 on 5 February to 1100 on 7 February 2008 and is summarized in Table 5.12-3, Long-Term Noise Measurement Data Summary. Noise sources witnessed while setting up the sound monitor included noise from a quarry approximately 2,500 feet north of the measurement position, road noise from Evan Hewes Highway, and noise from various types of aircraft. The aircraft noise experienced at this measurement location is typical to that of other noted events of this noise survey. The CNEL for this period was 60. Measurement setup is in photos 15 through 17 of Appendix CC, Noise Measurements.

Water Supply Pipeline

ML6

This measurement location was in an open area, approximately 528 feet and 74 feet south of Evan Hewes Highway and the inactive railroad tracks, respectively; as well as 15 feet west of the Fern Canal. This location was selected to provide representative existing sound levels of the terminus of the water pipeline that will serve the Project. Direct lines of sight are present between this measurement position and both Evan Hewes Highway and I-8. Measurement setup is illustrated in photos 18 and 19 of Appendix CC, Noise Measurements.

Short-term daytime and nighttime measurements were conducted at this location. The daytime short-term measurement was conducted between 1735 and 1750 on 29 January 2008. Daytime noise sources included bird and insect vocalization, traffic noise from Evan Hewes Highway and I-8, a propeller-driven airplane, and two helicopters. The nighttime short-term measurement was conducted between 0645 and 0659 on 30 January 2008. The nighttime noise was dominated by wind noise but included wind-induced vegetation noise, noise from vehicles traveling on I-8, a jet aircraft, and both avian and ruminant vocalizations. The daytime and the nighttime L_{eq}s are shown in Table 5.12-2, Short-Term Noise Measurement Data Summary. Assuming conditions consistent to the short-term measurement periods, the calculated CNEL is 55.

Transmission Line

ML7

This measurement location was under the existing transmission line 4 miles north of the Imperial Valley Sub Station and 4 miles south of I-8. This location was selected to provide representative existing sound levels of the transmission line alignment. Measurement setup is shown in photos 20 and 21 of Appendix CC, Noise Measurements.

A short-term daytime measurement was conducted at this location between 1300 and 1315 on 29 January 2008. Noise sources included the steady crackle from the power transmission lines but also included operational noise from a blimp, large propeller-driven airplanes, and jet aircraft (distant and close). The air activities were the dominant noise sources when present. The daytime L_{eq} is shown in Table 5.12-2, Short-Term Noise Measurement Data Summary. Assuming conditions consistent to this daytime short-term measurement period, the calculated CNEL is 51.

ML8

This measurement location was near the northeastern fence line of the SDG&E substation. Placement of the meter was 13 feet east and 12 feet south of the fence corner. The substation is approximately 8 miles south of I-8. Measurement setup is shown in photos 22 and 23 of Appendix CC, Noise Measurements.

Daytime and nighttime short-term measurements and long-term sound monitoring were conducted at this location. The daytime short-term measurement was conducted between 1210 and 1230 on 29 January 2008. Daytime noise sources included distant and close commercial and military airborne jet aircraft activity. The nighttime short-term measurement was conducted between 0600 and 0615 on 30 January 2008. The nighttime noise sources included dominant wind noise, wind-induced vegetation noise, wind noise resulting from what appears to be turbulent wind diffraction around the transformers, and the consistent operational hum from the substation. The daytime and the nighttime L_{eq} levels are shown in Table 5.12-2, Short-Term Noise Measurement Data Summary. The long-term measurement was taken from 1200 on 29 January to 1300 on 30 January 2008 and is summarized in Table 5.12-3, Long-Term Noise Measurement Data Summary. Noise sources for the long-term measurements are consistent with the short term. The CNEL for this location is 62.

ML9

This measurement location represents sound levels at the residence 1 mile north of the existing substation. The meter was positioned 43 feet east of the residence fence line, adjacent to the Fern Canal, and 80 feet north of the Western Main water channel. Measurement setup is shown in photos 24 through 26 of Appendix CC, Noise Measurements.

An unattended long-term measurement was conducted at this location. Noise sources witnessed while setting up the sound monitor included the consistent voltage-related hum from the overhead power lines, commercial and military aircraft flights, dogs barking, birds vocalizing, wind noise, and the dominant water flow noise from the Fern Canal. The long-term measurement was taken from 1600 on 30 January 2008 to 1700 on 31 January 2008 and is summarized in Table 5.12-3, Long-Term Noise Measurement Data Summary. The CNEL for this location is 60.

5.12.2 Environmental Consequences

Noise will be produced at the Project Site during its construction and operation. Potential noise effects from both categories of activity will be assessed in this section. Federal, state, and local LORS that apply to the Project are included in Section 5.12.5, LORS Compliance. These include the noise elements and noise ordinances of the County to determine the significance of Project-generated increases in noise levels. Based on State of California and Imperial County guidelines, environmental consequences of the Project would be considered significant if they fall in any of the categories noted below.

- Noise from Project construction exceeds 75 dBA L_{eq} hourly sound level at a noise-sensitive land use.
- Noise from Project operations exceeds 75 dBA L_{eq} hourly sound level at Project boundary.
- Noise from Project construction takes place between 1900 and 0700 Monday through Friday, 1700 and 0900 on Saturday, or at anytime on Sunday.
- Noise from Project operations exceeds 50 dBA L_{eq} hourly sound levels at a noise-sensitive land use between 0700 and 2200.
- Noise from Project operations exceeds 45 dBA L_{eq} hourly sound levels at a noise-sensitive land use between 2200 and 0:00.
- Noise from Project operations exceeds 60 dBA CNEL at a noise-sensitive land use.
- Noise from Project operations increases the existing noise level at a noise-sensitive land use by 5 dBA CNEL.
- Based on CEC guidelines, if noise from the Project increases the existing background noise level by 5 dBA or more, an effect may result.

5.12.2.1 Construction Noise

The construction schedule of the Project will take place in two phases over a period of 40 months between the hours of 0700 and 1900 Monday through Friday, and 0900 and 1700 on Saturday. During construction activities, a varying number of construction equipment and personnel will occupy the Project area and result in varying levels of construction noise. The Project will utilize conventional construction techniques and equipment, including excavators, bulldozers, heavy trucks (e.g., water truck, dump truck), and similar heavy construction equipment. A limited amount of specialized construction using trenchers and cranes may also be needed.

Phase I includes construction of up to 12,000 SunCatchers, a Main Service Complex, arterial and Solar Field access roads, a double-circuit transmission line from the Solar Two Project Substation to SDG&E Imperial Valley Substation, and an underground power collection system and fiber-optic network for the supervisory control and data acquisition system connection from the 1.5-megawatt solar group blocks to the Solar Two Project Substation. Adjacent to the Main Services Complex, an 11-acre construction laydown area will be built. Also, a 100-acre construction laydown area that will include a 25-acre truck staging area will be located east of Dunaway Road. Contractors and equipment suppliers will use the latter laydown area during construction to coordinate delivery of equipment and materials, construction, and for construction worker parking and processing.

Phase II includes construction of up to 18,000 SunCatchers. Also, the underground power collection system and fiber-optic network for the supervisory control and data acquisition system will be installed connecting the solar group blocks to the Solar Two Project Substation.

Conventional construction activities at the Project would result in a short-term, temporary increase in the ambient noise level resulting from the operation of construction equipment. The increase in noise level would be primarily experienced close to the noise source. The magnitude of the noise effects would depend on the type of construction activity, noise level generated by construction equipment, duration of the construction phase(s), and the distance between the noise source and receiver.

Construction noise effects associated with the Project were assessed with spreadsheet-based noise calculations. User inputs are listed below.

- **Distance from Source:** the distance between the edge of the construction site and the considered receiver.
- **Duty Cycle:** the portion of an hour, in aggregate, that a piece of equipment is energized (stationary or mobile) and creating noise.
- **Quantity:** the number of equipment pieces or noise-producing events over a specific time period (e.g., equipment utilization per month).
- **Hours:** the number of daytime hours (up to 12) that represent a typical daily work shift.

These inputs allow sound propagation prediction using the following formula:

$$L_{eq} = \text{Source SPL} + 10 * \log_{10}(\text{Duty Cycle}) + 10 * \log_{10}(\text{Quantity}) + 10 * \log_{10}(\text{Hours}/12) - 20 * \log_{10}(\text{Distance from Source / Reference Distance})$$

where source sound pressure level (SPL) and reference distance describe the typical noise, associated with a single piece of equipment, measured at a pre-defined distance. For instance, a chainsaw may have a source SPL of 78 dBA measured at a distance of 50 feet from its operator. Values for source SPL and reference distance have either been reproduced from available manufacturer's data or calculated from an industry-accepted formula linking sound generation to the rated engine horsepower of the equipment.

Due to the size of the Project area, construction noise is estimated separately for two types of construction activity.

SunCatcher Assembly and Installation

Assuming that construction would proceed at the site, one 18-megawatt "block" of SunCatchers at a time, with the geographical center of the block serving as the effective acoustic center point for various stationary and mobile sound sources, Table 5.12-4, Estimated Construction Noise from Nearest 18-Megawatt Block to East Receiver (2828 Evan Hewes Highway), shows what the estimated construction noise levels will be solely from the 4-month long construction of the block nearest to the representative noise-sensitive receiver on the east side of the Project vicinity (ML5). Table 5.12-5, Estimated Construction Noise from Nearest 18-Megawatt Block to West Receiver (1510 Painted Gorge Road), is similar, but considers the block constructed on the western side of the Project that will be closest to the nearest representative "west" noise-sensitive receiver (ML1). The center-to-receiver distances shown in these two tables should be the shortest for each case and thereby considered the loudest. Construction of other blocks would be farther away, and hence produce quieter noise levels. Equipment rosters and other input parameters from which these prediction results are based, can be found in Appendix CC, Noise Measurements.

Table 5.12-4
Estimated Construction Noise from Nearest 18-Megawatt Block to East Receiver (2828 Evan Hewes Highway)

Equipment Description	Distance to Receiver (feet)	Predicted Sound (dBA) from Quantity of Equipment During Indicated Month			
		1	2	3	4
Power line constructor trencher	10,466	41	0	0	0
Backhoe	10,466	40	0	0	0
Compactor	10,466	40	0	0	0
Cable/rigging truck	10,466	44	0	0	0
Flatbed truck with boom	10,466	44	0	0	0
Pickup truck	10,466	41	0	0	0
Dozer	10,466	44	0	0	0
Grader	10,466	42	0	0	0
Loader	10,466	44	0	0	0
Backhoe	10,466	40	0	0	0
Dump truck	10,466	44	0	0	0
Compactor	10,466	40	0	0	0
Vibratory machine	10,466	0	36	0	0
Fuel/service truck	10,466	0	43	0	0
Flatbed truck with boom	10,466	0	49	0	0
Pickup truck	10,466	0	46	0	0
Crane	10,466	0	48	0	0
Flatbed truck with boom	10,466	0	0	44	0
Maxi sneeker	10,466	0	0	40	0
Backhoe	10,466	0	0	40	0
Maxi sneeker	10,466	0	0	47	0
Flatbed truck with boom	10,466	0	0	51	0
Backhoe	10,466	0	0	47	0
Skid steer	10,466	0	0	43	0

Table 5.12-4
Estimated Construction Noise from Nearest 18-Megawatt Block to East Receiver (2828 Evan Hewes Highway)

Equipment Description	Distance to Receiver (feet)	Predicted Sound (dBA) from Quantity of Equipment During Indicated Month			
		1	2	3	4
Telehandler	10,466	0	0	0	46
Field service truck	10,466	0	0	0	53
Crane	10,466	0	0	0	47
Pickup truck	10,466	0	0	0	47
Track transporter	10,466	0	0	0	47
Grader	10,466	0	42	42	42
Compactor	10,466	0	40	40	40
Aggregate		**53**	**54**	**55**	**56**

Source: SES Solar Two, LLC, 2008.
Note:
dBA = A-weighted decibel

Table 5.12-5
Estimated Construction Noise from Nearest 18-Megawatt Block to West Receiver (1510 Painted Gorge Road)

Equipment Description	Distance to Receiver (feet)	Predicted Sound (dBA) from Quantity of Equipment During Indicated Month			
		1	2	3	4
Power line constructor trencher	3,300	50	0	0	0
Backhoe	3,300	50	0	0	0
Compactor	3,300	50	0	0	0
Cable/rigging truck	3,300	53	0	0	0
Flatbed truck with boom	3,300	54	0	0	0
Pickup truck	3,300	51	0	0	0
Dozer	3,300	53	0	0	0
Grader	3,300	52	0	0	0
Loader	3,300	53	0	0	0
Backhoe	3,300	50	0	0	0
Dump truck	3,300	53	0	0	0
Compactor	3,300	50	0	0	0
Vibratory machine	3,300	0	46	0	0
Fuel/service truck	3,300	0	52	0	0
Flatbed truck with boom	3,300	0	59	0	0
Pickup truck	3,300	0	56	0	0
Crane	3,300	0	58	0	0
Flatbed truck with boom	3,300	0	0	54	0
Maxi sneeker	3,300	0	0	49	0
Backhoe	3,300	0	0	50	0
Maxi sneeker	3,300	0	0	56	0

Table 5.12-5
Estimated Construction Noise from Nearest 18-Megawatt Block to West Receiver (1510 Painted Gorge Road)

Equipment Description	Distance to Receiver (feet)	Predicted Sound (dBA) from Quantity of Equipment During Indicated Month			
		1	2	3	4
Flatbed truck with boom	3,300	0	0	61	0
Backhoe	3,300	0	0	57	0
Skid steer	3,300	0	0	53	0
Telehandler	3,300	0	0	0	56
Field service truck	3,300	0	0	0	62
Crane	3,300	0	0	0	56
Pickup truck	3,300	0	0	0	57
Track transporter	3,300	0	0	0	57
Grader	3,300	0	52	52	52
Compactor	3,300	0	50	50	50
Aggregate		**63**	**64**	**65**	**66**

Source: SES Solar Two, LLC, 2008.
Note:
dBA = A-weighted decibel

Other Construction Noise

Aside from SunCatcher assembly and installation in the Solar Field, this type of noise encompasses all other construction activity (SunCatcher manufacture, road construction, substation construction, etc.), with a geographic acoustical center located at the Main Services Complex throughout the course of the Project's construction. Table 5.12-6, Estimated Other Construction Noise for Three Loudest Months, presents the estimated construction noise levels at a distance of 1 kilometer from this center point for the three busiest (and thereby loudest) months from the 40-month schedule. Equipment rosters and other input parameters from which these prediction results are based can be found in Appendix CC, Noise Measurements.

Table 5.12-6
Estimated Other Construction Noise for Three Loudest Months

Equipment Description	Distance to Receiver (feet)	Sound Level (dbA) in Construction Sequence Month		
		3	6	7
4-Wheeler	3,300	44	44	44
Aerial lift	3,300	61	61	61
Air compressor	3,300	46	46	46
Asphalt paver	3,300	53	50	50
Backhoe	3,300	63	63	63
Compactor	3,300	62	62	60
Concrete pump	3,300	58	58	56
Crane	3,300	62	63	63

Table 5.12-6
Estimated Other Construction Noise for Three Loudest Months

Equipment Description	Distance to Receiver (feet)	Sound Level (dbA) in Construction Sequence Month		
		3	6	7
Dozer	3,300	59	59	59
Drilling rig	3,300	62	63	63
Dump truck	3,300	64	60	60
Flatbed truck	3,300	65	65	65
Fork lift	3,300	56	56	56
Generator	3,300	49	54	54
Grader	3,300	62	59	59
Light tower	3,300	49	49	49
Loader	3,300	63	63	63
Maxi sneeker (trencher)	3,300	51	54	54
Pickup truck	3,300	59	59	59
Skid steer (Bobcat)	3,300	0	53	53
Telehandler	3,300	0	56	56
Water truck	3,300	63	63	63
Welding machine	3,300	51	51	49
Aggregate		**74**	**74**	**73**

Source: SES Solar Two, LLC, 2008.
Note:
dBA = A-weighted decibel

Note that while many kinds of equipment are common to both types of construction activity, each has its own unique noise-producing elements. For instance, the "vibratory machine" is associated only with SunCatcher installation because it is used to drive fin tubes into the earth for SunCatcher foundations. The "asphalt paver," on the other hand, will be used largely at the main services complex and, over the course of the Project's construction, be in use at other Project locations to pave roads on the site—but not necessarily in proximity to the construction of a SunCatcher block.

As shown in Table 5.12-4, Estimated Construction Noise from Nearest 18-Megawatt Block to East Receiver (2828 Evan Hewes Highway), and Table 5.12-5, Estimated Construction Noise from Nearest 18-Megawatt Block to West Receiver (1510 Painted Gorge Road), estimated SunCatcher block construction sound levels at either representative off-site sensitive receiver (East or West) would remain below 75 dBA L_{eq} during construction activity. Since both of these noise-sensitive receivers are considerably more distant from the main services complex than 1 kilometer, the resulting estimated levels will be much lower than 74 dBA L_{eq}. Therefore, the anticipated effects relating to Project construction noise are temporary and less than significant (see Section 5.12.4, Mitigation Measures, for a presentation of mitigation steps intended to help keep construction noise levels compliant).

Occupational Noise

Compliance with California Department of Industrial Relations, Occupational Safety and Health Administration (Cal/OSHA) regulations will ensure that construction personnel are adequately protected from potential noise hazards. The noise exposure level to protect worker hearing is regulated at 90 dBA over an 8-hour work shift. The Project's contractors are required to comply with all Cal/OSHA regulations. Occupational noise effects relating to Project construction is therefore considered to be less than significant.

Off-site Construction Laydown, Staging, and Parking Areas

An 11-acre construction laydown area will be built adjacent to the Main Services Complex. Also, a 100-acre construction laydown area that will include a 25-acre truck staging area will be located east of Dunaway Road. Contractors and equipment suppliers will use the latter laydown area during construction to coordinate delivery of equipment and materials, construction, and construction worker parking and processing.

The primary noise concern for the 100-acre construction laydown area would be the 25-acre truck staging area located within it. Pads will be prepared for setting down trailers that house the temporary construction facilities (offices, restrooms, meal rooms, meeting and conference rooms, etc.). The soil in the laydown area will be covered with protective gravel along the access roadways, parking, and vehicle marshalling areas, or with construction material on dunnage in the material storage areas so that soil losses will be negligible. In the areas to be restored after their use as construction laydown areas, geo-tech fabric and gravel will be removed and shallow swales and/or depressions will be created for revegetation. The closest sensitive receiver to the laydown area is the residence at 2828 Evan Hewes Highway, approximately 4,300 feet to the northeast. Based on this distance, the estimated sound level from construction vehicles and activity associated with such a staging/laydown area (operating at an average level of 89 dBA at 50 feet (EPA 1971) would be 53 dBA. The predicted sound level would not exceed the existing ambient sound level obtained from the sound level measurement (Table 5.12-3, Long-Term Noise Measurement Data Summary). Therefore, the noise effect from the construction laydown area is not anticipated to be significant.

Construction Traffic

The maximum expected vehicular traffic associated with Project construction would be, during the peak hour, approximately 709 vehicles, including 52 heavy trucks and 657 construction worker vehicles. Section 5.11, Traffic and Transportation, indicates that the existing average daily traffic (ADT) volumes on I-8 are approximately 15,300 vehicles, with 780 on Dunaway Road, and 515 on Evan Hewes Highway. The truck portions of these existing ADT volumes are 14 percent on I-8, 19 percent on Dunaway Road, and 29 percent on Evan Hewes Highway.

Section 5.11, Traffic and Transportation, indicates that the Year 2011 ADT volumes, including Project construction traffic, would be 16,950 on I-8, 2,500 on Dunaway Road, and 565 on Evan Hewes Highway. The truck mix percentages of these roadway totals would remain unchanged from the aforementioned existing volume fractions. As a result of the increase of traffic volumes due to the Project construction, the logarithmic relationship between volume and noise generation suggests there will be less than a 1 dBA increase on either I-8 or Evan Hewes

Highway, and less than a 5 dBA increase on Dunaway Road. Using a simple scenario generated with the Federal Highway Administration Traffic Noise Model, it is estimated that the traffic noise (including traffic increase associated with and during Project construction) would be approximately 66 dBA at 50 feet from the centerline of Dunaway Road. As described previously, the nearest noise-sensitive receiver from the Project entrance on Dunaway would be approximately 3,200 feet away. Based on a sound propagation calculation that reduces the noise level by 3 dB with each doubling of distance, the sound level at 2828 Evan Hewes Highway would be 48 dBA and not exceed the existing ambient sound level as shown in Table 5.12-3, Long-Term Noise Measurement Data Summary). Therefore, the estimated sound level from Project construction traffic would be considered a less than significant effect.

5.12.2.2 Operational Noise

Prediction Methods

The Cadna/A Noise Prediction Model (Version 3.7.124) was used to estimate the Project-generated sound pressure level at the property lines and noise-sensitive receivers. Cadna/A is a Windows based software program that predicts and assesses noise levels near industrial noise sources based on International Standards Organization 9613-2 standards for noise propagation calculations. The model uses industry-accepted propagation algorithms and accepts sound power levels (in dB re: 1 picoWatt) provided by the equipment manufacturer and other sources. The calculations account for classical sound wave divergence plus attenuation factors resulting from air absorption, basic ground effects, and barrier/shielding. Intervening natural and man-made topographical barrier effects were considered appropriate, including those from structures such as major buildings, tanks, and large equipment.

Calculations were performed using linear octave band sound power levels as inputs from each pre-defined noise source, as summarized in Table 5.12-7, Noise Model Sound Level Parameters. Recent URS Corporation-conducted field measurements at an existing Solar Two facility located at Sandia National Laboratories in Albuquerque, New Mexico, which provided the distance-dependent SPL data from which octave-band resolution sound power level (PWL) was derived for the SunCatcher assemblies considered in this Project model. For noise sources lacking Applicant-supplied sound data, sound levels were based on the appropriate calculation methods based on the information provided in the Project Description. The Project configuration was imported into Cadna/A from available Project Computer Aided Design files. As operation of the Project is linked to solar exposure and monitored on an hourly basis, the Cadna/A model consequently predicts hourly sound levels. The formula used to derive the overall SPL (in dBA) from PWL is as follows:

$$SPL = PWL - 20 \text{ Log } (r) - 10.9 + C$$

where r is in meters and C is a dimensionless absorption constant (Harris).

Table 5.12-7
Noise Model Sound Level Parameters

Project Component	Type of Source	Sound Power Level (PWL) at Octave Band Center Frequency (Hz)									Unweighted (linear)	A-Weighted	Acoustic Height (feet)
		31.5	63	125	250	500	1,000	2,000	4,000	8,000			
SunCatcher[1]	Point	119	111	101	93	97	95	90	88	81	120	99	38
Power Transformer (Substation component)	Point	79	85	87	82	82	76	71	66	59	91	82	23
Collector GSU	Vertical	55	61	63	58	58	52	47	42	35	58	67	7

Source: URS Corporation, 2008.
Notes:
URS calculations per typical industry methods.
[1]SunCatcher assembly includes measured composite levels from the Stirling Engine, electric generator, cooling fan, and air compressor.
GSU = General Step-Up Transformer
Hz = Hertz
PWL = power level

Community Noise

The full operation mode of the Project consists of 30,000 SunCatcher assemblies, 500 general step-up transformers, and a Solar Two Substation. The assemblies were modeled as evenly spaced point sources at an interval of 112 feet by 56 feet, or 5 per acre, and at a height of 38 feet. The general step-up transformers were modeled as an evenly distributed area source and the substation as a point source 21 feet high. The modeled results are indicative of the operation of 100 percent of the sources mentioned above at full-capacity.

The results of the predictive calculations are summarized in Table 5.12-8, Calculated Operation Levels at Existing Residences. The table shows the existing and calculated future noise levels at the closest sensitive receivers both to the east and the west of the Project. The calculated sound levels, contributed by the Project at these off-site receivers, range from 20 to 50 dBA L_{eq}.

Table 5.12-8
Calculated Operation Levels at Existing Residences

Noise-Sensitive Receiver	Distance to NSR (feet)/ Direction	Existing Noise Level (dBA)			Future Noise Level (dBA)		
		L_{eq} (Day)	L_{eq} (Night)	CNEL	Additional CNEL	Total CNEL	Increase
ML5 Imperial Lakes, 2828 Evan Hewes Highway	10,466/ Northeast	57	51	60	48	60	0
ML1[1] 426 Evan Hewes Highway/1510 Painted Gorge Road	3,300/ Northwest	51	42	51	52	55	+ 4

Source: URS Corporation, 2008.

Notes:

[1] Existing noise measurement data based on measurement at an acoustically representative location (426 Evan Hewes Road) near the closest noise-sensitive receiver (1510 Painted Gorge Road). Daytime and nighttime levels extracted from the corresponding intervals of the long-term measurement at the representative location.

< = less than
+ = positive
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibel
L_{eq} = equivalent sound level
NSR = Noise-Sensitive Receiver

For the Project, as designed and described in the Project description (see Section 3.0, Project Description and Location), the predicted operational noise levels would be in compliance with all applicable local LORS at sensitive receivers (limited to less than 50 dBA L_{eq} daytime/45 dBA L_{eq} nighttime) and at Project property lines (75 dBA hourly limit). Additionally, the calculated increase of ambient sound level, generated by Project operation, is calculated to be +4 dB at the closest of the two aforementioned sensitive receivers, which is an increase of less than 5 dBA L_{eq}. Therefore, operational noise from the Project with respect to existing noise-sensitive receivers is anticipated to be less than significant.

Occupational Noise

Based on the model estimates, operational noise levels within the Project boundary would be similar in magnitude to comparably sized large industrial projects. Noise levels within the Project Site were modeled to be below 85 dBA within 10 feet of the substation and amongst several SunCatcher assemblies. Consequentially, occupational noise is anticipated to be less than significant.

Operational Traffic Noise

Although there will be a modest fleet of maintenance vehicles (including but not limited to those used for SunCatcher dish wash and Power Conversion Unit hydrogen gas refill), the quantity of vehicles operating either at the main services complex or spread across the Project Site is not expected to impart noise having an L_{eq} greater than the continuous operation of the SunCatchers. Thus, operational traffic noise is considered to be a less than significant effect.

Power Transmission

Noise sources associated with power transmission include occasional breaker operation in the substation, corona noise, and very low magnetostriction hum from the conductors. Breaker noise is considered impulsive in nature, lasting a very short duration and may occur only a few times per year. Corona noise is characterized as a buzz or hums and is usually worse when the conductors are wet, such as in rain or fog.

The Electric Power Research Institute (EPRI) has conducted noise tests and studies and has published reference material on transmission line noise. Consistent with all acoustic textbooks' discussion of propagation of noise from a line source, EPRI states that noise produced by a conductor decreases at a rate of 3 dB per doubling of distance from the source. The EPRI Transmission Line Reference Book indicates that the audible noise from a typical 525-kV line with two conductors per phase would likely be less than 40 dBA at a distance of 40 feet from the outside conductor at ground level. If only one conductor per phase is used, the noise level will be less. Consistent with the Project description, the levels are expected to be less than described above because the transmission line used in the Project is 230 kV (i.e., less than 525 kV) (SES Solar Two, LLC, 2008).

In support of the above, the existing SDG&E Imperial Valley Substation was measured to be 55 dBA and 52 dBA at 13 feet from the fence line, during day and night measurements, respectively. The existing power transmission line measurement was measured to be 44 dBA during a daytime measurement directly under the transmission lines (transmission lines carrying 230 kV are mounted on steel lattice towers at a height of 110 feet). Residence 1 (ML9) is 3,900 feet from the beginning of the transmission line; the calculated sound level contributed by the transmission line is 29 dBA. The measured existing sound levels at Residence 1 (ML9) is 55 dBA. Consequentially, the new power transmission equipment for the Project is predicted to have no audible sound contribution to the aforementioned existing resident.

5.12.3 Cumulative Effects

The Solar Two Project is not expected to result in significant cumulative effects related to noise during construction, concurrent construction and partial Project operation, and full operation when construction is complete. The Imperial County Noise Ordinance imposes sound level limits at the Project property line and acceptable levels of increased sound over existing levels. Hence, as no significant effects are anticipated from Project construction or operational noise generation with respect to these regulations; neither are any significant cumulative effects expected. Construction noise is temporary and will conclude on completion of Project construction. Although operation of the Project will add noise to the ambient sound environment, the magnitude is not considered significant and dissipates with increasing distance from the Project boundary.

5.12.4 Mitigation Measures

5.12.4.1 Off-Site Operation

As no operational effects are expected for the Project, there is no corresponding need for mitigation.

5.12.4.2 Construction

Construction of the Project would temporarily elevate noise levels in the surrounding community. Most often the sound levels would be moderate, with a few processes causing short-term, substantially elevated noise levels to occur. Because construction would be of a limited duration, conducted during daylight hours, and because best practices for construction noise control will be implemented, no adverse construction noise effects are expected to occur in the surrounding community.

To help ensure that noise emission assumptions relied on herein are valid and acoustical design goals can be met by the Project during construction, the following Conditions of Certification are recommended:

NOISE-1

Construction noise emissions shall comply with the local LORS regarding hours of construction activity and permitted noise levels affecting adjacent uses.

NOISE-2

All noise-producing Project equipment and vehicles using internal combustion engines shall be equipped with mufflers, air-inlet silencers, where appropriate, and any other shrouds, shields, or other noise-reducing features in good operating condition that meet or exceed original factory specification. Mobile or fixed “package” equipment (e.g., arc-welders, air compressors) shall be equipped with shrouds and noise control features that are readily available for that type of equipment.

NOISE-3

All mobile or fixed noise-producing equipment used on the Project, which is regulated for noise output by a local, state, or federal agency, shall comply with such regulation while in the course of Project activity.

NOISE-4

The use of noise-producing signals, including horns, whistles, electronic alarms, sirens, and bells, will be for safety warning purposes only.

NOISE-5

No construction-related public address, loudspeaker, or music system shall be audible at any adjacent noise-sensitive land use.

NOISE-6

Additionally, the contractors shall implement a noise complaint process and hotline number for the surrounding community. The Applicant will have the responsibility and authority to receive and resolve noise complaints.

5.12.4.3 On-Site Occupational Noise Exposure

NOISE-7

Within 30 days of Phase I of the Project going online, the Applicant shall conduct an occupational noise survey to verify modeled noise levels and identify any additional noise hazard areas in the Project facilities. The survey shall be conducted by a qualified person in accordance with the provisions of Title 8 California Code of Regulations, Sections 5095-5099 (Article 105) and Title 29, Code of Federal Regulations (CFR), Section 1910.95. The survey results shall be used to determine the magnitude of employee noise exposure. Areas above 85 dBA that may be accessed by any personnel shall be posted as high noise level areas. Hearing protection shall be furnished and their use required in the posted areas.

NOISE-8

The Applicant shall prepare a report of the survey results and, if necessary, identify proposed measures that will be employed to comply with applicable state and federal regulations. Within 30 days of completing the survey, the Project owner shall submit the noise survey report to the Construction Project Manager. The Applicant shall make the report available to the Occupational Safety and Health Administration and Cal/OSHA on request.

5.12.5 Compliance with LORS

5.12.5.1 Federal

There are no federal LORS that directly affect this Project with respect to noise. However, the following guidelines at the federal level direct the consideration of a broad range of noise and vibration issues:

- the National Environmental Policy Act of 1969 (42 United States Code 4321, *et seq*.) (Public Law 91-190) (40 CFR §1506.5), and
- the Noise Control Act of 1972 (42 United States Code 4910).

The EPA has not promulgated standards or regulations for environmental noise generated by power plants; however, the EPA has published a guideline that specifically addresses issues of community noise (EPA Levels Document, Report Number 556/9-74-664). This guideline, commonly referred to as the "Levels Document," contains goals for noise levels affecting residential land use of L_{dn} <55 dBA for exterior levels and L_{dn} <45 dBA for interior levels.

Section 202(c)(1-9) of the Land Use Planning Handbook (BLM 1988) requires that land use planning comply with all applicable state and federal noise pollution standards, but does not provide specific noise standards.

Occupational exposure to noise is regulated by Title 29, CFR, Part 1910.95 occupational noise exposure. Protection against the effects of noise exposure shall be provided when the time-weighted average (TWA) sound levels exceed 90 dBA for an 8-hour period. When employees are subjected to sound exceeding this limit, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce TWA sound levels within 90 dBA, personal protective equipment (PPE) shall be provided and used to reduce sound levels to within limits. The employer shall administer a continuing, effective hearing conservation program whenever employee noise exposures equal or exceed an 8-hour TWA sound level of 85 decibels measured in dBA (slow response) or, equivalently, a dose of 50 percent. For purposes of the hearing conservation program, employee noise exposures shall be computed in accordance with CFR 1910.95, Appendix A (Noise Exposure Computation) without regard to any attenuation provided by the use of PPE.

5.12.5.2 State

The CEC has been delegated the authority to act as the lead agency for purposes of compliance with the California Environmental Quality Act (Public Resources Code Division 13, Environmental Protection, Section 21000 *et seq*.).

Occupational exposure to noise is regulated by Cal/OSHA in Title 8, Group 15, Article 105, Sections 5095 to 5100. The standard stipulates that protection against the effects of noise exposure shall be provided when sound levels exceed 90 dBA over an 8-hour exposure period. Protection shall consist of feasible administrative or engineering controls. If such controls fail to reduce sound levels to within acceptable levels, PPE shall be provided and used to reduce employee exposure. Also, a hearing conservation program must be instituted by employers whenever employee noise exposure equals or exceeds the action level of an 8-hour TWA sound level of 85 dBA. The hearing conservation program requirements consist of periodic area and personal noise monitoring, performance and evaluation of audiograms, provision of hearing protection, annual employee training, and record keeping.

The state also requires local jurisdictions (California Government Code Section 65302[f]) to prepare general plans that include land use and noise elements.

5.12.5.3 Local

Imperial County

The Project Site and environs are unincorporated areas within and governed by Imperial County. Project noise and any noise-sensitive use must comply with General Plan and Noise Limits established for maintaining noise/land use compatibility between residential and industrial land uses.

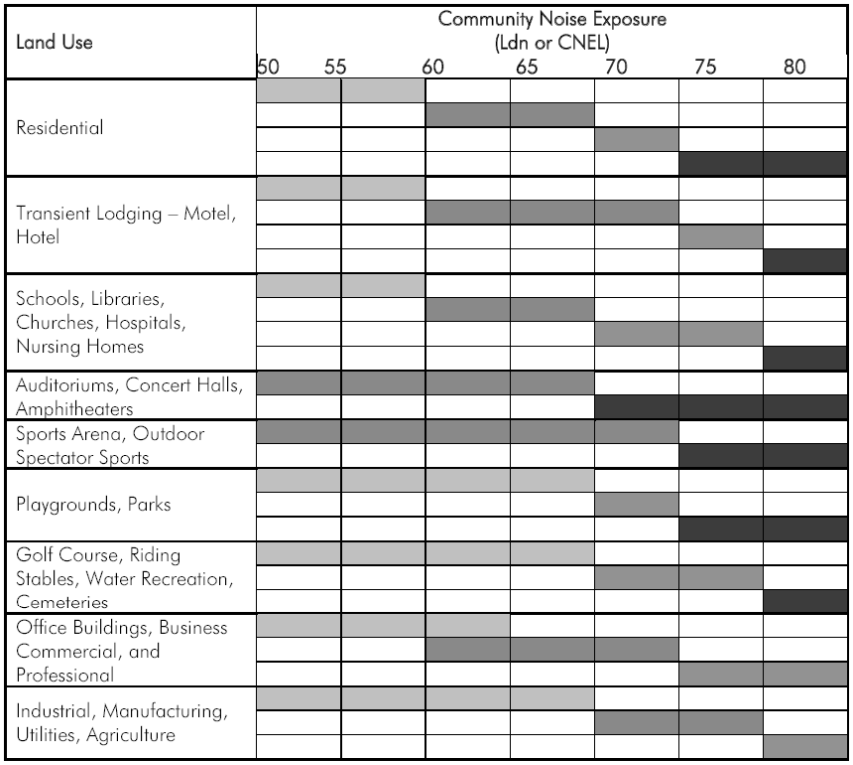
General Plan

1. Land Use Compatibility

The Noise Element of the General Plan identifies a “Noise Impact Zone” as an area that may be exposed to noise greater than 60 dB CNEL or 75 dB L_{eq} (1 hour). This zone identifies areas and properties where an acoustical analysis would be required to demonstrate Project compliance with land use compatibility requirements and other applicable environmental noise standards.

Land use compatibility defines the acceptability of a land use in a specified noise environment, as shown in Table 5.12-9, Imperial County Land Use Compatibility Guidelines.

Table 5.12-9
Imperial County Land Use Compatibility Guidelines



Source: Modified by CBA from 1998 State of California General Plan Guidelines.

ZONE A - Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved meet conventional Title 24 construction standards. No special noise insulation requirements.

ZONE B - Conditionally Acceptable: New construction or development shall be undertaken only after a detailed noise analysis is made and noise reduction measures are identified and included in the project design.

Zone C- Normally Unacceptable: New construction or development is discouraged. If new construction is proposed, a detailed analysis is required, noise reduction measures must be identified, and noise insulation features included in the design.

ZONE D- Clearly Unacceptable: New construction or development clearly should not be undertaken.

2. Property Line Standards

The Noise Element also identifies property line limits from noise generation from one property to an adjacent property based on the zoning of the properties. Table 5.12-10, Imperial County Property Line Sound Level Limits, summarizes property line limits.

Table 5.12-10
Imperial County Property Line Sound Level Limits

Zone	Time	Applicable Limit One-hour Average Sound Levels (dB)
Residential zones	0700 to 2200	50
	2200 to 0700	45
Multi-residential zones	0700 to 2200	55
	2200 to 0700	50
Commercial zones	0700 to 2200	60
	2200 to 0700	55
Light Industrial/Industrial park zones	Any time	70
General industrial zones	Any time	75

Source: Imperial County, 2008.

Notes:

When two adjacent properties have different uses, the more restrictive standard applies.

If the ambient sound level meets or exceeds the property line standard, the increase of the existing or proposed noise shall not exceed 3 dB L_{eq}.

dB = decibels

L_{eq} = equivalent sound level

3. Construction Noise Standards

The Noise Element identified construction noise and time limits. Construction noise shall not exceed 75 dBA L_{eq} when averaged over an 8-hour period at the nearest sensitive receptor. This standard assumes a construction period of days or weeks. In cases of extended length construction times, the standard is tightened to 75 dBA L_{eq} when averaged over a 1-hour period. Construction equipment operation shall be limited to the hours of 0700 to 1900 Monday through Friday and 0900 to 1700 Saturday. No construction operations are permitted on Sundays or holidays.

4. Significant Increase of Ambient Noise Levels

The Noise Element also takes into account existing noise levels, offering the guidelines below for determining potentially significant effects.

If the future noise level after the Project is completed will be within the “normally acceptable” noise levels shown in Table 5.12-9, Imperial County Land Use Compatibility Guidelines, but will increase the existing ambient noise level of 5 dB CNEL or greater, it will be considered a potentially significant noise effect.

If future noise levels after the Project is completed will be greater than the “normally acceptable” noise levels shown in Table 5.12-9, Imperial County Land Use Compatibility Guidelines, a noise increase of 3 dB CNEL or greater shall be considered a potentially significant effect.

The two criteria above are with respect to noise-sensitive receivers in the community.

Noise Ordinance

Imperial County has adopted Property Line Sound Level Limits that serve as the functional equivalent to a noise ordinance and these have been provided in Table 5.12-10, Imperial County Property Line Sound Level Limits. Table 5.12-11, Summary of LORS – Noise, provides a list of LORS applicable to the project.

Table 5.12-11
Summary of LORS – Noise

LORS	Requirements	Conformance Section	Administering Agency
Federal Jurisdiction			
National Environmental Policy Act of 1969 (42 USC 4321, *et seq*.) (PL-91-190) (40 CFR §1506.5)	Not applicable by statute.	Section 5.12.5.1	EPA
State Jurisdiction			
California Energy Commission 140-2006-002	Increase over existing background noise level of 5 dBA or greater at noise-sensitive areas is significant.	Section 5.12.5.2	CEC
California Occupational Safety and Health Administration 8 CCR, General Industrial Safety Orders, Article 105	Levels over 85 dBA at 8-hour work station require hearing conservation.	Section 5.12.5.2	Cal/OSHA
Local Jurisdiction			
Noise Element	Property line limit is 75 dB for General Industrial Zones. Construction noise shall not exceed 75 dB when averaged over an 8-hour period.	Section 5.12.5.3	Imperial County Planning Office
County Land Use Code 90702.00	Causing a 1-hour average sound level over 75 dB is unlawful.	Section 5.12.5.3	Imperial County Noise Ordinance

Source: URS Corporation, 2008.

Notes:
Cal/OSHA = California Occupational Health and Safety Administration
CCR = California Code of Regulations
CEC = California Energy Commission
CFR = Code of Federal Regulations
dB = decibels
dBA = A-weighted decibel
EPA = Environmental Protection Agency
LORS = laws, ordinances, regulations, and standards
PL = Public Law
USC = United States Code

5.12.5.4 Agencies and Agency Contacts

Agencies with jurisdiction to enforce LORS related to noise are shown in Table 5.12-12, Agency Contact List for LORS.

Table 5.12-12
Agency Contact List for LORS

	Agency	Contact	Address	Telephone
1	California Energy Commission	Steve Baker	1516 Ninth Street Sacramento, CA 95814	916-654-3915
2	Imperial County Planning Office	Hugo Valdez	801 Main Street El Centro, CA 92243-2875	760-482-4675
3	Imperial County Planning Office	Jurg Heuberger	939 Main Street El Centro, CA 92243-2875	

Source: URS Corporation, 2008.
Note:
LORS = laws, ordinances, regulations, and standards

5.12.5.5 Permits Required and Permitting Schedule

As shown in Table 5.12-13, Applicable Permits, no permits are required for the Project in the area of noise.

Table 5.12-13
Applicable Permits

Responsible Agency	Permit/Approval	Schedule
Federal	None required	Not applicable
State	None required	Not applicable
Local	None required	Not applicable

Source: URS Corporation, 2008.

5.12.6 References

Beranek, L.L. and I.L. Ver, eds. 1992. Noise and Vibration Control Engineering. John Wiley & Sons, Inc. New York, NY.

Bies, D. and C. Hansen. 2003. Engineering Noise Control: Theory and Practice. Third Edition. Spon Press New York, NY.

BLM (Bureau of Land Management). 1988. Land Use Planning Handbook. Section 202(c)(1-9).

Caltrans (California Department of Transportation). R. Hendricks. 1998. Transportation Related Earthborne Vibrations. Technical Advisory. October.

CEC (California Energy Commission). 2006. Rules of Practice and Procedure, Power Plant Site Certification Regulations. CEC-140-2006-002.

CEQA (California Environmental Quality Act) (Public Resources Code Division 13, Environmental Protection, Section 21000 *et seq*.). 2005.

EEI (Edison Electric Institute). 1983. Electric Power Plant Environmental Noise Guide, 2nd Edition, Revised.

EPA (Environmental Protection Agency). 1971. Noise from Construction Equipment and Operations, Building Equipment and Home Appliances. (Prepared under contract by Bolt et al., Bolt, Beranek & Newman, Boston, Massachusetts.) Washington, D.C.

Imperial County. *General Plan: Noise Element*. 1993.

Imperial County Ordinance - Title 9, Land Use Code. Section 90702.00 Sound Level Limits.

ISO (International Standards Organization). 1996a. Description and Measurement of Environmental Noise: Basic Quantities, and Procedures, Part 1, ISO 1996/1.

_____. 1996b. Description and Measurement of Environmental Noise: Acquisition of Data Pertinent to Land Use, Part 2, ISO 1996/2.

_____. 1996c. Description and Measurement of Environmental Noise: Application to Noise Limits, Part 3, ISO 1996/3.

SES Solar Two, LLC. 2008. *Project Description and Plan of Development*.

United States Department of Transportation, Federal Transit Administration. May 2006, FTA-VA-90-1003-06. Transit Noise and Vibration Impact Assessment. (Prepared under contract by Harris, Miller, Miller, and Hanson). Burlington, Massachusetts. April.

URS Corporation. 2007. Field work, observations, modeling, and research.

URS Corporation. 2008. Field work, observations, modeling, and research.

Adequacy Issue:	Adequate		Inadequate		DATA ADEQUACY WORKSHEET	Revision No.	0	Date	
Technical Area:	**Noise**				Project:	Solar Two Project		Technical Staff:	
Project Manager:					Docket:			Technical Senior:	

SITING REGULATIONS	INFORMATION	AFC SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (1)	...provide a discussion of the existing site conditions, the expected direct, indirect and cumulative impacts due to the construction, operation and maintenance of the project, the measures proposed to mitigate adverse environmental impacts of the project, the effectiveness of the proposed measures, and any monitoring plans proposed to verify the effectiveness of the mitigation.	Section 5.12.1 Section 5.12.2.1 Section 5.12.2.2 Section 5.12.4.2		
Appendix B (g) (4) (A)	A land use map which identifies residences, hospitals, libraries, schools, places of worship, or other facilities where quiet is an important attribute of the environment within the area impacted by the proposed project. The area potentially impacted by the proposed project is that area where, during either construction or operation, there is a potential increase of 5 dB(A) or more, over existing background levels.	Figure 5.9-2 Figure 5.12-1		

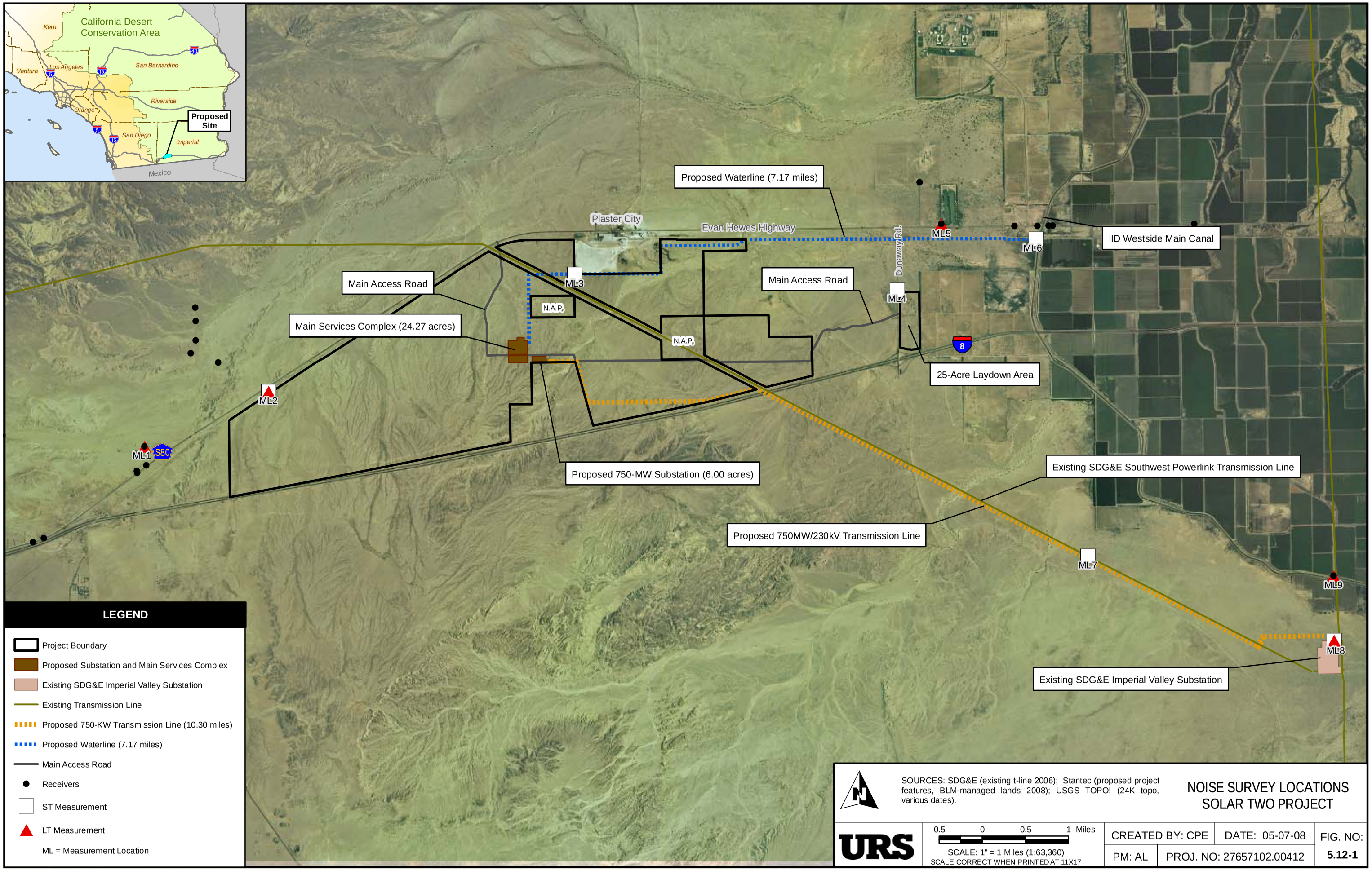
Adequacy Issue:	Adequate		Inadequate		DATA ADEQUACY WORKSHEET	Revision No.	0	Date	
Technical Area:	**Noise**			Project:	Solar Two Project		Technical Staff:		
Project Manager:				Docket:			Technical Senior:		

SITING REGULATIONS	INFORMATION	AFC SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (4) (B)	A description of the ambient noise levels at those sites identified under subsection (g)(4)(A) which the applicant believes provide a representative characterization of the ambient noise levels in the project vicinity, and a discussion of the general atmospheric conditions, including temperature, humidity, and the presence of wind and rain at the time of the measurements. The existing noise levels shall be determined by taking noise measurements for a minimum of 25 consecutive hours at a minimum of one site. Other sites may be monitored for a lesser duration at the applicant's discretion, preferably during the same 25-hour period. The results of the noise level measurements shall be reported as hourly averages in Leq (equivalent sound or noise level), Ldn (day-night sound or noise level) or CNEL (Community Noise Equivalent Level) in units of dB(A). The L10, L50, and L90 values (noise levels exceeded 10 percent, 50 percent, and 90 percent of the time, respectively) shall also be reported in units of dB(A).	Section 5.12.1.4 Table 5.12-2 Table 5.12-3 Appendix CC, Noise Measurements		
Appendix B (g) (4) (C)	A description of the major noise sources of the project, including the range of noise levels and the tonal and frequency characteristics of the noise emitted.	Table 5.12-7		
Appendix B (g) (4) (D)	An estimate of the project noise levels, during both construction and operation, at residences, hospitals, libraries, schools, places of worship or other facilities where quiet is an important attribute of the environment, within the area impacted by the proposed project.	Table 5.12-4 Table 5.12-5 Table 5.12-6 Table 5.12-8		

Adequacy Issue:	Adequate		Inadequate		DATA ADEQUACY WORKSHEET	Revision No.	0	Date	
Technical Area:	**Noise**			Project:	Solar Two Project		Technical Staff:		
Project Manager:				Docket:			Technical Senior:		

SITING REGULATIONS	INFORMATION	AFC SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (4) (E)	An estimate of the project noise levels within the project site boundary during both construction and operation and the impact to the workers at the site due to the estimated noise levels.	Section 5.12.2.1 Section 5.12.2.2		
Appendix B (g) (4) (F)	The audible noise from existing switchyards and overhead transmission lines that would be affected by the project and estimates of the future audible noise levels that would result from existing and proposed switchyards and transmission lines. Noise levels shall be calculated at the property boundary for switchyards and at the edge of the rights-of-way for transmission lines.	Section 5.12.1.4 Table 5.12-2 Table 5.12-3		
Appendix B (i) (1) (A)	Tables which identify laws, regulations, ordinances, standards, adopted local, regional, state, and federal land use plans, leases, and permits applicable to the proposed project, and a discussion of the applicability of, and conformance with each. The table or matrix shall explicitly reference pages in the application wherein conformance, with each law or standard during both construction and operation of the facility is discussed; and	Table 5.12-11		
Appendix B (i) (1) (B)	Tables which identify each agency with jurisdiction to issue applicable permits, leases, and approvals or to enforce identified laws, regulations, standards, and adopted local, regional, state and federal land use plans, and agencies which would have permit approval or enforcement authority, but for the exclusive authority of the commission to certify sites and related facilities.	Table 5.12-13		

Adequacy Issue:	Adequate		Inadequate		DATA ADEQUACY WORKSHEET	Revision No.	0	Date	
Technical Area:	**Noise**				Project:	Solar Two Project		Technical Staff:	
Project Manager:					Docket:			Technical Senior:	
SITING REGULATIONS	**INFORMATION**				**AFC SECTION NUMBER**	**ADEQUATE YES OR NO**		**INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS**	
Appendix B (i) (2)	The name, title, phone number, address (required), and email address (if known), of an official who was contacted within each agency, and also provide the name of the official who will serve as a contact person for Commission staff.				Table 5.12-12				
Appendix B (i) (3)	A schedule indicating when permits outside the authority of the commission will be obtained and the steps the applicant has taken or plans to take to obtain such permits.				N/A				



SOURCES: SDG&E (existing t-line 2006); Stantec (proposed project features, BLM-managed lands 2008); USGS TOPO! (24K topo, various dates).

NOISE SURVEY LOCATIONS
SOLAR TWO PROJECT

URS

0.5 0 0.5 1 Miles

SCALE: 1" = 1 Miles (1:63,360)
SCALE CORRECT WHEN PRINTED AT 11X17

CREATED BY: CPE	DATE: 05-07-08	FIG. NO:
PM: AL	PROJ. NO: 27657102.00412	5.12-1

Path: G:\gis\projects\1577\22238980\mxd\noise_survey_locations.mxd, 05/19/08,