NOISE ASSESSMENT

Independent Energy Solutions, Inc. (IES) /San Diego Gas & Electric (SDG&E) Solar Energy Project – Ramona
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GLOSSARY OF TERMS

Sound Pressure Level (SPL): a ratio of one sound pressure to a reference pressure (L_{ref}) of 20 µPa. Because of the dynamic range of the human ear, the ratio is calculated logarithmically by 20 log (L/L_{ref}).

A-weighted Sound Pressure Level (dBA): Some frequencies of noise are more noticeable than others. To compensate for this fact, different sound frequencies are weighted more.

Minimum Sound Level (L_{min}): Minimum SPL or the lowest SPL measured over the time interval using the A-weighted network and slow time weighting.

Maximum Sound Level (L_{max}): Maximum SPL or the highest SPL measured over the time interval the A-weighted network and slow time weighting.

Equivalent sound level (L_{eq}): the true equivalent sound level measured over the run time. Leq is the A-weighted steady sound level that contains the same total acoustical energy as the actual fluctuating sound level.

Day Night Sound Level (Ldn): Representing the Day/Night sound level, this measurement is a 24 –hour average sound level where 10 dB is added to all the readings that occur between 10 pm and 7 am. This is primarily used in community noise regulations where there is a 10 dB "Penalty" for night time noise. Typically Ldn's are measured using A weighting.

Community Noise Exposure Level (CNEL): The accumulated exposure to sound measured in a 24-hour sampling interval and artificially boosted during certain hours. For CNEL, samples taken between 7 pm and 10 pm are boosted by 5 dB; samples taken between 10 pm and 7 am are boosted by 10 dB.

Octave Band: An octave band is defined as a frequency band whose upper band-edge frequency is twice the lower band frequency.

Third-Octave Band: A third-octave band is defined as a frequency band whose upper band-edge frequency is 1.26 times the lower band frequency.

Response Time (F,S,I): The response time is a standardized exponential time weighting of the input signal according to fast (F), slow (S) or impulse (I) time response relationships. Time response can be described with a time constant. The time constants for fast, slow and impulse responses are 1.0 seconds, 0.125 seconds and 0.35 milliseconds, respectively.

EXECUTIVE SUMMARY

This noise study has been completed to determine the noise impacts associated with the development of the proposed Solar Energy Project – Ramona located on approximately 37 gross acres. The Project is located in the unincorporated community of Ramona in the northern portion of San Diego County, CA.

Operational Noise Analysis

Based on the empirical data, the manufacturers specifications and the distances to the property lines the unshielded cumulative noise levels from the proposed transformers/inverters were found to be below the most restrictive nighttime property line standard of 45 dBA at the adjacent properties zoned RR and A-70. No impacts are anticipated and no mitigation is required.

Panel washing is anticipated to occur approximately four times per year and would take approximately 5 weeks to complete. Washing of the photovoltaic panels/arrays would generally occur during the daytime hours of 7am - 10pm. To reduce the noise level below the County's most restrictive 50 dBA threshold, the wash station would need to be located 65 feet from the nearest residential property line. No direct or cumulative no impacts are anticipated and no mitigation measures are required.

Construction Noise Levels

During the grading operations, the equipment is anticipated to be spread out over the approximate 18 acre site with some equipment operating at or near the property line while the rest of the equipment may be located more than 600 feet from the same property line. This would result in an acoustical center for the grading operation at approximately 300 feet from the nearest property line. At a distance as close as 150 feet the anticipated worst case eight-hour average combined noise levels from the grading operations is anticipated to be 73.9 dBA at the nearest property line.

No offsite roadway improvements are proposed along Creelman Lane to accommodate the Proposed Project, with the exception of minor improvements to construct the driveway entrance and a pathway along Creelman Lane within the public right away adjacent to the project site. These improvements will be conducted as part of the overall grading phase and no impacts are anticipated.

During the installation of the PV panels, some equipment may be operating at a distance of 50-100 feet from the property line while the rest of the equipment may be located over 600 feet from the other equipment and same property line. Based upon normal installation procedures

the two sets of equipment needed for panel installation are anticipated to be separated on the site. This would result in an anticipated worst case eight-hour average combined noise level of up to 75 dBA at the property line. Given the spatial separation of the equipment, the hydraulic breaker is not working directly next to the crane and pneumatic tool based on normal installation procedures and safety, the noise levels will comply with the County of San Diego's 75 dBA standard at all property lines.

Construction Impulse Noise

Additionally, the County Noise Ordinance Section 36.410, states that no person shall produce or cause to be produced an impulsive noise that exceeds the maximum sound level shown of 82 dBA (at residential uses), when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is received, for 25 percent of the minutes in the measurement period. To reduce the maximum noise level of 86 dBA to 82 dBA the hydraulic breaker would need to be located 50 feet from the nearest occupied residential property line or only operate 25% of the hourly or daily duration (15 minutes of any hour) when located within that distance. Since all the PV panels are located 50 feet or more from the nearest property line the impulsive noise levels are anticipated to be below the County's 82 dBA threshold and no impacts are anticipated and no mitigation measures are required.

1.0 INTRODUCTION

This noise study was completed to determine the noise impacts associated with the development of the proposed Solar Energy Project – Ramona. The project is located at the northwest of the intersection of Creelman Lane and Ashley Road within the unincorporated town of Ramona within the County of San Diego. The general location of the site is 33°01' 09" N and 116° 51' 36" W. The entire project site is 37.23 acres however; the solar panels would only be sited on approximately 18.8 acres of the site. Elevations onsite are generally flat ranging from about 1,463 to 1,475 feet above mean sea level. A general project vicinity map is shown in Figure 1–A.

1.1 Project Description

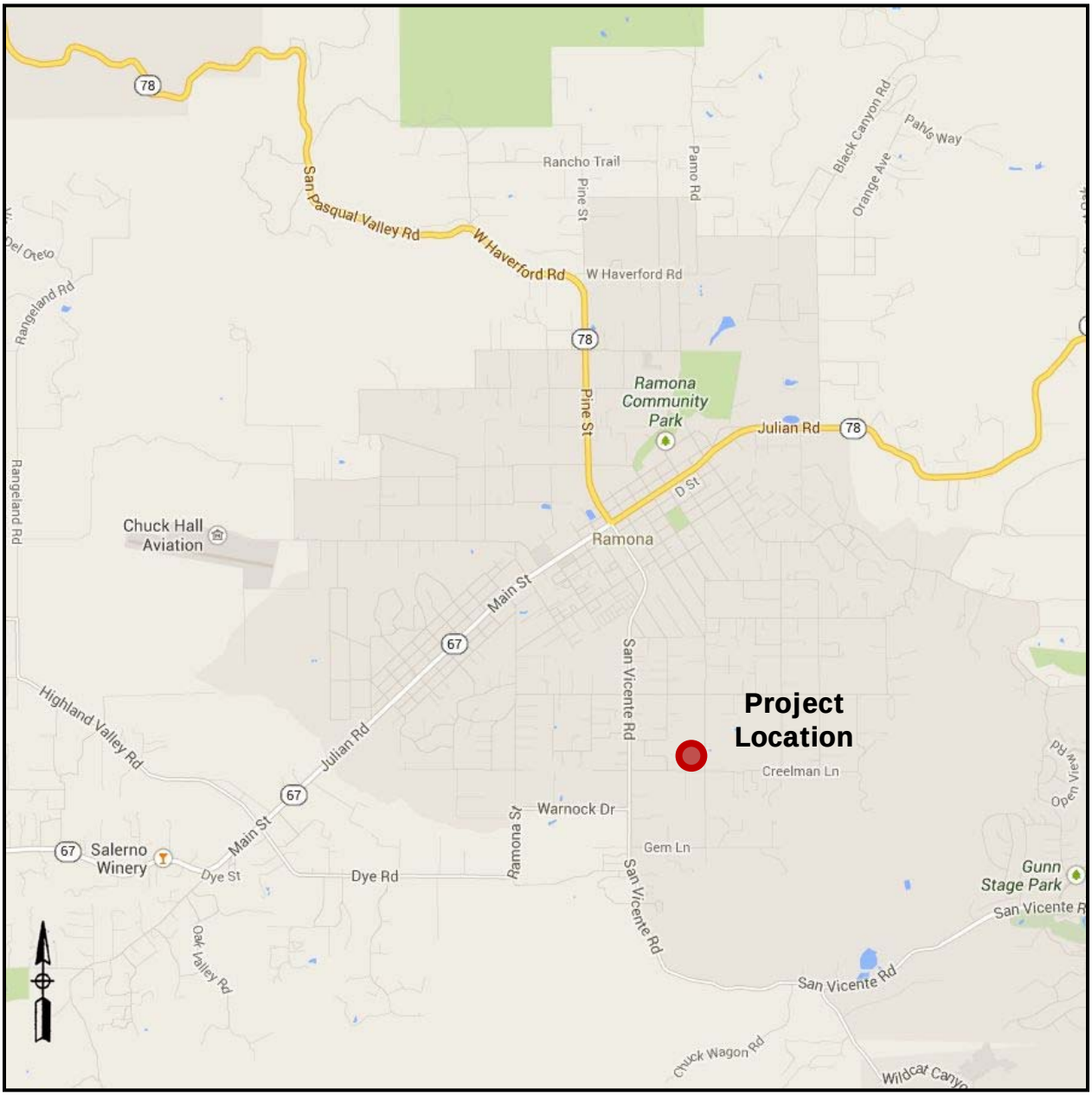
The Project proposes the construction of a photovoltaic power generation facility for the long-term generation of clean, renewable energy from solar power. The Project requires approval from the County of San Diego for a Major Use Permit (MUP) to allow construction, operation, and maintenance of such facilities.

The proposed site totals approximately 37.23 acres and is located approximately 1.5 miles southeast of SR-67 and approximately 0.35 miles east of San Vicente Road. The project development footprint would be limited to approximately 18.8 acres of this 37.23 acre site. The Project site is generally vacant undeveloped agricultural land however; there are a few existing sheds, miscellaneous walls and a small palm nursery which will be demolished and removed from the project site.

The Project design consists of mono-crystalline or poly-crystalline silicon cell photovoltaic solar modules mounted on fixed tilt system supported by a ground mount system. In isolated cases where geotechnical constraints are encountered, an appropriate foundation system would be utilized. Power stations, inverters, AC switchgear and medium voltage transformers would be sited at two locations within the module array. Electrical power from the solar array would travel through underground cables to a new interconnect pole at the western property line, and through overhead lines from the new interconnect pole to an existing interconnect pole on the west side of Casteel Lane. The project site configuration and layout is provided in Figure 1-B.

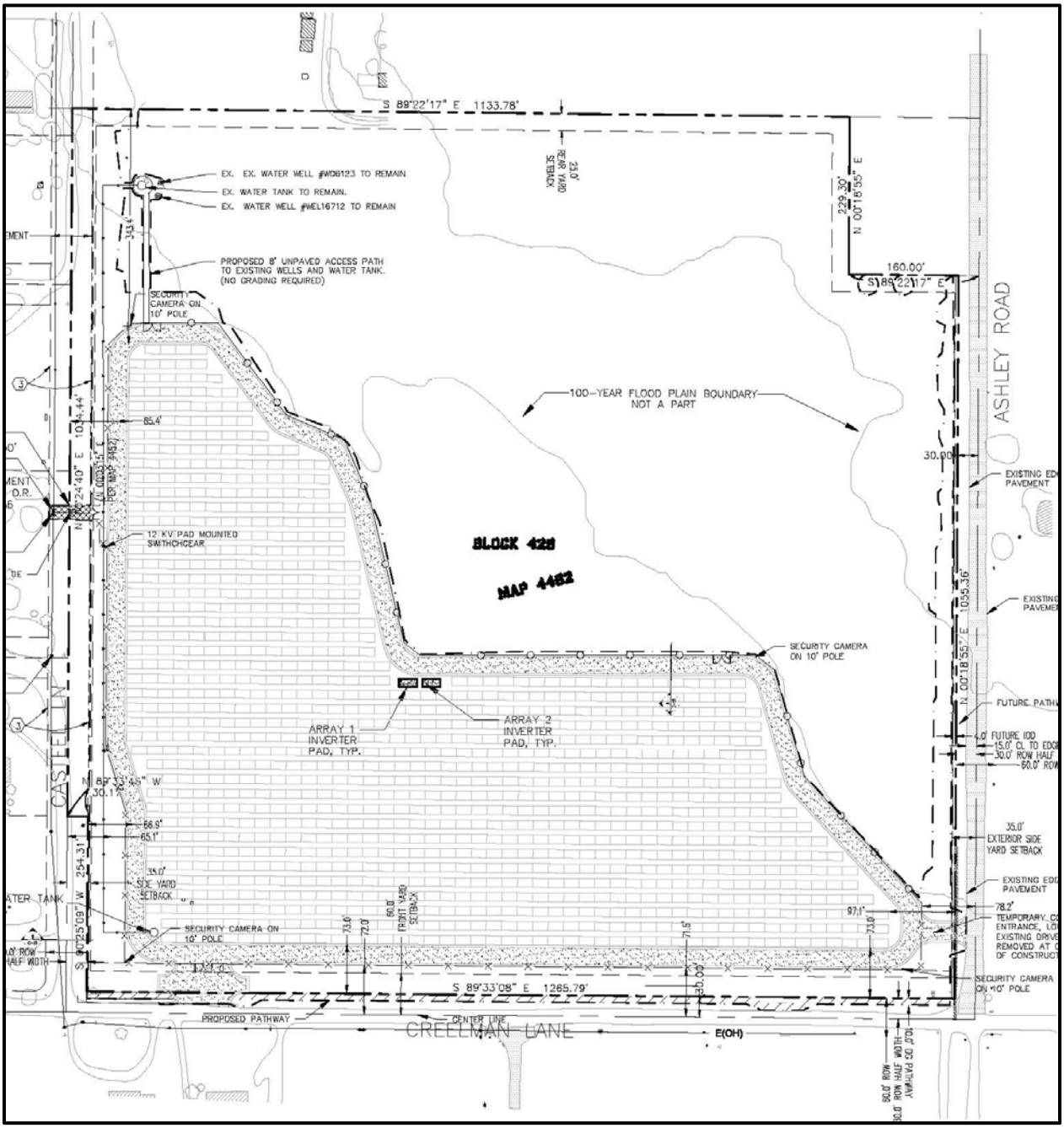
No offsite roadway improvements are proposed along Creelman Lane to accommodate the Proposed Project, with the exception of minor improvements to construct the driveway entrance and a pathway along Creelman Lane within the public right away adjacent to the project site.

Figure 1-A: Project Vicinity Map



Source: Google Maps, 2014

Figure 1-B: Overall Project Layout



Source: Berger ABAM, 2015

1.2 Environmental Settings & Existing Conditions

a) Settings & Locations

The Project would consist of a PV solar generation project on a single parcel of land to allow for the transport of the power generated to an existing SDG&E distribution line. The affected County Assessor Parcel Numbers (APNs) 284-340-35, totals approximately 37 acres; however, only a portion of the Project (approximately 19 acres) would be developed as part of the Project. The zoning for the Project parcel and all surrounding land uses is residential/agricultural (A-70).

b) Existing Noise Conditions

The Project site is generally vacant, undeveloped agricultural land however; there are a few existing sheds, walls and a small palm nursery which will be demolished and removed from the project site. The project site is surrounded by rural residential and land used primarily for agricultural purposes.

The Project site is located east of San Vicente Road and south of Hanson Lane, and is bordered by Creelman Lane on the south and Ashley Road to the east. Creelman Lane is an unclassified roadway in the County of San Diego's Circulation Element. Existing noise occurs mainly from infrequent vehicular traffic traveling on the nearby roadways.

1.3 Methodology

Noise is defined as unwanted or annoying sound which interferes with or disrupts normal activities. Exposure to high noise levels has been demonstrated to cause hearing loss. The individual human response to environmental noise is based on the sensitivity of that individual, the type of noise that occurs and when the noise occurs.

Sound is measured on a logarithmic scale consisting of sound pressure levels known as a decibel (dB). The sounds heard by humans typically do not consist of a single frequency but of a broadband of frequencies having different sound pressure levels. The method for evaluating all the frequencies of the sound is to apply an A-weighting to reflect how the human ear responds to the different sound levels at different frequencies. The A-weighted sound level adequately describes the instantaneous noise whereas the equivalent sound level depicted as Leq represents a steady sound level containing the same total acoustical energy as the actual fluctuating sound level over a given time interval.

The Community Noise Equivalent Level (CNEL) is the 24 hour A-weighted average for sound, with corrections for evening and nighttime hours. The corrections require an addition of 5 decibels to sound levels in the evening hours between 7 p.m. and 10 p.m. and an addition of 10 decibels to sound levels at nighttime hours between 10 p.m. and 7 a.m. These additions are made to account for the increased sensitivity during the evening and nighttime hours when sound appears louder.

Because mobile/traffic noise levels are calculated on a logarithmic scale, a doubling of the traffic noise or acoustical energy results in a noise level increase of 3 dBA. Therefore the doubling of the traffic volume, without changing the vehicle speeds or mix ratio, results in a noise increase of 3 dBA. Mobile noise levels radiate in an almost oblique fashion from the source and drop off at a rate of 3 dBA for each doubling of distance under hard site conditions and at a rate of 4.5 dBA for soft site conditions. Hard site conditions consist of concrete, asphalt and hard pack dirt while soft site conditions exist in areas having slight grade changes, landscaped areas and vegetation. On the other hand, fixed/point sources radiate outward uniformly as they travel away from the source. Their sound levels attenuate or drop off at a rate of 6 dBA for each doubling of distance.

The most effective noise reduction methods consist of controlling the noise at the source, blocking the noise transmission with barriers or relocating the receiver. Any or all of these methods could be required to reduce noise levels to an acceptable level.

2.0 OPERATIONAL ACTIVITIES

2.1 Guidelines for the Determination of Significance

Section 36.404 of the County of San Diego noise ordinance provides performance standards and noise control guidelines for determining and mitigating non-transportation, or stationary, noise source impacts to adjacent properties. The purpose of the noise ordinance is to protect, create and maintain an environment free from noise that may jeopardize the health or welfare, or degrade the quality of life. The County Noise Ordinance states that it shall be unlawful for any person to cause or allow the creation of any noise to the extent that the one-hour average sound level, at any point on or beyond the boundaries of the property exceeds the applicable limits provided in Table 2-1.

Table 2-1: Sound Level Limits in Decibels (dBA)

ZONE		APPLICABLE LIMIT ONE-HOUR AVERAGE SOUND LEVEL (DECIBELS)
R-S, R-D, R-R, R-MH, A-70, A-72, S-80, S-81, S-87, S-88, S-90, S-92, R-V, and R-U Use Regulations with a density of less than 11 dwelling units per acre.	7 a.m. to 10 p.m. 10 p.m. to 7 a.m.	50 45
R-RO, R-C, R-M, C-30, S-86, R-V, R-U and V5. Use Regulations with a density of 11 or more dwelling units per acre.	7 a.m. to 10 p.m. 10 p.m. to 7 a.m.	55 50
S-94, V4, and all other commercial zones.	7 a.m. to 10 p.m. 10 p.m. to 7 a.m.	60 55
V1, V2 V1, V2 V1 V2	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m. 10 p.m. to 7 a.m.	60 55 55 50
V3	7 a.m. to 10 p.m. 10 p.m. to 7 a.m.	70 65
M-50, M-52, M-54	Anytime	70
S-82, M-58, and all other industrial zones.	Anytime	75

Source: County of San Diego Noise Ordinance Section 36.404

As stated above in Section 1, the Project and surrounding properties are zoned residential/agricultural (A-70). Section 36.404 of the Noise Ordinance sets a most restrictive operational exterior noise limit for A-70 noise sensitive land uses of 50 dBA Leq for daytime hours of 7 a.m. to 10 p.m. and 45 dBA Leq during the noise sensitive nighttime hours of 10 p.m. to 7 a.m. as shown in Table 2-1 above. Most of the Project's operational components will only operate during the daytime hours but a few may operate during nighttime or early morning hours and therefore the most restrictive and conservative approach is to apply the 45 dBA Leq nighttime standard at the property lines.

2.2 Potential Operational Noise Impacts

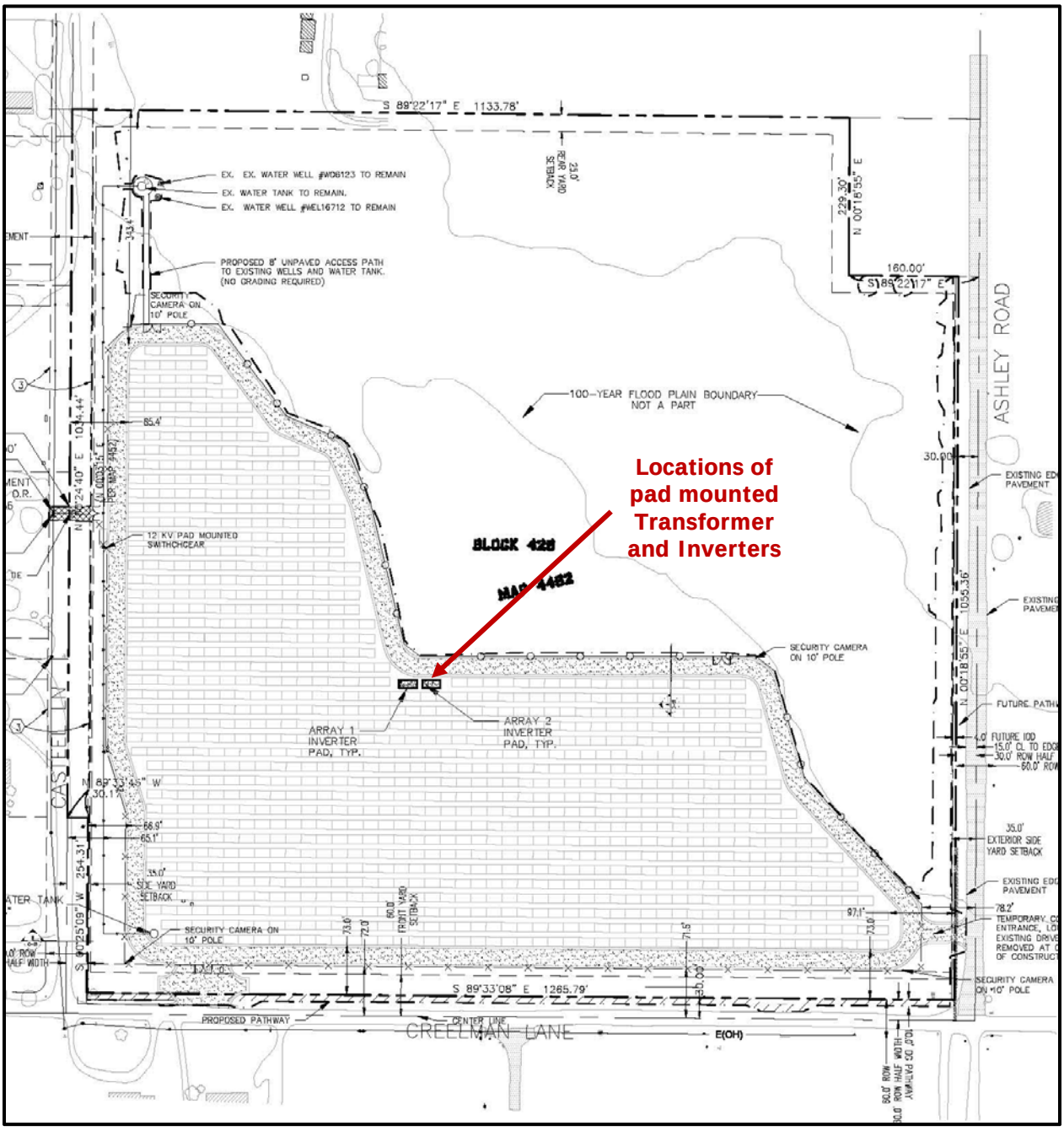
This section examines the potential stationary noise source impacts associated with the operation of the proposed Project; specifically, noise levels from the proposed transformers, inverters and connection to existing distribution lines. Panels would be electrically connected into panel strings using wiring attached to the racking. The electrical current is then transferred to the inverters, which convert the Direct Current (DC) produced by the PV panels into Alternating Current (AC). A pad-mounted transformer next to the inverter is needed to increase the voltage for proper transmission. The AC would then travel through underground gathering lines to connect to existing distribution lines.

Energy generated by the Project would be delivered to an existing distribution line. Connection would be made from the Project to the Point of Interconnect and no new substation, or any substation modifications are needed or proposed. The Project proposes the installation of two small-scale, above ground structures described below that would be located within the solar panel fields, near the center of the site for the needed inverter/distributor, transformers and switching gear. Each of these locations will house two Commercial Solar PV Inverters and two of the smaller transformers necessary to increase the voltage for transmission. The proposed inverter / transformer locations for the site can be seen in Figure 2-A on the following page.

Operational Equipment Noise Levels On-site

The Project is proposing small-scale transformers as part of the proposed inverter / transformer sites. There will be two 1,000kW inverters along with two small transformers at each pad location. The proposed transformers have an unshielded noise rating of less than 60 dBA at 5 feet *(Source: National Electric Manufactures Association (NEMA) Publication No. TR 1-1993)*. The proposed 1,000KW Solar PV Inverters could have unshielded noise ratings as high as 78 dB at 1 meter or 3.28 feet based on similar inverters of this size (Xantrex Inverters, Schneider Electric 2013). The NEMA test results for the transformers and the manufacturer's specifications for the sample Xantrex inverters are provided as ***Attachment A*** of this report.

Figure 2-A: Proposed Equipment Locations



The worst case property line noise levels will occur near the southern and western portion of the site. The proposed transformers and inverters are approximately 500 feet from the nearest property which is zoned A-70 and has a nighttime property line standard of 45 dBA. The worst case scenario is analyzed below to determine if impacts would occur and if additional analysis is warranted and if any mitigation measures will be required. The location and relationship to the southern property line for this configuration is shown in Figure 2-B below. The noise levels of 60 dBA for the transformers and 78 dBA for the inverters were combined and propagated out to the property line without any shielding. The results of the propagated noise levels are shown in Table 2-2.

Figure 2-B: Worst Case Property Line Orientation

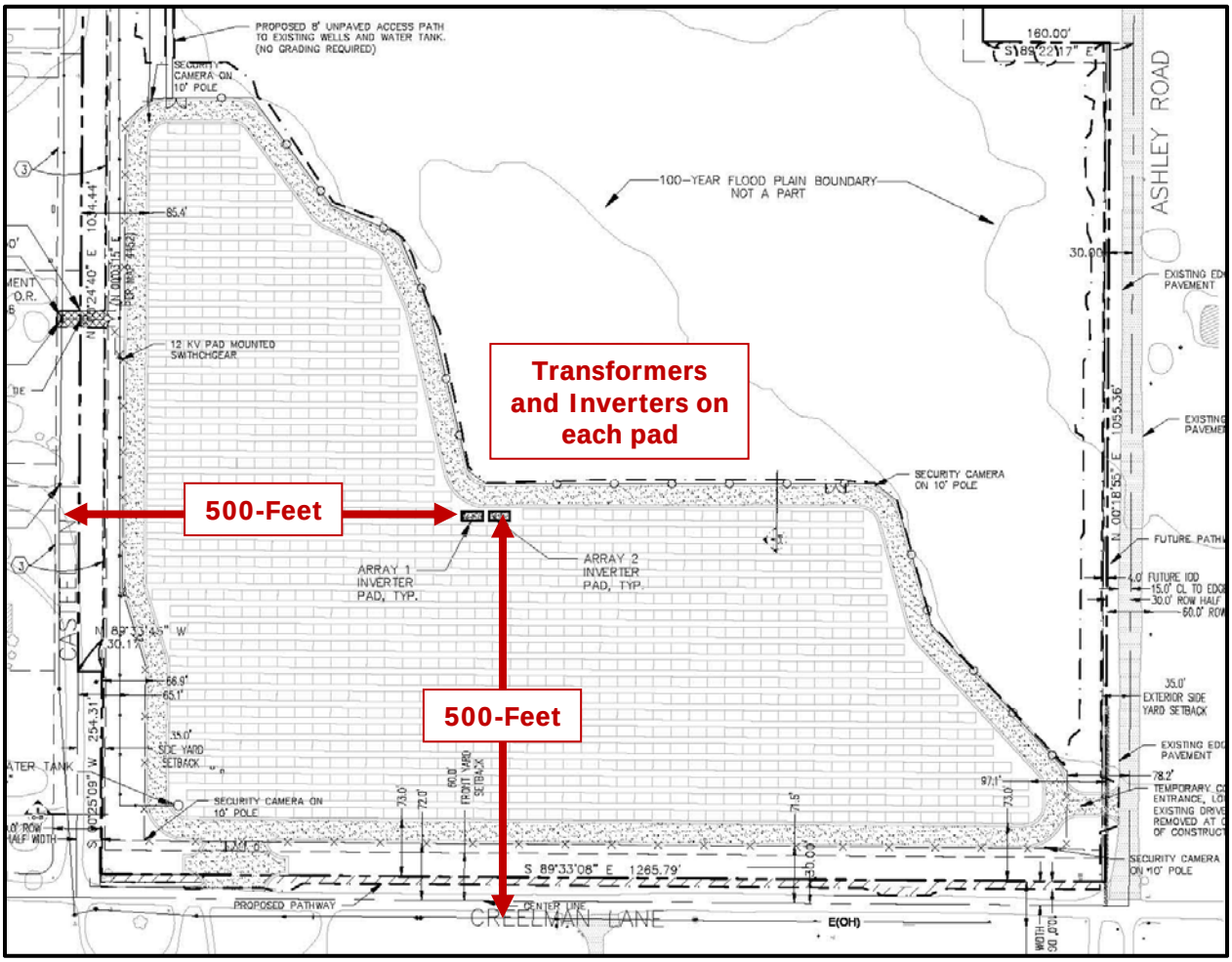


Table 2-2: Transformer/Inverter Noise Levels – Nearest Property Lines

Source	Distance from Source (Feet)	Cumulative Noise Level (dBA) [1, 2]	Distance to Nearest Property Line (Feet)	Noise Reduction due to distance (dBA)	Resultant Noise Level @ Property Line (dBA)
Transformers	5.0	63.0	500	-40.0	23.0
Inverters	3.28	81.0	500	-43.7	37.3
Transformers	5.0	63.0	500	-40.0	23.0
Inverters	3.28	81.0	500	-43.7	37.3
Cumulative Noise Level @ Property Line (dBA)					40.5

[1] Noise data provided as an attachment to this report
[2] Two inverters and transforms on each pad

Panel Washing Operational Noise Levels On-site

Periodic washing of the solar panels would be achieved using the truck or trailer mounted Wash Station equipped with a small 4-6 HP motor. Panel washing is anticipated to occur approximately four times per year and would take approximately 5 weeks to complete. Washing of the photovoltaic panels/arrays would generally occur during the daytime hours of 7am - 10pm. During panel/array washing times, the project power system would still be operational (i.e., inverters and transformers operating). Therefore, the panel washing activity is addressed cumulatively with other operational noise sources. Section 36.404 of the Noise Ordinance sets a most restrictive operational exterior noise limit for the RR and A-70 noise sensitive land uses of 50 dBA Leq for daytime hours of 7 a.m. to 10 p.m. Therefore the most restrictive 50 dBA Leq standard was applied at the property lines.

Noise exposure from the proposed operation of the solar panel wash station was found to have a reference maximum sound power level of 99 dB at 9 feet. This would equate to a sound pressure level of 67 dBA at 9 feet (Source: Honda Engines, 2011). To reduce the noise level of 67 dBA to the County's most restrictive 50 dBA threshold the wash station would need to be located 65 feet from the nearest residential property line. At a distance of 65 feet, the panel washing would result in and property line noise level of 49.8 dBA. Cumulatively, the panel washing noise level combined with the transformer and inverter noise levels (as shown in Table 2-2 above) would result in and over all cumulative noise level of 50.3 dBA. Since the panel washing equipment will be moving farther away from the property line and washing is conducted no impacts are anticipated and no mitigation measures are required.

2.3 Conclusions

Based on the empirical data, the manufacturers specifications and the distances to the property lines the unshielded cumulative noise levels from the proposed transformers/inverters were found to be below the most restrictive nighttime property line standard of 45 dBA at the adjacent properties zoned A-70. No impacts are anticipated and no mitigation is required.

Panel washing is anticipated to occur approximately four times per year and would take approximately 5 weeks to complete. Washing of the photovoltaic panels/arrays would generally occur during the daytime hours of 7am - 10pm. To reduce the noise level below the County's most restrictive 50 dBA threshold, the wash station would need to be located 65 feet from the nearest residential property line. No direct or cumulative no impacts are anticipated and no mitigation measures are required.

3.0 CONSTRUCTION ACTIVITIES

3.1 Guidelines for the Determination of Significance

Construction Noise: Noise generated by construction activities related to the project will exceed the standards listed in San Diego County Code Sections as follows.

SEC. 36.408: HOURS OF OPERATION OF CONSTRUCTION EQUIPMENT

Except for emergency work, it shall be unlawful for any person to operate or cause to be operated, construction equipment:

a. Between 7 p.m. and 7 a.m.

b. On a Sunday or a holiday. For purposes of this section, a holiday means January 1st, the last Monday in May, July 4th, the first Monday in September, December 25th and any day appointed by the President as a special national holiday or the Governor of the State as a special State holiday. A person may, however, operate construction equipment on a Sunday or holiday between the hours of 10 a.m. and 5 p.m. at the person's residence or for the purpose of constructing a residence for himself or herself, provided that the operation of construction equipment is not carried out for financial consideration or other consideration of any kind and does not violate the limitations in sections 36.409 and 36.410.

SEC. 36.409: SOUND LEVEL LIMITATIONS ON CONSTRUCTION EQUIPMENT

Except for emergency work, it shall be unlawful for any person to operate construction equipment or cause construction equipment to be operated, that exceeds an average sound level of 75 decibels for an eight-hour period, between 7 a.m. and 7 p.m., when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is being received.

SEC. 36.410: SOUND LEVEL LIMITATIONS ON IMPULSIVE NOISE

In addition to the general limitations on sound levels in section 36.404 and the limitations on construction equipment in section 36.409, the following additional sound level limitations shall apply:

(a) Except for emergency work or work on a public road project, no person shall produce or cause to be produced an impulsive noise that exceeds the maximum sound level shown in Table 36.410A (provided below), when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is received, for 25 percent of the minutes in the measurement period, as described in subsection (c) below. The maximum sound level depends on the use being made of the occupied property. The uses in Table 36.410A are as described in the County Zoning Ordinance.

TABLE 36.410A: MAXIMUM SOUND LEVEL (IMPULSIVE) MEASURED AT OCCUPIED PROPERTY IN DECIBELS (dBA)

OCCUPIED PROPERTY USE	DECIBELS (dBA)
Residential, village zoning or civic use	82
Agricultural, commercial or industrial use	85

(b) Except for emergency work, no person working on a public road project shall produce or cause to be produced an impulsive noise that exceeds the maximum sound level shown in Table 36.410B, when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is received, for 25 percent of the minutes in the measurement period, as described in subsection (c) below. The maximum sound level depends on the use being made of the occupied property. The uses in Table 36.410B are as described in the County Zoning Ordinance.

TABLE 36.410B: MAXIMUM SOUND LEVEL (IMPULSIVE) MEASURED AT OCCUPIED PROPERTY IN DECIBELS (dBA) FOR PUBLIC ROAD PROJECTS

OCCUPIED PROPERTY USE	dB(A)
Residential, village zoning or civic use	85
Agricultural, commercial or industrial use	90

(c) The minimum measurement period for any measurements conducted under this section shall be one hour. During the measurement period a measurement shall be conducted every minute from a fixed location on an occupied property. The measurements shall measure the maximum sound level during each minute of the measurement period. If the sound level caused by construction equipment or the producer of the impulsive noise exceeds the maximum sound level for any portion of any minute, it will be deemed that the maximum sound level was exceeded during that minute.

3.2 Potential Construction Noise Impacts

Construction noise represents a short-term impact on the ambient noise levels. Noise generated by construction equipment includes haul trucks, water trucks, graders, dozers, loaders and scrapers which can reach relatively high levels. Grading activities typically represent one of the highest potential sources for noise impacts. Little or no grading will be necessary for this project. The most effective method of controlling construction noise is through local control of construction hours and by limiting the hours of construction to normal weekday working hours.

The U.S. Environmental Protection Agency (U.S. EPA) has compiled data regarding the noise generating characteristics of specific types of construction equipment. Noise levels generated by heavy construction equipment at a distance of 50 feet can range from 60 dBA for a small tractor to up to 100 dBA for rock breakers. However, these noise levels diminish rapidly with distance from the construction site at a rate of approximately 6 dBA per doubling of distance. For example, a noise level of 87 dBA measured at 50 feet from the noise source would be reduced to 81 dBA at 100 feet from the source and be further reduced to 75 dBA at 200 feet from the source.

Using a point-source noise prediction model, calculations of the expected construction noise impacts were completed. The essential model input data for these performance equations include: the source levels of each type of equipment, relative source to receiver, horizontal and vertical separations, and the amount of time the equipment is operating in a given day, also referred to as the duty-cycle and any transmission loss from topography or barriers. To determine the worst-case noise levels for the grading operations no topographic attenuation, duty-cycle reductions or barrier reductions were utilized. The project site will be cleared and grubbed to remove vegetation and compacted in the first phase followed by grading of the site in the second phase and the installation of the PV panels in the third phase. The grading and subsequent installation of the PV panels is discussed below.

The grading operation may utilize a total of up to two loaders/backhoes, two dozers, two graders, three trenchers and two water trucks. This phase will require more construction equipment than is anticipated to be needed during clearing, grubbing and installation. This list of equipment is overly conservative in order to provide a worst case assessment. The noise levels utilized in this analysis based upon the conservative list of equipment is shown in Table 3-1 below. Most of the construction activities will consist of grading the site for the preparation of the PV panels. The equipment is anticipated to be spread out over the approximate 18 acre area with some equipment potentially operating at or near the property line while the rest of the equipment may be located more than 600 feet from the same property line. This would result in an acoustical center for the grading operation at approximately 300 feet from the nearest property line.

As can be seen in Table 3-1, if all the equipment was operating in the same location, which is not physically possible, at a distance as close as 150 feet from the nearest property line the point source noise attenuation from construction activities is reduced 9.6 dBA. This would result in an anticipated worst case eight-hour average combined noise level of 73.9 dBA at the property line. Given this and the spatial separation of the equipment, the noise levels will comply with the County of San Diego's 75 dBA standard at all Project property lines. No offsite roadway improvements are proposed with the exception of minor improvements to construct the driveway entrance and a pathway along Creelman Lane within the public right away adjacent to the project site. These improvements will be conducted as part of the overall grading and no impacts are anticipated.

Table 3-1: Construction Noise Levels

Construction Equipment	Quantity	Duty Cycle (Hours/Day)	Source Level @ 50-Feet (dBA)	Cumulative Noise Level @ 50-Feet (dBA Leq-8h)
Grader	2	8	74	77.0
Water Truck	2	8	70	73.0
Dozer	2	8	75	78.0
Loader/Tractor	2	8	73	76.0
Trenchers	3	8	72	76.8
			Cumulative Levels @ 50 Feet (dBA)	83.5
			Distance To Property Line	150
			Noise Reduction Due To Distance	-9.6
			NEAREST PROPERTY LINE NOISE LEVEL	73.9

The installation of the PV panels will utilize a total of two small hydraulic breakers to bore the holes for the panel stands, two mobile cranes to move the PV panel in position and two pneumatic tools to secure the panels to the stands. The noise levels utilized in this analysis, based upon the anticipated list of equipment, are shown in Table 3-2. Based upon normal installation procedures the equipment is anticipated to be spread out over the entire site with pile driving occurring first and then the installation of the PV panels with a crane and pneumatic tool.

The pneumatic tool, and crane are not continuously operating at full power; this is referred to as the usage factor. The usage factor is the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power. Based on empirical data collected at the Central Artery/Tunnel (CA/T) project in Boston, Massachusetts which was used to develop the Road Construction Noise Model (RCNM), a pneumatic tool has a usage factor of 20-25% and the crane would only run under full load up to 50%.

Some equipment may be operating at a distance of 50-100 feet from the property line while the rest of the equipment may be located over 600 feet from the other equipment and same property line. Based upon normal installation procedures the two sets of equipment needed for panel installation are anticipated to be separated on the site.

As can be seen in Table 3-2, if all the equipment was operating in the same location, which is not physically possible, at a an average distance of 200 feet from the nearest property line the point source noise attenuation from construction activities is reduced 12.0 dBA. This would result in an anticipated worst case eight-hour average combined noise level of 75 dBA at the property line. Given the spatial separation of the equipment, the hydraulic breaker is not working directly next to the crane and pneumatic tool based on normal installation procedures and safety, the noise levels will comply with the County of San Diego's 75 dBA standard at all property lines.

Table 3-2: PV Panel Installation Noise Levels

Construction Equipment	Quantity	Duty Cycle (Hours/Day)	Source Level @ 50-Feet (dBA)	Cumulative Noise Level @ 50-Feet (dBA Leq-8h)
Hydraulic Breaker	2	8	82	85.0
Mobile Crane	2	4	78	78.0
Pneumatic Tool	2	2	84	81.0
			Cumulative Levels @ 50 Feet (dBA)	87.0
			Distance To Property Line	200
			Noise Reduction Due To Distance	-15.6
			NEAREST PROPERTY LINE NOISE LEVEL	74.2

Additionally, the County Noise Ordinance Section 36.410, states that except for emergency work or work on a public road project, no person shall produce or cause to be produced an impulsive noise that exceeds the maximum sound level shown of 82 dBA (at residential uses), when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is received, for 25 percent of the minutes in the measurement period. The maximum sound level and uses are shown above in Table 36.410A as described in the County Zoning Ordinance.

As described above, the installation of the PV panels will utilize a total of two small hydraulic breakers to bore the holes for the installation of the panel stands that could produce impulsive noise. Based upon normal installation procedures the two hydraulic breakers are anticipated to be separated on the site. A single hydraulic breakers would be operating at a distance of 50 feet or more from the property line for a short time to install a single panel stand. The hydraulic breakers would then move further from the property line to set another panel stand and continue is this fashion. Each panel stand installation process is only anticipated to last 5 minutes or less.

The proposed SBU hydraulic breaker (Model SBU 160) pile drivers can produce maximum noise levels (Lmax) of 86 dBA at a distance of 10 meters (32.8 feet) when the drive head is operating (Source: Atlas Copco). This would equate to a maximum sound level of 82 dBA, County Threshold, at a distance of 50 feet. The manufacturer's noise test results for the hydraulic breakers are provided in ***Attachment B*** of this report. Since all the PV panels are located 50 feet or more from the nearest property line, no impulsive noise impacts are anticipated and no mitigation measures, setbacks or duty cycle restrictions are needed. Typically, a hydraulic breaker is not continuously operating at full power; this is referred to as the usage factor. The usage factor is the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power. Therefore, the noise levels are anticipated to be below 82 dBA at a distance of 50 feet.

3.3 Construction Conclusions

During the grading operations, the equipment is anticipated to be spread out over the approximate 18 acre area with some equipment potentially operating at or near the property line while the rest of the equipment may be located more than 600 feet from the same property line. This would result in an acoustical center for the grading operation at approximately 300 feet from the nearest property line. At a distance as close as 150 feet the anticipated worst case eight-hour average combined noise levels from the grading operations is anticipated to be 73.9 dBA at the nearest property line. No offsite roadway improvements are proposed along Creelman Lane to accommodate the Proposed Project, with the exception of minor improvements to construct the driveway entrance and a pathway along Creelman Lane within the public right away adjacent to the project site.

No offsite roadway improvements are proposed with the exception of minor improvements to construct the driveway entrance and a pathway along Creelman Lane within the public right away adjacent to the project site. These improvements will be conducted as part of the overall grading phase and no impacts are anticipated.

During the installation of the PV panels, some equipment may be operating at a distance of 50-100 feet from the property line while the rest of the equipment may be located over 600 feet from the other equipment and same property line. Based upon normal installation procedures the two sets of equipment needed for panel installation are anticipated to be separated on the site. This would result in an acoustical center for the PV installation at an average distance of 200 feet or more for all the equipment from the nearest property line. This would result in an anticipated worst case eight-hour average combined noise level of up to 75 dBA at the property line. Given the spatial separation of the equipment, the hydraulic breaker is not working directly next to the crane and pneumatic tool based on normal installation procedures and safety, the noise levels will comply with the County of San Diego's 75 dBA standard at all property lines.

Additionally, the County Noise Ordinance Section 36.410, states that no person shall produce or cause to be produced an impulsive noise that exceeds the maximum sound level shown of 82 dBA (at residential uses), when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is received, for 25 percent of the minutes in the measurement period. To reduce the maximum noise level of 86 dBA to 82 dBA the hydraulic breaker would need to be located 50 feet from the nearest occupied residential property line or only operate 25% of the hourly or daily duration (15 minutes of any hour) when located within that distance. Since all the PV panels are located 50 feet or more from the nearest property line the impulsive noise levels are anticipated to be below the County's most restrictive 82 dBA threshold and no impacts are anticipated and no mitigation measures are required.

4.0 SUMMARY OF PROJECT IMPACTS, MITIGATION & CONCLUSIONS

- Operational Noise Analysis

  Based on the empirical data, manufacturers specifications and the distances to the property lines the unshielded noise levels from the proposed transformers/inverters were found to be below the most restrictive nighttime property line standard of 45 dBA at the adjacent properties zoned RR and A-70. No impacts are anticipated and no mitigation is required.

  Panel washing is anticipated to occur approximately four times per year and would take approximately 5 weeks to complete. Washing of the photovoltaic panels/arrays would generally occur during the daytime hours of 7am -10pm. To reduce the noise level below the County's most restrictive 50 dBA threshold, the wash station would need to be located 65 feet from the nearest residential property line. No direct or cumulative no impacts are anticipated and no mitigation measures are required.

- Construction Noise Levels

  During the grading operations, the equipment is anticipated to be spread out over the approximate 18 acre site with some equipment operating at or near the property line while the rest of the equipment may be located more than 600 feet from the same property line. This would result in an acoustical center for the grading operation at approximately 300 feet from the nearest property line. At a distance as close as 150 feet the anticipated worst case eight-hour average combined noise levels from the grading operations is anticipated to be 73.9 dBA at the nearest property line.

  During the installation of the PV panels, some equipment may be operating at a distance of 50-100 feet from the property line while the rest of the equipment may be located over 600 feet from the other equipment and same property line. Based upon normal installation procedures the two sets of equipment needed for panel installation are anticipated to be separated on the site. This would result in an anticipated worst case eight-hour average combined noise level of up to 75 dBA at the property line. Given the spatial separation of the equipment, the hydraulic breaker is not working directly next to the crane and pneumatic tool based on normal installation procedures and safety, the noise levels will comply with the County of San Diego's 75 dBA standard at all property lines.

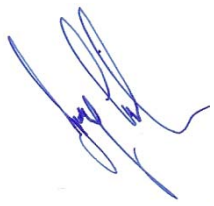
- Construction Impulse Noise

  Additionally, the County Noise Ordinance Section 36.410, states that no person shall produce or cause to be produced an impulsive noise that exceeds the maximum sound level shown of 82 dBA (at residential uses), when measured at the boundary line of the property where the noise

source is located or on any occupied property where the noise is received, for 25 percent of the minutes in the measurement period. To reduce the maximum noise level of 86 dBA to 82 dBA the hydraulic breaker would need to be located 50 feet from the nearest occupied residential property line or only operate 25% of the hourly or daily duration (15 minutes of any hour) when located within that distance. Since all the PV panels are located 50 feet or more from the nearest property line the impulsive noise levels are anticipated to be below the County's 82 dBA threshold and no impacts are anticipated and no mitigation measures are required.

5.0 CERTIFICATIONS

The contents of this report represent an accurate depiction of the existing and future acoustical environment and impacts within the proposed Solar Energy Project – Ramona. The report was prepared by Jeremy Louden; a County approved CEQA Consultant for Acoustics.



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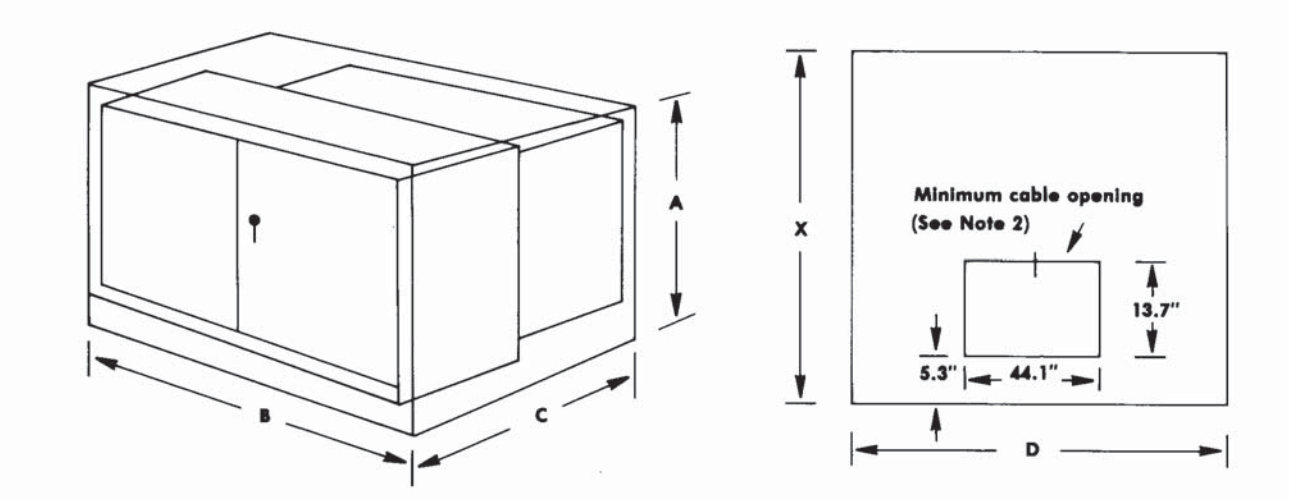
760-473-1253
jlouden@ldnconsulting.net

Date May 13, 2015

ATTACHMENT A

MANUFACTURERS SPECIFICATIONS AND NOISE DATA
(Transformers and Inverters)

Mechanical and Electrical Data



NOTES: 1. In some cases (particularly larger kVAs), the radiation will extend beyond the pad. If this is not acceptable, substitute the "B" and "C" dimensions for the "D" and "X" dimensions, respectively, to determine an optimum pad size.

2. High- and low-voltage compartments are **not** symmetrical. Since cable opening shown is minimum, adequate space may not be available on some configurations.

Typical Dimensions* Dimensions in Inches							
kVA	A	B	C	D	X	Typ. Weight	Typ. Gall Oil
75	63	72	53	71	52	2965	200
112.5	63	72	53	71	52	3050	200
150	63	72	53	71	52	3250	200
225	65	72	55	71	54	3350	225
300	65	72	55	71	54	3800	240
500	69	72	55	71	54	4500	250
750	77	72	74	71	58	6200	300
1000	77	75	75	71	59	9400	340
1500	77	76	76	71	67	12200	365
2000	87	78	79	71	69	13200	410
2500	87	78	79	71	69	13800	450

*Typical Dimensions include aluminum windings, tap changer, loop fedd and bayonet fusing.

Typical Impedance	
kVA	% Impedance Range
75	1.50–2.50
112.5	1.70–2.20
150	1.70–3.10
225	2.20–3.40
300	2.60–4.00
500	3.00–5.52
750–5000	5.75

*ANSI Standards allow for 7 ½% tolerance.

Audible Sound Levels	
kVA	Average Sound Levels (db)
51–100	51
101–300	55
301–500	56
750	57
1000	58
1500	60
2000	61
2500	62

Identification:

Filename[1]:	DES07-06A_XC-NA_EP1_snN12304000056_NoiseEmissionTestOutdoor_rev-B

[1]Automatic field based on save filename. Right click and select 'Update Field' to make current)

Approvals:

	Tester	**Author (Editor)[1]**	**Technical Champion[2]**	**Compliance Engineering[3]**	**Test Lab Manager[4]**
Signature	Email approval	Email approval	Email approval		Email approval
Printed Name	Michael Girardelli	Alex Viel	James Yin		Vernon Chase
Date yyyy-mm-dd	2013-11-19	2013-11-19	2013-11-19		2013-11-19

[1] If Tester is Author (Editor), then the signature only needs to read "Tester"
[2] If Author (Editor) is Technical Champion, then this is a technical check countersignature to the Technical Champion.
[3] Compliance Engineer is required to sign if results apply towards product compliance test records.
[4] Test Lab Manager (if applicable) signs to verify tests were conducted according to accepted test protocol and practices.

Report Revision History:

Rev	**Author Initials**	**Description**	**Date yyyy-mm-dd**
A	AV	Initial release	2013-11-19
B	VWC	Update Report for external noise sources	2013-11-25

Template Information:

Name: LABORATORY TEST REPORT Owner: Engineering Project Manager
Revision: 03 Date: 2013-07-26

This laboratory test report template is in accordance with Schneider Electric policy C102-6.
http://eestandards.us.schneider-electric.com/plcm/pdf/c102-6.pdf

To be completed by the Test Requestor:

Date of Request	2013-11-13
Name of Requestor	Alex Viel

Description of product, product prototype, system or component *(For manufactured products, this will include catalog number, class and type number, date code, serial number, etc.)* **:**

XC680-NA, Eng Proto 1, S/N N12304000056

Reason, for test inspection or analysis:

Evaluate noise emission of the inverter outdoors.

Brief description of test to be performed:

Identify the location of the highest level of noise emitting from the inverter.

Measure noise emission (dBA) of the inverter at 1.00 m and 3.00 m distance, for a 680kVA configuration. Minimum 10 feet distance from inverter to any surrounding reflective surfaces.

Reference standards for test *(e.g. UL, CSA, etc.):*

n/a

Reference to previous tests *(List name and embed pdf file)***:**

n/a

Data to be recorded, and PASS/FAIL criteria for test:

- Record sound power level in dBA at all four sides of the inverter at heights of 1.00m and 2.15m, at 1.00 m and 3.00m distances.
- No pass/fail criteria.

Date record of performance(s) of test, inspection, or analysis conducted:

Name of Tester	Date yyyy-mm-dd	Test Description	Comments
Michael Girardelli	2013-11-18	Sound Level Measurement	Meter calibrated.

Equipment and instrumentation (including calibration dates) used:

Instrument / Equipment List						
Function	Mfr Name	Mfr Model	S/N	Calibration Date yyyy-mm-dd	Settings	
					Range Used	Mfr's accuracy spec in range used
Sound Level Meter	Extech Instruments	SL120	N/A	2013-09-13	30-80 dBA, 60-110 dBA	±1.5 dB

Methods

1.1 The test is conducted outside the Livermore test lab, with minimum 10 feet clearance distance around the inverter device under test (DUT) from any reflective walls. The outside environment is exposed to noise emission from nearby traffic and building power transformers. The DC source is located inside the Livermore test lab in the Anti-Islanding test bay, having its noise mostly suppressed from contributing to noise emission measurements.

Figure 1. Livermore Lab

1.2 Configure the test bay for the DUT to operate 380 VAC output, max power 680 kVA.

1.3 Configure the Extech Instruments LS120 Sound Level Meter to *A (A-weighting)*mode and *S (Slow Response , 1 second sampling)* mode. **Make sure the meter is calibrated.**

1.4 Measure the sound level (in dBA) at the locations given in Figure 2, with the meter's microphone aimed perpendicular at the DUT, at vertical heights of 1.00 m and 2.15 m from the base of the inverter (bottom of its plinth), for the following operating conditions:

1.4.1 No equipment energized in the immediate test environment.

1.4.2 DUT energized but offline.

1.4.3 DUT energized and online with 0% power production.

1.4.4 PV voltage 650 Vdc, 10% power.

1.4.5 PV voltage 800 Vdc, 10% power.

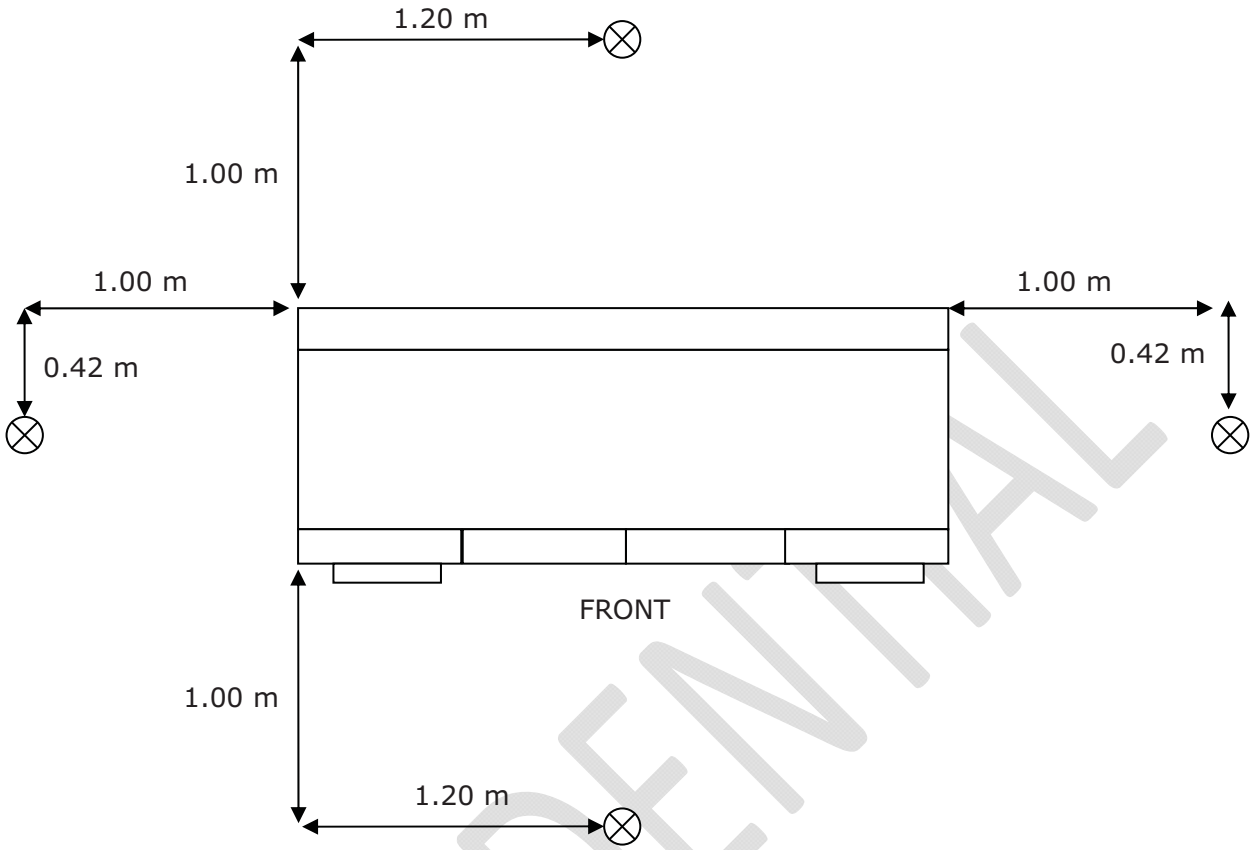


Figure 2. Top view of DUT and measurement locations at 1.00 m distance (not shown to scale).

1.5 Repeat step 1.4 with the power level set to 10%, 20%, 30%, 50%, 75% and 100%.

Data:

Additional photos of DUT placement:






Location in which the inverter emits the highest noise level:

DUT online PV 650 Vdc, Power Level 100%: Rear, 2.15m high

DUT online PV 800 Vdc, Power Level 100%: Rear, 2.15m high

Measurements from Extech LS120 meter:

Condition	Power Level	Sound Level (dBA) 1.00m distance 1.00m height				Sound Level (dBA) 3.00m distance 1.00m height				Sound Level (dBA) 1.00m distance 2.15m height				Sound Level (dBA) 3.00m distance 2.15m height			
		Rear	Left	Front	Right	Rear	Left	Front	Right	Rear	Left	Front	Right	Rear	Left	Front	Right
No Equipment Energized	N/A	50.9	54.2	62.3	53.2	55.9	53	56.7	52.5	54.1	55.4	54.9	59.7	53.6	54.8	53.4	53.9
DUT Offline	N/A	54.8	55.8	52.7	54.9	55.7	55.5	54.3	59.3	56.4	56.9	64.3	64.4	56.2	55.1	54.3	63.5
DUT Online	0%	63.5	59.0	62.4	58.5	60.0	57.3	57.5	58.3	65.1	59.3	64.9	65.4	64.5	57.7	58.4	63.7
DUT Online PV 650 Vdc	10%	64.6	60.9	67.7	57.8	61.1	55.9	57.9	54.5	65.6	58.8	64.9	60.5	66.1	57.1	58.4	60.1
	20%	67.6	59.8	63.4	58.9	64.2	57.6	57.4	56.3	67.8	58.9	65.2	67.0	68.1	57.5	59.9	61.4
	30%	69.3	59.2	65.2	58.6	66.4	58.2	58.5	55.9	69.2	59.7	66.0	65.8	70.2	58.1	60.8	62.0
	50%	73.6	62.4	67.7	61.2	69.5	61.0	60.0	57.5	72.3	60.4	66.9	64.0	72.9	58.8	60.4	64.9
	75%	76.1	62.5	69.6	62.3	73.2	62.9	61.0	60.7	75.4	62.3	70.2	68.1	76.1	60.3	62.4	68.2
	100%	79.8	71.2	76.6	69.9	77.4	69.0	71.2	67.9	80.2**	73.4	76.6	75.0	80.5	68.4	72.7	72.5
DUT Online PV 800 Vdc	10%	65.3	59.2	62.5	59.0	62.3	56.3	57.7	57.5	65.4	58.7	63.8	57.5	60.2	57.5	58.4	55.7
	20%	68.6	60.2	64.1	58.1	65.9	60.3	58.2	55.3	67.4	59.1	64.9	58.1	61.8	57.0	59.1	56.9
	30%	70.8	60.8	65.5	58.9	68.2	59.8	59.3	57.9	69.7	59.7	64.8	58.3	62.9	58.1	60.2	57.8
	50%	74.6	64.1	66.8	60.8	71.4	62.9	61.9	56.9	73.9	60.7	66.8	60.0	65.6	59.1	60.5	60.0
	75%	77.3	65.8	70.4	62.9	74.8	64.4	64.5	59.6	76.1	62.3	68.3	62.2	68.4	61.5	65.4	62.8
	100%	80.3	70.9	77.1	69.9	78.5	69.3	71.3	67.8	80.7	72.5	78.0	71.9	75.2	58.8	73.9	71.5

** The measurement appeared to be corrupted and an estimate based on extrapolated values has been inserted.

Nearby traffic flow was nearly constant. Tester attempted best effort to avoid taking readings when there was immediate street traffic contributing noise.

Analysis:

Average of highest sound levels at 1.00m distance with DUT online, 100% power, 650Vdc and 800Vdc:

Measurements taken at the rear of the unit included reflective noise from the concrete building located approximately 3 meters from the inverter. The highest noise level recorded occurred in the front of the unit at a distance of 1 meter and measured 78.0 dBA.

ATTACHMENT B

MANUFACTURERS SPECIFICATIONS AND NOISE DATA
(Hydraulic Breaker)

SBU hydraulic breakers

Universal Solid Body breakers

Atlas Copco

A new line of Solid Body breakers

Atlas Copco's solid body breakers are internationally recognized for their superior toughness and reliability. To meet the market needs for high back pressure breakers, Atlas Copco has developed a universal line of Solid Body breakers.

Tough and reliable

What do you really want from a breaker? Breaking, of course. As much as possible, without breakdowns, at any time, on any job. And that's just what you can expect from an Atlas Copco SBU breaker.
With the new line of universal Solid Body breakers you get a hydraulic breaker that is easy to install on all carrier types.

Solid Body concept

A solid body breaker is machined from a single block of cast metal.

The advantages are many:

- Integrated percussion mechanism and guide system
- Designed without side bolts for maximum reliability
- Compact design for easy positioning
- Lower vibration and less noise
- Few parts and easy maintenance

Wide range of applications

Atlas Copco's hydraulic breakers have been developed for a wide variety of applications. With technically advanced percussion mechanisms and long piston stroke, they offer one of the highest performance-to-weight ratios on the market. The Atlas Copco SBU breakers are used for road work, trenching, general demolition, plus primary and secondary rock breaking. It has air injection porting for under water breaking.

SBU HYDRAULIC BREAKERS		SBU 160	SBU 220	SBU 340
Carrier weight class [1]	t	2.2-5.0	2.8-6.0	4.5-9.0
Service weight [2]	kg	160	224	328
Length without tool	mm	687	732	807
Working tool diameter	mm	50	65	80
Working length of working tool	mm	250	300	440
Oil flow	l/min	30-50	42-75	62-100
Operating pressure	bar	100-150	100-150	100-150
Back pressure acceptance	bar	8 [4]	35 [5]	35 [5]
Max. hydr. input power	kW	13	19	25
Impact rate	bpm	1000-2000	750-1,400	700-1,300
Sound power level guaranteed [3]	dB(A)	115	118	122
Sound pressure level (r=10m) [3]	dB(A)	86	89	93
Part number	-	8460 0300 45	8460 0300 55	8460 0300 65

TOOLS FOR EVERY JOB	SBU 160	SBU 220	SBU 340
Moil point	3083 3169 00	3083 3162 00	3083 3191 00
Moil point (XProfile)	3363 0982 50	3363 0982 52	3363 0982 54
Chisel (cross)	3083 3170 00	3083 3161 00	3083 3192 00
Chisel (XProfile)	3363 0982 51	3363 0982 53	3363 0982 55
Blunt tool	3083 3182 00	3083 3411 00	3083 3195 00
Wide chisel (cross)	3083 3171 00	3083 3163 00	3083 3193 00
Wide chisel (parallel)	3083 3172 00	3083 3167 00	3083 3194 00

1) Weights apply to standard carriers only. Any variances must be agree with Atlas Copco and/or the carrier manufacturer prior to attachment.
2) Breaker and breaker box with standard adapter, screw kit plus working tool.
3) Important: EN ISO 3744 in accordance with directive 2000/14/EC. Full details of measurement are available in the Safety and Operating Instruction of the product (part no 9800 0908 01). It can be found on www.acprintshop.com
4) Back pressure acceptance at full performance; maximum back pressure 30 bar at reduced impact rate.
5) Back pressure acceptance at full performance.

Atlas Copco

www.atlascopco.com