# EXHIBIT X
# NOISE

OAR 345-02100010(1)(x)

## TABLE OF CONTENTS



**TABLES**



**FIGURES**

**OAR 345-021-0010(1)(x):** *Information about noise generated by construction and operation of the proposed facility, providing evidence to support a finding by the Council that the proposed facility complies with the Oregon Department of Environmental Quality's noise control standards in OAR 340-035-0035.*

**Response**: This Exhibit provides a noise assessment consistent with the requirements of OAR 345-021-0010(1)(x). The evidence provided in this Exhibit demonstrates that Madras PV1, LLC (Applicant) has a reasonable likelihood of designing and operating the Madras Solar Energy Facility (Facility) in compliance with the Oregon Department of Environmental Quality's (DEQ's) noise control standards in OAR 340-035-0035, Noise Control Regulations for Industry and Commerce.

## X.1 BACKGROUND INFORMATION ABOUT NOISE

An understanding of how noise is defined and measured provides useful background for this Exhibit. Noise is defined as unwanted sound. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. There are several different ways to measure noise, depending on the source of the noise, the receiver, and the reason for the noise measurement. Table X-1 summarizes the technical noise terms used in this Exhibit.

**Table X-1. Definitions of Acoustical Terms**

| Term | Definition |
|---|---|
| Ambient noise level | The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location. |
| Decibel (dB) | A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the measured pressure to the reference pressure, which is 20 micropascals. |
| A-weighted sound pressure level (dBA) | The sound pressure level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted. |
| Statistical noise level ($L_n$) | The noise level exceeded during n percent of the measurement period, where n is a number between 0 and 100 (for example, $L_{50}$ is the level exceeded 50 percent of the time). |

Table X-2 shows the relative A-weighted noise levels of common sounds measured in the environment and in industry for various sound levels.

**Table X-2. Typical Sound Levels Measured in the Environment and Industry**

| Noise Source At a Given Distance | A-Weighted Sound Level in Decibels | Noise Environment (as applicable) | Subjective Impression (as applicable) |
|---|---|---|---|
| Civil defense siren (100 feet) | 130 | | |
| Jet takeoff (200 feet) | 120 | | Pain threshold |
| | 110 | Rock music concert | |
| Pile driver (50 feet) | 100 | | Very loud |
| Ambulance siren (100 feet) | 90 | Boiler room | |
| Freight cars (50 feet) | | Printing press plant | |
| Pneumatic drill (50 feet) | 80 | In kitchen with garbage disposal running | |
| Freeway (100 feet) | 70 | | Moderately loud |
| Vacuum cleaner (10 feet) | 60 | Data processing center | |
| Department store; light traffic (100 feet) | 50 | Private business office | |
| Large transformer (200 feet) | 40 | | Quiet |
| Soft whisper (5 feet) | 30 | Quiet bedroom | |
| | 20 | Recording studio | |

Source: Beranek, 1988

An understanding of the difference between a sound *pressure* level (or noise level) and a sound *power* level also can be useful. A sound power level (commonly abbreviated as PWL or Lw) is analogous to the wattage of a light bulb; it is a measure of the acoustical energy emitted by the source and is, therefore, independent of distance. A sound pressure level is analogous to the brightness or intensity of light experienced at a specific distance from a source and is measured directly with a sound-level meter. Sound pressure levels always should be specified with a location or distance from the noise source.

Sound power level data are used in acoustic models to predict sound pressure levels. This is because sound power levels take into account the size of the acoustical source and account for the total acoustical energy emitted by the source.

It is also important to note that decibels cannot be directly added arithmetically, that is, 50 dBA + 50 dBA does not equal 100 dBA. When two sources of equal level are added together the result will always be 3 dB greater; that is 50 dBA + 50 dBA = 53 dBA and 70 dBA + 70 dBA = 73 dBA. If the difference between the two sources is 10 dBA, the level (when rounded to the nearest whole decibel) will not increase; that is 40 dBA + 50 dBA=50 dBA and 60 dBA + 70 dBA=70 dBA.

The decrease in sound level caused by distance from any single sound source normally follows the inverse square law; that is, the sound pressure level changes in inverse proportion to the square of the distance from the sound source. In a large open area with no obstructive or reflective surfaces, it is a general rule that at distances greater than approximately the largest dimension of the noise-emitting surface, the sound pressure level from a single source of sound drops off at a rate of 6 dB with each doubling of the distance from the source. Sound energy is absorbed in the air as a function of temperature, humidity, and the frequency of the sound. This attenuation can be up to 2 dB over 1,000 feet. The drop-off rate will also vary based on terrain conditions and the presence of obstructions in the sound's propagation path. These factors are considered in the development of the acoustical model.

## X.2 SITE BOUNDARY AND ANALYSIS AREA

The approximately 284-acre Facility site boundary encompasses exclusively private land that sits unused except for pasture grazing one time in the past 25 years. The Applicant has negotiated a long-term option to lease the land within the site boundary. The analysis area consists of any area within the vicinity of the Facility site boundary that could be affected by noise from Facility construction or operation.

## X.3 REGULATORY REQUIREMENTS

**OAR 340-035-0035(1)(b)(B)(i)** *No person owning or controlling a new industrial or commercial noise source located on a previously unused industrial or commercial site shall cause or permit the operation of that noise source if the noise levels generated or indirectly caused by that noise source increase the ambient statistical noise levels, $L_{10}$ or $L_{50}$, by more than 10 dBA in any one hour, or exceed the levels specified in Table 8, as measured at an appropriate measurement point, as specified in subsection (3)(b) of this rule.*

**Response**: Noise standards promulgated by DEQ are contained in OAR 340-035-0035, Noise Control Regulations for Industry and Commerce (DEQ Noise Rules). The DEQ Noise Rules provide two types of noise limits for new industrial or commercial noise sources on a previously unused site.[1] Specifically, OAR 340-035-0035(1)(b)(B)(i) limits the increase over existing ambient levels to 10 dBA while ensuring that a given project does not exceed the levels identified in Table 8 of the OAR.

Table X-3 contains the "Table 8" statistical noise limits referenced in the DEQ Noise Rules. The $L_{50}$ is the median sound level (50 percent of the measurement interval is above this level and 50 percent is below).

[1] A "previously unused industrial or commercial site" is defined in OAR 340-035-0015(47) as property which has not been used by any industrial or commercial noise source during the 20 years immediately preceding commencement of construction of a new industrial or commercial source on that property.

**Table X-3. New Industrial and Commercial Noise Source Standards**
*Allowable Statistical Noise Levels in Any One Hour*

| Statistical Descriptor | Daytime (7 a.m. – 10 p.m.) (dBA) | Nighttime (10 p.m. – 7 a.m.) (dBA) |
|---|---|---|
| $L_{50}$ | 55 | 50 |
| $L_{10}$ | 60 | 55 |
| $L_1$ | 75 | 60 |

Source: OAR 340-35-0035, Table 8.
https://www.oregon.gov/deq/Rulemaking%20Docs/div35table1-10.pdf

In addition, OAR 340-035-0035(1)(f) establishes standards that regulate octave band sound pressure levels and audible discrete tones. Such standards can be applied by DEQ when it believes the limits discussed above do not adequately protect the health, safety, or welfare of the public[2].

OAR 340-035-0035(5) provides exemptions for emergency equipment, warning devices not operating continuously for more than 5 minutes, sounds that originate on construction sites, and sounds created in construction or maintenance of capital equipment.

The noise limits apply at “appropriate measurement points” on “noise-sensitive property.” The “appropriate measurement point” is defined in the DEQ Noise Rules under OAR 340-35-0035(3)(b) as whichever of the following is farther from the noise source:

- 25 feet (7.6 meters) toward the noise source from that point on the noise-sensitive building nearest the noise source
- That point on the noise-sensitive property line nearest the noise source

“Noise-sensitive property” is defined in OAR 340-35-0015(38) as “real property normally used for sleeping, or normally used as schools, churches, hospitals, or public libraries. Property used in industrial or agricultural activities is not noise-sensitive property unless it meets the foregoing criteria in more than an incidental manner.” Property that is zoned for agricultural use and is void of a residence does not meet the definition of noise-sensitive property per OAR 340-035-0015(38).

Potential noise-sensitive properties in the Facility area are shown on Figure X-1. The closest residential receptor to the solar array inverters, battery storage system, and inverter and substation transformers is more than one-half mile away.

## X.4 NOISE ANALYSIS METHODOLOGY

This Exhibit analyzes potential noise impacts from construction and operation of the proposed solar array, associated inverters, inverter and substation transformers, and battery storage system.

Few sources of noise are associated with solar facilities and they are generally minor compared to other energy facilities. The primary noise sources are inverters and transformers. The current produced by solar modules is in the form of direct current (DC). In order to be sent to the electrical grid, the DC current must be converted into alternating current (AC) power, and inverters serve this function. Transformers increase the voltage to ensure the power is efficiently transmitted to the grid. The Applicant has identified the primary source of noise from the battery storage system to be air-conditioning systems built into the storage containers.

## X.5 IMPACTS OF THE PROPOSED FACILITY

*The applicant shall include: **OAR 345-021-0010(1)(x)(A)** Predicted noise levels resulting from construction and operation of the proposed facility.*

[2] Impulse noise is also regulated in OAR 340-35-0035(1)(d), but solar facilities do not generate impulsive sounds such as those associated with blasting, gunfire, pile-driving, riveting, hammering, or stamping.

**OAR 345-021-0010(1)(x)(B)** *An analysis of the proposed facility's compliance with the applicable noise regulations in OAR 340-035-0035, including a discussion and justification of the methods and assumptions used in the analysis.*

**Response**:

## X.5.1 Construction

OAR 340-035-0035(5)(g) specifically exempts construction activity. Therefore, by regulatory definition, there will be no construction noise impacts. Regardless, the following presents potential construction noise levels at the residential receptors nearest to the Facility, the closest of which is more than 1/2 mile away, as stated in Section X.3.

Table X-4 documents the results of a U.S. Environmental Protection Agency (EPA) Office of Noise Abatement and Control analysis of noise from construction equipment, power plant construction sites, and other types of facilities (EPA, 1971). Data from the EPA study have been used as a basis for Facility analysis in the absence of specific information about types, quantities, and operating schedules of construction equipment. The EPA data are conservative because the evolution of construction equipment has generally been toward quieter design. Use of these data is reasonable for estimating noise levels, given that they are still widely used by acoustical professionals.

**Table X-4. Average Noise Levels from Common Construction at a Reference Distance of 50 feet**

| Construction Equipment | Typical Average Noise Level at 50 feet (dBA) |
|---|---|
| Air compressor | 81 |
| Backhoe | 85 |
| Concrete mixer | 85 |
| Concrete pump | 82 |
| Crane, mobile | 83 |
| Dozer | 80 |
| Generator | 78 |
| Grader | 85 |
| Loader | 79 |
| Paver | 89 |
| Pile driver | 101 |
| Pneumatic tool | 85 |
| Pump | 76 |
| Rock drill | 98 |
| Saw | 78 |
| Scraper | 88 |
| Shovel | 82 |
| Truck | 91 |

Source: EPA, 1971.

Table X-5 shows the total composite noise level at a reference distance of 50 feet as well as additional distances, based on typical equipment operating during each phase of construction and the typical usage factor for each piece of equipment. The predicted construction noise levels at 1 mile is also shown. The calculated levels are likely conservative, because the only attenuating mechanism considered was geometric spreading, which results in an attenuation rate of 6 dBA per doubling of distance; attenuation related to the presence of structures, trees or vegetation, ground effects, and terrain is not considered.

**Table X-5. Composite Construction Site Noise Levels**

| Construction Phase | 50 feet (dBA) | 100 feet (dBA) | 200 feet (dBA) | 400 feet (dBA) | 1/2 mile (dBA) | 1 mile (dBA) |
|---|---|---|---|---|---|---|
| Clearing | 88 | 82 | 76 | 70 | 54 | 48 |
| Excavation | 90 | 84 | 78 | 72 | 56 | 50 |
| Foundation | 89 | 83 | 77 | 71 | 55 | 49 |
| Erection | 84 | 78 | 72 | 66 | 50 | 44 |
| Finishing | 89 | 83 | 77 | 71 | 55 | 49 |

## X.5.2 Operations

A noise model of the proposed Facility was developed using source input levels derived from data supplied by manufacturers, the applicant or information found in the technical literature. The noise levels presented represent the anticipated steady-state level from the Facility with essentially all equipment operating.

Standard acoustical engineering methods were used in the noise analysis. The noise model, CADNA/A by DataKustik GmbH of Munich, Germany, is a sophisticated device that enables one to fully model complex industrial plants. The sound propagation factors used in the model have been adopted from ISO 9613-2 *Acoustics—Sound Attenuation During Propagation Outdoors*. Atmospheric absorption was estimated for conditions of 10 degrees Celsius (°C) and 70 percent relative humidity (conditions that favor propagation) and computed in accordance with ISO 9613-1. The model divides the proposed Facility into a list of individual noise sources representing each piece of equipment that produces a significant amount of noise. The sound power levels representing the standard performance of each of these components are assigned based on data supplied by manufacturers or information found in the technical literature. Using these sound power levels as a basis, the model calculates the sound pressure level that would occur at each receptor from each source after losses from distance, air absorption and other factors are considered. The sum of all these individual levels is the total plant level at the modeling point.

The model is based on 19 inverters, 19 small transformers (2,500-kilovolt ampere [kVA]) that are collocated with the inverters, and 1 primary substation transformer (70 megavolt ampere [MVA]). The Facility may be developed with a battery storage system housed within a maximum of 120 battery storage containers. The maximum battery storage scenario with up to 120 battery storage containers is shown on the Figure C-2B site plan in Exhibit C. The constructed Facility ultimately may have fewer than 120 battery storage containers. The model that includes storage is based on 120 battery storage containers to account for the maximum storage capacity scenario. As is typical at this stage of a project, these data are preliminary and detailed vendor specifications will ultimately be developed to ensure the Facility complies with the conditions of certification.

The sound power levels used in the model are summarized in Table X-6. As noted above, sound power level data are used in acoustic models to predict sound pressure levels. This is because sound power levels take into account the size of the acoustical source and account for the total acoustical energy emitted by the source. The approximate sound pressure level at 400 feet, the sound level one would measure or hear, is 44 dBA less than the sound power levels identified in Table X-6. As is typical at this stage of a project, these data are preliminary and detailed vendor specifications will ultimately be developed to ensure the Facility complies with the conditions of certification.

**Table X-6. Sound Levels Used to Model the Facility**

| Facility Component | Sound Power Level (dBA) |
|---|---|
| Inverter | 92 |
| Inverter Transformer (2,500 kVA) | 75 |
| Substation Transformer (70 MVA) | 86 |
| Battery Storage Container | 87 |

Given the low level of sound emitted from Facility components and the distance to the closest residence (over 1/2 mile), the predicted full load sound levels attributable to Facility operations is low: 26 dBA without the battery storage units operating and 29 dBA with the battery storage air conditioners operating at the closest residence, R-2 (refer to Figures X-2 and X-3 for predicted sound contours of the solar only and solar plus battery storage system, respectively). When the Facility is not operating at full load, the sound level would be less. During the nighttime hours, the inverters are not at full capacity and emit less noise. Additionally, the cooling requirements for the batteries and transformers are expected to be diminished during the nighttime hours, allowing the fans to operate at lower speed and sound level. Noise generated during the testing and commissioning phase of the Facility is not expected to be substantially different from that produced during normal full-load operation.

These low sound levels clearly comply with the limits summarized in Table X-3, the most restrictive of which is 50 dBA at night. To confirm compliance with the ambient degradation standard, ambient sound monitoring was conducted at representative locations R-3 and R-4. Larson Davis 831, ANSI S1.4 Type 1 (precision) data logging sound level meters were deployed for approximately 1 week. The hourly results are tabulated in attached Tables A-1 and A-2 for R-3 and R-4, respectively. The quietest average nighttime (10:00 p.m. to 7:00 a.m.) $L_{50}$ was 23 dBA at R-3 and 24 dBA at R-4. Given that the highest predicted sound level at the closest residence is 29 dBA, compliance with the 10-decibel ambient degradation standard is expected.

## X.6 PROPOSED MITIGATION MEASURES

**OAR 345-021-0010(1)(x)(C*)*** *Any measures the applicant proposes to reduce noise levels or noise impacts or to address public complaints about noise from the facility.*

**Response**: The Applicant proposes to employ the equipment selection and specification criteria necessary to ensure compliance with the Oregon noise standards (OAR 340-035-0035). While the Facility is anticipated to operate in compliance with the Oregon noise standards without unusual noise mitigation measures, the Applicant has many measures available to ensure compliance is achieved during detailed design. Such measures may include specifying quieter equipment (when available) and installing improved acoustical enclosures or barriers. Therefore, no significant noise impacts from the operations are anticipated and no additional mitigation is planned.

## X.7 PROPOSED MONITORING MEASURES

**OAR 345-021-0010(1)(x)(D)** A*ny measures the applicant proposes to monitor noise generated by operation of the facility.*

**Response**: Given the distance to the closest noise-sensitive areas from the Facility's primary noise sources and the low level of noise associated with solar and battery storage equipment, the Applicant intends to monitor noise only in response to a legitimate noise complaint.

## X.8 NOISE-SENSITIVE PROPERTIES

**OAR 345-021-0010(1)(x)(E)** *A list of the names and addresses of all owners of noise sensitive property, as defined in OAR 340-035-0015, within one mile of the proposed site boundary.*

**Response**: The Applicant's consultants reviewed aerial photography and conducted a field visit on July 1 and 2, 2019, to locate potential noise-sensitive properties, as defined in OAR 340-035-0015, within 1 mile of the Facility site boundary. Each noise-sensitive property is a potential residence. Table X-7 lists potential noise-sensitive properties within 1 mile of the Facility site boundary.

**Table X-7. Owners of Noise-Sensitive Property within 1 Mile of the Facility Site Boundary**

| Residence (see Figure X-1) | Tax Lot Number | Landowner Name | Address |
|---|---|---|---|
| R-1 | 1013300000201 | Simtustus Lake LLC | PO BOX 69, GOVERNMENT CAMP, OR 97028 |
| R-2 | 1013300000200 | Gladys P Grant | PO BOX 494, WARM SPRINGS, OR 97761-0494 |
| R-3 | 1013290000201 | Paul Clowers | 3815 NW DOGWOOD LN, MADRAS, OR 97741-8907 |
| R-4 | 1113060000201 | Everett Zack and Cindy M Fisher | 845 NW ELK DR, MADRAS, OR 97741-9459 |
| R-5 | 1113060000203 | Western United Life Assurance Co., C/O Susan Brown | P O BOX 934, MADRAS, OR 97741-0931 |
| R-6 | 1113060000202 | Wayne Alan Powers | 752 NW ELK DR, MADRAS, OR 97741-9456 |
| R-7 | 1113060000206 | Darrell and Regina Dahlgren | 857 NW ELK DR, MADRAS, OR 97741-9459 |
| R-8 | 1012000001300 | Ernest McCall EH Trust | 5052 SW HILLTOP LN, PORTLAND, OR 97221-2304 |

## X.9 SUMMARY

The noise analysis presented in this Exhibit provides sufficient evidence to support an Energy Facility Siting Council (EFSC) finding that Facility construction and operation can comply with applicable DEQ noise control standards in OAR 340-035-0035.

Specifically, the Applicant has provided information about the existing sound levels as well as the predicted noise levels during the Facility's construction and operations in accordance with OAR 345-021-0010(1)(x)(A), and included an analysis of the Facility's compliance with applicable DEQ noise regulations per OAR 345-021-0010(1)(x)(B). The Applicant has employed reasonable assumptions into its noise modeling analysis to demonstrate that the final Facility is capable of complying with the DEQ noise standard. The Applicant is committed to designing and operating the Facility in full compliance with the applicable requirements.

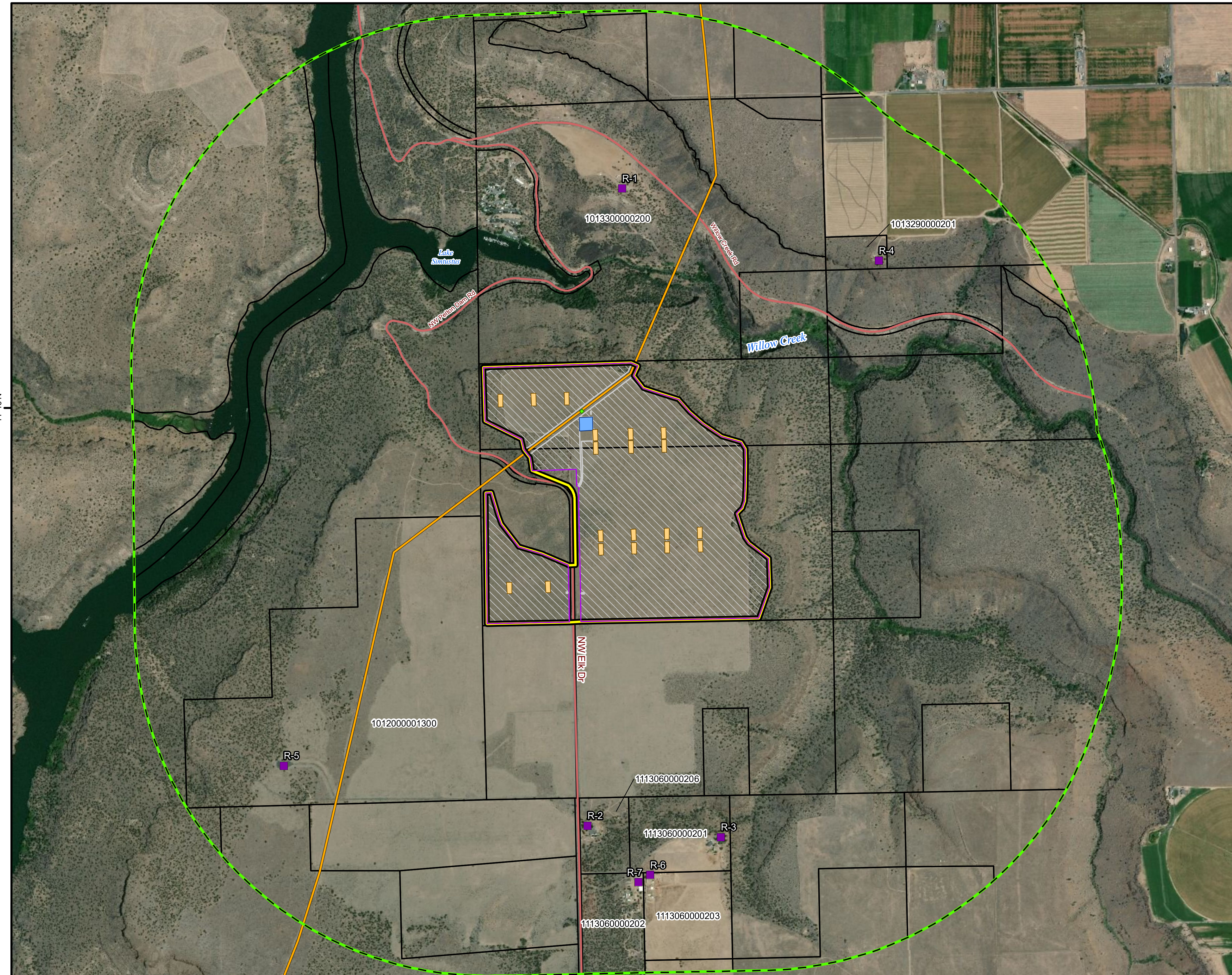
## X.10 REFERENCES

Beranek, L. L. 1988. *Acoustical Measurements*. American Institute of Physics. Woodbury, New York.

CADNA/A 2019. DataKustik, GmbH, Munich, Germany. http://www.datakustik.de/frameset.php?lang=en.

U.S. Environmental Protection Agency (EPA). 1971. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*.

# Figures




VICINITY MAP


## LEGEND

- Madras Solar Energy Facility Site Boundary
- Analysis Area (1 mile)
- Existing Pelton Dam to Round Butte 230-kV Transmission Line
- Existing Road
- Fence Line
- Battery Storage and Inverters
- POI Switching Station
- Solar Array
- Substation
- Potential Residence
- Tax Lot

N

Coordinate System: NAD 1983 UTM Zone 10N

0 750 1,500 3,000 4,500

Feet

1 inch equals 0.28 miles

**Figure X-1**

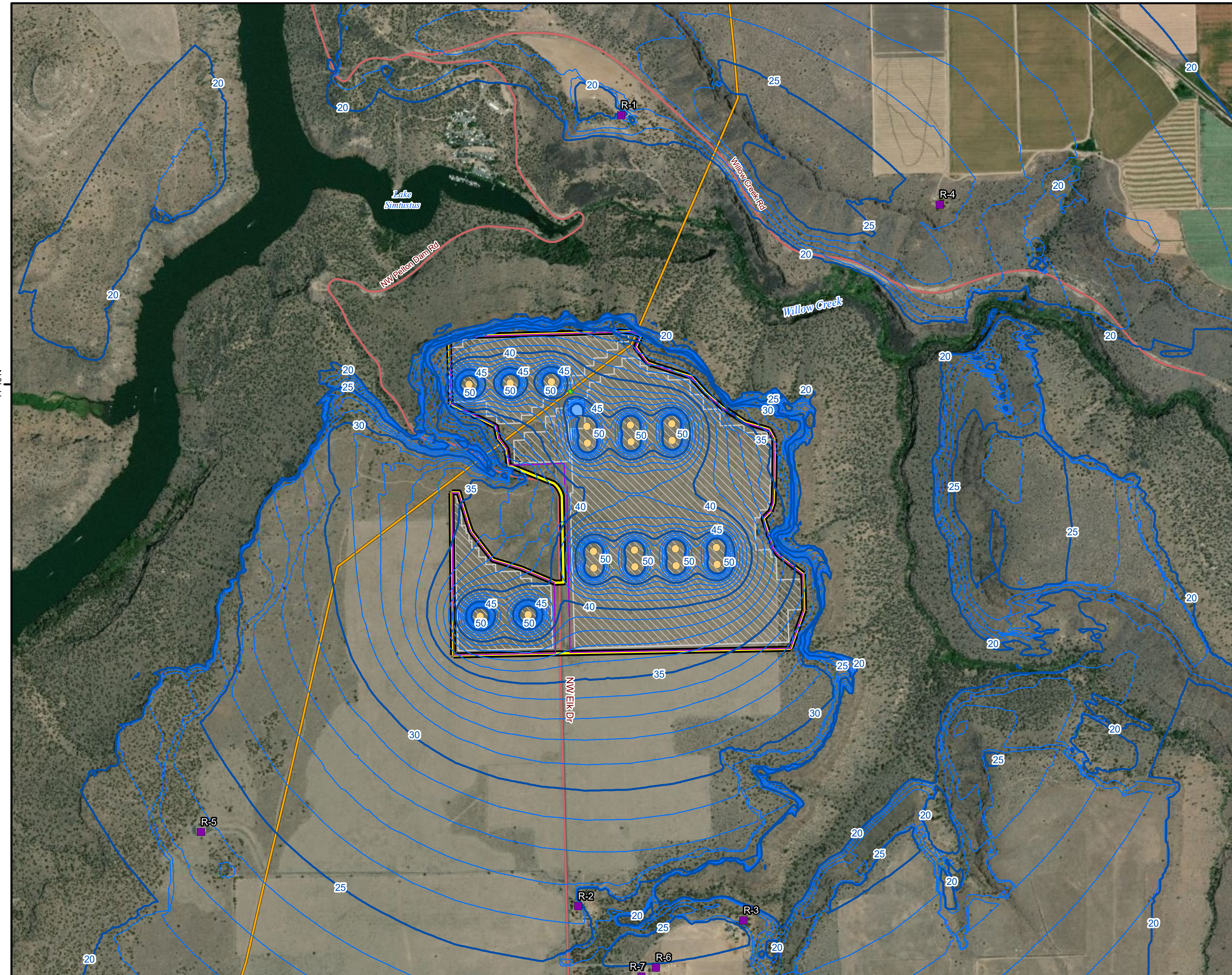
Noise-Sensitive Properties

Application for Site Certificate

Madras Solar Energy Facility

*Jefferson County, OR*

JACOBS




VICINITY MAP


## LEGEND

- Madras Solar Energy Facility Site Boundary
- Existing Pelton Dam to Round Butte 230-kV Transmission Line
- Existing Road
- Fence Line
- Inverter
- POI Switching Station
- Solar Array
- Substation
- Potential Residence
- Sound Contour (dBA)

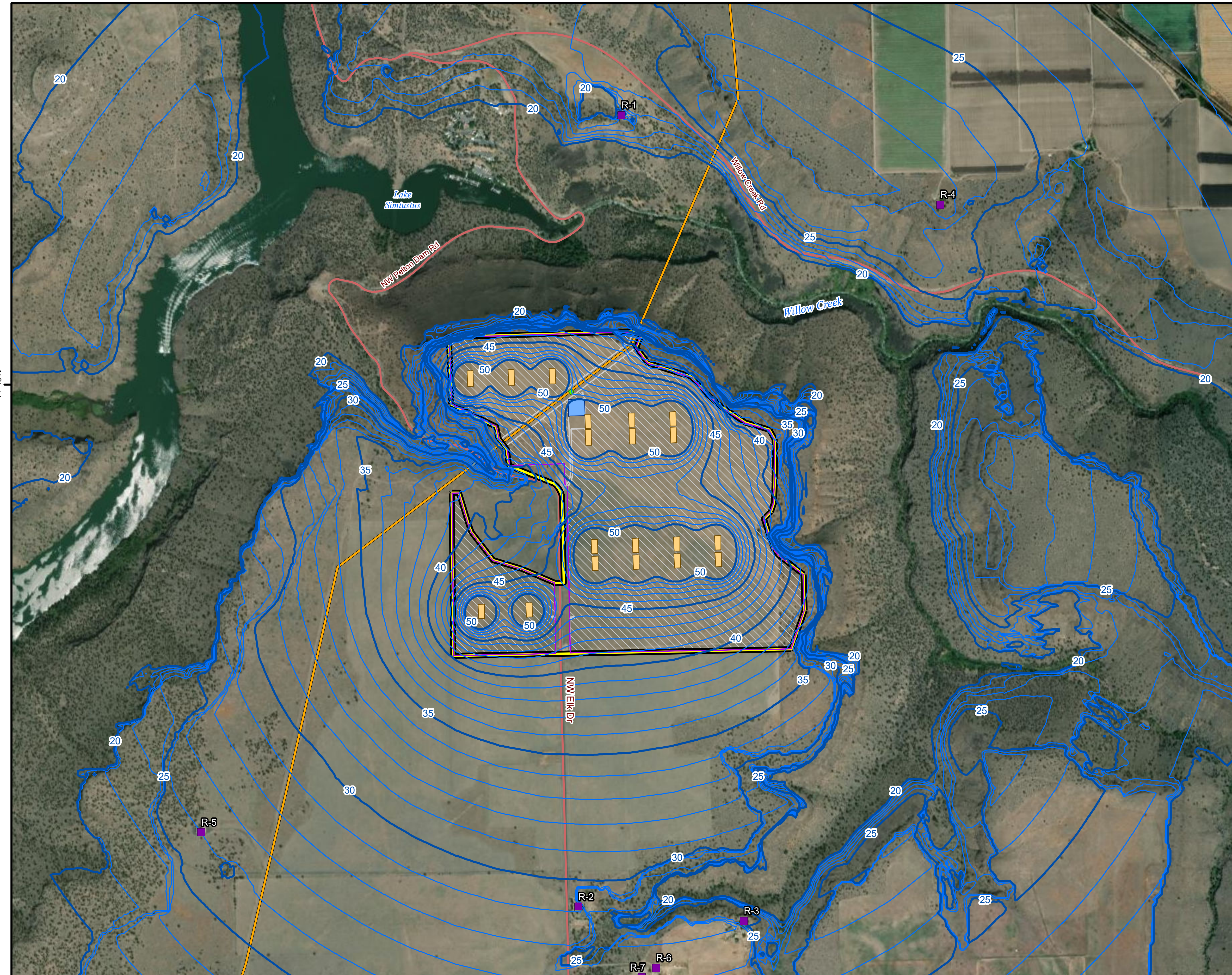
Coordinate System: NAD 1983 UTM Zone 10N

0 500 1,000 2,000 3,000
Feet

1 inch equals 0.23 miles

**Figure X-2**
Predicted Solar-Only Facility Sound Contours (dBA)
Application for Site Certificate
Madras Solar Energy Facility
*Jefferson County, OR*

JACOBS




VICINITY MAP


## LEGEND

- Madras Solar Energy Facility Site Boundary
- Existing Pelton Dam to Round Butte 230-kV Transmission Line
- Existing Road
- Fence Line
- Battery Storage and Inverters
- POI Switching Station
- Solar Array
- Substation
- Potential Residence
- Sound Contour (dBA)

N

Coordinate System: NAD 1983 UTM Zone 10N

0 500 1,000 2,000 3,000
Feet

1 inch equals 0.23 miles

**Figure X-3**
Predicted Solar and Battery Storage System Sound Contours (dBA)
Application for Site Certificate
Madras Solar Energy Facility
*Jefferson County, OR*

JACOBS

\\DC1VS01\GISPROJ\E\ECOPLEXUS\MADRASSOLARPROJECT\MAPS\REPORT\2019\SITECERTIFICATEAPP\X-3_200720.MXD KGRANT1 8/26/2020 3:57:39 PM

# Attachment
# Ambient Sound Monitoring Results

**Table A-1. Measured Sound Pressure Levels at Monitoring Location R-3 (dBA)**

| Date | Time | $L_1$ | $L_{10}$ | $L_{50}$ |
|---|---|---|---|---|
| 2020-07-02 | 18:00:00 | 47 | 41 | 35 |
| 2020-07-02 | 19:00:00 | 52 | 45 | 33 |
| 2020-07-02 | 20:00:00 | 54 | 42 | 33 |
| 2020-07-02 | 21:00:00 | 42 | 35 | 27 |
| 2020-07-02 | 22:00:00 | 30 | 25 | 23 |
| 2020-07-02 | 23:00:00 | 34 | 28 | 25 |
| 2020-07-03 | 00:00:00 | 42 | 34 | 28 |
| 2020-07-03 | 01:00:00 | 29 | 27 | 25 |
| 2020-07-03 | 02:00:00 | 27 | 25 | 24 |
| 2020-07-03 | 03:00:00 | 29 | 27 | 25 |
| 2020-07-03 | 04:00:00 | 41 | 33 | 26 |
| 2020-07-03 | 05:00:00 | 42 | 35 | 25 |
| 2020-07-03 | 06:00:00 | 42 | 33 | 27 |
| 2020-07-03 | 07:00:00 | 39 | 30 | 27 |
| 2020-07-03 | 08:00:00 | 47 | 39 | 28 |
| 2020-07-03 | 09:00:00 | 49 | 40 | 28 |
| 2020-07-03 | 10:00:00 | 52 | 37 | 31 |
| 2020-07-03 | 11:00:00 | 47 | 37 | 30 |
| 2020-07-03 | 12:00:00 | 58 | 40 | 34 |
| 2020-07-03 | 13:00:00 | 60 | 42 | 32 |
| 2020-07-03 | 14:00:00 | 50 | 48 | 31 |
| 2020-07-03 | 15:00:00 | 52 | 49 | 35 |
| 2020-07-03 | 16:00:00 | 51 | 46 | 40 |
| 2020-07-03 | 17:00:00 | 52 | 46 | 39 |
| 2020-07-03 | 18:00:00 | 53 | 47 | 41 |
| 2020-07-03 | 19:00:00 | 50 | 45 | 39 |
| 2020-07-03 | 20:00:00 | 47 | 40 | 32 |
| 2020-07-03 | 21:00:00 | 37 | 28 | 24 |
| 2020-07-03 | 22:00:00 | 33 | 27 | 24 |
| 2020-07-03 | 23:00:00 | 32 | 26 | 24 |
| 2020-07-04 | 00:00:00 | 30 | 26 | 24 |
| 2020-07-04 | 01:00:00 | 28 | 26 | 25 |
| 2020-07-04 | 02:00:00 | 28 | 27 | 25 |
| 2020-07-04 | 03:00:00 | 32 | 26 | 25 |
| 2020-07-04 | 04:00:00 | 42 | 34 | 25 |
| 2020-07-04 | 05:00:00 | 41 | 32 | 26 |
| 2020-07-04 | 06:00:00 | 40 | 31 | 25 |
| 2020-07-04 | 07:00:00 | 52 | 32 | 25 |
| 2020-07-04 | 08:00:00 | 49 | 36 | 27 |
| 2020-07-04 | 09:00:00 | 61 | 42 | 30 |
| 2020-07-04 | 10:00:00 | 51 | 38 | 28 |

**Table A-1. Measured Sound Pressure Levels at Monitoring Location R-3 (dBA)**

| Date | Time | $L_1$ | $L_{10}$ | $L_{50}$ |
|---|---|---|---|---|
| 2020-07-04 | 11:00:00 | 59 | 45 | 35 |
| 2020-07-04 | 12:00:00 | 44 | 37 | 31 |
| 2020-07-04 | 13:00:00 | 55 | 41 | 31 |
| 2020-07-04 | 14:00:00 | 56 | 41 | 35 |
| 2020-07-04 | 15:00:00 | 43 | 37 | 30 |
| 2020-07-04 | 16:00:00 | 55 | 36 | 29 |
| 2020-07-04 | 17:00:00 | 50 | 42 | 33 |
| 2020-07-04 | 18:00:00 | 54 | 42 | 33 |
| 2020-07-04 | 19:00:00 | 47 | 41 | 34 |
| 2020-07-04 | 20:00:00 | 52 | 39 | 31 |
| 2020-07-04 | 21:00:00 | 48 | 31 | 23 |
| 2020-07-04 | 22:00:00 | 40 | 31 | 25 |
| 2020-07-04 | 23:00:00 | 52 | 35 | 24 |
| 2020-07-05 | 00:00:00 | 27 | 24 | 22 |
| 2020-07-05 | 01:00:00 | 29 | 24 | 22 |
| 2020-07-05 | 02:00:00 | 31 | 24 | 22 |
| 2020-07-05 | 03:00:00 | 30 | 23 | 21 |
| 2020-07-05 | 04:00:00 | 37 | 32 | 23 |
| 2020-07-05 | 05:00:00 | 37 | 30 | 23 |
| 2020-07-05 | 06:00:00 | 37 | 30 | 25 |
| 2020-07-05 | 07:00:00 | 41 | 30 | 25 |
| 2020-07-05 | 08:00:00 | 41 | 31 | 25 |
| 2020-07-05 | 09:00:00 | 58 | 36 | 25 |
| 2020-07-05 | 10:00:00 | 59 | 38 | 28 |
| 2020-07-05 | 11:00:00 | 53 | 41 | 30 |
| 2020-07-05 | 12:00:00 | 52 | 42 | 32 |
| 2020-07-05 | 13:00:00 | 54 | 37 | 29 |
| 2020-07-05 | 14:00:00 | 53 | 39 | 31 |
| 2020-07-05 | 15:00:00 | 52 | 37 | 28 |
| 2020-07-05 | 16:00:00 | 49 | 38 | 30 |
| 2020-07-05 | 17:00:00 | 51 | 43 | 34 |
| 2020-07-05 | 18:00:00 | 53 | 46 | 39 |
| 2020-07-05 | 19:00:00 | 53 | 48 | 41 |
| 2020-07-05 | 20:00:00 | 54 | 45 | 37 |
| 2020-07-05 | 21:00:00 | 48 | 39 | 33 |
| 2020-07-05 | 22:00:00 | 40 | 30 | 25 |
| 2020-07-05 | 23:00:00 | 32 | 24 | 22 |
| 2020-07-06 | 00:00:00 | 25 | 24 | 22 |
| 2020-07-06 | 01:00:00 | 26 | 24 | 23 |
| 2020-07-06 | 02:00:00 | 31 | 25 | 23 |
| 2020-07-06 | 03:00:00 | 28 | 24 | 22 |

**Table A-1. Measured Sound Pressure Levels at Monitoring Location R-3 (dBA)**

| Date | Time | $L_1$ | $L_{10}$ | $L_{50}$ |
|---|---|---|---|---|
| 2020-07-06 | 04:00:00 | 37 | 32 | 27 |
| 2020-07-06 | 05:00:00 | 41 | 35 | 28 |
| 2020-07-06 | 06:00:00 | 42 | 33 | 28 |
| 2020-07-06 | 07:00:00 | 57 | 38 | 29 |
| 2020-07-06 | 08:00:00 | 52 | 38 | 28 |
| 2020-07-06 | 09:00:00 | 42 | 33 | 24 |
| 2020-07-06 | 10:00:00 | 50 | 36 | 29 |
| 2020-07-06 | 11:00:00 | 58 | 47 | 33 |
| 2020-07-06 | 12:00:00 | 52 | 46 | 30 |
| 2020-07-06 | 13:00:00 | 55 | 40 | 32 |
| 2020-07-06 | 14:00:00 | 56 | 45 | 36 |
| 2020-07-06 | 15:00:00 | 57 | 50 | 40 |
| 2020-07-06 | 16:00:00 | 60 | 55 | 47 |
| 2020-07-06 | 17:00:00 | 61 | 54 | 47 |
| 2020-07-06 | 18:00:00 | 56 | 50 | 44 |
| 2020-07-06 | 19:00:00 | 59 | 53 | 46 |
| 2020-07-06 | 20:00:00 | 57 | 51 | 45 |
| 2020-07-06 | 21:00:00 | 50 | 46 | 38 |
| 2020-07-06 | 22:00:00 | 31 | 26 | 21 |
| 2020-07-06 | 23:00:00 | 34 | 23 | 20 |
| 2020-07-07 | 00:00:00 | 27 | 22 | 20 |
| 2020-07-07 | 01:00:00 | 32 | 25 | 21 |
| 2020-07-07 | 02:00:00 | 29 | 26 | 23 |
| 2020-07-07 | 03:00:00 | 30 | 24 | 21 |
| 2020-07-07 | 04:00:00 | 34 | 30 | 23 |
| 2020-07-07 | 05:00:00 | 41 | 34 | 26 |
| 2020-07-07 | 06:00:00 | 43 | 34 | 28 |
| 2020-07-07 | 07:00:00 | 48 | 40 | 30 |
| 2020-07-07 | 08:00:00 | 62 | 47 | 32 |
| 2020-07-07 | 09:00:00 | 56 | 42 | 28 |
| 2020-07-07 | 10:00:00 | 55 | 41 | 31 |
| 2020-07-07 | 11:00:00 | 49 | 40 | 31 |
| 2020-07-07 | 12:00:00 | 53 | 45 | 35 |
| 2020-07-07 | 13:00:00 | 56 | 48 | 40 |
| 2020-07-07 | 14:00:00 | 53 | 46 | 39 |
| 2020-07-07 | 15:00:00 | 61 | 47 | 38 |

Note:

Shading represents nighttime periods.

**Table A-2. Measured Sound Pressure Levels at Monitoring Location R-4 (dBA)**

| Date | Time | $L_1$ | $L_{10}$ | $L_{50}$ |
|---|---|---|---|---|
| 2020-07-02 | 16:00:00 | 49 | 44 | 25 |
| 2020-07-02 | 17:00:00 | 51 | 38 | 23 |
| 2020-07-02 | 18:00:00 | 48 | 38 | 28 |
| 2020-07-02 | 19:00:00 | 50 | 43 | 35 |
| 2020-07-02 | 20:00:00 | 52 | 41 | 33 |
| 2020-07-02 | 21:00:00 | 41 | 35 | 27 |
| 2020-07-02 | 22:00:00 | 42 | 32 | 26 |
| 2020-07-02 | 23:00:00 | 45 | 33 | 29 |
| 2020-07-03 | 00:00:00 | 47 | 37 | 28 |
| 2020-07-03 | 01:00:00 | 50 | 28 | 24 |
| 2020-07-03 | 02:00:00 | 52 | 40 | 29 |
| 2020-07-03 | 03:00:00 | 33 | 31 | 27 |
| 2020-07-03 | 04:00:00 | 55 | 43 | 30 |
| 2020-07-03 | 05:00:00 | 45 | 36 | 30 |
| 2020-07-03 | 06:00:00 | 43 | 34 | 31 |
| 2020-07-03 | 07:00:00 | 43 | 35 | 29 |
| 2020-07-03 | 08:00:00 | 52 | 38 | 26 |
| 2020-07-03 | 09:00:00 | 52 | 38 | 26 |
| 2020-07-03 | 10:00:00 | 48 | 39 | 27 |
| 2020-07-03 | 11:00:00 | 45 | 37 | 28 |
| 2020-07-03 | 12:00:00 | 53 | 40 | 31 |
| 2020-07-03 | 13:00:00 | 55 | 45 | 34 |
| 2020-07-03 | 14:00:00 | 46 | 37 | 28 |
| 2020-07-03 | 15:00:00 | 49 | 40 | 31 |
| 2020-07-03 | 16:00:00 | 45 | 39 | 31 |
| 2020-07-03 | 17:00:00 | 45 | 39 | 32 |
| 2020-07-03 | 18:00:00 | 44 | 39 | 33 |
| 2020-07-03 | 19:00:00 | 47 | 40 | 36 |
| 2020-07-03 | 20:00:00 | 49 | 41 | 32 |
| 2020-07-03 | 21:00:00 | 43 | 36 | 30 |
| 2020-07-03 | 22:00:00 | 43 | 35 | 26 |
| 2020-07-03 | 23:00:00 | 47 | 29 | 23 |
| 2020-07-04 | 00:00:00 | 47 | 34 | 26 |
| 2020-07-04 | 01:00:00 | 39 | 29 | 25 |
| 2020-07-04 | 02:00:00 | 40 | 25 | 23 |
| 2020-07-04 | 03:00:00 | 45 | 29 | 23 |
| 2020-07-04 | 04:00:00 | 40 | 32 | 25 |
| 2020-07-04 | 05:00:00 | 44 | 36 | 27 |
| 2020-07-04 | 06:00:00 | 45 | 35 | 28 |
| 2020-07-04 | 07:00:00 | 55 | 37 | 27 |
| 2020-07-04 | 08:00:00 | 52 | 41 | 27 |

**Table A-2. Measured Sound Pressure Levels at Monitoring Location R-4 (dBA)**

| Date | Time | $L_1$ | $L_{10}$ | $L_{50}$ |
|---|---|---|---|---|
| 2020-07-04 | 09:00:00 | 60 | 43 | 29 |
| 2020-07-04 | 10:00:00 | 54 | 42 | 31 |
| 2020-07-04 | 11:00:00 | 56 | 46 | 35 |
| 2020-07-04 | 12:00:00 | 51 | 39 | 29 |
| 2020-07-04 | 13:00:00 | 53 | 45 | 31 |
| 2020-07-04 | 14:00:00 | 52 | 41 | 31 |
| 2020-07-04 | 15:00:00 | 52 | 42 | 31 |
| 2020-07-04 | 16:00:00 | 57 | 41 | 31 |
| 2020-07-04 | 17:00:00 | 51 | 43 | 35 |
| 2020-07-04 | 18:00:00 | 53 | 45 | 37 |
| 2020-07-04 | 19:00:00 | 42 | 35 | 27 |
| 2020-07-04 | 20:00:00 | 51 | 41 | 32 |
| 2020-07-04 | 21:00:00 | 46 | 40 | 34 |
| 2020-07-04 | 22:00:00 | 47 | 37 | 29 |
| 2020-07-04 | 23:00:00 | 42 | 29 | 23 |
| 2020-07-05 | 00:00:00 | 42 | 25 | 22 |
| 2020-07-05 | 01:00:00 | 49 | 39 | 21 |
| 2020-07-05 | 02:00:00 | 46 | 24 | 22 |
| 2020-07-05 | 03:00:00 | 33 | 24 | 22 |
| 2020-07-05 | 04:00:00 | 50 | 39 | 24 |
| 2020-07-05 | 05:00:00 | 47 | 39 | 25 |
| 2020-07-05 | 06:00:00 | 43 | 34 | 25 |
| 2020-07-05 | 07:00:00 | 41 | 27 | 23 |
| 2020-07-05 | 08:00:00 | 41 | 31 | 22 |
| 2020-07-05 | 09:00:00 | 53 | 41 | 25 |
| 2020-07-05 | 10:00:00 | 53 | 39 | 27 |
| 2020-07-05 | 11:00:00 | 52 | 40 | 29 |
| 2020-07-05 | 12:00:00 | 49 | 39 | 30 |
| 2020-07-05 | 13:00:00 | 49 | 41 | 30 |
| 2020-07-05 | 14:00:00 | 50 | 43 | 30 |
| 2020-07-05 | 15:00:00 | 43 | 36 | 28 |
| 2020-07-05 | 16:00:00 | 56 | 39 | 29 |
| 2020-07-05 | 17:00:00 | 49 | 42 | 34 |
| 2020-07-05 | 18:00:00 | 52 | 47 | 40 |
| 2020-07-05 | 19:00:00 | 53 | 49 | 44 |
| 2020-07-05 | 20:00:00 | 51 | 47 | 41 |
| 2020-07-05 | 21:00:00 | 46 | 41 | 34 |
| 2020-07-05 | 22:00:00 | 45 | 33 | 25 |
| 2020-07-05 | 23:00:00 | 26 | 23 | 21 |
| 2020-07-06 | 00:00:00 | 46 | 34 | 24 |
| 2020-07-06 | 01:00:00 | 53 | 39 | 22 |

**Table A-2. Measured Sound Pressure Levels at Monitoring Location R-4 (dBA)**

| Date | Time | $L_1$ | $L_{10}$ | $L_{50}$ |
|---|---|---|---|---|
| 2020-07-06 | 02:00:00 | 43 | 25 | 21 |
| 2020-07-06 | 03:00:00 | 44 | 27 | 22 |
| 2020-07-06 | 04:00:00 | 48 | 39 | 34 |
| 2020-07-06 | 05:00:00 | 51 | 41 | 36 |
| 2020-07-06 | 06:00:00 | 48 | 40 | 34 |
| 2020-07-06 | 07:00:00 | 51 | 38 | 30 |
| 2020-07-06 | 08:00:00 | 53 | 35 | 27 |
| 2020-07-06 | 09:00:00 | 42 | 33 | 25 |
| 2020-07-06 | 10:00:00 | 52 | 40 | 31 |
| 2020-07-06 | 11:00:00 | 56 | 47 | 35 |
| 2020-07-06 | 12:00:00 | 51 | 40 | 31 |
| 2020-07-06 | 13:00:00 | 52 | 43 | 34 |
| 2020-07-06 | 14:00:00 | 59 | 46 | 34 |
| 2020-07-06 | 15:00:00 | 56 | 47 | 38 |
| 2020-07-06 | 16:00:00 | 59 | 52 | 46 |
| 2020-07-06 | 17:00:00 | 60 | 55 | 49 |
| 2020-07-06 | 18:00:00 | 61 | 56 | 50 |
| 2020-07-06 | 19:00:00 | 58 | 53 | 47 |
| 2020-07-06 | 20:00:00 | 56 | 53 | 48 |
| 2020-07-06 | 21:00:00 | 49 | 44 | 37 |
| 2020-07-06 | 22:00:00 | 44 | 39 | 31 |
| 2020-07-06 | 23:00:00 | 36 | 29 | 23 |
| 2020-07-07 | 00:00:00 | 49 | 22 | 19 |
| 2020-07-07 | 01:00:00 | 40 | 22 | 20 |
| 2020-07-07 | 02:00:00 | 40 | 23 | 20 |
| 2020-07-07 | 03:00:00 | 42 | 24 | 20 |
| 2020-07-07 | 04:00:00 | 52 | 42 | 26 |
| 2020-07-07 | 05:00:00 | 48 | 37 | 27 |
| 2020-07-07 | 06:00:00 | 45 | 32 | 27 |
| 2020-07-07 | 07:00:00 | 55 | 43 | 32 |
| 2020-07-07 | 08:00:00 | 57 | 47 | 34 |
| 2020-07-07 | 09:00:00 | 60 | 45 | 31 |
| 2020-07-07 | 10:00:00 | 55 | 45 | 30 |
| 2020-07-07 | 11:00:00 | 52 | 42 | 31 |
| 2020-07-07 | 12:00:00 | 52 | 46 | 37 |
| 2020-07-07 | 13:00:00 | 54 | 49 | 42 |
| 2020-07-07 | 14:00:00 | 57 | 51 | 44 |
| 2020-07-07 | 15:00:00 | 55 | 49 | 40 |
| 2020-07-07 | 16:00:00 | 53 | 48 | 41 |

Note:

Shading represents nighttime periods.