Exhibit Y

Noise

West End Solar Project
September 2022

Prepared for
EE West End Solar LLC

Prepared by

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Acronyms and Abbreviations

Applicant	EE West End Solar LLC
dB	decibel
dBA	A-weighted decibel
EFSC	Energy Facility Siting Council
Hz	hertz
kV	kilovolt
L_{eq}	equivalent sound level
L_w	sound power level
NSR	noise sensitive receptor
OAR	Oregon Administrative Rules
ODEQ	Oregon Department of Environmental Quality
Project	West End Solar Project

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1.0 Introduction

EE West End Solar LLC (Applicant), a subsidiary of Eurus Energy America Corporation, proposes to construct the West End Solar Project (Project), a solar energy generation facility and related or supporting facilities in Umatilla County, Oregon. Exhibit Y was prepared to meet the submittal requirements in Oregon Administrative Rules (OAR) 345-021-0010(1)(y).

The Project will be a photovoltaic solar energy facility with an estimated nominal and average generating capacity[1] of 50 megawatts of alternating current in a Project Site Boundary of 324 acres. The Project may include an energy storage system with a capacity of up to 70 megawatts. The layout of the Project has not been finalized and may vary depending on project size, technology, and other constraints. The Project will include approximately twenty-five inverter skids distributed throughout the Project site consisting of an inverter and inverter step-up transformer. The collector line system will link transformers throughout the solar array to the proposed collector substation. The collector line system is anticipated to be buried often adjacent to access roads within the solar arrays. The collector substation is anticipated to be located on the east side of the site, near the Umatilla Electric Cooperative 115-kilovolt (kV) line. A switchyard substation will also be constructed adjacent to the collector substation. The switchyard substation will be constructed and owned by the utility and will facilitate the Project's interconnection with the electric grid. The switchyard substation will have similar equipment as the Project's collector substation. Battery storage is also being incorporated into the Project and two configurations are being considered:

1. Distributed Battery Storage: Eight battery energy storage units will be collocated with each inverter skid; and
2. Centralized Battery Storage: Two hundred battery storage units will be located in one consolidated area in proximity to the collector substation.

The Project's operations and maintenance enclosure is anticipated to be located adjacent to the substation.

There are two existing transmission line rights-of-way that run southeast to northwest through the Site Boundary: Bonneville Power Administration's McNary to Roundup 230-kV line and PacifiCorp's Pendleton to Hermiston 69-kV line. In addition, there is a Umatilla Electric Cooperative 115-kV line that parallels the eastern edge of the Site Boundary. All three existing transmission lines provide interconnection capabilities within or immediately adjacent to the Site Boundary, eliminating the need for a Project transmission line. Although it is anticipated that interconnection will occur at the Umatilla Electric Cooperative 115-kV line, the Applicant seeks interconnection micrositing flexibility for all or part of the Project to the Umatilla Electric Cooperative, Bonneville Power Administration, and PacifiCorp transmission lines.

[1] Based on Oregon Revised Statutes 469.300(4)'s definition of average generating capacity for all energy facilities besides wind and geothermal.

Tetra Tech, Inc. (Tetra Tech) prepared an acoustic assessment for the Project, evaluating potential sound impacts relative to the applicable noise limits prescribed by the Oregon Department of Environmental Quality (ODEQ) noise rules. An acoustic analysis was conducted evaluating sound produced during facility construction and operation. Operational sound sources consisted primarily of the inverters, step-up transformers, battery storage units, and the substation/switchyard transformers. Both battery storage configurations under consideration were analyzed. Modeled sound levels from Project operation were evaluated against the limits given in OAR Chapter 340, Division 35. The overall objectives of this assessment were to: 1) identify Project sound sources and estimate sound propagation characteristics; 2) computer-simulate sound levels using internationally accepted calculation standards; and 3) confirm that the Project will operate in compliance with the applicable noise regulations.

1.1 Study Area

The Analysis Area for noise impacts is defined in OAR 345-021-0010 as including those noise sensitive receptors within 1 mile of the Site Boundary.

1.2 Acoustic Terminology

Airborne sound is described as the rapid fluctuation or oscillation of air pressure above and below atmospheric pressure, creating a sound wave. Sound is characterized by properties of the sound waves, which are frequency, wavelength, period, amplitude, and velocity. Noise is defined as unwanted sound. A sound source is defined by a sound power level (L_w), which is independent of any external factors. The acoustic sound power is the rate at which acoustical energy is radiated outward and is expressed in units of watts. Sound energy travels in the form of a wave, a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure. A sound pressure level is a measure of this fluctuation and can be directly determined with a microphone or calculated from information about the source sound power level and the surrounding environment through predictive acoustic modeling. While the sound power of a source is strictly a function of the total amount of acoustic energy being radiated by the source, the sound pressure levels produced by a source are a function of the distance from the source and the effective radiating area or physical size of the source. In general, the magnitude of a source's sound power level is always considerably higher than the observed sound pressure level near a source since the acoustic energy is being radiated in various directions.

Sound levels are presented on a logarithmic scale to account for the large pressure response range of the human ear and are expressed in units of decibels (dB). A dB is defined as the ratio between a measured value and a reference value usually corresponding to the lower threshold of human hearing defined as 20 micropascals. Conversely, sound power is commonly referenced to 1 picowatt, which is one trillionth of a watt. Broadband sound includes sound energy summed across the frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum is often completed to determine tonal characteristics. The unit of frequency is hertz (Hz), which corresponds to the rate in cycles per second that sound pressure waves are generated. Typically, a sound frequency analysis examines 11 octave bands (or 33 1/3 octave) ranging from 20 Hz (low) to 20,000 Hz (high). This range encompasses the entire human audible frequency range. Since the human ear does not perceive every frequency with equal loudness, spectrally varying sounds are often adjusted with a weighting filter. The A-weighted filter is applied to compensate for the frequency response of the human auditory system. Sound exposure in acoustic assessments is commonly measured and calculated as A-weighted dB (dBA). Unweighted sound levels are referred to as linear. Linear dB are used to determine a sound's tonality and to engineer solutions to reduce or control noise as techniques are different for low and high frequency noise.

Sound can be measured, modeled, and presented in various formats, with the most common metric being the equivalent sound level (L_{eq}). The equivalent sound level has been shown to provide both an effective and uniform method for comparing time-varying sound levels and is widely used in acoustic assessments.

2.0 Regulatory Environment

A review was conducted of noise regulations applicable to the Project at the federal, state, county, and local levels. There are no federal environmental noise requirements specific to the Project. Umatilla County has a noise control ordinance (Umatilla County 1999), but the Project is exempt through Section 96.04(G) of the ordinance (see Section 2.2). The ODEQ noise control standards in OAR 340-035-0035 (ODEQ Noise Rules) are discussed in Section 2.1. The ODEQ Noise Rules are incorporated by reference in the Oregon Energy Facility Siting Council's (EFSC) rule regarding the contents of Exhibit Y (OAR 345-021-0010(1)(y)).

2.1 ODEQ Noise Rules

The ODEQ Noise Rules relevant to the Project are provided in OAR 340-035-0035 and provide an antidegradation standard and maximum permissible statistical noise levels for new industrial or commercial noise sources on a previously unused site.[2]

> *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, except as specified in subparagraph (1)(b)(B)(iii).*

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[2] 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.

OAR 340-035-0035(1)(b)(B)(ii)

The ambient statistical noise level of a new industrial or commercial noise source on a previously unused industrial or commercial site shall include all noises generated or indirectly caused by or attributable to that source including all of its related activities. Sources exempted from the requirements of section (1) of this rule, which are identified in subsections (5)(b) - (f), (j), and (k) of this rule, shall not be excluded from this ambient measurement."

The specific levels of "Table 8" of OAR 340-035-0035(1)(b)(A) are listed in Table Y-1 for reference. All levels are presented in terms of dBA, which is a weighting scaled for human hearing. The L_{50} is the median sound level (50 percent of the measurement interval is above this level; 50 percent is below). The noise limits apply at "appropriate measurement points" on "noise sensitive property" as defined in OAR 340-035-0035(3)(b). The appropriate measurement point is defined as whichever of the following is farther from the noise source:

- 25 feet toward the noise source from that point on the noise sensitive building nearest the noise source; or
- The point on the noise sensitive property line nearest the noise source.

"Noise sensitive property" is defined in OAR 340-035-0035(3)(b) 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 above criteria in more than an incidental manner."

Table Y-1. New Industrial and Commercial Noise Standards

Statistical Descriptor	Maximum Permissible Statistical Noise Levels (dBA)	
	Daytime (7:00 a.m. – 10 p.m.)	Nighttime (10 p.m. – 7 a.m.)
L_{50}	55	50
L_{10}	60	55
L_{1}	75	60
Source: OAR 340-035-0035, Table 8.		

In accordance with the regulatory definitions in OAR Chapter 340-035, the analysis presented in this assessment assumes that the solar facility will constitute an industrial or commercial use, predominantly located on previously unused sites. Therefore, to demonstrate compliance with OAR 340-035-0035(1)(b)(B)(i), the Project must demonstrate that as a result of operation, the ambient statistical noise level must not be increased by more than 10 dBA in any one hour at any identified noise sensitive receptor (NSR) [3].

[3] For purposes of this exhibit, "noise sensitive property" is the same as an NSR.

2.1.1 Exemptions to State Noise Regulations

OAR 340-035-0035(5) specifically exempts construction activity from the state noise standards and regulations, as indicated below. This section also provides an exemption for maintenance of capital equipment, the operation of aircraft (such as helicopters used in Project construction), and sounds created by activities related to timber harvest.

> *OAR 340-035-0035(5) Exemptions:*
>
> *Except as otherwise provided in subparagraph (1)(b)(B)(ii) of this rule, the rules in section (1) of this rule shall not apply to:*
>
> [section abridged for brevity]
>
> > *(b) Warning devices not operating continuously for more than 5 minutes;*
> >
> > *(g) Sounds that originate on construction sites.*
> >
> > *(h) Sounds created in construction or maintenance of capital equipment;*
> >
> > *(j) Sounds generated by the operation of aircraft and subject to pre-emptive federal regulation. This exception does not apply to aircraft engine testing, activity conducted at the airport that is not directly related to flight operations, and any other activity not pre-emptively regulated by the federal government or controlled under OAR 340-035-0045;*
> >
> > *(k) Sounds created by the operation of road vehicle auxiliary equipment complying with the noise rules for such equipment as specified in OAR 340-035-0030(1)(e);*
> >
> > *(m) Sounds created by activities related to the growing or harvesting of forest tree species on forest land as defined in subsection (1) of ORS 526.324.*

In accordance with the allowable exemptions, the Project will claim noise produced during construction as an exemption to the ODEQ Noise Rules.

2.1.2 Exceptions to State Noise Regulations

OAR 340-035-0035(6) allows for some exceptions to the state noise regulations:

> *OAR 340-035-0035 (6) Exceptions:*
>
> *Upon written request from the owner or controller of an industrial or commercial noise source, the Department may authorize exceptions to section (1) of this rule, pursuant to rule 340-035-0010, for:*
>
> > *(a) Unusual and/or infrequent events;*
> >
> > *(b) Industrial or commercial facilities previously established in areas of new development of noise sensitive property;*

(c) Those industrial or commercial noise sources whose statistical noise levels at the appropriate measurement point are exceeded by any noise source external to the industrial or commercial noise source in question;

(d) Noise sensitive property owned or controlled by the person who controls or owns the noise source;

(e) Noise sensitive property located on land zoned exclusively for industrial or commercial use.

2.2 County and Municipal Noise Regulations

The Umatilla County Noise Control Ordinance restricts noise received at sensitive receptors. The Project would be exempt under Section 96.04(G), which exempts sound cause by industrial, agricultural, commercial, or construction activities.

3.0 Existing Conditions

The Project will be located in a rural area with low population density. Within the Analysis Area, there are a total of 12 NSRs. All NSRs were identified as single-family residential structures, except for NSR 10, which has been identified as a general-purpose building. Given the lack of industrial and commercial sound sources, the Applicant expects the existing area of the Project to have low ambient sound levels.

A wide range of noise settings occur within the acoustic Analysis Area. The background sound level will vary spatially and is related to various physical characteristics such as topography, land use, proximity to transportation corridors and terrain coverage including extent and height of exposed vegetation. The acoustic environment will also vary due in part to surrounding land use and population density. Areas in proximity to major transportation corridors such as interstate highways and areas with higher population densities and are expected to generally have higher existing ambient sound levels as compared to open and rural lands. Table Y-2 shows the relative A-weighted noise levels of common sounds measured in the environment and industry.

Table Y-2. Sound Pressure Levels and Relative Loudness

Noise Source or Activity	Sound Level (dBA)	Subjective Impression	Relative Loudness (Perception of Different Sound Levels)
Jet aircraft takeoff from carrier (50 feet)	140	Threshold of pain	64 times as loud
50-hp siren (100 feet)	130		32 times as loud
Loud rock concert near stage Jet takeoff (200 feet)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 feet)	110		8 times as loud

Noise Source or Activity	Sound Level (dBA)	Subjective Impression	Relative Loudness (Perception of Different Sound Levels)
Jet takeoff (2,000 feet)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 feet)	90		2 times as loud
Garbage disposal Food blender (2 feet) Pneumatic drill (50 feet)	80	Loud	Reference loudness
Vacuum cleaner (10 feet)	70	Moderate	1/2 as loud
Passenger car at 65 mph (25 feet)	65		
Large store air-conditioning unit (20 feet)	60		1/4 as loud
Light auto traffic (100 feet)	50	Quiet	1/8 as loud
Quiet rural residential area with no activity	45		
Bedroom or quiet living room Bird calls	40	Faint	1/16 as loud
Typical wilderness area	35		
Quiet library, soft whisper (15 feet)	30	Very quiet	1/32 as loud
Wilderness with no wind or animal activity	25	Extremely quiet	
High-quality recording studio	20		1/64 as loud
Acoustic test chamber	10	Just audible	
	0	Threshold of hearing	
Adapted from: EPA 1971.			

3.1 Field Measurement Methodology

Collection of field data was necessary to define the existing daytime and nighttime ambient sound levels at NSRs in the Analysis Area. A total of three short-term (30-minute) sound measurement locations were selected within the Analysis Area at publicly accessible land in proximity to NSRs. These measurement locations were selected to represent the nearest NSAs to the Project within the Analysis Area. The short-term monitors consisted of a sound level analyzer directly mounted to a tripod with the microphone and windscreen at a height of approximately 5 feet above ground.

Ambient sound measurements were collected July 23 – 24, 2021. During the survey weather was fair, with no precipitation. On July 23rd, temperatures ranged from 56°F to 88°F and wind speed ranged 0 to 12 mph. On July 24th, weather conditions were similar with temperatures ranging from 58°F to 95°F and wind speed ranged 0 to 13 mph.

All measurements were taken with a Larson Davis 831 real-time sound level analyzer, equipped with a PCB model 377B02 ½-inch precision condenser microphone. This instrument has an operating range of 5 decibels (dB) to 140 dB, and an overall frequency range of 8 to 20,000 Hz and meets or exceeds all requirements set forth in the American National Standards Institute standards for Type 1 sound level meters for quality and accuracy.

Prior to any field measurements, all test equipment was field calibrated with an American National Standards Institute Type 1 calibrator that has accuracy traceable to the National Institute of Standards and Technology. Each sound analyzer was programmed to measure and log broadband A-weighted sound pressure levels in 10- and 1-minute time intervals as well as a number of statistical sound levels. The statistical sound levels provide the sound level exceeded for that percentage of time over the given measurement period. For example, the L_{10} level is often referred to as the intrusive noise level, and is the sound level that is exceeded 10 percent of the measurement period. The equivalent sound level (L_{eq}), L_{10} (intrusive noise level), L_{50} (median), and L_{90} (residual sound level) sound metrics were data-logged for the duration of the monitoring period to fully characterize the ambient acoustic environment. Data were collected for 1/1 and 1/3 octave band data spanning the frequency range of 8 Hz to 20 kilohertz. The locations of monitoring locations were recorded using a global positioning system unit, and photographs were taken to document surroundings. Following the completion of the measurement period all monitored data was downloaded to a computer and backed up on an external hard drive for further analysis.

When sound measurements are attempted in the presence of elevated wind speeds, extraneous noise can be self-generated across the microphone and is often referred to as "pseudonoise." Air blowing over a microphone diaphragm creates a pressure differential and turbulence. All sound level analyzer microphones were protected from wind-induced pseudonoise by a 7-inch diameter foam windscreen made of specially prepared open-pored polyurethane. By using this microphone protection, the pressure gradient and turbulence are effectively moved farther away from the microphone, minimizing self-generated wind-induced noise. Weather conditions during the baseline sound survey were conducive for accurate data collection.

Several statistical sound levels were measured by the monitors in consecutive 1-minute intervals during each 30-minute measurement period. Of these, the median, or L_{50}, level (the sound level exceeded 50 percent of the time), is considered the most meaningful quantity for this type of survey. It captures the consistently present sound level that exists during each period in the absence of sporadic and extraneous noise events, such as wind gusts or aircraft overflights. The results of the baseline monitoring program were used to establish a range of existing ambient sound levels within the analysis area and assist in determining compliance with OAR 340-035-0035(1)(b)(B)(i), which prescribes an incremental increase limit of 10 dBA over the ambient statistical noise levels of either the L_{10} or L_{50}.

3.2 Sound Survey Analysis and Results

Measurements of the existing sound levels were conducted for both the daytime and nighttime periods. OAR 340-035-0035(1)(b)(A) defines daytime (7:00 AM – 10:00 PM) and nighttime (10:00

PM – 7:0 AM) statistical noise limits as summarized in Table Y-1. A solar facility will generate maximum operations primarily during the daytime period; however, the facility will also operate during nighttime hours. Therefore, the baseline measurement data were correlated by daytime and nighttime measurement periods, for purposes of assessing compliance with the ambient degradation test.

Table Y-3 presents a summary of ambient sound survey results at each monitoring location, providing information including Universal Transverse Mercator coordinates and distance to the nearest Project fence line (see Exhibit C, Figure C-2 for proposed fence line). In addition, daytime and nighttime L_{eq}, L_{10}, L_{50}, and L_{90} parameters are provided. Figure Y-1 shows the monitoring locations selected for the baseline sound survey. Measurements were collected on publicly accessible land closest to the corresponding NSRs.

Table Y-3. Summary of Ambient Sound Survey Results

Noise Sensitive Location ID	UTM Coordinates		Distance to Nearest Project Fence Line (feet/meters)	Time Period	Baseline Sound Level Metric			
	Easting (meters)	Northing (meters)			L_{eq}	L_{10}	L_{50}	L_{90}
ST-1	327096	5076866	1,172/357	Day	38	39	38	36
				Night	37	40	35	34
ST-2	325914	5076523	3,897/1,188	Day	40	42	39	39
				Night	42	46	40	39
ST-3	328216	5078078	5,247/1,599	Day	44	49	40	38
				Night	41	45	40	38

L_{eq} = equivalent sound level; L_{10} = intrusive sound level; L_{50} = median sound level; L_{90} = residual sound level; UTM = Universal Transverse Mercator.

Site-specific field observations were made during the ambient sound survey. It was noted that ambient sound levels within the Project study area were variable and can generally be considered low. Typical sound sources that were present during the survey and were related to traffic, wildlife (birds) and barking dogs. Noise from homes in the Analysis Area was minimal most of the time, with items such as air conditioners or heat pumps producing noticeable sound within their immediate vicinity. Louder sounds, such as those from mowers or other lawn care equipment can be expected on an intermittent basis. Gravel roads are present in the Analysis Area, and vehicle traffic will produce variable noise levels depending on the time of day. Other sound sources that could reasonably be expected, though not observed during the survey, are farm equipment during planting and harvest time, and impact sprinklers in the agricultural fields.

Sound from the existing transmission lines within the Analysis Area was included in the ambient sound survey results. Ambient sound monitoring location ML-1 is approximately 300 feet from the existing PacifiCorp transmission line and 1,000 feet from the existing Bonneville Power

Administration transmission line. The existing Bonneville Power Administration transmission is approximately 0.4 miles northeast of ML-2 and the existing PacifiCorp transmission line is approximately southwest of ML-3. Since fair weather conditions occurred during the survey, the sound contribution of the existing transmission lines was minimal.

4.0 Predicted Noise Levels – OAR 345-021-0010(1)(y)(A)

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

4.1 Construction Noise Assessment

OAR 340-035-0035(5)(g) exempts noise emanating from construction activities from compliance with the state noise regulations. Therefore, the Applicant provides the following information on construction noise sources for reference.

The Applicant predicted construction noise levels using a semi-qualitative approach based on equipment sound levels provided in the *Federal Highway Administration Roadway Construction Noise Model* (FHWA 2006). This equipment is also used on solar projects, so the Federal Highway Administration's sound levels are applicable to incorporate into the Project. Construction activities associated with the Project have the potential for localized sound on a temporary basis, as construction activities progress through certain locations within the Project area. Construction activities at the Project can be generally divided into five phases:

- Preparation of the site and staging areas, including grading and on-site access roads;
- Installation of array foundations, conductors, the operations and maintenance building, and the control enclosure;
- Assembly of solar panels and electrical connection components;
- Construction of the inverter pad, substation, cabling, terminations, and transmission lines; and
- Commissioning of the array and interconnection, revegetation, and waste removal and recycling facilities.

These activities will occur sequentially for discrete groupings of solar arrays, with the potential for overlap. In addition to the solar panels, construction activities will also occur for supporting infrastructure. The inverters and distribution transformers are likely to be completed while respective solar arrays are being constructed; completion of other Project-related elements, such as the operations and maintenance building, will occur independently.

Sound generated by Project construction is expected to vary depending on the construction phase. Table Y-4 lists the typical sound levels associated with common construction equipment and the composite level per phase at the closest NSA. Periodically, sound levels may be higher or lower; however, the overall sound levels should generally be lower due to excess attenuation.

Table Y-4. Summary of Solar Farm Construction Equipment by Phase

Phase No.	Construction Phase	Construction Equipment	Usage Factor %	Maximum L_{max} Equipment Noise Level at 50 feet dBA	Composite Maximum L_{max} Equipment Noise Level at Nearest NSA 1200 feet dBA
1	Demolition	Excavators (168 horsepower [hp]) Tractors/Loaders/Backhoes (108 hp) Rough Terrain Forklifts (93 hp) Dump Truck	40 40 40 40	85 80 85 85	59
2	Site Preparation and Grading	Graders (174 hp) Rubber Tired Loaders (164 hp) Scrapers (313 hp) Water Trucks (189 hp) Generator Sets	40 40 40 40 50	85 85 85 88 82	61
3	Trenching and Road Construction	Excavators (168 hp) Graders (174 hp) Water Trucks (189 hp) Trencher (63 hp) Rubber Tired Loaders (164 hp) Generator Sets	40 40 40 40 40 50	85 85 88 85 80 82	61
4	Equipment Installation	Crane (399 hp) Forklifts (145 hp) Pile drivers Pickup Trucks/ATVs Water Trucks (189 hp) Generator Sets	16 40 20 40 40 50	85 85 95 55 88 82	63
5	Commissioning	Pickup Trucks/ATVs	40	55	23

4.2 Operational Noise Assessment

The Applicant modeled noise sources from the Project to demonstrate that operation of the Project will not exceed the noise levels outlined in the ODEQ Noise Rules. Inputs for the acoustic model included the maximum proposed number of inverters, transformers, and battery storage system components. This analysis presents the noise outputs from the full build out of the Project.

4.3 Noise Prediction Model

The Cadna-A® computer noise model was used to calculate sound pressure levels from the operation of the Project equipment in the vicinity of the Project site. An industry standard, Cadna-A® was developed by DataKustik GmbH to provide an estimate of sound levels at distances from sources of known emission (DataKustik GmbH 2014). It is used by acousticians and acoustic engineers due to the capability to accurately describe noise emission and propagation from complex facilities consisting of various equipment types like the Project and in most cases, yields conservative results of operational noise levels in the surrounding community.

The outdoor noise propagation model is based on the International Organization for Standardization (ISO) 9613, Part 2: "Attenuation of Sound during Propagation Outdoors" (ISO 1996). The method described in this standard calculates sound attenuation under weather conditions that are favorable for sound propagation, such as for downwind propagation or atmospheric inversion, conditions which are typically considered worst-case. The calculation of sound propagation from source to receiver locations consists of full octave band sound frequency algorithms, which incorporate the following physical effects from geometric divergence, reflection from surfaces, atmospheric absorption, screening from topography and obstacles, ground effects, source sound power, directivity, and cumulative effects. The sound model propagation calculation parameters are summarized in Table Y-5.

Table Y-5. Acoustic Model Setup Parameters

Model Input	Parameter Value
Standards	ISO 9613-2, Acoustics – Attenuation of sound during propagation outdoors.[1]
Engineering Design	Conceptual Project Layout Design dated 7/1/2021
Grid Spacing	10 m
Terrain Description	Per USGS topography (USGS 2019)
Ground Absorption	0.5 (semi-reflective) and 0.0 (reflective)
Receiver Characteristics	5 feet above ground level
Meteorological Factors	Omnidirectional downwind propagation / mild to moderate atmospheric temperature
Temperature	50°F
Relative Humidity	70%
Search radius	1 mile

1. Propagation calculations under the ISO 9613 standard incorporate the effects of downwind propagation from facility to receptor) with wind speeds of 1 to 5 meters per second (3.6 to 18 kilometers per hour) measured at a height of 3 to 11 meters above the ground.

The Project's general arrangement was directly imported into the acoustic model so that onsite equipment could be easily identified, structures could be added, and sound emissions ratings could be assigned to sources as appropriate. Cadna-A allows for three basic types of sound sources to be introduced into the model: point, line, and area sources. Each noise-radiating element was modeled based on its noise emission pattern. Small dimension sources, which radiate sound hemispherically, were modeled as point sources. Larger dimensional sources, such as the transformer walls were modeled as area sources.

Ground absorption rates are described by a numerical coefficient. For pavement and water bodies, the absorption coefficient is defined as G = 0 to account for reduced sound attenuation and higher reflectivity. In contrast, ground covered in vegetation, including suburban lawns, are acoustically absorptive and aid in sound attenuation (i.e., G = 1.0). For the acoustic modeling analysis, a conservative semi-reflective value of G = 0.5 was used to represent the Analysis Area, while a value of G = 0 was used to represent the Project Boundary.

4.4 Input to the Noise Prediction Model

The principal sources of noise are associated with the battery storage HVAC units, the electrical components of the inverters and the step-up transformer associated with each of the 25 inverter skids , and the main power transformer at the collector substation. The step-up transformers, battery storage units, and inverters are mounted on pads at grade level.

Substations have switching, protection, and control equipment, as well as a main power transformer, which generate the sound generally described as a low humming. There are three chief noise sources associated with a transformer: core noise, load noise, and noise generated by the operation of the cooling equipment. The core is the principal noise source and does not vary significantly with electrical load. The load noise is primarily caused by the load current in the transformer's conducting coils (or windings) and consequently the main frequency of this sound is twice the supply frequency: 120 Hz for 60 Hz transformers. The cooling equipment (fans and pumps) may also be an important noise component, depending on fan design. During air forced cooling method, cooling fan noise is produced in addition to the core noise. The resulting audible sound is a combination of hum and the broadband fan noise. Breaker noise is a sound event of very short duration, expected to occur only a few times throughout the year. Just as horsepower ratings designate the power capacity of an electric motor, a transformer's megavolt amperes rating indicates its maximum power output capacity.

The switchyard substation will have small transformers for service power and meters; however, for purposes of this acoustic assessment, a second main power transformers is assumed to be located at the switchyard as the specific equipment at the switchyard substation has not been determined. This assumption provides for a conservative acoustic assessment as the transformer equipment at the switchyard is anticipated to emit less noise than a main power transformer. The transformers are mounted on pads at grade level within the collector substation and switchyard.

Reference sound power levels input to Cadna-A were provided by equipment manufacturers, based on information contained in reference documents or developed using empirical methods. The source levels used in the predictive modeling are based on estimated sound power levels that are generally deemed to be conservative. The projected operational noise levels are based on Applicant-supplied sound power level data for the major sources of equipment. Table Y-6 summarizes the equipment sound power level data used as inputs to the acoustic modeling analysis. For the purpose of the analysis, it was assumed that all equipment would operate consistently during both daytime and nighttime periods.

As indicated above, two Project site layout configurations are being considered for battery storage:

1. Distributed Battery Storage: Eight battery energy storage units will be collocated with each of the 25 inverter skids; and
2. Centralized Battery Storage: Two hundred battery storage units will be located in one consolidated area in proximity to the collector substation.

As mentioned above, two main power transformers are assumed to be onsite for purposes of the acoustic modeling; one associated with the collector substation and the other associated with the switchyard.

Table Y-6. Equipment Sound Power Level by Octave Band Center Frequency

Noise Sources	Quantity	Octave Band Sound Power Level by Frequency (Hz) dBA									Broadband (dBA)
		31.5	63	125	250	500	1000	2000	4000	8000	
Inverter	25	77	88	82	95	84	78	85	71	58	88
Inverter Step-up Transformer	25	69	75	73	81	77	70	66	58	45	77
Battery Storage HVAC Unit	200	-	103	92	92	94	95	91	85	79	98
Main Power Transformer	2	89	95	97	92	92	86	81	76	69	102

4.5 Acoustic Modeling Results

The Project has been designed to comply with the ODEQ Noise Rules. Modeling results presented are assuming all components are operating concurrently for the daytime and nighttime period.

The Applicant calculated broadband sound pressure levels for expected, normal Project operation, assuming that all previously identified components operate continuously and concurrently at the representative manufacturer-rated sound level during the daytime and nighttime. Table Y-7 provides the received sound level at NSRs within 1 mile of the Project Site Boundary resulting from operation of the Project assuming the distributed battery storage configuration. Table Y-8 provides the received sound level at NSRs within 1 mile of the Project Site Boundary resulting from operation of the Project assuming the centralized battery storage configuration.

Table Y-7. Acoustic Modeling Results, Distributed Battery Storage

NSR ID	Time Period	Background Noise (dBA, L_{50})	Solar Project Noise (dBA)	Combined Noise (Background/Solar Project) (dBA)	Change in Noise (dBA)	Compliance with OAR 340-035-0035
1	Day	38	51	51	13	No
	Night	35	51	51	16	No
2	Day	38	39	41	3	Yes
	Night	35	39	40	5	Yes
3	Day	40	36	41	1	Yes
	Night	40	36	41	1	Yes
4	Day	40	37	42	2	Yes
	Night	40	37	42	2	Yes
5	Day	40	39	42	2	Yes
	Night	40	39	42	2	Yes
6	Day	40	36	41	1	Yes
	Night	40	36	41	1	Yes
7	Day	38	38	41	3	Yes
	Night	35	38	40	5	Yes
8	Day	38	40	42	4	Yes
	Night	35	40	41	6	Yes
9	Day	39	44	45	6	Yes
	Night	40	44	45	5	Yes
10	Day	39	43	44	5	Yes
	Night	40	43	45	5	Yes
11	Day	39	41	43	4	Yes
	Night	40	41	43	3	Yes
12	Day	39	39	42	3	Yes
	Night	40	39	43	3	Yes

Table Y-8. Acoustic Modeling Results, Centralized Battery Storage

NSR ID	Time Period	Background Noise (dBA, L_{50})	Solar Project Noise (dBA)	Combined Noise (Background/Solar Project) (dBA)	Change in Noise (dBA)	Compliance with OAR 340-035-0035
1	Day	38	39	42	4	Yes
	Night	35	39	41	6	Yes
2	Day	38	34	39	1	Yes
	Night	35	34	37	2	Yes
3	Day	40	33	41	1	Yes
	Night	40	33	41	1	Yes
4	Day	40	33	41	1	Yes
	Night	40	33	41	1	Yes
5	Day	40	34	41	1	Yes
	Night	40	34	41	1	Yes
6	Day	40	30	40	0	Yes
	Night	40	30	40	0	Yes
7	Day	38	31	39	1	Yes
	Night	35	31	37	2	Yes
8	Day	38	33	39	1	Yes
	Night	35	33	37	2	Yes
9	Day	39	34	40	1	Yes
	Night	40	34	41	1	Yes
10	Day	39	35	40	1	Yes
	Night	40	35	41	1	Yes
11	Day	39	33	40	1	Yes
	Night	40	33	41	1	Yes
12	Day	39	32	40	1	Yes
	Night	40	32	41	1	Yes

Results show there are no predicted noise exceedances when analyzing the centralized battery storage area, where the battery storage units are located near the substation. There is one predicted exceedance of the OAR 10 dBA ambient antidegradation standard and 50 dBA fixed nighttime standard at NSR ID 1 when analyzing the Project with distributed battery storage. Figures Y-1 and Y-2 show sound contour plots displaying broadband sound levels presented as color-coded isopleths for both modeling scenarios evaluated. The noise contours are graphical representations of the cumulative noise associated with full operation of the solar facility components and show how the operational noise would be distributed over the surrounding area within a 1-mile radius of the Project Site Boundary.

5.0 Assessment of Compliance with Applicable Noise Regulations – OAR 345-021-0010(1)(y)(B)

OAR 345-021-0010(1)(y)(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.

The Applicant has demonstrated compliance with the ODEQ Noise Rules at all NSRs within the Analysis Area for the centralized battery storage scenario. There is one predicted exceedance of the OAR 10 dBA ambient antidegradation standard and 50 dBA fixed nighttime standard at NSR ID 1 when analyzing the Project with distributed battery storage. However, the acoustic analysis presented in this exhibit included a number of conservative assumptions. For instance, no additional attenuation for foliage was accounted for and the analysis did not incorporate diffraction around and over existing anthropogenic structures such as buildings. Also, during the nighttime hours, the inverters are not at full capacity and emit less noise and the cooling requirements at the battery storage units are expected to diminish at night allowing the fans to operate at lower speed and sound levels. When the Project is not operating at full load, the sound level would be less. Based on these factors, the predicted noise levels presented in this exhibit are likely more conservative and higher than what will occur during the actual Project operation.

Prior to construction, the final layout, equipment specifications, and noise warranty data will be modeled and reviewed by an acoustician to ensure compliance with OAR 340-035-0035. Specifically, the Applicant shall provide to the Oregon Department of Energy the following prior to construction: a) Information that identifies the final design locations of all facility components to be built at the phase of development b) the maximum sound power level data for the facility components based on manufacturers' warranties or confirmed by other means accept; and c) the results of the noise analysis of the final facility design performed in a manner consistent with the requirements of OAR 340-035-0035(1)(b)(B) (iii)(IV) and (VI). The analysis will demonstrate, prior to construction, that the total noise generated by the Project will meet the ambient noise degradation test and maximum allowable test at the appropriate measurement point for all potentially-affected noise sensitive properties, or that the Applicant has obtained the legally effective easement or real covenant for expected exceedances of the ambient noise degradation test.

6.0 Measures to Reduce Noise Levels or Impacts to Address Public Complaints – OAR 345-021-0010(1)(y)(C)

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

Under the centralized battery storage scenario, the Applicant has demonstrated compliance with the ODEQ Noise Rules at all NSRs within the analysis area. Final equipment specifications and noise warranty data will be reviewed by an acoustician to ensure compliance with OAR 340-035-0035. Therefore, no additional noise reduction measures are necessary for operation of the Project under the centralized battery storage scenario.

Under the distributed battery storage scenario, there is one predicted exceedance of the OAR 10 dBA ambient antidegradation standard and 50 dBA fixed nighttime standard at NSR ID 1. The Applicant has many measures available to ensure compliance is achieved during detailed design of a distributed battery storage layout. Such measures may include siting the inverter skids/battery storage equipment an adequate distance away from NSR ID 1 to reduce the operational sound to a level compliant with the Oregon noise standard, specifying quieter equipment (when available), and/or installing improved acoustical enclosures or barriers. Final equipment specifications and noise warranty data and final locations of the inverter skids/battery storage units will be reviewed by an acoustician to ensure compliance with OAR 340-035-0035.

The Applicant proposes to employ the equipment selection and specification criteria necessary to ensure compliance with the Oregon noise standards (OAR 340-035-0035) and will site the battery storage equipment in locations necessary to ensure compliance with the Oregon noise standard or will obtain the legally effective easement or real covenant for expected exceedances of the ambient noise degradation test. Therefore, no significant noise impacts from the operations are anticipated and no additional mitigation is planned.

7.0 Monitoring – OAR 345-021-0010(1)(y)(D)

> *OAR 345-021-0010(1)(y)(D) Any measures the applicant proposes to monitor noise generated by operation of the facility.*

No noise monitoring is proposed for the Project. There is one predicted exceedance of the OAR 340-035-0035 anti-degradation rule and the 50 dBA fixed nighttime standard at NSR ID 1 under the distributed battery storage scenario; however, final design is anticipated to either reduce the noise emissions or site the noise source in a location that meets the Oregon noise standard (OAR 340-035-0035). Therefore, no exceedances are anticipated during operations. Additionally, the legislative authority granted to EFSC in OAR 345-026-0010(1) states that under Oregon Revised Statutes 469.430, EFSC "has continuing authority over the site for which a site certificate is issued and may inspect, direct the Department of Energy to inspect, or ask another state agency or local government to inspect, the site at any time to ensure that the certificate holder is operating the facility in compliance with the terms and conditions of the site certificate."

8.0 Owners of Noise Sensitive Property– OAR 345-021-0010(1)(y)(E)

OAR 345-021-0010(1)(y)(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.

The Applicant's consultants reviewed aerial photography to locate potential noise-sensitive properties (as defined by OAR 340-035-0015) within 1 mile of the Project Site Boundary and verified these noise sensitive properties during the field visits on July 22nd and 23rd, 2021, Each noise-sensitive property is a potential residence. Table Y-9 lists potential noise-sensitive properties within 1 mile of the Project Site Boundary.

Table Y-9. Owners of Noise-Sensitive Properties within 1 Mile of the Project Site Boundary

NSR ID (see Figure X-1)	Tax Lot Number	Landowner Name	Address
NSR-1	4N29180001200	Stanfield Hutterian Bretheren	36345 Despain Gulch Rd, Stanfield, OR 97875
NSR-2	4N29180000900	Lifshay Dean B & Karen D	250 Heather Dr, Stanfield, OR 97875
NSR-3	4N29080001800	Walchli Clinton P & Sherry L	32697 E Loop Rd, Hermiston, OR 97838
NSR-4	4N29080002700	Almaguer Juan A Jr & Melba D Jr	79479 Canal Rd, Stanfield, OR 97875-4629
NSR-5	4N29180000100	Dimbat Todd M & Mary A	PO Box 305, Hermiston, OR 97838
NSR-6	4N29180000300	Walker Rita	32378 E Highland Ext, Stanfield, OR 97875
NSR-7	4N29180000700	Brown Margaret & Kenneth W	PO Box 566, Hermiston, OR 97838
NSR-8	4N29180000800	Wallace David N & Neila B C	PO Box 243, Hermiston, OR 97838
NSR-9	4N29180001700	Reise Sharron	PO Box 664, Hermiston, OR 97838
NSR-10	4N29180001700	Reise Sharron	PO Box 664, Hermiston, OR 97838
NSR-11	4N29180001500	Kreuger Michael T & Tara M	PO Box 581, Hermiston, OR 97838
NSR-12	4N29180001400	Misener Richard H & Michele	1955 S Ott Rd, Hermiston, OR 97838

9.0 Summary

The noise analysis presented in this exhibit provides sufficient evidence to support an EFSC finding that Project 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 Project's construction and operations in accordance with OAR 345-021-0010(1)(y)(A), and included an analysis of the Project's compliance with applicable DEQ noise regulations per OAR 345-021-0010(1)(y)(B). The Applicant has employed reasonable assumptions into its noise modeling analysis to demonstrate that the final Project design can comply with the DEQ noise standard. The Applicant is committed to designing and operating the Project in full compliance with the applicable requirements.

10.0 References

DataKustik GmbH. 2014. Computer-Aided Noise Abatement Model CadnaA, Version 4.4.145. Munich, Germany, 2014.

EPA (U.S. Environmental Protection Agency). 1971. Community Noise. NTID300.3 (N-96-01 IIA-231). Prepared by Wylie Laboratories.

FHWA (Federal Highway Administration). 2006. FHWA Roadway Construction Noise Model User's Guide, FHWA-HEP-05-054, January 2006.

ISO (Organization for International Standardization). 1996. Standard ISO 9613-2 Acoustics – Attenuation of Sound During Propagation Outdoors. Part 2 General Method of Calculation. Geneva, Switzerland.

Umatilla County. 1999. Chapter 96 Noise Control Ordinance. Code of Umatilla County. Ord. 99-07, passed 10-20-99. Available here: http://www.co.umatilla.or.us/fileadmin/user_upload/BCC/Codes/96.pdf

USGS (U.S. Geological Survey). 2019. National Geospatial Program, USGS National Elevation Dataset 1/3 arc-second (publish date unknown): U.S. Geological Survey. Accessed April 2019. https://www.arcgis.com/home/item.html?id=988463d698004560b594105967feaaa1#%20.

Figures

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