Exhibit Y

Noise

Wagon Trail Solar Project
December 2023

Prepared for

Prepared by

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Acronyms and Abbreviations

Applicant	Wagon Trail Energy Center, LLC c/o NextEra Energy Resources, LLC
CadnaA	Computer Aided Noise Abatement
Council	Oregon Energy Facility Siting Council
dB	decibel
dBA	A-weighted decibel
Facility	Wagon Trail Solar Project
FHWA	Federal Highway Administration
Hz	hertz
ISO	International Organization for Standardization
L_{10}	intrusive noise level
L_{50}	median sound level
L_{90}	residual sound level
L_{eq}	equivalent sound level
NSR	noise sensitive receptor
OAR	Oregon Administrative Rule
ODEQ	Oregon Department of Environmental Quality
UTM	Universal Transverse Mercator

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1.0 Introduction

Wagon Trail Energy Center, LLC c/o NextEra Energy Resources, LLC (Applicant) proposes to construct and operate the Wagon Trail Solar Project (Facility), a solar energy generation facility and related or supporting facilities in Morrow County, Oregon. This Exhibit Y was prepared to evaluate potential sound impacts relative to the applicable noise limits prescribed by the Oregon Department of Environmental Quality (ODEQ) noise rules and to meet the submittal requirements in OAR 345-021-0010(1)(y).

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 substation transformers. Modeled sound levels from Facility operation were evaluated against the limits given in Oregon Administrative Rule (OAR) Chapter 340, Division 35. The overall objectives of this assessment were to: 1) identify Facility sound sources and estimate sound propagation characteristics; 2) computer-simulate sound levels using internationally accepted calculation standards; and 3) confirm that the Facility will operate in compliance with the applicable noise regulations.

2.0 Analysis Area

The analysis area for noise impacts is defined in the Project Order as "the area within and extending 1 mile from the site boundary" (ODOE 2021). The site boundary is defined in detail in Exhibits B and C.

3.0 Regulatory Environment

A review was conducted of noise regulations applicable to the Facility at the federal, state, county, and local levels. There are no federal environmental noise requirements specific to this Facility.

The following subsections describe the regulations at the State level that apply to the Facility, including the Oregon Energy Facility Siting Council (Council) rule regarding the contents of Exhibit Y, and the ODEQ's noise control standards in OAR 340-035-0035 (ODEQ Noise Rules).

3.1 Required Contents of Exhibit Y

In accordance with OAR 345-021-0010(1)(y), Exhibit Y must include the following:

> *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 shall include:*
>
> *(A) Predicted noise levels resulting from construction and operation of the proposed facility.*

(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.

(C) Any measures the applicant proposes to reduce noise levels or noise impacts or to address public complaints about noise from the facility.

(D) Any measures the applicant proposes to monitor noise generated by operation of the facility.

(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.

3.2 ODEQ Noise Rules

The ODEQ Noise Rules relevant to the Facility are provided in OAR 340-035-0035, and are incorporated in the Council's general standard of review, OAR 345-022-0000. Relevant to the Facility, the ODEQ Noise Rules provide an antidegradation standard and maximum permissible statistical noise levels for new industrial or commercial noise sources on a previously unused site.

> *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).*
>
> *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 A-weighted decibels (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"[1] 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.

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

"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 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 Facility 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).

3.2.1 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 Facility 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 Facility will claim noise produced during construction as an exemption to the ODEQ Noise Rules.

3.2.2 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.

3.3 County and Municipal Noise Regulations

Tetra Tech's regulatory review indicated that Morrow County does not have any noise requirements with numerical decibel limits that would be applicable to the Facility.

4.0 Existing Conditions

The Facility will be located in a rural area with low population density. Within the analysis area, there are a total of 33 NSRs. All NSRs were identified as single-family residential structures. The Wheatridge Wind Energy Facilities I, II, and III are also located within the analysis area. Given the low sound levels of the wind turbines and the lack of other industrial and commercial sound sources, the Applicant expects the existing area of the Facility 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-1. Sound Pressure Levels (LP) 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 ft.)	140	Threshold of pain	64 times as loud
50-hp siren (100 ft.)	130		32 times as loud
Loud rock concert near stage Jet takeoff (200 ft.)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 ft.)	110		8 times as loud
Jet takeoff (2,000 ft.)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 ft.)	90		2 times as loud
Garbage disposal Food blender (2 ft.) Pneumatic drill (50 ft.)	80	Loud	Reference loudness
Vacuum cleaner (10 ft.)	70	Moderate	1/2 as loud
Passenger car at 65 mph (25 ft.)	65		
Large store air-conditioning unit (20 ft.)	60		1/4 as loud
Light auto traffic (100 ft.)	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 ft.)	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: Bolt, Beranek and Newman, Inc., 1988 and EPA, 1971.			

4.1 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 five 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 NSRs to the Facility 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.

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 hertz (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 (L_n). 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 were 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}.

4.2 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 a.m. – 10:00 p.m.) and nighttime (10:00 p.m. – 7:00 a.m.) 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 (UTM) coordinates and distance to the nearest Facility fence line (see Exhibit C, Figure C-2 for proposed fence line). In addition, daytime and nighttime L_{eq}, sound levels 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. Ambient Sound Survey Results

Noise Sensitive Location ID	UTM Coordinates		Distance to Nearest Facility Fence Line (feet/meters)	Time Period	Baseline L_{eq} Sound Level (dBA)
	Easting (meters)	Northing (meters)			
ML-1	291060	5043878	648/197	Day	44
				Night	38
ML-2	292744	5045433	88/27	Day	38
				Night	32
ML-3	294193	5044858	1,337/407	Day	61
				Night	31
ML-4	294392	5048547	672/205	Day	42
				Night	40
ML-5	295248	5052070	689/210	Day	39
				Night	36

5.0 Predicted Noise Levels and Assessment of Compliance with Applicable Noise Regulations

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 shall include:

(A) Predicted noise levels resulting from construction and operation of the proposed facility.

(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.

5.1 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* (Federal Highway Administration [FHWA] 2006). This equipment is also used on solar projects, so the FHWA's sound levels are applicable to incorporate into the Facility. Construction activities associated with the Facility have the potential for localized sound on a temporary basis, as construction activities progress through certain locations within the Facility area. Construction activities at the Facility can be generally divided into five phases:

1. Preparation of the site and staging areas, including grading and on-site access roads;
2. Installation of array foundations, conductors, the operations and maintenance building, and the control enclosure;
3. Assembly of solar panels and electrical connection components;
4. Construction of the inverter pad, substation, cabling, terminations, and transmission lines; and
5. 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 Facility-related elements, such as the operations and maintenance building, will occur independently.

Sound generated by Facility 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 NSR. 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 ft (15 m) dBA	Composite Maximum L_{max} Equipment Noise Level at Nearest NSR 88 ft (27 m) 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	81
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	84
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	84
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	86
5	Commissioning	Pickup Trucks/ATVs	40	55	46

5.1.1 Transmission Line Construction

Noise levels from overhead transmission line construction were evaluated using a screening-level analysis approach. The calculation methodology requires the input of the number and type of construction equipment by phase as well as a typical noise source levels associated with that equipment. The results of this evaluation are estimated composite sound levels at a distance of 50 feet and 1,000 feet. Table Y-5 summarizes results for the five conceptual construction phases.

Table Y-5. Construction Phase Noise Levels for Overhead Line Construction

Phase No.	Construction Phase	Example Construction Equipment	Equipment Noise Level at 50 feet, dBA	Composite Noise Level at 50 feet, dBA	Composite Leq Noise Level at 1000 feet, dBA
1	Site Access and Preparation	Bulldozer Grader Roller – Compactor Loader Water Truck Dump Truck	86 82 73 78 80 80	85	51
2	Installation of Structure Foundations	Bulldozer Loader Backhoe-Loader Fork Lift Mobile Crane Mobile Crane Auger Rig Drill Rig Compressor Pump Portable Mixer Jackhammer Cement Mixer Truck Dump Truck Slurry Truck Specialty Truck Water Truck	86 78 80 80 82 82 85 87 81 83 82 90 80 80 80 75 80	91	56
3	Erecting of Support Structures	Forklift Mobile Crane Compressor Flatbed Truck Flatbed Truck Water Truck Heavy Lift Helicopter	80 82 81 75 75 80 95	95	60
4	Stringing of Conductors, Shield Wire and Fiber Optic Ground Wire	Tracked Dozer Backhoe-Loader Compressor Line Puller Mixed Trucks Specialty Truck Specialty Truck Water Truck Light Helicopter	86 80 81 81 80 75 75 80 92	93	58

Data compiled in part from the following sources: FHWA, 1992, 2006; Bolt, Beranek and Newman, Inc., 1977.

Note: Table of results is subject to revision. Data are provided for illustrative purposes only and may not be representative of final equipment used during Facility construction.

5.2 Operational Noise Assessment

The Facility is being designed to comply with the ODEQ Noise Rules. Inputs for the acoustic model included the maximum proposed number of inverters, transformers, and battery energy storage system components. This analysis presents the noise outputs from the full build out of the Facility.

The Applicant calculated broadband sound pressure levels for expected, normal Facility operation, assuming that all identified components operate continuously and concurrently at the representative manufacturer-rated sound level during the daytime and nighttime.

5.2.1 Acoustic Modeling

The CadnaA® (Computer-Aided Noise Abatement) computer noise model was used to calculate sound pressure levels from the operation of the Facility equipment in the vicinity of the Facility site. An industry standard, CadnaA was developed by DataKustik GmbH to provide an estimate of sound levels at distances from sources of known emission. 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 Facility 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" (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 that 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-6.

Table Y-6. Acoustic Model Setup Parameters

Model Input	Parameter Value
Standards	ISO 9613-2, Acoustics – Attenuation of sound during propagation outdoors.[1]
Engineering Design	Conceptual Facility Layout Design dated 7/1/2021
Grid Spacing	10 meters (m)
Terrain Description	Per Facility analysis area grading plan and USGS topography
Ground Absorption	0.5 (semi-reflective) and 0.0 (reflective)
Receiver Characteristics	1.52 m (5 ft) 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 m per second (3.6 to 18 kilometers per hour) measured at a height of 3 to 11 m above the ground.

The Facility's general arrangement was directly imported into the acoustic model so that on-site equipment could be easily identified, structures could be added, and sound emissions ratings could be assigned to sources as appropriate. CadnaA® 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 Facility analysis area, while a value of G = 0 was used to represent the Facility site.

5.2.2 Acoustic Modeling Input Parameters

5.2.2.1 Solar Facility

The principal sources of noise are associated with the battery storage heating, ventilation, and air conditioning units, the electrical components of the inverters, the step-up transformer associated with each power conversion station, and the main power transformer at the collector substation. The step-up transformers, battery energy 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.

Reference sound power levels input to CadnaA were provided by equipment manufacturers, based on information contained in reference documents or developed using empirical methods. The information used in the acoustic modeling is based on current equipment specifications, though technology is evolving. 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-7 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. In addition, since the location of the battery energy storage system inverters was unknown, it was conservatively assumed that an inverter was collocated with each battery storage unit.

Table Y-7. 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 / Step-up Transformer	142	56	75	88	90	95	93	89	84	85	99
Battery Energy Storage Unit/Inverter	695	31	54	71	85	93	96	95	90	79	100
Substation Main Power Transformer	3	55	74	86	89	94	92	88	83	73	98

5.2.2.2 Transmission Line

Noise generated by transmission lines typically contributes little to area noise levels when compared to other common sources such as from vehicles, aircraft, and industrial sources; however, with increasing transmission line voltages, audible noise produced by corona on the transmission line conductors has become a concern. Audible noise from transmission lines occurs primarily in foul weather. In dry conditions, corona sources are limited to insects, scratches, and vegetation. These sources are such that the corona threshold is barely exceeded, and the audible noise generated is very low. Generally, the fair-weather audible noise of transmission lines cannot be distinguished from ambient noise at the edge of the right-of-way. Conversely, in wet conditions water drops impinging or collecting on the conductors produce a large number of corona discharges, each of them creating a burst of noise.

Audible noise generated by corona on power transmission lines is composed of two major components. The first is a broadband component that has a significant high-frequency content distinguishing it from more common environmental noises. The random phase relationship of the pressure waves generated by each corona source along a line combined with the significant high-frequency content results in the crackling, frying, or hissing characteristic of transmission line noise. The second component is a low-frequency pure tone that is superimposed over the broadband noise. The corona discharges produce positive and negative ions that, under the influence of the alternating electric field around alternating current conductors, are alternately attracted to and repelled from the conductors. This motion establishes a sound-pressure wave having a frequency twice that of the voltage, namely, 120 Hz for a 60-Hz system. Higher harmonics, 240 Hz, may also be present, but they are of generally less significance. In different weather conditions, the relative magnitudes of random noise and hum may be different. Noise levels in fog and snow usually do not attain the elevated level as compared to rain, and when attained, are usually for a shorter duration in proportion of the event.

In conditions of foul weather, there exists the potential for a large concentration of corona sources in the form of water drops or snowflakes that stick to the conductor surface. Noise levels in rain may vary over a wide range. In the initial stages of a rain, when the conductors are not thoroughly wet, there may be a considerable fluctuation in the noise level as the rain intensity varies. When the conductors are thoroughly wet, the noise fluctuations will often be less significant because, even as the rain intensity lessens, the conductors will still be saturated with water drops that act as corona sources. The variation in noise levels during rain depends greatly on the condition of the conductor surface and on the voltage gradient at which the conductors are operating. At high operating gradients, the audible noise is less sensitive to rain rate than at low gradients. Consequently, the dispersion of noise levels is less for the higher gradients.

During meteorological conditions favorable to sound propagation and very quiet background ambient sound conditions, and meteorological conditions conducive to corona noise generation, corona noise may be periodically audible at more distant locations. Conversely, corona noise may be partially or fully masked by elevated ambient sound levels generated by rainfall events. If ambient noise is very low, even a modest amount of wind can obscure the other noise sources and become the dominant ambient noise, particularly in areas with mature tree stands.

As a component of the Facility, a 230-kV transmission line will be constructed; however, the transmission line route is still in the process of being finalized. That being said, the transmission line will be sited such that received sound levels at NSRs will adhere to the applicable ODEQ Noise Rules.

5.3 Acoustic Modeling Results

Table Y-8. provides the received sound level at NSRs within 1 mile of the Facility site boundary. Figure Y-1 shows sound contour plots displaying broadband sound levels presented as color-coded isopleths. The noise contours are graphical representations of the cumulative noise associated with full operation of the Facility components and show how the operational noise would be distributed over the surrounding area within a 1-mile radius of the Facility.

Table Y-8. Acoustic Modeling Results Summary

NSR ID	Time Period	Background Noise (dBA, L_{eq})	Solar Facility Noise (dBA)	Combined Noise (Background/Solar Facility) (dBA)	Change in Noise (dBA)
1	Day	39	29	39	0
	Night	36	29	37	1
2	Day	39	29	39	0
	Night	36	29	37	1
3	Day	39	26	39	0
	Night	36	26	36	0

NSR ID	Time Period	Background Noise (dBA, L_{eq})	Solar Facility Noise (dBA)	Combined Noise (Background/Solar Facility) (dBA)	Change in Noise (dBA)
4	Day	44	30	44	0
	Night	38	30	39	1
5	Day	44	45	47	3
	Night	38	45	46	8
6	Day	44	47	49	5
	Night	38	47	47	9
7	Day	38	53	53	15
	Night	32	53	53	21
8	Day	38	52	53	15
	Night	32	52	52	20
9	Day	38	51	51	13
	Night	32	51	51	19
10	Day	61	36	61	0
	Night	31	36	37	6
11	Day	61	43	61	0
	Night	31	43	43	12
12	Day	61	44	61	0
	Night	31	44	44	13
13	Day	61	43	61	0
	Night	31	43	43	12
14	Day	44	30	44	0
	Night	38	30	39	1
15	Day	44	30	44	0
	Night	38	30	39	1
16	Day	61	33	61	0
	Night	31	33	35	4
17	Day	44	27	44	0
	Night	38	27	38	0
18	Day	42	41	45	3
	Night	40	41	44	4
19	Day	42	45	47	5
	Night	40	45	46	6
20	Day	42	40	44	2
	Night	40	40	43	3
21	Day	42	40	44	2

NSR ID	Time Period	Background Noise (dBA, L_{eq})	Solar Facility Noise (dBA)	Combined Noise (Background/Solar Facility) (dBA)	Change in Noise (dBA)
	Night	40	40	43	3
22	Day	42	55	56	14
	Night	40	55	56	16
23	Day	39	23	39	0
	Night	36	23	36	0
24	Day	39	23	39	0
	Night	36	23	36	0
25	Day	39	53	53	14
	Night	36	53	53	17
26	Day	61	29	61	0
	Night	31	29	33	2
27	Day	39	47	47	8
	Night	36	47	47	11
28	Day	39	47	48	9
	Night	36	47	48	12
29	Day	44	32	44	0
	Night	38	32	39	1
30	Day	44	32	44	0
	Night	38	32	39	1
31	Day	44	32	44	0
	Night	38	32	39	1
32	Day	44	32	44	0
	Night	38	32	39	1
33	Day	44	24	44	0
	Night	38	24	38	0

dBA = A-weighted decibels; NSR = noise sensitive receptor
Shaded cells represent locations where the exceedance is over 10 dBA.

6.0 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 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. 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 Facility operation.

Prior to construction of each phase, 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. Based on the results of the model, the Applicant will provide waivers or consents (or using engineering controls), to demonstrate compliance with OAR 340-035-0035. Specifically, the Applicant shall provide to the Oregon Department of Energy the following: 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, by phase of development, prior to construction that the total noise generated by the Facility 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.

7.0 Measures to Reduce Noise Levels or Impacts to Address Public Complaints

> *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.*

Construction noise is exempt from OAR regulations. Thus, no construction noise measures are planned beyond restricting noisy construction activities to daytime periods and keeping a noise complaint log at the construction site to track and resolve noise complaints. Prior to construction of each phase, 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. Based on the results of the modeling, the Applicant will provide waivers or consents (or using engineering controls) as necessary, to demonstrate compliance with OAR 340-035-0035.

8.0 Monitoring

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 Facility. No exceedances of the OAR 340-035-0035 anti-degradation rule or the fixed thresholds will occur for which the Applicant has not obtained a legally effective easement or real covenant for expected exceedances of the ambient noise degradation test prior to construction. Additionally, the legislative authority granted to the Council in OAR 345-026-0010(1) states that, under Oregon Revised Statute 469.430, "the Council 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."

9.0 Owners of Noise Sensitive Property

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.

Attachment Y-1 has a list of the names and addresses of all owners of noise sensitive property within 1 mile from the Facility site boundary, as defined in OAR 340-035-0015.

10.0 Submittal Requirements and Approval Standards

10.1 Submittal Requirements

Table Y-2. Submittal Requirements Matrix

Requirement	Location
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 shall include:	–
(A) Predicted noise levels resulting from construction and operation of the proposed facility	Section 5.0
(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.	Section 4.0, Section 5.0
(C) Any measures the applicant proposes to reduce noise levels or noise impacts or to address public complaints about noise from the facility.	Section 6.0

Requirement	Location
(D) Any measures the applicant proposes to monitor noise generated by operation of the facility.	Section 7.0
(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.	Section 8.0, Attachment Y-1

10.2 Approval Standards

OAR 345 Division 22 does not provide an approval standard specific to Exhibit Y.

11.0 References

Beranek, L. 1988. Noise and Vibration Control, Chapter 7 - Sound Propagation Outdoors. Institute of Noise Control Engineering, Washington, DC.

Bolt, Beranek, and Newman, Inc. 1977. Power Plant Construction Noise Guide, prepared for the Empire State Electric Energy Research Corporation, Report No. 3321, 1977.

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). 1992. "Procedures for Abatement of Highway Traffic Noise and Construction Noise". Code of Federal Regulations, Title 23, Part 772, 1992.

FHWA. 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.

ODOE (Oregon Department of Energy). 2021. Wagon Trail Solar Project. First Amended Project Order. Issued August 17, 2021. Salem, OR. Available online at: https://www.oregon.gov/energy/facilities-safety/facilities/Facilities%20library/2021-08-17-WTS-APP-NOI-Amended-Project-Order.pdf

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Figures

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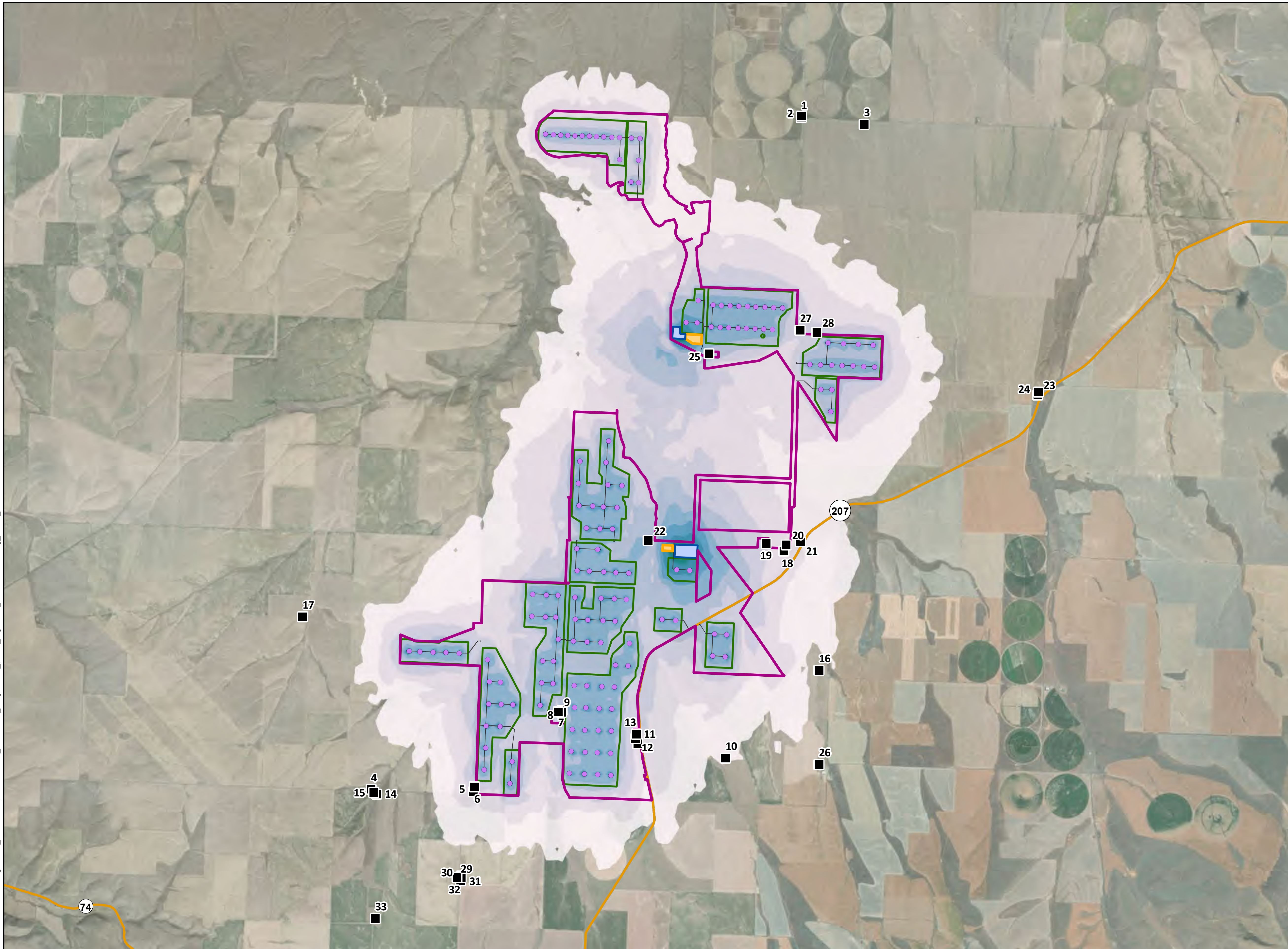
Wagon Trail Solar Project

Figure Y-1 Summary of Acoustic Modeling Results

MORROW COUNTY, OREGON



- Site Boundary
- Inverter Location
- Fenceline
- AC BESS Area
- Project Substation
- Access Road
- State Highway
- Noise Sensitive Receptor

Acousitic Modeling Contours (dB)

- 35-40
- 40-45
- 45-50
- 50-55
- 55-60
- 60-65
- 65-70
- 70-75
- 75-80
- 80-85

TETRA TECH

NEXTera ENERGY RESOURCES

Data Sources

NextEra-Project Infrastructure; USDA-Aerial Imagery; ESRI-County Boundaries

Reference Map

1:70,000 WGS 1984 UTM Zone 11N

0 0.5 1 2 3 4 Miles

NOT FOR CONSTRUCTION

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Attachment Y-1. Owners of Noise Sensitive Properties (Confidential)

(submitted under separate cover)

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