Exhibit Y

Noise

Yellow Rosebush Energy Center
August 2024

Prepared for
Yellow Rosebush Energy Center, LLC

Prepared by

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Acronyms and Abbreviations

Applicant	Yellow Rosebush Energy Center, LLC
BESS	battery energy storage system
BPA	Bonneville Power Administration
CadnaA	Computer Aided Noise Abatement
dB	decibel
dBA	A-weighted decibel
EFSC	Oregon Energy Facility Siting Council
Facility	Yellow Rosebush Energy Center
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
L_{max}	maximum sound level
L_n	statistical sound level
L_w	sound power level
MVA	megavolt-ampere
MVT	medium voltage transformer
MW	megawatt
NSR	noise sensitive receptor
O&M	Operations and maintenance
OAR	Oregon Administrative Rules
ODEQ	Oregon Department of Environmental Quality
RFA	Request for Amendment
UTM	Universal Transverse Mercator

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1.0 Introduction

Yellow Rosebush Energy Center, LLC (Applicant) proposes to construct and operate the Yellow Rosebush Energy Center (Facility), a solar energy generation facility, battery energy storage system, and related or supporting facilities in Wasco and Sherman counties, 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 Oregon Administrative Rules (OAR) 345-021-0010(1)(y).

2.0 Analysis Area

The analysis area for noise impacts is defined in the Project Order[1] as "the area within and extending 1 mile from the site boundary." The Facility site boundary is defined in detail in Exhibits B and C.

3.0 Regulatory Environment

This section describes the noise-related requirements that may be applicable to the Facility at the federal, state, county and local levels.

3.1 Federal Noise Regulations

There are no federal environmental noise requirements specific to this Facility.

3.2 State Noise Regulations

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

3.2.1 Required Contents of Exhibit Y

Exhibit Y addresses the following in accordance with OAR 345-021-0010(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:*

[1] Oregon Department of Energy, Project Order for Yellow Rosebush Energy Center (January 2024).

(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; and

(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.

3.2.2 ODEQ Noise Rules

OAR Chapter 340, Division 35 prescribes noise regulations (or ODEQ Noise Rules) applicable to the Facility that are incorporated in EFSC's general standard of review under OAR 345-022-0000. The following ODEQ Noise Rules are relevant to the Facility and provide an anti-degradation standard and maximum permissible statistical noise levels for new industrial or commercial noise sources on a previously unused site:

OAR 340-035-0035(1) Standards and Regulations:

(b) New Noise Sources:

(B) New Sources Located on Previously Unused Site:

(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, L10 or L50, 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).

(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.

Table Y-1 gives statistical noise levels from Table 8 of OAR 340-035-0035(1)(b)(A). Levels are presented in terms of A-weighted decibels (dBA). 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."[2] The appropriate measurement point is defined in OAR 340-035-0035(3)(b)(A)(B) 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 340-035-0015(38) as "real property normally used for sleeping, or normally used as schools, churches, hospitals or public libraries. Property used in industrial or agricultural activities is not Noise Sensitive Property unless it meets the 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 Division 35, the analysis presented in this assessment assumes that the Facility will constitute an industrial or commercial use 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]

3.2.3 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:*

[2] OAR 340-035-0035(3)(b)

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

[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.

3.2.4 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 Noise Regulations

There are no quantitative noise limits in Wasco County. Wasco County provides guidance for commercial power generating facilities within Chapter 19 of the Wasco County Land Use and Development Ordinance (Wasco County 2022), stating the following:

The energy facility shall comply with the noise regulations in OAR 340-035.

4.0 Existing Conditions

A wide range of noise settings occur within the acoustic analysis area defined in Section 2.0. 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 (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

Noise Source or Activity	Sound Level (dBA)	Subjective Impression	Relative Loudness (Perception of Different Sound Levels)
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: Beranek (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 six 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.

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 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, 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 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, 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. Sound level analyzer microphones were protected from wind-induced pseudonoise by a 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 the 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 AM – 10:00 PM) and nighttime (10:00 PM – 7:00 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. 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		Time Period	Baseline Sound Level Metric			
	Easting (meters)	Northing (meters)		L_{eq}	L_{10}	L_{50}	L_{90}
ML-1	665816	5002691	Day	47	53	37	26
			Night	19	20	18	18
ML-2	668473	5001728	Day	29	31	27	25
			Night	26	28	25	23
ML-3	667696	5000042	Day	58	54	38	27
			Night	17	19	16	15
ML-4	670188	4997512	Day	22	25	20	17
			Night	16	18	15	15
ML-5	670554	4995345	Day	24	28	22	18
			Night	22	25	16	16
ML-6	663921	5011970	Day	36	39	30	24
			Night	33	34	33	31

5.0 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:

> *OAR 345-021-0010(1)(y)(A) Predicted noise levels resulting from construction and operation of the proposed facility;*

5.1 Construction Noise Assessment

Potential noise impacts associated with Facility construction were reviewed; however, according to OAR 340-035-0035(5)(g), sound originating from construction sites is exempt from state noise regulations.

Construction of the Facility will require the use of construction equipment that may have the potential for localized sound on a temporary basis, as construction activities progress through certain locations within the Facility site boundary. The list of construction equipment that may be used for the Facility and estimates of construction sound levels are presented in Table Y-4 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 in solar projects, so the Federal Highway Administration's sound levels are applicable to incorporate in this analysis. Construction activities at the Facility are generally categorized as follows:

- Preparation of the site and staging areas, including grading and on-site service roads;
- Installation of array piles, conductors, and the operations and maintenance (O&M) building;
- Assembly of solar panels and electrical connection components;
- Construction of the inverter pad and battery pads, collector substation, battery energy storage system (BESS), cabling, terminations, and generation-tie (gen-tie) line; and
- Commissioning of the solar 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 related or supporting components, such as the O&M building, will occur independently.

Overhead gen-tie line construction is typically completed in the following stages, but various construction activities may overlap, with multiple construction crews operating simultaneously:

- Preparing the site and site access;
- Installing structure foundations;
- Erecting of support structures; and
- Stringing of conductors, shield wire and fiber optic ground wire.

The sound levels resulting from construction activities vary significantly depending on several factors such as the type and age of equipment, the specific equipment manufacturer and model, the operations being performed, and the overall condition of the equipment and exhaust system mufflers. Table Y-4 lists the typical sound levels associated with common construction equipment at various distances. Periodically, sound levels may be higher or lower; however, the overall sound levels should generally be lower due to excess attenuation.

Table Y-4. Estimated L_{max} Sound Pressure Levels from Construction Equipment

Construction Equipment	Expected Sound Level by Distance (dBA)			
	50 feet	1,000 feet	2,500 feet	5,000 feet
Bulldozer (250 to 700 horsepower [hp])	88	62	54	43
Front-end loader (6 to 15 cubic yards)	88	62	54	43
Truck (200 to 400 hp)	86	60	52	41
Grader (13- to 16-foot blade)	85	59	51	40
Shovel (2 to 5 cubic yards)	84	58	50	39
Portable generators (50 to 200 kilowatts)	84	58	50	39
Mobile crane (11 to 20 tons)	83	57	49	38
Concrete pumps (30 to 150 cubic yards)	81	55	47	36
Tractor (0.75 to 2 cubic yards)	80	54	46	35

Source: Adapted from Beranek (1988); FHWA 2006.
dBA = A-weighted decibel

Reasonable efforts will be made to minimize the impact of noise resulting from construction activities. Candidate construction noise mitigation measures include scheduling louder construction activities during daytime hours and equipping internal combustion engines with appropriately sized muffler systems to minimize noise excessive emissions.

5.2 Operational Noise Assessment

The Applicant modeled noise sources from the Facility to demonstrate that operation of the Facility will 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 identified components operate continuously and concurrently at the representative manufacturer-rated sound level during the daytime and nighttime.

5.2.1 Solar and Battery Energy Storage Facilities

The principal sources of noise associated with the solar facilities are the BESS cooling units, the electrical components of the inverters, and the inverter step-up transformers associated with each inverter skid that are distributed throughout the Facility layout. The inverter skids and battery storage units are mounted on pads at grade level.

5.2.2 Substations

The primary ongoing noise sources at substations are the generator step-up transformers, which generate sound generally described as a low humming. There are three main sound sources associated with a transformer: core noise, load noise, and noise generated by the operation of the cooling equipment. The core vibrational noise is the principal noise source and does not vary significantly with electrical load.

Transformer noise varies with transformer dimensions, voltage rating, and design, and attenuates with distance. The noise produced by substation transformers 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 (60 Hz). The characteristic humming sound consists of tonal components generated at harmonics of 120 Hz. Most of the acoustical energy resides in the fundamental tone (120 Hz) and the first three or four harmonics (240, 360, 480, and 600 Hz).

Circuit-breaker operations may also cause audible noise, particularly the operation of air-blast breakers, which is characterized as an impulsive sound event of very short duration and expected to occur no more than a few times throughout the year. Because of its short duration and infrequent occurrence, circuit breaker noise was not considered in this analysis.

5.2.3 Generation-tie Lines

Noise generated by transmission lines typically contributes little to area noise levels when compared to other common sources such as vehicles, aircraft, and agricultural and industrial sources. Transmission line sound sources will consist primarily of corona noise in addition to Aeolian noise, and noise associated with maintenance activities. Transmission line noise (also known as corona noise) is caused by the partial electrical breakdown of the insulating properties of air around the electrical conductors and overhead power lines. Audible noise generated by corona on transmission lines is composed of two major components. The higher frequencies of the broadband component distinguish it from more common outdoor environmental noise. The random phase relationship of the pressure waves generated by each corona source along a transmission line results in a characteristic sound commonly described as hum or crackling. The second component is a lower-frequency sound 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 (i.e., 120 Hz for a 60-Hz system). Higher harmonics (e.g., 240 Hz) may also be present, but they are generally of lower significance (EPRI 2015). Corona activity increases with increasing altitude, and with increasing voltage in the line, but is generally not affected by system loading. The relative magnitude of hum and broadband noise may be different depending on weather conditions at the line. According to the Electric Power Research Institute, when the line is wet (such as during rainy weather conditions), the broadband component typically dominates; however, under icing conditions, the lower frequency components may be more prevalent (EPRI 2015).

Corona noise levels during precipitation may vary over a wide range. During the initial stages, when the conductors are not thoroughly wet, there may be considerable fluctuation in the noise level as the precipitation intensity varies. When the conductors are thoroughly wet, the noise fluctuations will often be less significant, because even as the intensity of precipitation diminishes the conductors will still be saturated, which can result in corona discharge. 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 variation in noise levels is less for the higher gradients. 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 same magnitude as compared to rain, and elevated noise levels during fog and snow are usually for a shorter duration in proportion to the event (EPRI 1982).

During fair weather conditions, corona occurs only at scratches or other imperfections in the conductor surface or where dust has settled on the line. These limited sources are such that the corona activity is minimal, 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.

Corona noise is not generally an issue at substations. The presence of equipment such as circuit breakers, switches, and measuring devices reduces the electromagnetic field gradient on the buses to a great extent. In addition, the distance from most of the buses to the perimeter of the substation is considerable (on average, greater than 100 meters). Consequently, low levels of corona noise would likely not be readily detectable immediately outside the substation fence line (EPRI 1982).

In addition to corona noise, wind blowing across power lines and power poles can generate noise when airflow is non-laminar or turbulent. Aeolian, or wind, noise is produced when a steady flow of wind interacts with a solid object, such as a tower. The interaction produces oscillating forces on the object that in turn can radiate sound as a dipole source at a given frequency.

The occurrence of Aeolian noise is dependent on several factors and is difficult to predict. Wind noise from a stationary source requires perfect conditions: to produce any sound, the wind must blow for enough time in a specific direction at a specific speed; a slight deviation in either the direction or intensity would disrupt the conditions necessary to produce noise. Wind can create a variety of sounds, ranging from a low hum to a snapping sound to a high whistle. Aeolian noise is not considered a significant contributor to noise disturbance and has not been considered further in the acoustic analysis.

5.3 Acoustic Modeling Analysis

Two programs were used for the Facility acoustic analysis, DataKustik GmbH's computer-aided noise abatement program (CadnaA; DataKustik 2023) and the Corona and Field Effects Program Version 3 (Corona 3; BPA 1991). Further details pertaining to these two programs are given in the following subsections.

5.3.1 CadnaA

The acoustic modeling analysis was conducted using the most recent version of CadnaA, a comprehensive three-dimensional acoustic software model that conforms to the International Organization for Standardization (ISO) standard ISO 9613-2 "Attenuation of Sound during Propagation Outdoors" (ISO 1996). The engineering methods specified in this standard consist of full (1/1) octave band algorithms that incorporate geometric spreading due to wave divergence, reflection from surfaces, atmospheric absorption, screening by topography and obstacles, ground effects, source directivity, heights of both sources and receptors, seasonal foliage effects, and meteorological conditions.

Topographical information was imported into the acoustic model using the official U.S. Geological Survey digital elevation dataset to accurately represent terrain in three dimensions (USGS 2023). Terrain conditions, vegetation type, ground cover, and the density and height of foliage can also influence the absorption that takes place when sound waves travel over land. The ISO 9613-2 standard accounts for ground absorption rates by assigning a numerical coefficient of G=0 for acoustically hard, reflective surfaces and G=1 for absorptive surfaces and soft ground. If the ground is hard-packed dirt, typically found in industrial complexes, pavement, bare rock or for sound traveling over water, 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, livestock and agricultural fields (both fallow with bare soil and planted with crops), will be acoustically absorptive and aid in sound attenuation (i.e., G=1). A mixed (semi-reflective) ground factor of G=0.5 was used in the Facility acoustic modeling analysis and is considered standard engineering practice. In addition to geometrical divergence, attenuation factors include topographical features, terrain coverage, and/or other natural or anthropogenic obstacles that can affect sound attenuation and result in acoustical screening. To be conservative, sound attenuation through foliage and diffraction around and over existing anthropogenic structures such as buildings was not included in this modeling analysis.

Sound attenuation by the atmosphere is not strongly dependent on temperature and humidity; however, the temperature of 10 degrees Celsius (50 degrees Fahrenheit) and 70 percent relative humidity parameters were selected for this analysis and is considered standard engineering practice. Over short distances, the effects of atmospheric absorption are minimal. The ISO 9613-2 standard calculates attenuation for meteorological conditions favorable to propagation, i.e., downwind sound propagation or what might occur typically during a moderate atmospheric ground level inversion. Though a physical impracticality, the ISO 9613-2 standard simulates omnidirectional downwind propagation. In addition, the acoustic modeling algorithms essentially assume laminar atmospheric conditions, in which neighboring layers of air do not mix. This conservative assumption does not take into consideration turbulent eddies and micrometeorological inhomogeneities that may form when winds change speed or direction, which can interfere with the sound propagation path and increase effects of attenuation.

5.3.2 Corona and Field Effects Program

Transmission line corona sound levels were evaluated using Corona 3, a DOS-based computer model developed by the Bonneville Power Administration (BPA; BPA 1991). The Corona 3 program uses the algorithms developed by BPA to predict a variety of outputs including electric and magnetic fields and audible noise. The inputs to the Corona 3 model are line voltage, load flow (current), and the physical dimensions of the line (number of phases, conductor diameter, spacing, height, and subconductor configuration), and site elevation.

The BPA method of calculating audible noise from transmission lines is based on long-term statistical data collected from operating and test transmission lines. This method calculates the L_{50} noise level during rainy conditions of 1 millimeter per hour. Long-term measurements show that L_{50} audible noise levels occur at this rain rate. Results during fair weather conditions are also evaluated. Additional details regarding the Corona 3 program are provided in Exhibit AA.

5.3.3 Solar and Battery Energy Storage Facilities

It is expected that Facility equipment would potentially operate consistently during both daytime and nighttime hours. The projected operational noise levels are based on Applicant-supplied manufacturer sound power level data. The BESS unit sound power information is based on manufacturer data testing in accordance with ISO 3744: 2011-02. Table Y-5 summarizes the equipment sound power level data used as inputs to the initial modeling analysis.

Table Y-5. Modeled Octave Band Sound Power Level of Solar/BESS Equipment

Equipment	Octave Band Sound Power Level (dBA) by Frequency (Hz)									Broadband (dBA)
	31.5	63	125	250	500	1000	2000	4000	8000	
Inverter	46	57	79	92	94	100	100	97	85	105
BESS Unit	48	59	69	88	86	84	82	77	75	92
MVT	57	70	82	89	99	95	100	98	90	105

5.3.4 Substations

The Facility includes a collector substation located inside the solar array fence line. The collector substation will include four generator step-up transformers. The transformer rating of 240 megavolt ampere (MVA) corresponds to a National Electrical Manufacturers Association rating of 84 dBA. The Lw for the substation generator step-up transformers were calculated using the methodology recommended by the Electric Power Plant Environmental Noise Guide (Volume 1, 2nd edition) (Edison Electric Institute 1983). Table Y-6 presents the transformer sound source data by octave band center frequency input to the acoustic modeling analysis.

Table Y-6. Transformer Sound Power Level

Equipment	Octave Band Sound Power Level (dBA) by Frequency (Hz)									Broadband (dBA)
	31.5	63	125	250	500	1000	2000	4000	8000	
240 MVA Transformer	71	90	102	105	110	107	103	98	89	114

5.3.5 Transmission Lines

Audible noise levels associated with the transmission line is dependent upon the configuration of the transmission line. Exhibit AA provides the modeling assumptions used as inputs to Corona 3. The alternate gen-tie line route is still being finalized, and as such it hasn’t been included in the acoustic model. If the alternate point of interconnection is used, the final alternate gen-tie line route will be sited such that received sound levels at NSRs will adhere to applicable ODEQ Noise Rules.

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;

Construction activities are categorically exempted under OAR 340-35-0035(5)(g). Construction noise is short term and not expected to result in significant long-term impacts.

The acoustic modeling analysis evaluated simultaneous operation of Facility components including the proposed solar facilities, BESS facilities, and collector substation. Resultant received sound levels were evaluated at the closest residences within 1 mile relative to the applicable ODEQ noise regulations. The acoustic model contains a number of conservative assumptions, and actual sound levels during Facility operation may be lower than modeled. Modeling results identified in Attachment Y-1 indicate that noise generated during proposed Facility operations would exceed the absolute ODEQ limits (55 dBA daytime, 50 dBA nighttime) at 1 NSR, and would exceed the ambient 10-dB degradation standard at 4 NSRs during daytime hours and 9 NSRs at nighttime hours. A sound contour plot displaying modeled Facility operational sound levels in color-coded isopleths is provided in Figure Y-2. The resultant noise contour plots are independent of the existing acoustic environment (i.e., are Facility-generated sound levels only).

Given these projected exceedances the Applicant will take measures prior to construction of each phase to ensure the Facility will meet maximum allowable noise levels and ambient noise degradation requirements for all potentially affected NSRs, or obtain legally effective easements or real covenants for expected exceedances from the owners of the impacted NSRs.

The Applicant does not estimate the noise levels that would be generated by the alternate gen-tie line, but notes that the line route is still in the process of being finalized and if the alternate point of interconnect is selected for the Facility, the alternate gen-tie line will be sited such that received sound levels at NSRs will adhere to the applicable ODEQ Noise Rules.

7.0 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;

Construction noise is exempt from OAR regulations. Thus, no construction noise measures are planned beyond restricting 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 Facility design, equipment specifications, and noise warranty data will be modeled and reviewed by an acoustician to demonstrate compliance with OAR 340-035-0035. Based on the results of the modeling, the Applicant will provide legally effective easements or real covenants (as available under DEQ Noise Rules), or noise mitigation implementation, as necessary, to demonstrate compliance with OAR 340-035-0035.

8.0 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; and

Noise monitoring is not proposed for the Facility during operations. 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, or implemented noise mitigation as necessary, for expected exceedances of the ambient noise degradation test prior to construction. In addition, EFSC has authority under OAR 345-026-0010(1), which 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)

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-2 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-7. 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 must include:	-
A) Predicted noise levels resulting from construction and operation of the proposed Facility;	Section 5.0, Section 6.0
(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, Section 6.0
(C) Any measures the applicant proposes to reduce noise levels or noise impacts or to address public complaints about noise from the facility;	Section 7.0
(D) Any measures the applicant proposes to monitor noise generated by operation of the facility; and	Section 8.0
(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 9.0, Attachment Y-2

10.2 Approval Standards

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

11.0 References

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Figures

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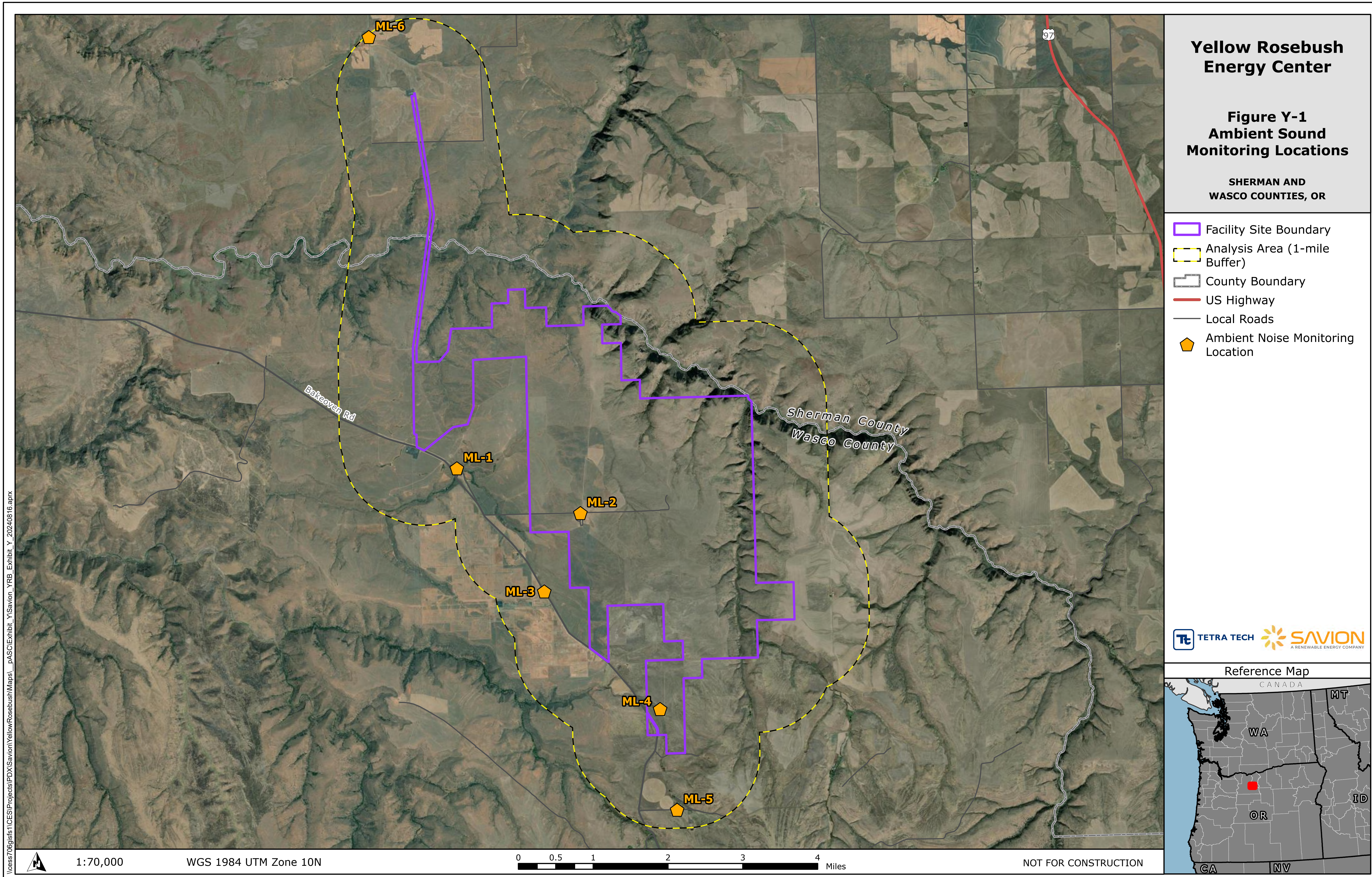
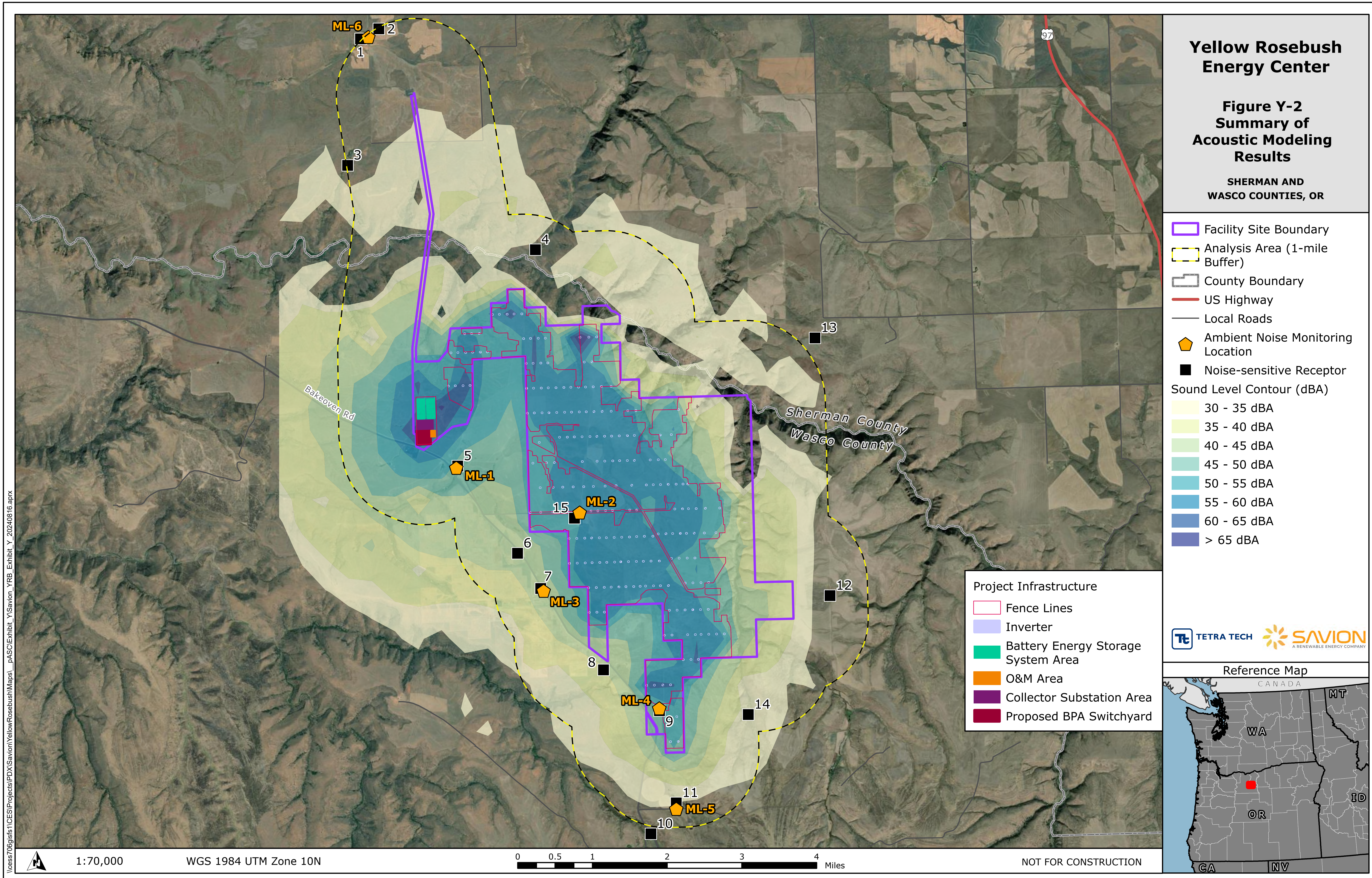


Yellow Rosebush Energy Center

Figure Y-1
Ambient Sound Monitoring Locations

SHERMAN AND WASCO COUNTIES, OR



Yellow Rosebush Energy Center
Figure Y-2
Summary of Acoustic Modeling Results
SHERMAN AND WASCO COUNTIES, OR
Facility Site Boundary
Analysis Area (1-mile Buffer)
County Boundary
US Highway
Local Roads
Ambient Noise Monitoring Location
Noise-sensitive Receptor
Sound Level Contour (dBA)
30 - 35 dBA
35 - 40 dBA
40 - 45 dBA
45 - 50 dBA
50 - 55 dBA
55 - 60 dBA
60 - 65 dBA
> 65 dBA
Project Infrastructure
Fence Lines
Inverter
Battery Energy Storage System Area
O&M Area
Collector Substation Area
Proposed BPA Switchyard
TETRA TECH
SAVION
A RENEWABLE ENERGY COMPANY
Reference Map
CANADA
WA
MT
ID
OR
CA
NV
ML-1
ML-2
ML-3
ML-4
ML-5
ML-6
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
97
Bakeoven Rd
Sherman County
Wasco County
1:70,000
WGS 1984 UTM Zone 10N
0
0.5
1
2
3
4
Miles
NOT FOR CONSTRUCTION
\\cess706gis1\CES\Projects\PDX\Savion\YellowRosebush\Maps_pASC\Exhibit_Y\Savion_YRB_Exhibit_Y_20240816.aprx

Attachment Y-1. Tabulated Summary of Acoustic Modeling Results by Receptor Location

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Attachment Y-1. Tabulated Summary of Acoustic Modeling Results by Receptor Location

NSR ID	Participation Status	Monitoring Location	Level (Facility dBA)		Ambient (Background dBA)		Level + Ambient (dBA)		Increase over Ambient (dBA)	
			Day	Night	Day	Night	Day	Night	Day	Night
1	Not Participating	ML-6	22	22	30	33	31	33	1	0
2	Not Participating	ML-6	22	22	30	33	31	33	1	0
3	Not Participating	ML-6	28	28	30	33	32	34	2	1
4	Not Participating	ML-6	29	29	30	33	32	34	2	1
5	Participating	ML-1	46	46	37	18	47	46	10	28
6	Not Participating	ML-3	42	42	38	16	43	42	5	26
7	Not Participating	ML-3	42	42	38	16	44	42	6	26
8	Not Participating	ML-4	39	39	20	15	39	39	19	24
9	Participating	ML-4	49	49	20	15	49	49	29	34
10	Not Participating	ML-5	24	24	22	16	26	25	4	9
11	Not Participating	ML-5	30	30	22	16	31	30	9	14
12	Not Participating	ML-4	28	28	20	15	29	28	9	13
13	Not Participating	ML-2	27	27	27	25	30	29	3	4
14	Not Participating	ML-4	32	32	20	15	33	32	13	17
15	Participating	ML-2	56	56	27	25	56	56	29	31

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

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Attachment Y-2. Owners of Noise Sensitive Properties

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Attachment Y-2.

Property Owner List of Noise Sensitive Property within 1-mile of the Facility Site Boundary - Sherman and Wasco County Assessor Data (Obtained August 8, 2024)

NSR ID #	Map Tax Lot	Owner	Mail Address	Mail City	State	Zip Code	Full Mailing Address
1	04S15E00001800	BUCKLEY RANCH, LLC	30 SIMPSON RD	SEQUIM	WA	98382	30 SIMPSON RD SEQUIM WA 98382
2	04S15E0000300	LEMLEY RANCH LLC	30 SIMPSON ROAD	SEQUIM	WA	98382	30 SIMPSON ROAD SEQUIM WA 98382
3	04S15E00002200	SKORO RANCH, LLC	PO BOX 38	BORING	OR	97009	PO BOX 38 BORING OR 97009
4	04S16E00003400	BIBBY, DOUGLAS J	92018 KOPKE LANE	GRASS VALLEY	OR	97029	92018 KOPKE LANE GRASS VALLEY OR 97029
5	5S 15E 0 100	ASHLEY L STEVEN ET AL	PO BOX 158	MAUPIN	OR	97037	PO BOX 158 MAUPIN OR 97037
6	5S 15E 0 1100	ASHLEY VICKI	90530 BAKEOVEN RD	MAUPIN	OR	97037	90530 BAKEOVEN RD MAUPIN OR 97037
7	5S 16E 0 1201	ASHLEY VICKI	90530 BAKEOVEN RD	MAUPIN	OR	97037	90530 BAKEOVEN RD MAUPIN OR 97037
8	5S 16E 0 2200	ASHLEY VICKI	90530 BAKEOVEN RD	MAUPIN	OR	97037	90530 BAKEOVEN RD MAUPIN OR 97037
9	5S 16E 0 1300	CHRISMAN LEVI FAMILY LLC	62261 DEER TRIAL RD	BEND	OR	97701	62261 DEER TRIAL RD BEND OR 97701
10	5S 16E 0 3400	WARNOCK RANCHES INC	91440 BAKEOVEN RD	MAUPIN	OR	97037	91440 BAKEOVEN RD MAUPIN OR 97037
11	5S 16E 0 3300	CARVER BLAINE D	91443 HINTON RD	MAUPIN	OR	97037	91443 HINTON RD MAUPIN OR 97037
12	5S 16E 0 600	CARVER FAMILY RANCHES LLC	91443 HINTON RD	MAUPIN	OR	97037	91443 HINTON RD MAUPIN OR 97037
13	04S16E00005400	JEFFERIES, TIMOTHY & KATHRINE	93520 WILSON LANE	GRASS VALLEY	OR	97029	93520 WILSON LANE GRASS VALLEY OR 97029
14	5S 16E 0 2500	BAKEOVEN I LLC	12819 SE 38TH ST #9	BELLEVUE	WA	98006	12819 SE 38TH ST #9 BELLEVUE WA 98006
15	5S 16E 0 1000	PHILLIPS DON W ET AL	PO BOX 689	BEAVERCREEK	OR	97004-0689	PO BOX 689 BEAVERCREEK OR 97004-0689

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