EXHIBIT 6

OXFORD ENERGY CENTER BESS NOISE ASSESSMENT

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Prepared for Oxford Energy Center, LLC

Report Title:

Oxford Energy Center BESS Noise Assessment

Report Prepared by:

RSG

Report Prepared for:

Oxford Energy Center, LLC

For additional information regarding this report, or for questions about permissions or use of findings contained therein, please contact:

RSG (Headquarters)
55 Railroad Row, Suite 200
White River Junction, VT 05001
(802) 295-4999
www.rsginc.com

CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

The Oxford Energy Center Battery Energy Storage System ("BESS") Project ("Project") is rated up to 69 MWh and will be fitted with six power inverters and 24 battery containers proposed in Oxford, Connecticut. To inform the local permitting process, RSG was retained by the developer of the Project, Oxford Energy Center, to perform a noise assessment of the Project. This report of the assessment includes:

- A Project description;
- Noise limits applicable to the Project;
- Sound monitoring procedures and results;
- Sound propagation modeling procedures and results; and
- Conclusions.

A primer of acoustical terminology used in this report can be found in Appendix A.

2.0 PROJECT DESCRIPTION

2.1 PROJECT AREA

The Project is a 69 MWh BESS with six inverters and 24 battery containers proposed for N. Larkey Road in Oxford, Connecticut, 275 meters (902 feet) north of Commerce Drive. The end of the Waterbury-Oxford Airport runway is 350 meters (1,148 feet) to the northwest. The area surrounding the Project consists of mostly industrial and forested parcels with the closest residential property 326 meters (1,187 feet) to the southeast on Jacks Hill Road. A map of the Project area and the zoning districts is provided in Figure 1.

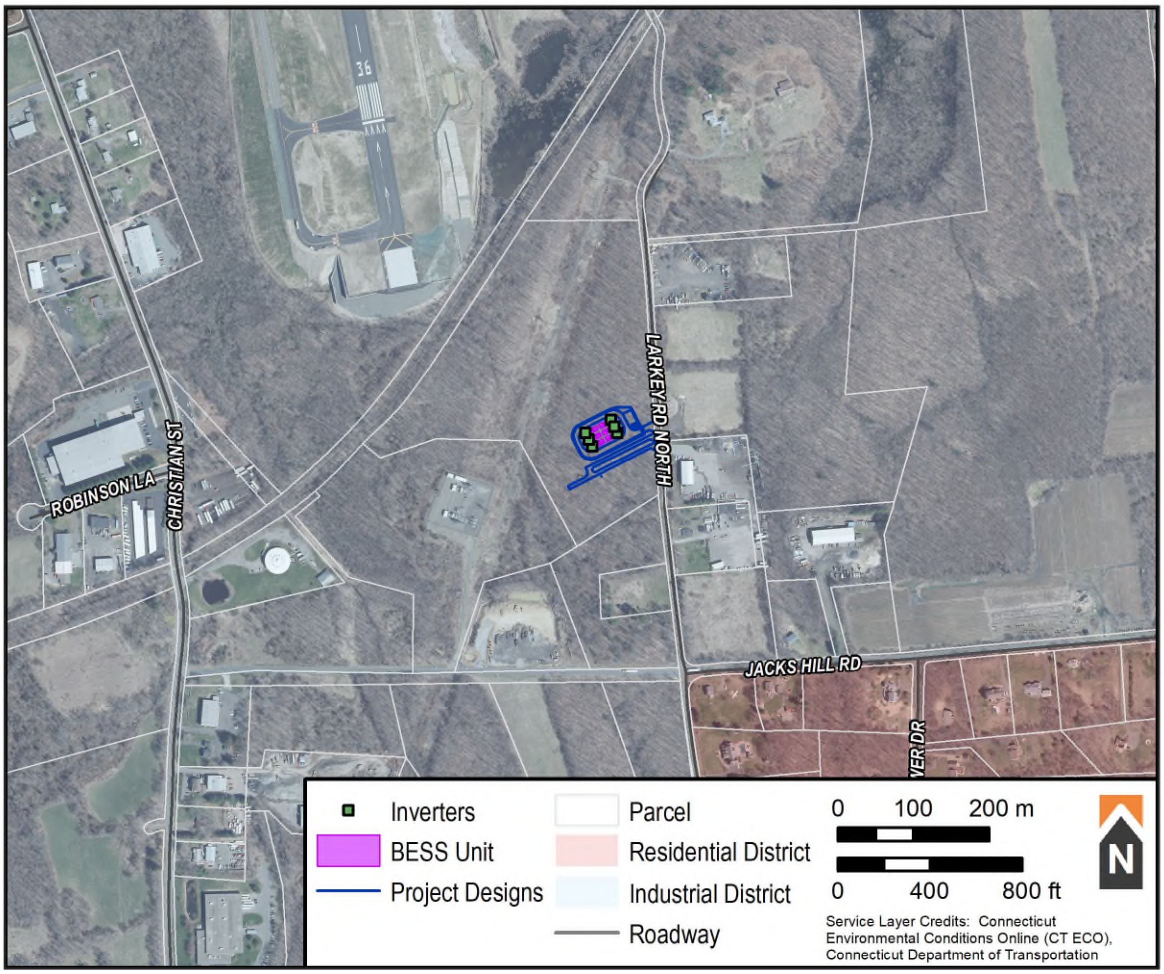

FIGURE 1: PROJECT AREA MAP

2.2 APPLICABLE NOISE LIMITS

Connecticut Noise Limits

The State of Connecticut noise limits are classified by land use into Noise Zones as described in Section 22a-69-2 of the Regulations. Class A Noise Zone is residential or where humans tend to sleep, Class B Noise Zone is intended for commercial or institutional uses, and Class C Noise Zone is industrial.

The Project parcel classifies as a Class C Noise Zone and is surrounded by a mix of other Class C and Class A Noise Zones. For Class C Noise Zone, the emitter cannot exceed the noise level limits at the adjacent Noise Zones provided in Table 1.

TABLE 1: CONNECTICUT CLASS C NOISE ZONE - LIMITS

	RECEPTOR NOISE ZONE			
	C	B	A/DAY	A/NIGHT
Class C Emitter	70 dBA	66 dBA	61 dBA	51 dBA

Daytime is defined as 7:00 am to 10:00 pm and nighttime is defined as 10:00 pm to 7:00 am.

There are additional provisions in the regulations that apply to tonal sound, ultrasound, and infrasound.

Town of Oxford Noise Limits

The State of Connecticut allows municipalities to provide their own noise ordinances if they are as stringent as the state's noise ordinance. The Town of Oxford ordinance does have its own noise ordinance and is provided in Title IX: Chapter 95 of the Town of Oxford Code of Ordinances. The noise limits are categorized by zoning designations as defined in the Oxford zoning ordinance and are the same as those found in Table 1. In cases where the background sound level is above the noise limits, five decibels above the background sound level would be considered excessive noise. The background sound level is defined as the level which is exceeded 90% of the time (L_{90}).

3.0 BACKGROUND SOUND LEVEL MONITORING

Background sound monitoring prior to construction allows us to assess whether the area under consideration is defined as a “High background noise area” in the regulations. It is also useful for assessing the noise impacts of the project relative to the existing soundscape.

3.1 PROCEDURES

Background sound levels were measured at two locations during the spring of 2024. A map of the monitoring locations is provided in Figure 2.

Equipment

Sound levels were measured using ANSI/IEC Class 1 sound level meters (Table 2). Audio recordings were also made at each location to aid in source identification and soundscape characterization. All sound level meters logged A-weighted and 1/3 octave band equivalent sound levels once each second continuously throughout the monitoring period (Table 3).

TABLE 2: SOUND LEVEL METERS AT EACH LOCATION

LOCATION	MANUFACTURER	MODEL	SERIAL NUMBER	LAST NIST-TRACEABLE CALIBRATION
Oxford 1	Cesva	SC310	T221731	02/01/2024
Oxford 2	Cesva	SC310	T224253	07/14/2023

TABLE 3: SOUND MONITORING START, END, AND DURATION AT EACH LOCATION

LOCATION	START	END	DURATION
Oxford 1	03/25/2024	03/31/2024	6.4 days
Oxford 2	03/25/2024	03/31/2024	5.8 days

Each sound level meter microphone was mounted on a wooden stake at a height of approximately 1.2 meters (4 feet) and covered with a 7-inch weather-resistant windscreen. The windscreen reduces the influence of wind-induced self-noise on the measurements. The sound level meters were field calibrated using a Class 1 calibrator before and after the measurement period. Further, all sound level meters and calibrators were calibrated in a NIST-traceable lab within one year of the deployment.

Wind speeds were logged at each site using ONSET anemometers which recorded average wind speed and wind gust speed every minute and were installed within 20 feet of each microphone and at microphone height (~1.2 meters). Other meteorological data was taken from the National Weather Service ASOS Station at the Waterbury-Oxford Airport, about 0.8 miles from the project location.

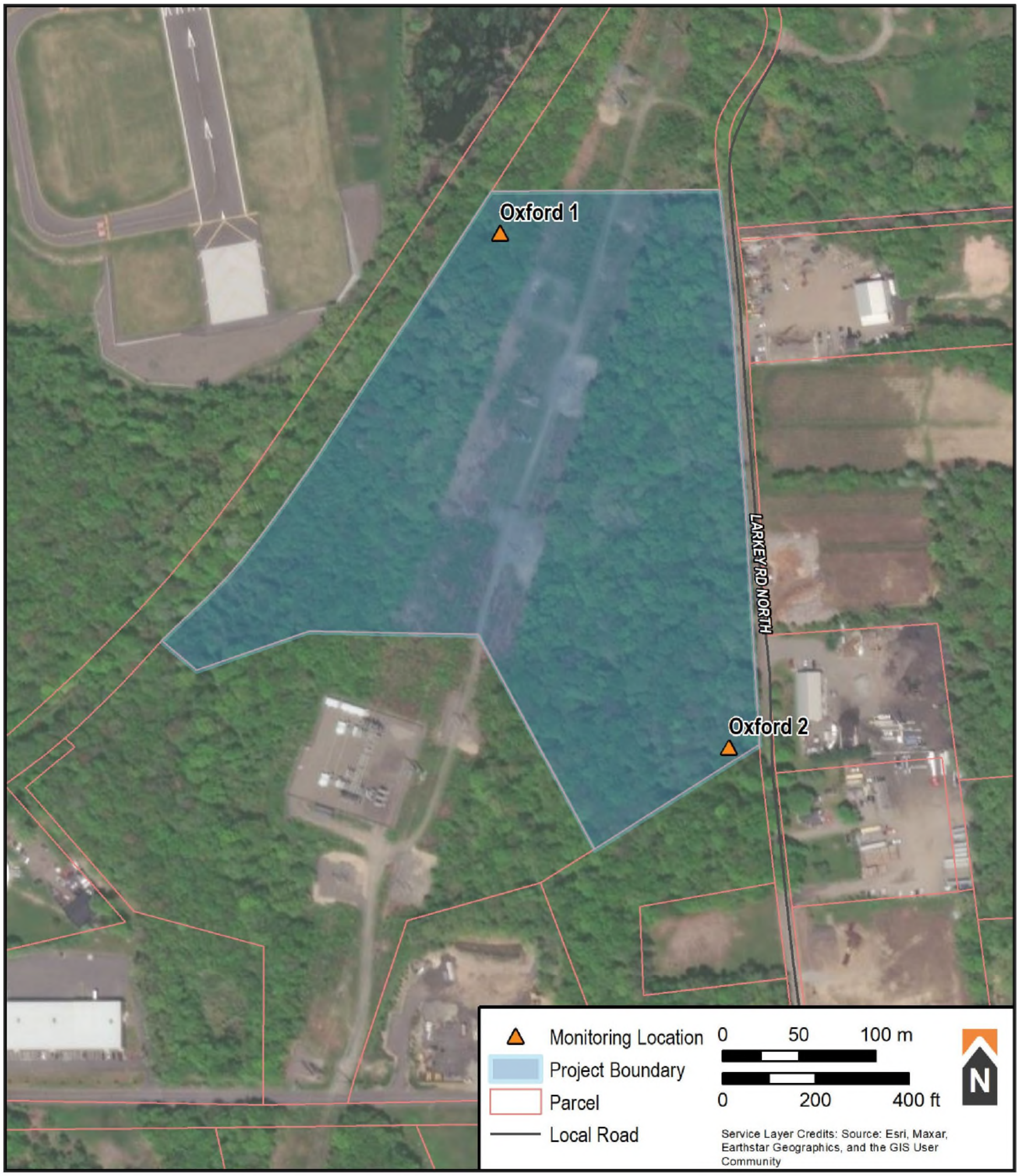

FIGURE 2: BACKGROUND SOUND MONITORING LOCATIONS

3.2 MONITORING LOCATIONS

Sound monitoring was set up at locations generally representative of noise-sensitive land uses near the project. The goal in selecting monitoring locations was to capture representative soundscapes in the proposed project area, which is primarily affected by varying traffic volumes and land uses.

The characteristics of the two selected sound monitoring locations are as follows.

Oxford 1 Monitor

The Oxford 1 Monitor was in the northwest corner of the project area, in the woods between the utility lines service road and the Waterbury-Oxford Airport. There was a hiking trail to the west of the monitor. The airport runway is 160 meters (525 feet) west of the monitor location, and the service road was 65 meters (213 feet) east.

During the day, sound sources include planes taking off and landing, work trucks on the utility service road, and bird calls. The planes were the primary sound source.

FIGURE 3: OXFORD 1 MONITOR LOCATION, FACING NORTHEAST

Oxford 2 Monitor

The Oxford 2 Monitor was located on the southeast section of the project area (Figure 4). It was in the woods 25 meters (82 feet) west of Larkey Road North, a road that has multiple contractor yards. Because of this, there are often work trucks passing at the start and end of the workday. The airport runway is 470 meters (1,542 feet) northwest of the monitor location. The nearest contractor yard driveway is 65 meters (213 feet) northeast of the monitor.

The soundscape included birdsong and passing vehicles along Larkey Road North. Some vehicle noise also came from trucks idling in contractor yards. Plane takeoffs and landings were present, but not as dominant in the soundscape as at Oxford 1.

FIGURE 4: OXFORD 2 MONITOR LOCATION, FACING EAST

3.3 DATA ANALYSIS

Data were excluded under the following conditions:

- Wind gust speeds above 5 m/s (11 mph) in accordance with ASA/ANSI S12.9 Part 3
- Temperatures below -10° C (14° F) (outside the specification of the sound level meters)

- Precipitation in the form of rain, sleet, or ice
- Thunder
- Humidity outside the specifications of the sound level meter
- Anomalous sounds that were out of character for the area being monitored
- Seasonal sound sources such as nearby lawn mowers, and
- Equipment interactions by field staff during microphone calibration and maintenance.

Precipitation events were obtained from Waterbury-Oxford Airport and were corroborated through both analysis of sound level spectrograms and from audio recordings.

The remaining one-second sound level data from each monitor were energy-averaged into 10-minute periods and summarized over the entire monitoring period. Statistical levels were calculated from the one-second equivalent continuous sound level (L_{eq}) data.

3.4 RESULTS

An overall summary of the long-term A-weighted sound levels is provided in Table 4,. Sound levels for each location are summarized into overall, daytime, and nighttime levels for the equivalent continuous (L_{eq}),[1] lower 10th percentile (L_{90}), median (L_{50}), and upper 10th percentile (L_{10}). A detailed description of the sound metrics is provided in Appendix A.

Figure 5 and Figure 6 show the time-history for each sound monitoring location. For display purposes, the one second data that was collected is displayed in 10-minute summarized values in the time history-graphs to show overall trends. Sound levels are plotted along with ambient temperature and wind speed to show relating trends. Time periods during which data was removed for the sound level summary presented in are indicated with color-coded markers. Sound level data during periods when the entire 10-minute interval was excluded for wind, rain, or anomalies are still present in these graphs as lighter colors, with the darker colors representing 10-minute intervals where there were no data exclusions or only partial data exclusions.[2] The duration of each time history graph is one week, and each graph exhibits day/night shading where night is defined as 22:00 to 7:00 and shaded grey.

[1] The equivalent continuous level is level based on the pressure average across the time period.
[2] For some 10-minute periods, shorter durations within the 10-minutes are excluded due to wind, rain, or anomalies, but the rest of the 10-minute interval is still used in the summary. These periods are shown in the darker colors (L_{eq} and L_{90}) as only some of the 10-minute period was excluded.

TABLE 4: SUMMARY OF BACKGROUND SOUND LEVELS BY MONITOR

MONITOR	SOUND LEVEL (dBA)											
	DAY				NIGHT				OVERALL			
	L_{eq}	L_{10}	L_{50}	L_{90}	L_{eq}	L_{10}	L_{50}	L_{90}	L_{eq}	L_{10}	L_{50}	L_{90}
Oxford 1	54	51	41	36	40	43	38	34	52	48	40	35
Oxford 2	51	50	42	37	43	44	39	34	49	48	41	36
Average	**52**	**50**	**42**	**36**	**41**	**44**	**39**	**34**	**50**	**48**	**40**	**35**

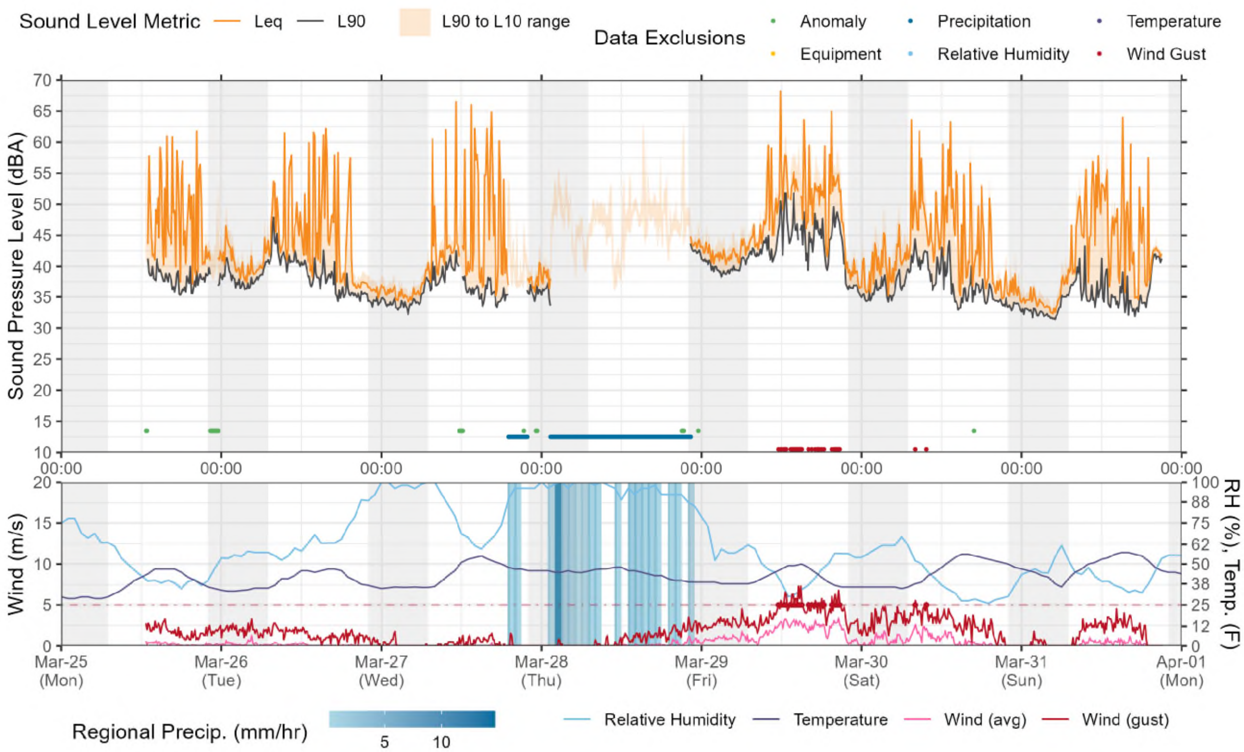

FIGURE 5: OXFORD 1 MONITOR SOUND LEVELS AND METEOROLOGY

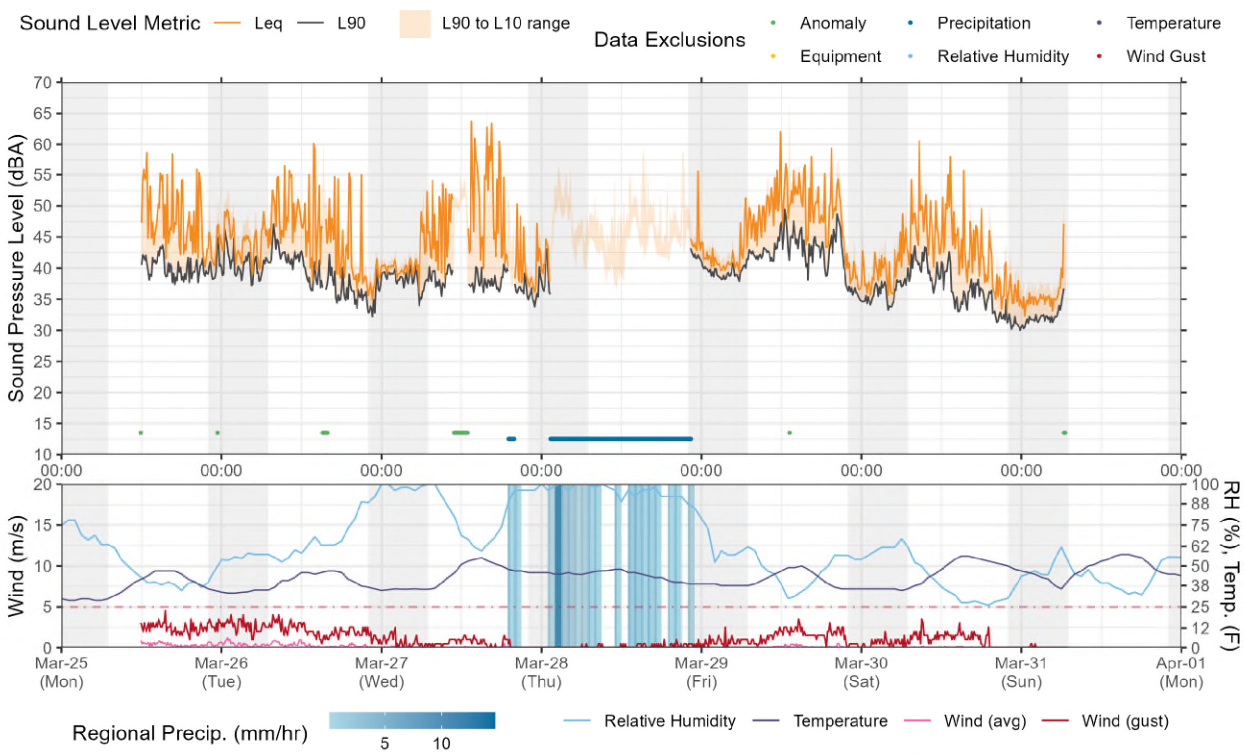

FIGURE 6: OXFORD 2 MONITOR SOUND LEVELS AND METEOROLOGY

4.0 SOUND PROPAGATION MODELING

4.1 MODELING PROCEDURES

Sound modeling for the Project was in accordance with the standard ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation." The ISO standard states,

> This part of ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level … under meteorological conditions favorable to propagation from sources of known sound emissions. These conditions are for downwind propagation … or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night.

The model takes into account source sound power levels, surface reflection and absorption, atmospheric absorption, geometric divergence, meteorological conditions, walls, barriers, berms, and terrain. The acoustical modeling software used here was CadnaA, from Datakustik GmbH. CadnaA is a widely accepted acoustical propagation modeling tool, used by many noise control professionals in the United States and internationally.

ISO 9613-2 assumes downwind sound propagation between every source and every receiver, consequently, all wind directions, including the prevailing wind directions, are taken into account.

To evaluate sound levels, a 10-meter by 10-meter (33 feet by 33 feet) grid of receptors was set up in the model covering over 3.5 square kilometers (1.3 square miles) in and around the Project area. Additional model parameters are provided in Appendix B including the equipment sound power spectra and source locations.

4.2 SOUND SOURCES

The Project includes 24 BESS containers. The primary sound source of the BESS containers is the chiller, which has an overall sound power level of 97 dBA and is modeled as a vertical area source. The sound power was calculated from the manufacturer sound pressure measurements (L_{max}) when the equipment was running at its maximum operating state. For each group of four BESS containers, there is one inverter making for a total of six inverters. The inverters include a silencer kit and have an overall sound power of 86 dBA. The inverters are modeled as a point source. The sound power level for the inverters and the battery energy storage containers are calculated based on the manufacturers' sound test reports.

4.3 RESULTS

In Figure 7, the modeled sound levels are represented by colored isolines expressed in A-weighted decibels (dBA). The industrial noise limit of 70 dBA is shown as a light blue dashed line. The 70 dBA isoline is completely within the project parcel. The nighttime residential noise limit of 51 dBA and the daytime residential limit of 61 dBA do not encroach into the closest residential zoning district to the southeast. The 51 dBA isoline is shown as a pink dashed line.

This indicates that the applicable Town of Oxford noise limits are modeled to be met within all residential and industrial zoned property boundaries.

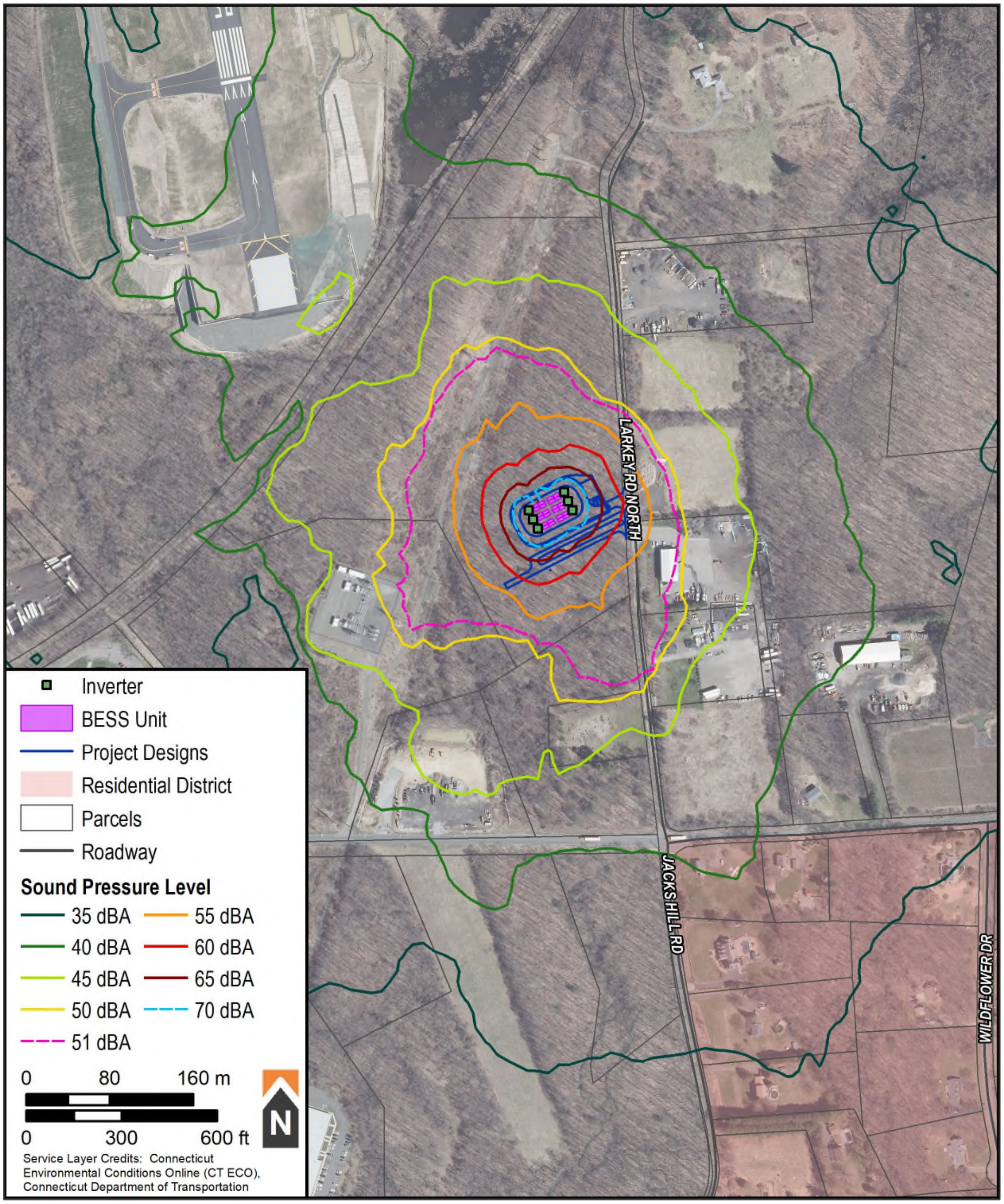

FIGURE 7: SOUND PROPAGATION MODELING RESULTS

5.0 SUMMARY AND CONCLUSION

Oxford Energy Center is proposing a 69 MWH Battery Energy Storage System in Oxford, CT. RSG conducted sound monitoring and sound propagation modeling to forecast the Project's operational sound levels.

Our summary and conclusions are as follows:

1. Sound monitoring was conducted at two locations over six days to quantify the existing sound levels across the Project area. The primary sound sources in the existing soundscape include vehicle traffic along North Larkey Road, aircraft noise from the Waterford-Oxford Airport, and bird and insect noise. The average daytime sound level was 52 dBA, and the average nighttime sound level was 41 dBA.
2. Sound propagation modeling was conducted in accordance with ISO 9613-2 at a grid of receptors throughout the Project area and were used to create sound level isolines.
3. Model results are provided in Section 3.4. The results show that all residential properties are modeled to have Project sound levels at or below the Town of Oxfords 51 dBA residential nighttime noise limit. All industrial properties in the vicinity of the Project are modeled to have Project sound levels at or below the 70 dBA industrial noise limit.

APPENDIX A. ACOUSTICS PRIMER

Expressing Sound Levels in Decibels

The varying air pressure that constitutes sound can be characterized in many different ways. The human ear is the basis for the metrics that are used in acoustics. Normal human hearing is sensitive to sound fluctuations over an enormous range of pressures, from about 20 micropascals (the "threshold of audibility") to about 20 pascals (the "threshold of pain").[3] This factor of one million in sound pressure difference is challenging to convey in engineering units. Instead, sound pressure is converted to sound "levels" in units of "decibels" (dB, named after Alexander Graham Bell). Once a measured sound is converted to dB, it is denoted as a level with the letter "L".

The conversion from sound pressure in pascals to sound level in dB is a four-step process. First, the sound wave's measured amplitude is squared and the mean is taken. Second, a ratio is taken between the mean square sound pressure and the square of the threshold of audibility (20 micropascals). Third, using the logarithm function, the ratio is converted to factors of 10. The final result is multiplied by 10 to give the decibel level. By this decibel scale, sound levels range from 0 dB at the threshold of audibility to 120 dB at the threshold of pain.

Typical sound sources, and their sound pressure levels, are listed on the scale in Figure 8.

Human Response to Sound Levels: Apparent Loudness

For every 20 dB increase in sound level, the sound pressure increases by a *factor* of 10; the sound *level* range from 0 dB to 120 dB covers 6 factors of 10, or one million, in sound *pressure*. However, for an increase of 10 dB in sound *level* as measured by a meter, humans perceive an approximate doubling of apparent loudness: to the human ear, a sound level of 70 dB sounds about "twice as loud" as a sound level of 60 dB. Smaller changes in sound level, less than 3 dB up or down, are generally not perceptible.

[3] The pascal is a measure of pressure in the metric system. In Imperial units, they are themselves very small: one pascal is only 145 millionths of a pound per square inch (psi). The sound pressure at the threshold of audibility is only 3 one-billionths of one psi: at the threshold of pain, it is about 3 one-thousandths of one psi.

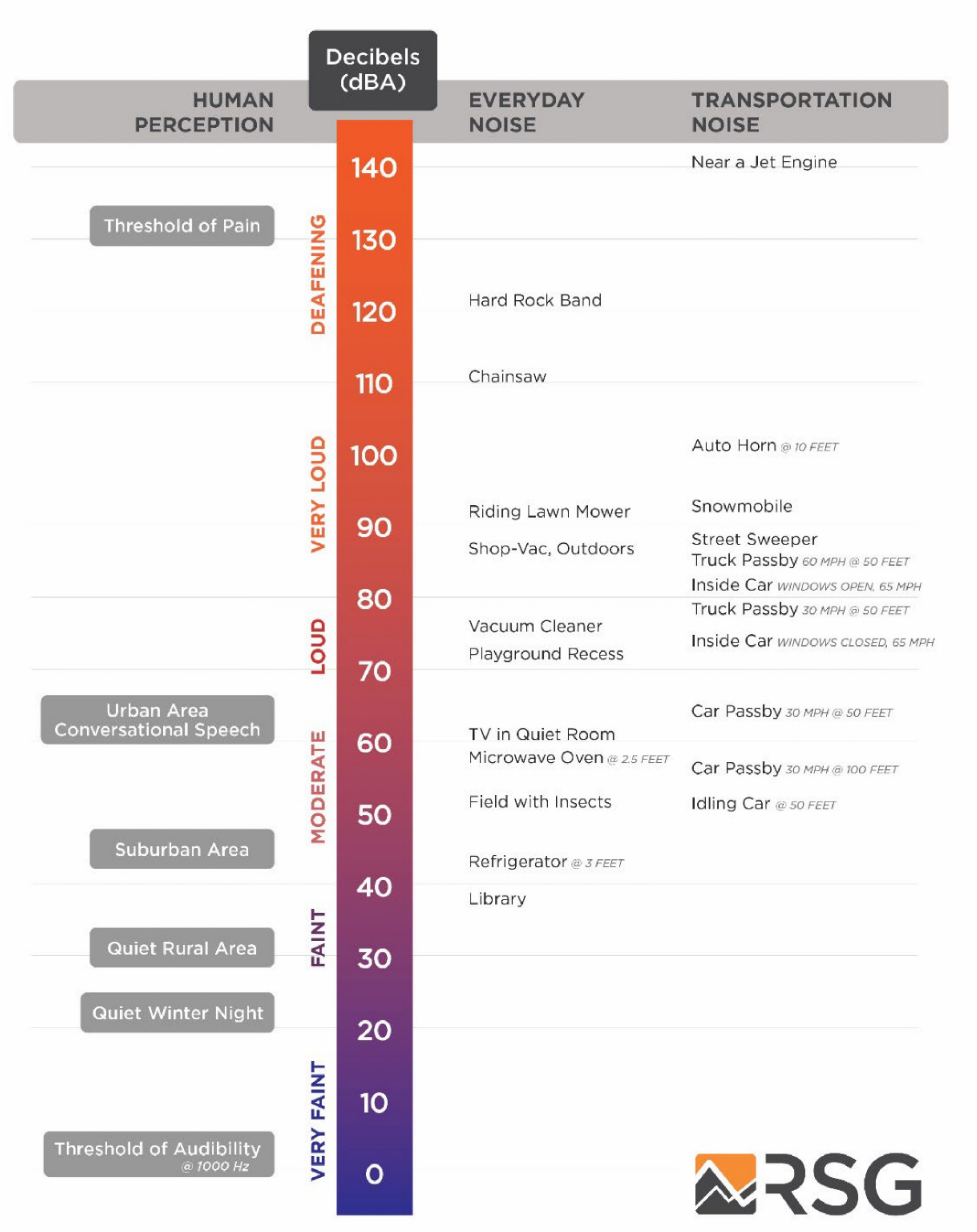

FIGURE 8: A SCALE OF SOUND PRESSURE LEVELS FOR TYPICAL SOUND SOURCES

Frequency Spectrum of Sound

The "frequency" of a sound is the rate at which it fluctuates in time, expressed in Hertz (Hz), or cycles per second. Very few sounds occur at only one frequency: most sound contains energy at many different frequencies, and it can be broken down into different frequency divisions, or bands. These bands are similar to musical pitches, from low tones to high tones. The most common division is the standard octave band. An octave is the range of frequencies whose upper frequency limit is twice its lower frequency limit, exactly like an octave in music. An octave band is identified by its center frequency: each successive band's center frequency is twice as high (one octave) as the previous band. For example, the 500 Hz octave band includes all sound whose frequencies range between 354 Hz (Hertz, or cycles per second) and 707 Hz. The next band is centered at 1,000 Hz with a range between 707 Hz and 1,414 Hz. The range of human hearing is divided into 10 standard octave bands: 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1,000 Hz, 2,000 Hz, 4,000 Hz, 8,000 Hz, and 16,000 Hz. For analyses that require finer frequency detail, each octave-band can be subdivided. A commonly used subdivision creates three smaller bands within each octave band, or so-called 1/3-octave bands.

The Spectrogram

One method of viewing the spectral sound level is to look at a spectrogram of the sound. As shown in Figure 9, the spectrogram shows the level, frequency spectra, and time in one graph. That is, the horizontal axis represents time, the vertical axis is frequency, and the intensity of the color is proportional to the intensity of the sound.

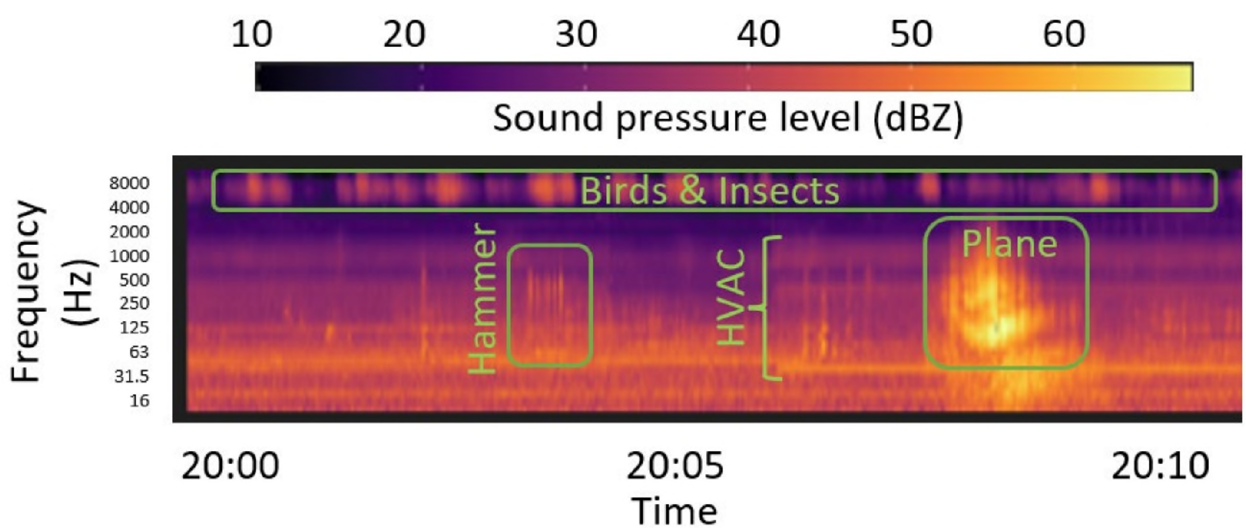

FIGURE 9: AN EXAMPLE OF A SOUND SPECTROGRAM WITH ANNOTATIONS

The spectrogram is useful for identifying the sources of sound. For example, birds show short bursts of high frequency sound, while airplanes are mostly low frequency sound and show slow rise and fall times. In the example above, we can see several of these events.

Human Response to Frequency: Weighting of Sound Levels

The human ear is not equally sensitive to sounds of all frequencies. Sounds at some frequencies seem louder than others, despite having the same decibel level as measured by a sound level meter. In particular, human hearing is much more sensitive to medium pitches (from about 500 Hz to about 4,000 Hz) than to very low or very high pitches. For example, a tone measuring 80 dB at 500 Hz (a medium pitch) sounds quite a bit louder than a tone measuring 80 dB at 60 Hz (a very low pitch). The frequency response of normal human hearing ranges from 20 Hz to 20,000 Hz. Below 20 Hz, sound pressure fluctuations are not “heard”, but sometimes can be “felt”. This is known as “infrasound”. Likewise, above 20,000 Hz, sound can no longer be heard by humans; this is known as “ultrasound”. As humans age, they tend to lose the ability to hear higher frequencies first; many adults do not hear very well above about 16,000 Hz. Most natural and man-made sound occurs in the range from about 40 Hz to about 4,000 Hz. Some insects and birdsongs reach about 8,000 Hz.

To adjust measured sound pressure levels so that they mimic human hearing response, sound level meters apply filters, known as “frequency weightings”, to the signals. There are several defined weighting scales, including “A”, “B”, “C”, “D”, “G”, and “Z”. The most common weighting scale used in environmental noise analysis and regulation is A-weighting. This weighting represents the sensitivity of the human ear to sounds of low to moderate level. It attenuates sounds with frequencies below 1000 Hz and above 4000 Hz; it amplifies very slightly sounds between 1000 Hz and 4000 Hz, where the human ear is particularly sensitive. The C-weighting scale is sometimes used to describe louder sounds. The B- and D- scales are seldom used. All of these frequency weighting scales are normalized to the average human hearing response at 1000 Hz: at this frequency, the filters neither attenuate nor amplify. When a reported sound level has been filtered using a frequency weighting, the letter is appended to “dB”. For example, sound with A-weighting is usually denoted “dBA”. When no filtering is applied, the level is denoted “dB” or “dBZ”. The letter is also appended as a subscript to the level indicator “L”, for example “L_A” for A-weighted levels.

A relatively new standard weighting is the ANS weight. ANS stands for A-weighted, natural sounds. The ANS weight is the same as the A-weighting, but it filters out all sound above the 1,000 Hz octave band. Thus, it removes the impact of many high frequency biogenic sounds such as insects, birds, and amphibians. The ANS weighting is often used to eliminate the effects of seasonality of sound, as there are fewer insects and birds during the winter than the summer.

Time Response of Sound Level Meters

Because sound levels can vary greatly from one moment to the next, the time over which sound is measured can influence the value of the levels reported. Often, sound is measured in real time, as it fluctuates. In this case, acousticians apply a so-called "time response" to the sound level meter, and this time response is often part of regulations for measuring sound. If the sound level is varying slowly, over a few seconds, "Slow" time response is applied, with a time constant of one second. If the sound level is varying quickly (for example, if brief events are mixed into the overall sound), "Fast" time response can be applied, with a time constant of one-eighth of a second.[4] The time response setting for a sound level measurement is indicated with the subscript "S" for Slow and "F" for Fast: L_S or L_F. A sound level meter set to Fast time response will indicate higher sound levels than one set to Slow time response when brief events are mixed into the overall sound, because it can respond more quickly.

In some cases, the maximum sound level that can be generated by a source is of concern. Likewise, the minimum sound level occurring during a monitoring period may be required. To measure these, the sound level meter can be set to capture and hold the highest and lowest levels measured during a given monitoring period. This is represented by the subscript "max", denoted as "L_{max}". One can define a "max" level with Fast response L_{Fmax} (1/8-second time constant), Slow time response L_{Smax} (1-second time constant), or Continuous Equivalent level over a specified time period $L_{eq.max}$.

Accounting for Changes in Sound Over Time

A sound level meter's time response settings are useful for continuous monitoring. However, they are less useful in summarizing sound levels over longer periods. To do so, acousticians apply simple statistics to the measured sound levels, resulting in a set of defined types of sound level related to averages over time. An example is shown in Figure 10. The sound level at each instant of time is the grey trace going from left to right. Over the total time it was measured (1 hour in the figure), the sound energy spends certain fractions of time near various levels, ranging from the minimum (about 27 dB in the figure) to the maximum (about 65 dB in the figure). The simplest descriptor is the average sound level, known as the Equivalent Continuous Sound Level. Statistical levels are used to determine for what percentage of time the sound is louder than any given level. These levels are described in the following sections.

Equivalent Continuous Sound Level - L_{eq}

One straightforward, common way of describing sound levels is in terms of the Continuous Equivalent Sound Level, or L_{eq}. The L_{eq} is the average sound pressure level over a defined period of time, such as one hour or one day. L_{eq} is the most commonly used descriptor in noise

[4] There is a third-time response defined by standards, the "Impulse" response. This response was defined to enable use of older, analog meters when measuring very brief sounds; it is no longer in common use.

standards and regulations. L_{eq} is representative of the overall sound to which a person is exposed. Because of the logarithmic calculation of decibels, L_{eq} tends to favor higher sound levels: loud and infrequent sources have a larger impact on the resulting average sound level than quieter but more frequent sounds. For example, in Figure 10, even though the sound levels spends most of the time near about 34 dBA, the L_{eq} is 41 dBA, having been "inflated" by the maximum level of 65 dBA and other occasional spikes over the course of the hour.

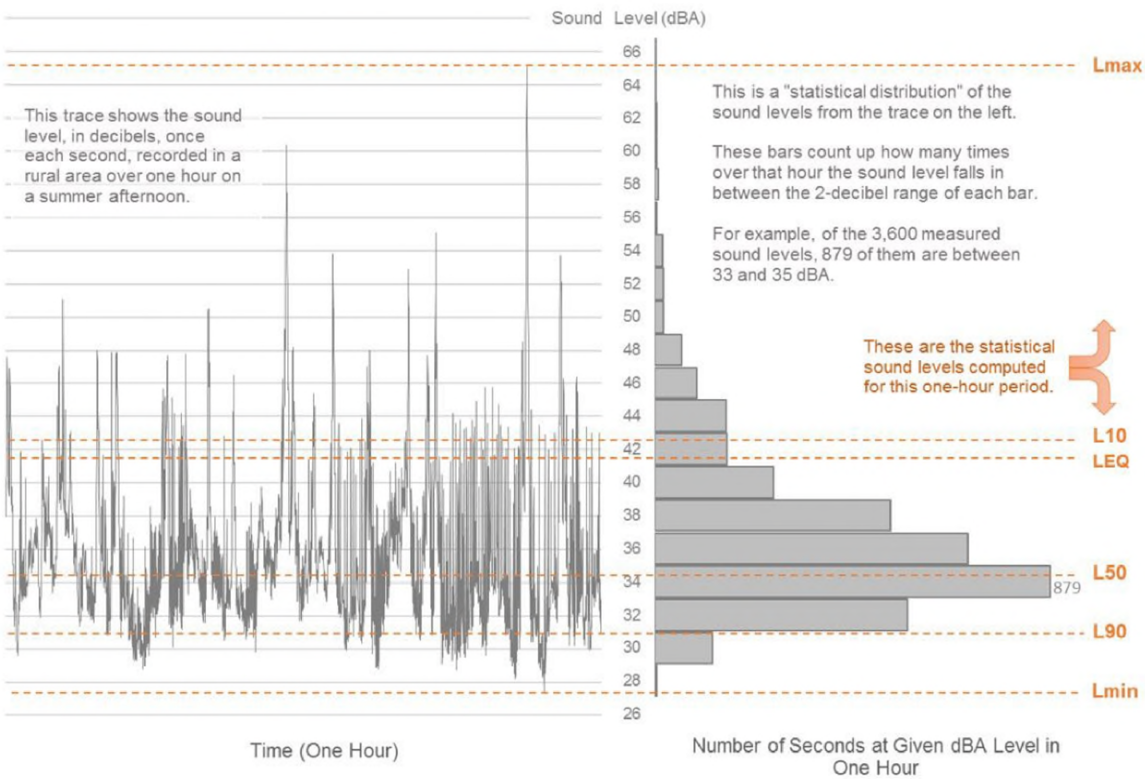

FIGURE 10: EXAMPLE OF DESCRIPTIVE TERMS OF SOUND MEASUREMENT OVER TIME

Percentile Sound Levels – L_n

Percentile sound levels describe the statistical distribution of sound levels over time. "L_N" is the level above which the sound spends "N" percent of the time. For example, L_{90} (sometimes called the "residual base level") is the sound level exceeded 90% of the time: the sound is louder than L_{90} most of the time. L_{10} is the sound level that is exceeded only 10% of the time. L_{50} (the "median level") is exceeded 50% of the time: half of the time the sound is louder than L_{50}, and half the time it is quieter than L_{50}. Note that L_{50} (median) and L_{eq} (mean) are not always the same, for reasons described in the previous section.

L_{90} is the sound that persists for longer periods, and below which the overall sound level seldom falls. It tends to filter out other short-term environmental sounds that aren't part of the source being investigated. L_{10} represents the higher, but less frequent, sound levels. These could include such events as barking dogs, vehicles driving by and aircraft flying overhead, gusts of wind, and work operations. L_{90} represents the background sound that is present when these event sounds are excluded.

Note that if one sound source is very constant and dominates the soundscape in an area, all of the descriptive sound levels mentioned here tend toward the same value. It is when the sound is varying widely from one moment to the next that the statistical descriptors are useful.

Sound Levels from Multiple Sources: Adding Decibels

Because of the way that sound levels in decibels are calculated, the sounds from more than one source do not add arithmetically. Instead, two sound sources that are the same decibel level increase the total sound level by 3 dB. For example, suppose the sound from an industrial blower registers 80 dB at a distance of 2 meters (6.6 feet). If a second industrial blower is operated next to the first one, the sound level from both machines will be 83 dB, not 160 dB. Adding two more blowers (a total of four) raises the sound level another 3 dB to 86 dB. Finally, adding four more blowers (a total of eight) raises the sound level to 89 dB. It would take eight total blowers, running together, for a person to judge the sound as having "doubled in loudness".

Recall from the explanation of sound levels that a difference of 10 decibels is a factor of 20 in sound pressure and a factor of 10 in sound power. (The difference between sound pressure and sound power is described in the next Section.) If two sources of sound differ individually by 10 decibels, the louder of the two generates *ten times* more sound. This means that the loudest source(s) in any situation always dominates the total sound level. Looking again at the industrial blower running at 80 decibels, if a small ventilator fan whose level alone is 70 decibels were operated next to the industrial blower, the total sound level increases by only 0.4 decibels, to 80.4 decibels. The small fan is only 10% as loud as the industrial blower, so the larger blower completely dominates the total sound level.

The Difference Between Sound Pressure and Sound Power

The human ear and microphones respond to variations in sound *pressure*. However, in characterizing the sound emitted by a specific source, it is proper to refer to sound *power*. While sound pressure induced by a source can vary with distance and conditions, the power is the same for the source under all conditions, regardless of the surroundings or the distance to the nearest listener. In this way, sound power levels are used to characterize noise sources because they act like a "fingerprint" of the source. An analogy can be made to light bulbs. The bulb emits a constant amount of light under all conditions, but its perceived brightness diminishes as one moves away from it.

Both sound power and sound pressure levels are described in terms of decibels, but they are not the same thing. Decibels of sound pressure are related to 20 micropascals, as explained at the beginning of this primer. Sound power is a measure of the acoustic power emitted or radiated by a source; its decibels are relative to one picowatt.

Sound Propagation Outdoors

As a listener moves away from a source of sound, the sound level decreases due to "geometrical divergence": the sound waves spread outward like ripples in a pond and lose energy. For a sound source that is compact in size, the received sound level diminishes or attenuates by 6 dB for every doubling of distance: a sound whose level is measured as 70 dBA at 100 feet from a source will have a measured level of 64 dBA at 200 feet from the source and 58 dBA at 400 feet. Other factors, such as walls, berms, buildings, terrain, atmospheric absorption, and intervening vegetation will also further reduce the sound level reaching the listener.

The type of ground over which sound is propagating can have a strong influence on sound levels. Harder ground, pavement, and open water are very reflective, while soft ground, snow cover, or grass is more absorptive. In general, sounds of higher frequency will attenuate more over a given distance than sounds of lower frequency: the "boom" of thunder can be heard much further away than the initial "crack".

Atmospheric and meteorological conditions can enhance or attenuate sound from a source in the direction of the listener. Wind blowing from the source toward the listener tends to enhance sound levels; wind blowing away from the listener toward the source tends to attenuate sound levels. Normal temperature profiles (typical of a sunny day, where the air is warmer near the ground and gets colder with increasing altitude) tend to attenuate sound levels; inverted profiles (typical of nighttime and some overcast conditions) tend to enhance sound levels.

APPENDIX B. MODEL INPUT DATA

TABLE 5: MODEL PARAMETER SETTING

MODEL PARAMETER	SETTING
Atmospheric Absorption	Based on 10°C and 70% RH
Foliage	No Foliage Attenuation
Ground Absorption	ISO 9613-2 spectral, G=0 for BESS area and G=1 elsewhere
Receiver Height	1.5 meters for sound level isolines
Search Radius	2,000 meters from each source

TABLE 6: MODELED SOUND POWER SPECTRA, DBZ UNLESS OTHERWISE NOTED

SOURCE	OCTAVE BAND CENTER FREQUENCY (Hz)									OVERALL SOUND POWER LEVEL		REFERENCE
	31.5	63	125	250	500	1000	2000	4000	8000	dBA	dBZ	
BESS Chiller	64	84	97	94	90	92	92	-	-	97	101	Manufacturer Noise Test Report
Inverter	85	86	81	81	73	68	75	84	77	86	91	Manufacturer Noise Test Report

TABLE 7: SOURCE LOCATIONS

SOURCE ID	SOUND POWER LEVEL (dBA)	HEIGHT (m)	COORDINATES (NAD83 UTM18N)		
			X (m)	Y (m)	Z (m)
Inverter01	86	2.3	656120	4592385	206
Inverter02	86	2.3	656115	4592393	206
Inverter03	86	2.3	656145	4592420	207
Inverter04	86	2.3	656153	4592402	208
Inverter05	86	2.3	656149	4592411	207

SOURCE ID	SOUND POWER LEVEL (dBA)	HEIGHT (m)	COORDINATES (NAD83 UTM18N)		
			X (m)	Y (m)	Z (m)
Inverter06	86	2.3	656111	4592402	206
BESS01	97	2.8	656138	4592417	207
BESS02	97	2.8	656132	4592414	207
BESS03	97	2.8	656139	4592414	207
BESS04	97	2.8	656133	4592411	207
BESS05	97	2.8	656123	4592409	206
BESS06	97	2.8	656117	4592406	206
BESS07	97	2.8	656125	4592406	207
BESS08	97	2.8	656119	4592403	206
BESS09	97	2.8	656142	4592408	207
BESS10	97	2.8	656136	4592405	207
BESS11	97	2.8	656143	4592405	207
BESS12	97	2.8	656137	4592402	207
BESS13	97	2.8	656146	4592399	208
BESS14	97	2.8	656140	4592396	207
BESS15	97	2.8	656148	4592397	208
BESS16	97	2.8	656142	4592394	207
BESS17	97	2.8	656127	4592401	207
BESS18	97	2.8	656122	4592398	206
BESS19	97	2.8	656129	4592398	207
BESS20	97	2.8	656123	4592395	206
BESS21	97	2.8	656132	4592392	207
BESS22	97	2.8	656126	4592389	207
BESS23	97	2.8	656133	4592389	207
BESS24	97	2.8	656127	4592386	207