Section 5
Noise

Evergreen Wind Power II, LLC (Evergreen II) conducted a sound level assessment in order to ensure compliance with Maine Department of Environmental Protection (MDEP) regulatory requirements for control of noise as found in 06-096 CMR c. 375.10. The *Sound Level Assessment* by Bodwell EnviroAcoustics is included as Appendix 5-1. The assessment determines expected sound levels from the project and compares them to the MDEP sound level limits for "quiet areas" of 45 decibels (dBA) during the nighttime and 55 dBA during the daytime at protected locations. The report conservatively estimates wind turbine sound levels and propagation by:

- utilizing conservative factors for ground attenuation by specifically mapping lakes and ponds as reflective surfaces and excluding potential sound attenuation due to foliage;
- adding 2.0 dBA to the manufacturer's wind turbine performance specification to account for uncertainty in measurements used to derive turbine sound output;
- adding 3 dBA to the turbine sound power level to account for the specified accuracy of ISO 9613-2 Attenuation of sound during propagation outdoors; and
- assuming that all turbines are operating simultaneously at continuous full sound output except where daytime only or noise restricted operation (NRO) is required.

The assessment includes an Operating Plan that identifies turbines that will operate during daytime hours only and where NRO is required for predicted sound levels to meet the MDEP quiet limits at all regulated protected locations. In those areas that are not part of the project where the assessment predicts MDEP sound level limits may be exceeded with the proposed noise abatement measures, Evergreen II has acquired sound level easements (Appendix 5-2).

Some additional sound commitments were made as part of the Town of Oakfield review process for the original Oakfield Wind Project and were incorporated into the MDEP permit process. These commitments include:

- Development of a Sound Complaint Response and Resolution Protocol to provide a transparent process for identifying and responding to potential sound complaints (see Exhibit 3 of Appendix 5-1);
- Implementation of Operations Sound Testing as set forth in an approved protocol and reporting of sound level exceedances including those caused by tonal sounds (see Exhibit 2 of Appendix 5-1);
- Development and implementation of a mitigation plan in the event of that a sound level exceedance occurs (also see Exhibit 2 of Appendix 5-1);
- Comply with the 45 dBA quiet nighttime limit at applicable regulatory locations even if the pre-development ambient sound level is more than 35 dBA; and
- Comply with the 45 dBA nighttime limit (at applicable regulatory locations) for the combined sound level of the proposed wind project and any future First Wind project.

The report concludes that, with the acquisition of the referenced sound level easements and implementation of the proposed Operating Plan, the construction and routine operation of the Amended Oakfield Wind Project will not exceed MDEP sound level limits at regulated protected locations.

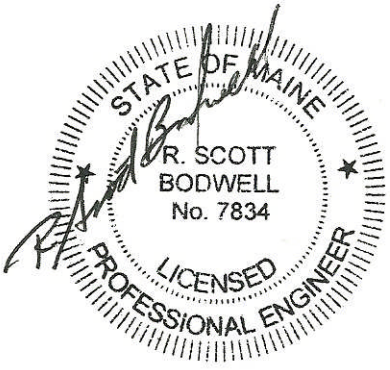
Appendix 5-1

Sound Level Assessment
Evergreen Wind Power II, LLC
Revised Oakfield Wind Project
Aroostook County, Maine

June 2011

Prepared for:
Stantec Consulting Services, Inc.

Prepared by:
R. Scott Bodwell PE
Bodwell EnviroAcoustics LLC
55 Ocean Drive
Brunswick, Maine 04011



1.0 Introduction

Bodwell EnviroAcoustics LLC (BEA) assessed sound levels expected to result from construction and operation of the Revised Oakfield Wind Project (Revised Project) proposed for Aroostook County, Maine. Evergreen Wind Power II, LLC (Evergreen II) amends the previously approved and permitted Oakfield Wind Project (Original Project) that will now consist of up to 50 Vestas V112-3.0 MW wind turbines to be located in Oakfield and T4 R3 WELS, Maine. The Vestas V112 has a rated output power of 3.075 megawatts and the total generating capacity of the proposed Revised Oakfield project is 153.75 megawatts (MW). The Original Project received approval in January 2010 (DEP #L-24572-24-A-N/L-24572-TF-B-N) for 34 General Electric 1.5 MW turbines totaling 51 MW of generating capacity. The GE turbines would be installed on 80 meter towers whereas the Vestas V112 turbines would have 84 meter towers. The rotor diameter of the Vestas V112 turbines is 112 meters compared to 77 meters for the GE turbines.

The main objective of this Sound Level Assessment is to calculate sound levels expected from full and simultaneous operation of all proposed wind turbines at noise sensitive land uses in the vicinity of the Revised Project. These sound level predictions are compared to applicable noise standards as set forth in Maine Department of Environmental Protection (DEP) Site Location of Development regulations for Control of Noise (ref. 06-096 CMR c. 375.10). In addition, this Sound Level Assessment addresses issues and concerns raised by the Town of Oakfield Wind Energy Review Committee in their Final Report dated September 9, 2009.

2.0 Environmental Acoustics

The study of environmental acoustics relates to the role that sound (or noise) plays in the environment. Geographically, this is an extremely diverse area of study ranging from wilderness to urban settings and from airborne sound to the underwater sound environment of oceans and lakes. Environmental acoustics is most commonly associated with assessing the noise impact of land-based developments such as wind energy projects. The following subsections provide an overview of acoustic terminology and wind turbine noise.

2.1 Sound and Decibels

Sound is produced by many different sources that generate pressure fluctuations in air that the human ear often has the capability to detect as audible. Sound can also travel through other media such as water or structural components of a building. The types of sounds that humans experience every day can generally be divided into two categories, natural and man-made sound.

There are many types of natural sounds that can be heard by humans. The most common of these are wildlife (e.g. birds, frogs and insects), sounds generated by the forces of wind acting on terrain and vegetation, and sounds generated by water action such as ocean waves, river flow and rain. There are also many man-made sounds generated by industrial, transportation and construction sources as well as

sounds generated for the purposes of enjoyment such as music. Residential sounds are also common in many areas and include recreation, yard maintenance, human voices, and amplified music.

The magnitude or loudness of sound waves is measured in units of pressure (pascals) that yield large numbers that are difficult to interpret. For simplicity, the decibel unit or dB was developed to quantify sound pressure levels to reduce the range of numbers. The dB unit represents a ratio of the sound pressure to a standard pressure, usually 20 micropascals. This is a logarithmic ratio similar to the Richter scale for earthquakes so that a small change in sound level expressed in dB represents a larger change in the sound pressure. For example, a 10 dB change in sound level is a tenfold increase in sound pressure. However, this does not mean that the sound is perceived as ten times as loud. A change in sound levels of 3 dB is a doubling of the sound pressure but is considered to be the minimum change that is perceptible to human hearing. A change of 5 dB becomes quite noticeable and an increase of 10 dB is perceived as twice as loud.

The frequency or pitch of sound is expressed in Hertz (Hz) and is the number of sound waves passing a specific point each second, i.e. cycles per second. Frequencies generally considered audible to the human ear range from 20 to 20,000 Hz. Within this range, there are octaves that represent a band of frequencies for purposes of characterizing sound and calculating sound propagation and attenuation. Standard whole octave bands are centered around 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz and 8000 Hz. The center frequency of each octave is double that of the previous octave. Octave bands can be further divided (typically third octaves) and used to determine if a sound source generates an audible pure tone such as a whistle or hum that may be more perceptible than a broad mixture of frequencies. Low frequency sound is typically considered to be at frequencies of 200 Hz and below. Within this range, infrasound has frequencies below 20 Hz and is not generally considered audible to humans except at very high decibel levels.

Sound levels in frequencies ranging from 500 to 2500 Hz are more audible to humans compared with frequencies below 100 Hz. Consequently, the A-weighting scale was developed to measure sound levels in units of dBA to simulate the hearing response of humans. Under this weighting system, the sound pressure level at low frequencies is reduced based on its audibility to humans. The linear (no weighting) and C-weighting are often used to determine the relative contribution of low frequency sounds during a sound measurement. These low frequency sounds may not be audible to humans hence the use and wide acceptance of the A-weighting network. Figure 1 provides a graph that shows the reduction by frequency for A- and C-weighting scales.

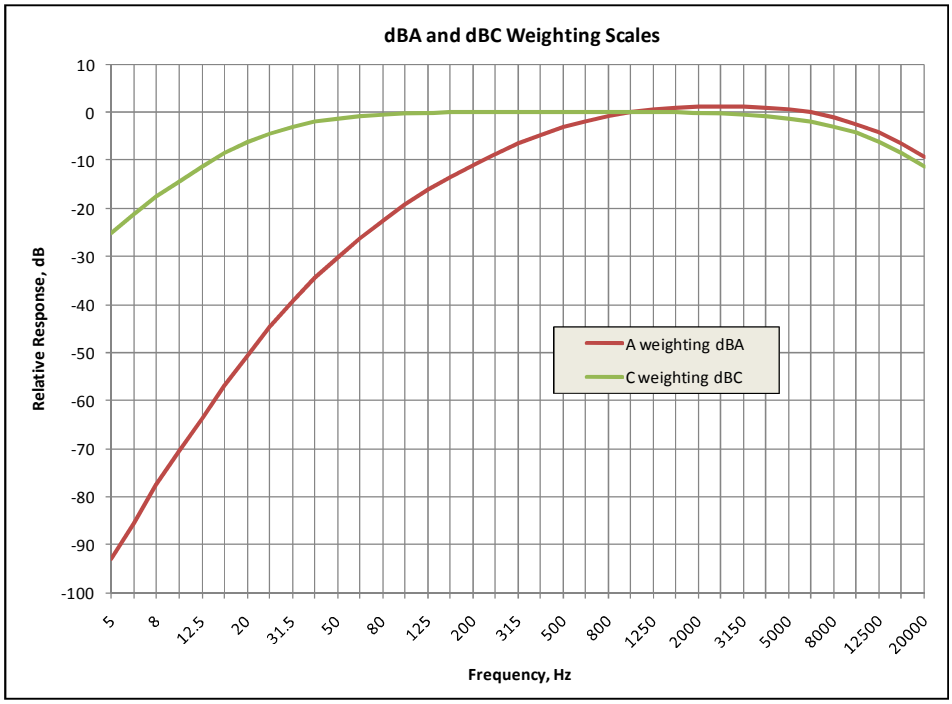


Figure1. Weighting Curves for dBA and dBC Sound Levels

Sound level measurements are also time-weighted to represent the relevant parameters or timeframes of interest or identify short duration events. The most common time weightings are “Fast” and “Slow”. Fast-time weighting is based on 1/8 second intervals and is useful for determining rapid changes in sound levels. The slow-time weighting integrates the measured sound levels over a one-second period that reduces the rapid fluctuations for ease of observation.

Similar to the size and period of ocean waves, sound waves can vary considerably in amplitude and frequency. When using fast-time weighting, a sound level meter will measure a sound pressure level every 1/8 of second which results in 480 measurements each minute and 28,800 measurements in an hour. Because it would be nearly impossible to evaluate over 28,000 measurements per hour, numerous statistical parameters have been developed for use in quantifying long-term sound level measurements. The most common is the A-weighted equivalent sound level or LAeq, which represents the time-varying sound level as a single dBA level by effectively spreading the sound energy across the entire measurement period. Other common parameters are percentile levels that represent the percentage of time that a specific sound level was exceeded. For example, the LA10 provides the sound level that was exceeded 10% of the time during the measurement period. This means that 10% of the measured sound levels were higher and 90% were lower than the measured LA10. Other commonly used percentiles include the LA50 or median sound level and the LA90 for which 90% of the measured sound levels are higher. The LA90 is often referred to as the background sound level as it eliminates most fluctuations from short term sound events such as aircraft flights and wind gusts. Figure 2

presents a graph that shows the measured sound pressure levels and the resulting equivalent (LAeq), LA10 and LA90 sound level parameters.

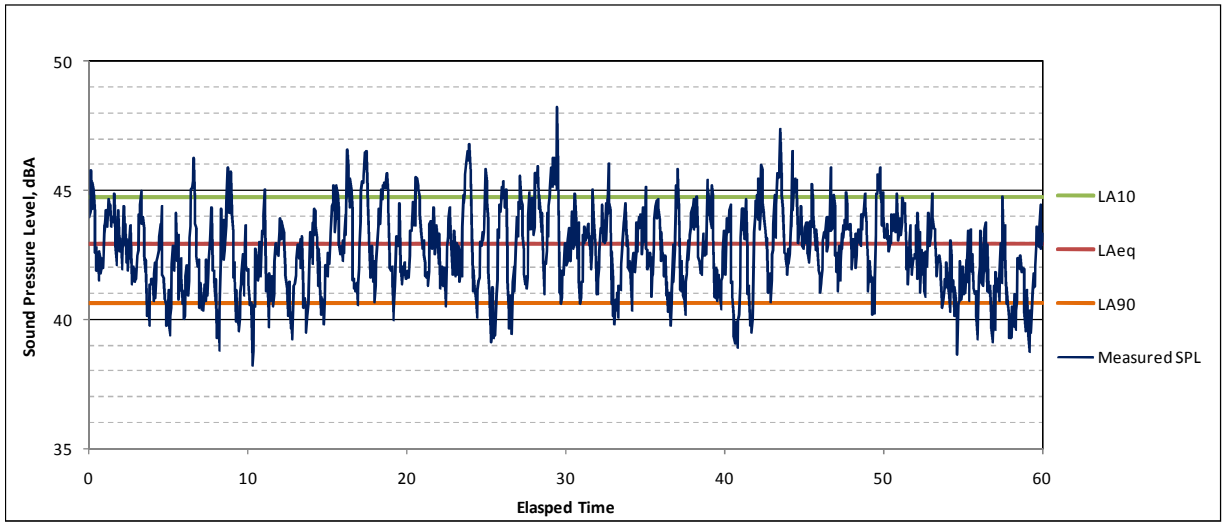


Figure 2. Measured Sound Pressure Levels and Statistical Parameters

For purposes of quantifying industrial and other man-made sound sources, the term "sound power level" is used. The unit of sound power level is watts and the term is commonly expressed as Lw. When applied to sound power, the dB unit represents a logarithmic ratio of the source sound power to a reference sound power (10^{-12} watt). Sound power levels are determined by measuring the sound pressure level from a source at a specific distance and calculating the sound attenuation between the source and measurement location. The sound power level provides a mechanism for ranking and quantifying noise sources, such as wind turbines, in a consistent and standardized manner. It is commonly used in sound performance specifications and as a source input to sound level prediction models. By its nature, the sound power level cannot be measured directly and can be a source of confusion to the public relative to sound pressure levels that are predicted and measured at community locations.

The combination of all existing sound sources, natural and man-made, at a specific location or in a community is known as the ambient sound environment or soundscape. The amplitude and characteristics of the soundscape vary significantly depending on the amount of industrial and residential development, proximity to transportation uses such as highways and airports, and the presence of natural sounds such as wind, flowing water, and wildlife. In general, the more rural or undeveloped an area is, the lower the ambient sound levels will be. Ambient sound levels are usually higher during daytime hours than at night due to more traffic and human activity, higher wind speeds and other natural sounds during the day. At night, these daytime sources typically diminish and sound levels are reduced with the exception of strong winds or rain occurring during the overnight period.

Noise is generally defined as unwanted sound. The perception of noise as an unwanted sound can vary significantly by individual and preferences concerning types of sound. A simple example of this is music. One person may enjoy a certain type of music that another may find extremely annoying. Some individuals find enjoyment and solitude in listening to natural sounds or the nighttime quiet of a rural area while others have little interest in such soundscapes.

The character of sound is determined by its loudness or amplitude and its pitch or frequency. Humans can detect a wide range of sound level amplitudes and frequencies as audible but are more sensitive to a specific range of frequencies. Consequently, the perceived loudness of sound also depends not only on its amplitude but on its frequency characteristics as well. For example, the sound of birds, frogs or flowing water is often perceived as quieter than man-made sounds at the same amplitude. The sound levels associated with some common noise sources and sound environments is presented as Table 1.

Sound travels through air at a speed of approximately 1126 feet per second or 768 miles per hour. Thus it takes just over two seconds for a sound wave to travel a half mile. The number of sound waves that travel past a given point in one second is determined by its frequency or pitch. The sound pressure level decreases or attenuates as sound spreads out and travels over distance through the air. Attenuation results from distance, atmospheric absorption, and terrain effects. The rate of attenuation due to distance or spreading of the sound wave (i.e. divergence) is the same for all frequencies, which is approximately 6 dB per doubling of distance from a simple point source.

Table 2 provides the sound pressure level at various distances from a point source having a sound power level of 106 dBA. This relationship is shown graphically in Figure 3. The sound level reduction shown in Table 2 and Figure 3 is due only to distance attenuation and does not include attenuation from atmospheric absorption, terrain and foliage, or reflection from hard surfaces.

Indoor Setting	Outdoor Setting	Sound Sources	Sound Pressure Level, dBA
*Rock Concert**		*Jet Takeoff at 300 feet**	*120*
Ship Engine Room	*Loud Thunder**	*Rifle Blast at 100 feet*	*110*
*Movie Theater**		*Chain Saw high rpm at 5 feet* *Siren at 100 ft*	*100*
*Heavy Industrial Work Space**		*Lawn Mower high rpm at 10 feet* *Large Truck or Loader high rpm 50 feet**	*90*
Busy Airport	*Heavy Rain*	*Motor Boat high rpm at 100 feet*	*80*
Light Industrial Workspace	*Heavy Surf Beach** *Busy City or Highway*	*AC Unit at 5 feet* *Automobile 45 mph at 50 feet*	*70*
Busy Office/Conversation Room with TV	*Urban Daytime*	*Strong Wind in Trees** *Nighttime Frogs* *Airplane Flyover**	*60*
	Suburban Daytime/Urban Nighttime	*Bird Calls/Morning Chorus* *Small waves on shoreline*	*50*
Quiet Office *Library*	*Rural Area Daytime*	*Moderate Wind in Trees*	*40*
Sleeping Quarters at Night	*Rural Area Nighttime*	*Light Wind in Trees*	*30*
Idle Recording Studio	*Very Remote Area Nighttime* *Perceived Silence*		*20*
			10
		Threshold of Hearing	*0*

Table 1. Typical A-Weighted Sound Levels

Note: These are typical sound levels and subject to significant variation depending on the number of and distances from sound and transportation sources.

**Sound with prominent Low Frequency components*

Sources:
www.mvn.usace.army.mil/ss/osha600/s600/refer/menu14c.pdf
Measurements and Observations by R. Scott Bodwell, P.E.

Source Sound Power Level (LwA) = 106 dBA	
Distance, Feet	**Sound Pressure Level, dBA**
25	80
50	74
100	68
200	62
400	56
800	50
1600	44
3200	38

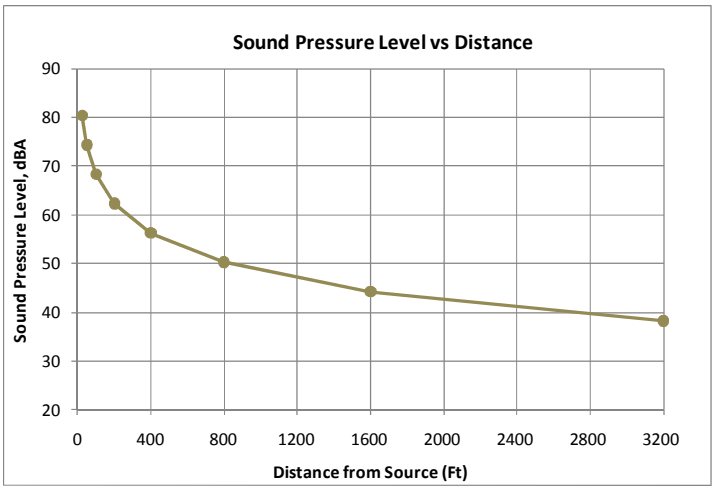


Table 2 & Figure 3. Attenuation of Sound Pressure Level over Distance

Sound energy is absorbed by the atmosphere as it travels through the air. The amount of absorption varies by the frequency of the sound and the temperature and humidity of the air. More sound is absorbed at higher frequencies than at lower frequencies due to the relative wavelengths.

In addition to temperature and humidity, wind speed and direction can affect outdoor sound propagation. When sound travels upwind the sound waves can bend upward creating a "shadow" zone near the ground where sound levels decrease when compared to downwind sound propagation. Wind gradients, temperature inversions and cloud cover can cause refraction or bending of sound waves toward the ground resulting in less sound attenuation from terrain and ground cover over large distances.

Sound attenuation can also result from intervening terrain and certain types of ground cover and vegetation. An example of intervening terrain is a hill or ridge that blocks the horizontal sound path between a sound source and receiver. This same effect can result from buildings and other solid structures such as a sound barrier fence. Sound will also attenuate as it travels over soft ground cover or through vegetation such as trees and shrubs. The amount of ground and foliage attenuation depends on the characteristics of the ground cover and the height and density of vegetation. Conversely, reflective ground or the surface of a water body can cause reflection of sound and less overall attenuation.

When multiple sound sources are present in an area, the sound level contribution from each source must be added to determine of the combined sound level of all sources. Due to logarithmic basis of the dB unit, adding sound levels is different than standard arithmetic. Adding two equal sound sources that each measure 50 dBA at a specific point will result in a combined sound level of 53 dBA. It will then take

two more equal sound sources of 50 dBA each, or four total, to cause the sound level to increase by another 3 dBA. Thus, four equal sources at 50 dBA results in a total sound level of 56 dBA.

Specifications for calculating outdoor sound propagation have been developed by international standards organizations as well as individual countries based on empirical data developed over many years. These specifications form the basis for computerized sound level prediction models that allow calculation of outdoor sound propagation through the use of three-dimensional terrain models. The most widely used and accepted standard for calculating outdoor sound propagation is ISO 9613-2 Acoustics - Attenuation of Sound During Propagation Outdoors - Part 2: General Method of Calculation. This standard has been applied to accurately calculate the sound levels that result from operation of wind turbines and is the standard applied in this analysis. Further details concerning the sound level prediction model developed for Oakfield Wind to account for various site and weather conditions can be found in Section 6.2 of this report.

2.3 Wind Turbine Sound

The sources of sound from operation of wind turbines are mechanical noise from gears, motors and cooling equipment in the turbine nacelle and the aerodynamic effects of the rotor blades traveling through the air. When operating at or near full sound output, the primary sound source from a wind turbine is rotation of the rotor blades with more sound energy generated from the outer sections of the blade and blade tip.

An international standard has been developed as IEC 61400-11 *Wind turbine generator systems – Part 11: Acoustic noise measurement techniques* that provides specific and detailed procedures for determining the sound power level from wind turbines. The IEC standard was develop by industry and acoustic experts to establish a consistent and repeatable methodology with full documentation for determining the sound output of any type of vertical blade wind turbine. Manufacturers of utility-scale wind turbines follow this methodology to determine the sound output and uncertainty of their turbines for purposes of estimating community sound levels and providing performance guarantees to owners and operators of wind energy facilities.

There has been much advancement in the technology of wind turbines over the last 10 to 20 years. The first generation of utility wind turbines consisted of downwind rotors that were capable of generating significant levels of low frequency sound. Turbines with upwind rotors have replaced the early designs and drastically reduced low frequency sound emissions. Modern wind turbines are known to generate a "whoosh" type sound under certain operating and weather conditions that results from the passage of each blade. A short-term increase in sound levels often occurs on the down-stroke motion of the blade that is referred to as "amplitude modulation" and generally results in sound level fluctuations of 2 to 5 dBA for utility-scale wind turbines with occasional excursions above 6 dBA.[1] Amplitude modulation

[1] Observations and analysis of sound level measurements for Mars Hill Wind Farm and Stetson Wind Project, R. S. Bodwell, P.E. G.P. van den Berg, The Sounds of High Winds.

occurs at a mixture of audible frequencies and should not be confused with low frequency sound and infrasound.

Sound from wind turbines has been the subject of extensive research, conferences and publications over the past 10 to 15 years. There is considerable technical and related information available that addresses the characteristics, control and impact of sound from wind turbines. There is an abundance of well-researched and informative studies and reports from reputable institutions and individuals.

It is a common assertion that wind turbines generate significant and perhaps harmful levels of infrasound and low frequency sound. In relation to the modern generation of upwind turbines, there is little basis for this claim that can be found in any well-researched and impartial technical studies and literature. In fact, the consensus of the independent research community is that annoyance from wind turbine sound is primarily in the most audible mid to high frequencies and not from infrasound or low frequency sound.[2]

2.4 Noise Impact and Regulation

The noise impact that results from wind turbines depends on several factors notably the change or increase in ambient or background sound levels that will result from turbine operation. For rural areas where hill or ridge top wind turbines are located, the ambient sound level at lower elevations and community locations varies by time of day, weather conditions, and to some degree, by season. Sound levels from wind turbines vary based on the wind speed and turbulence at the turbine hub and can range from no sound output during calm winds to full sound output when winds at the turbine hub reach approximately 20 miles per hour. Sound from wind turbines will be most noticeable during stable atmospheric conditions when surface winds are light and the winds aloft (at the turbine hub) remain high enough for full turbine sound output. At other times, when surface winds increase or when wind turbine output diminishes, the sound from operating wind turbines will be less noticeable.

During the planning stages of a wind energy project, considerable effort is made to accurately map land uses and the topography of the entire area potentially impacted by sound from wind turbine operation. Along with wind turbine sound level performance data, this information is used to develop a sound level prediction model for the project. The model inputs and settings are typically adjusted to produce conservative sound level predictions for wind turbine operation. These results are compared to various noise regulations and guidelines to assess the impact of the proposed wind energy project.

The Maine DEP has established sound level limits for developments as part of its Site Location of Development Law Regulations. The Maine DEP Regulation Chapter 375.10 specifies sound level limits based on land use and existing ambient sound levels. For rural areas, the quietest limits of 55 dBA daytime and 45 dBA nighttime for hourly equivalent sound levels (LAeq) emitted from a project usually

[2] G.P. van den Berg, The Sounds of High Winds.
Danish Electronics, Light and Acoustics (DELTA), Low Frequency Noise from Large Wind Turbines.

apply. Maine DEP nighttime limits apply within 500 feet of a residence on a protected location so that the resulting sound levels at the residence will be below the limit. Beyond 500 feet, the daytime limit applies 24 hours per day. The Maine DEP regulation applies sound level limits on an hourly basis with no averaging over daytime, nighttime or longer periods. There are also special provisions and "penalties" that apply when the sound levels generated by a development result in tonal or short duration repetitive sounds. This standard is described in more detail in the remainder of this report.

3.0 Project Description

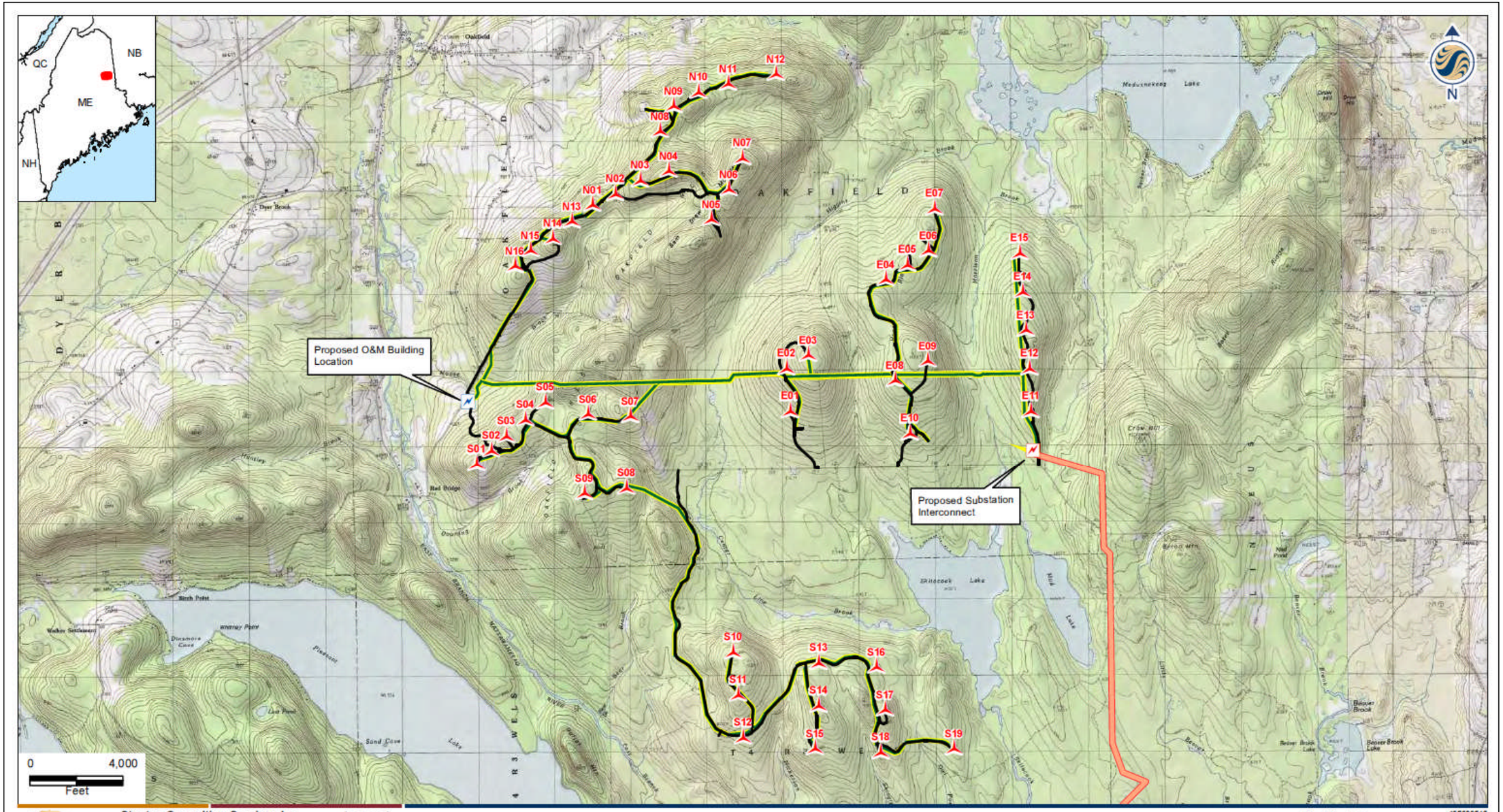
Evergreen II is amending the original Oakfield Wind Project that was approved by the Maine DEP in January 2010 (ref. Order L-24572-24-A-N). The Revised Oakfield Project consists of 50 wind turbines arranged in four primary groups: one to the north, one to the east, and two to the south. As proposed, the north group consists of 16 wind turbines; the east group has 15 wind turbines; the south group in Oakfield consists of 9 wind turbines; and a second south group in unorganized township T4 R3 WELS consists of 10 wind turbines. All of the proposed wind turbines are Vestas Model V112-3.0 MW manufactured by Vestas Wind Systems A/S. The proposed Vestas V112 has a rated capacity of 3.075 megawatts (MW), a hub height of 84 meters, and a rotor diameter of 112 meters. The total height with a rotor blade fully extended at the top of the blade rotation is approximately 140 meters (459 feet).

Other key components of the Revised Oakfield Project are electrical transmission facilities including a proposed substation and an Operations & Maintenance Building. The proposed substation is located off South Road south of the easternmost turbine string. The proposed O&M Building is located in Oakfield along the Thompson Settlement Road northwest of the nearby south turbine group.

Surrounding land uses consist mostly of undeveloped forestry land and rural residential and seasonal properties such as hunting camps. The majority of residential properties in the vicinity of the north turbine group are located north and east of the proposed turbines along Spaulding Lake Road and Brown Road. There are also several residential parcels to the west along Thompson Settlement Road. Several of these residences are situated on large parcels of land and there also many large undeveloped parcels nearby. To the south, there are a few dwellings on large lots (generally 40 acres or more) that were created in 1987 as part of the "Patten Subdivision", which is located in Oakfield between the north and south turbine groups.

Residential parcels in proximity to the south turbine groups are located in Oakfield west of the proposed turbines along both the Thompson Settlement Road and along the South Road. Residential uses in the vicinity of the east turbine group are located along South Road south of the proposed turbines and Brown Road which bisects the east group. Much of the land surrounding the east and both south turbine groups is undeveloped forest land. Figure 4 provides a Project Location Map that shows proposed wind turbines and other facilities in relation to surrounding land uses.

Evergreen II has purchased property or obtained leases with local landowners to install and operate wind turbines at the proposed locations. Evergreen II has also obtained agreements with landowners who may experience sound levels from the project that have the potential to exceed applicable sound level limits. Figure 5 provides a map of the proposed wind turbine locations along with parcel and land use information including topographic contours of the study area. Figure 5 depicts parcels within the study area that Evergreen II has purchased or leased and shows parcels where required sound easements have been obtained for the proposed turbine operations. As set forth by Maine DEP 375.10, Section C.5.s, a noise (sound) easement exempts the project from Maine DEP noise limits for the specific noise, parcel of land and term covered by the agreement.



Stantec Consulting Services Inc.
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Topsham, ME USA
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Phone (207) 729-1199
Fax: (207) 729-2715
www.stantec.com

Legend
- Proposed Turbine (Vestas 50)
- Proposed 115kv Transmission Corridor
- Proposed Collector Corridor
- Proposed Access Roads

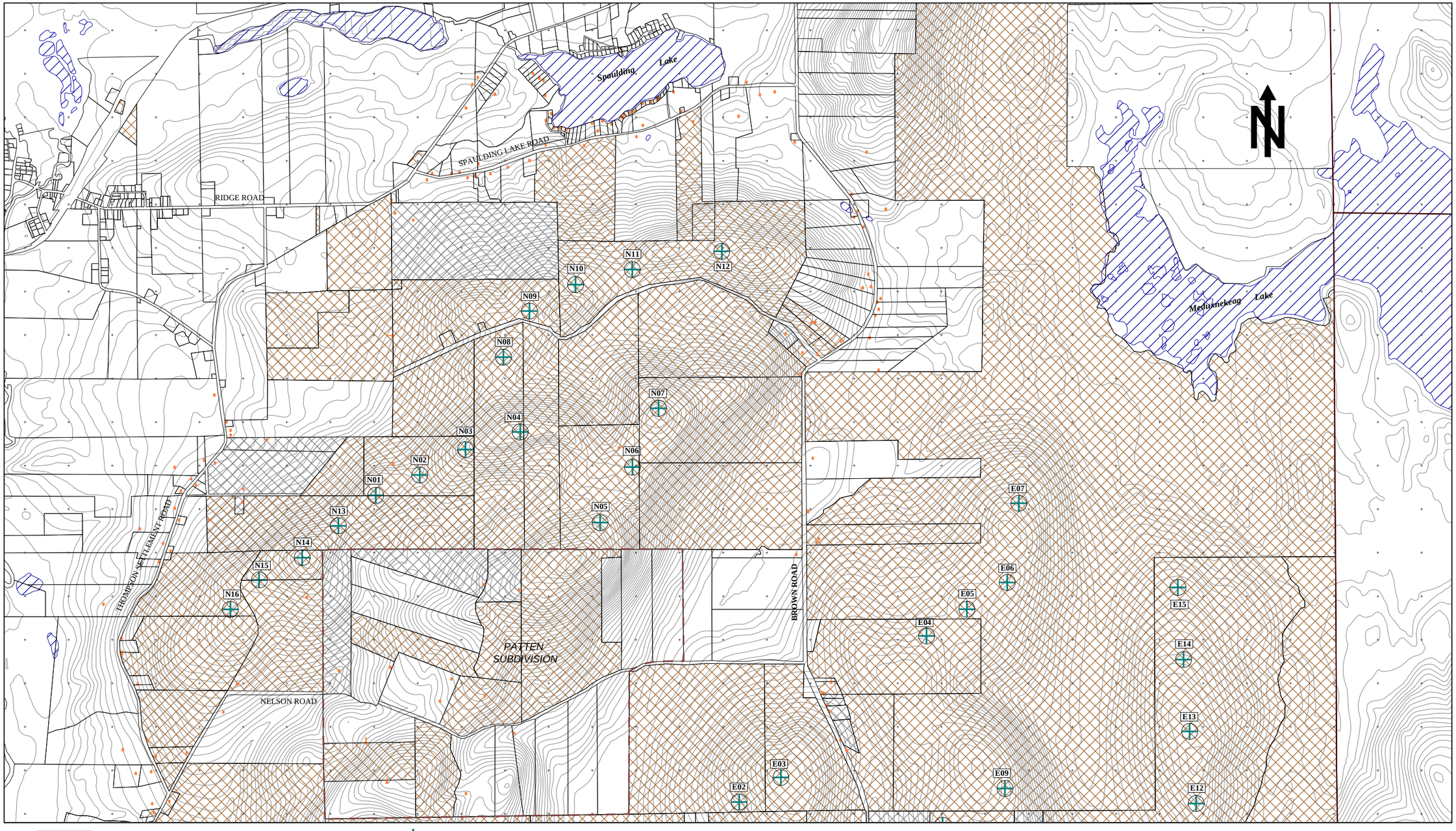
195600518

Client/Project
Evergreen Wind Power II, LLC
Oakfield Wind Project Amendment
Oakfield, Maine

FIGURE 4

Title
Summit Project Development Area

Figure 5 (1 of 2). Land Uses and Proposed Wind Turbines (North)



Participating Landowner

Sound Easement

Wind Turbine

Dwelling

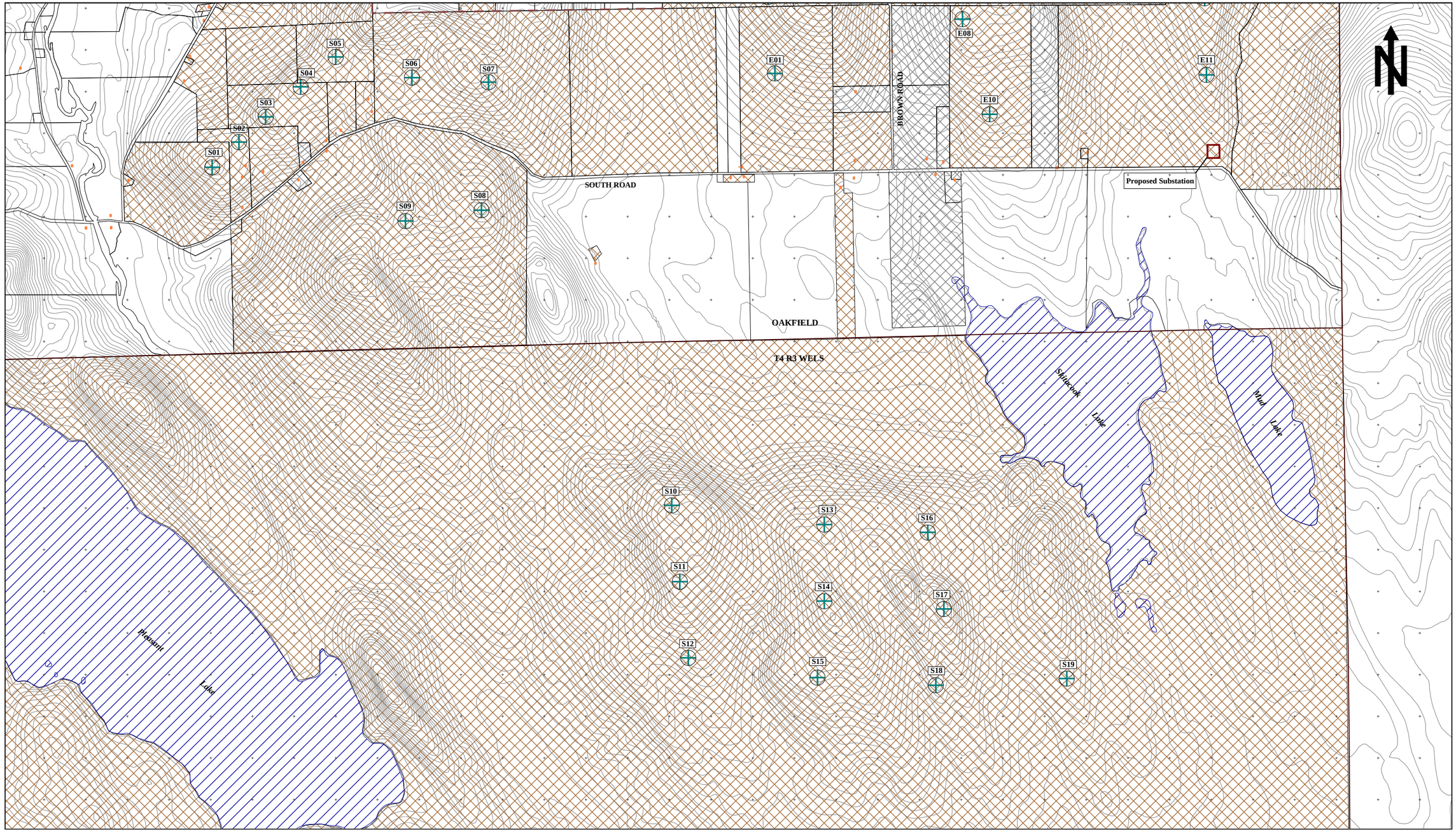
Coordinate Grid Spacing = 1000 ft

Topographic Contour Interval = 5 meters (16 ft) ft

Bodwell EnviroAcoustics LLC
R Scott Bodwell PE

June 2011

Figure 5 (2 of 2). Land Uses and Proposed Wind Turbines (South)



Participating Landowner

Sound Easement

Wind Turbine

Dwelling

Coordinate Grid Spacing = 1000 ft

Topographic Contour Interval = 5 meters (16 ft) ft

Bodwell EnviroAcoustics LLC
R Scott Bodwell PE

June 2011

4.0 Vestas Wind Turbine Sound Levels

Evergreen II proposes to erect Vestas V112-3.0 MW wind turbines to generate electric power for the Revised Project. The Vestas V112 is a pitch-regulated upwind turbine with a rotor diameter of 112 meters and a rated capacity of 3.075 megawatts (MW). The turbine operates at variable speeds ranging from 6.2 to 17.7 rpm depending on the wind speed acting on the turbine rotor and operational settings.

Vestas Wind Systems A/S has provided sound level performance specifications for the proposed V112 wind turbine. In its unrestricted operating mode, the overall sound power levels produced by the V112 range from 97.3 dBA at low rpm to 106.5 dBA at full rpm. Table 3 provides octave band sound levels at various wind speeds by octave bands ranging from 16 to 8,000 Hz.

The values are valid for the following conditions:
Meas. Standard: IEC 61400-11:2002, using amendment procedure above 95% RP
Wind shear:**0.16** Hub Height: **84 m**
Maximum turbulence intensity at 10 meters above ground level: 16%
Inflow angle (vertical): 0 ± 2

Noise Mode 0 Wind Shear 0.16 Hub Height 84 m	**Wind Speed @10m [m/s]**											
Frequency	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
16Hz [dB(A)]	NAN	49.8	52.5	58.8	57.6	60.6	61.1	63.2	63.2	63.2	63.2	63.2
31.5Hz [dB(A)]	NAN	68.1	71.8	78.2	77.1	78.3	78.9	79.1	79.1	79.1	79.1	79.1
63Hz [dB(A)]	NAN	77.8	81.2	87.7	86.7	87.7	88.2	88.2	88.2	88.2	88.2	88.2
125Hz [dB(A)]	NAN	85.5	90.2	90.2	95.5	95.5	95.7	95.3	95.3	95.3	95.3	95.3
250Hz [dB(A)]	NAN	87.6	91.2	92.3	96.4	97.0	97.5	97.0	97.0	97.0	97.0	97.0
500Hz [dB(A)]	NAN	91.6	95.1	96.9	100.5	100.8	101.0	100.8	100.8	100.8	100.8	100.8
1000Hz [dB(A)]	NAN	91.7	95.4	97.5	100.5	100.9	100.7	100.7	100.7	100.7	100.7	100.7
2000Hz [dB(A)]	NAN	90.7	93.9	98.5	98.6	99.3	99.0	99.6	99.6	99.6	99.6	99.6
4000Hz [dB(A)]	NAN	84.2	87.5	97.7	92.4	94.1	93.5	93.9	93.9	93.9	93.9	93.9
8000Hz [dB(A)]	NAN	69.1	72.6	79.1	76.3	81.0	80.2	81.1	81.1	81.1	81.1	81.1
Spectra Value [dB(A)]	**NAN**	**97.3**	**100.9**	**104.3**	**106**	**106.5**	**106.5**	**106.5**	**106.5**	**106.5**	**106.5**	**106.5**

Notify: NAN indicates data not available
Disclaimer:
The values are valid for the A-weighted sound power levels
Octave band values must be regarded as informative
Site specific values are not warranted

Table 3. Sound Power Levels for Vestas V112 Wind Turbine – Unrestricted Operation (Mode 0)

The sound power levels were derived from acoustic testing in accordance with IEC 61400-11 and proprietary computer models and are intended for use in order to calculate the measureable sound pressure levels at nearby community points and protected locations. At full unrestricted operation, the Vestas V112 wind turbine generates a sound power level of 106.5 dBA with an uncertainty of 2.0 dBA.

Vestas specification data also provides sound power levels for Noise-Restricted Operating modes (NRO) of the proposed wind turbines. These NRO modes can be implemented as part of the turbine operating plan to reduce sound emissions by restricting the rotational speed of the wind turbines. Sound performance data from Vestas for NRO modes achieving 1 dBA (Mode 5), 2 dBA (Mode 2) and 4 dBA (Mode 4) sound level reductions are presented in Table 4 through Table 6.

The values are valid for the following conditions:
Meas. Standard: IEC 61400-11:2002, using amendment procedure above 95% RP
Wind shear:**0.16** Hub Height: **84 m**
Maximum turbulence intensity at 10 meters above ground level: 16%
Inflow angle (vertical): 0 ± 2

Noise Mode 5 Wind Shear 0.16 Hub Height 84 m	**Wind Speed @10m [m/s]**											
Frequency	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
16Hz [dB(A)]	NaN	49.8	52.5	58.8	57.1	59.6	60.1	62.2	62.2	62.2	62.2	62.2
31.5Hz [dB(A)]	NaN	68.1	71.8	78.2	76.6	77.3	77.9	78.1	78.1	78.1	78.1	78.1
63Hz [dB(A)]	NaN	77.8	81.2	87.7	86.2	86.7	87.2	87.2	87.2	87.2	87.2	87.2
125Hz [dB(A)]	NaN	85.5	90.2	90.2	95.0	94.5	94.7	94.3	94.3	94.3	94.3	94.3
250Hz [dB(A)]	NaN	87.6	91.2	92.3	95.9	96.0	96.5	96.0	96.0	96.0	96.0	96.0
500Hz [dB(A)]	NaN	91.6	95.1	96.9	100.0	99.8	100.0	99.8	99.8	99.8	99.8	99.8
1000Hz [dB(A)]	NaN	91.7	95.4	97.5	100.0	99.9	99.7	99.7	99.7	99.7	99.7	99.7
2000Hz [dB(A)]	NaN	90.7	93.9	98.5	98.1	98.3	98.0	98.6	98.6	98.6	98.6	98.6
4000Hz [dB(A)]	NaN	84.2	87.5	97.7	91.9	93.1	92.5	92.9	92.9	92.9	92.9	92.9
8000Hz [dB(A)]	NaN	69.1	72.6	79.1	75.8	80.0	79.2	80.1	80.1	80.1	80.1	80.1
Spectra Value [dB(A)]	**NaN**	**97.3**	**100.9**	**104.3**	**105.5**	**105.5**	**105.5**	**105.5**	**105.5**	**105.5**	**105.5**	**105.5**

Notify: NAN indicates data not available
Disclaimer:
The values are valid for the A-weighted sound power levels
Octave band values must be regarded as informative
Site specific values are not warranted

Table 4. Sound Power Levels for Vestas V112 Wind Turbine – NRO 1 (Mode 5)

The values are valid for the following conditions:
Meas. Standard: IEC 61400-11:2002, using amendment procedure above 95% RP
Wind shear:**0.3** Hub Height: **84 m**
Maximum turbulence intensity at 10 meters above ground level: 16%
Inflow angle (vertical): 0 ± 2

Noise Mode 2 Wind Shear 0.3 Hub Height 84 m	**Wind Speed @10m [m/s]**											
Frequency	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
16Hz [dB(A)]	47.3	51.4	55.9	58.6	60.0	61.2	61.2	61.2	61.2	61.2	61.2	61.2
31.5Hz [dB(A)]	65.6	70.8	75.4	76.3	77.0	77.1	77.1	77.1	77.1	77.1	77.1	77.1
63Hz [dB(A)]	75.3	80.2	85.0	85.7	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2
125Hz [dB(A)]	83.1	86.7	92.1	93.5	93.5	93.3	93.3	93.3	93.3	93.3	93.3	93.3
250Hz [dB(A)]	85.1	88.1	93.3	95.0	95.3	95.0	95.0	95.0	95.0	95.0	95.0	95.0
500Hz [dB(A)]	89.1	92.3	97.5	98.8	98.9	98.8	98.8	98.8	98.8	98.8	98.8	98.8
1000Hz [dB(A)]	89.2	92.7	97.7	98.9	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7
2000Hz [dB(A)]	88.2	92.2	96.6	97.3	97.3	97.6	97.6	97.6	97.6	97.6	97.6	97.6
4000Hz [dB(A)]	81.7	87.9	91.8	92.1	91.7	91.9	91.9	91.9	91.9	91.9	91.9	91.9
8000Hz [dB(A)]	66.6	71.6	75.0	78.9	78.6	79.1	79.1	79.1	79.1	79.1	79.1	79.1
Spectra Value [dB(A)]	**94.8**	**98.5**	**103.4**	**104.5**	**104.5**	**104.5**	**104.5**	**104.5**	**104.5**	**104.5**	**104.5**	**104.5**

Notify: NAN indicates data not available
Disclaimer:
The values are valid for the A-weighted sound power levels
Octave band values must be regarded as informative
Site specific values are not warranted

Table 5. Sound Power Levels for Vestas V112 Wind Turbine – NRO 2 (Mode 2)

The values are valid for the following conditions:
Meas. Standard: IEC 61400-11:2002, using amendment procedure above 95% RP
Wind shear:**0.3** Hub Height: **84 m**
Maximum turbulence intensity at 10 meters above ground level: 16%
Inflow angle (vertical): 0 ± 2°

Noise Mode 4 Wind Shear 0.3 Hub Height 84 m	**Wind Speed @10m [m/s]**											
Frequency	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
16Hz [dB(A)]	49.9	54.2	54.9	56.6	58.0	59.2	59.2	59.2	59.2	59.2	59.2	59.2
31.5Hz [dB(A)]	68.3	73.6	74.3	74.3	75.0	75.1	75.1	75.1	75.1	75.1	75.1	75.1
63Hz [dB(A)]	77.9	83.0	83.9	83.7	84.2	84.2	84.2	84.2	84.2	84.2	84.2	84.2
125Hz [dB(A)]	85.7	89.5	91.0	91.5	91.5	91.3	91.3	91.3	91.3	91.3	91.3	91.3
250Hz [dB(A)]	87.7	90.9	92.3	93.0	93.3	93.0	93.0	93.0	93.0	93.0	93.0	93.0
500Hz [dB(A)]	91.7	95.1	96.5	96.8	96.9	96.8	96.8	96.8	96.8	96.8	96.8	96.8
1000Hz [dB(A)]	91.9	95.5	96.7	96.9	96.7	96.7	96.7	96.7	96.7	96.7	96.7	96.7
2000Hz [dB(A)]	90.8	95.0	95.5	95.3	95.3	95.6	95.6	95.6	95.6	95.6	95.6	95.6
4000Hz [dB(A)]	84.3	90.8	90.8	90.1	89.7	89.9	89.9	89.9	89.9	89.9	89.9	89.9
8000Hz [dB(A)]	69.2	74.4	74.0	76.9	76.6	77.1	77.1	77.1	77.1	77.1	77.1	77.1
Spectra Value [dB(A)]	**97.4**	**101.3**	**102.5**	**102.5**	**102.5**	**102.5**	**102.5**	**102.5**	**102.5**	**102.5**	**102.5**	**102.5**

Notify: NAN indicates data not available
Disclaimer:
The values are valid for the A-weighted sound power levels
Octave band values must be regarded as informative
Site specific values are not warranted

Table 6. Sound Power Levels for Vestas V112 Wind Turbine – NRO 4 (Mode 4)

Sound power levels for unrestricted Mode 0 in relation to wind speed at a height of 10 meters, based on an assumed wind shear of 0.16, are shown graphically in Figure 6.

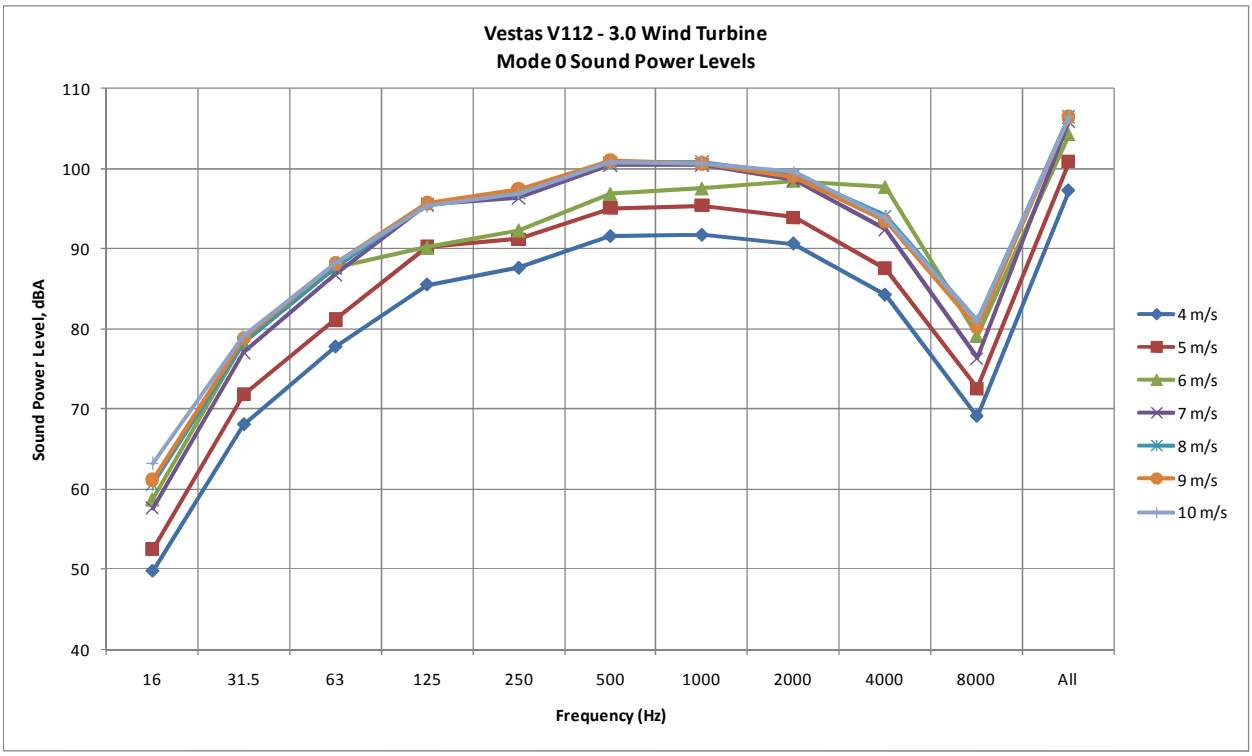


Figure 6. Sound Power Levels for Vestas V112 Wind Turbine Mode 0 and Wind Speeds of 4 to 10 meters/second

5.0 Noise Standards and Guidelines

Maine DEP Chapter 375.10, Control of Noise, establishes hourly sound level limits for wind energy facilities and other developments based on time of day, land use, local zoning and pre-construction sound levels. Although the DEP noise regulation specifies a 75 dBA at the facility property line, the most restrictive limits apply at noise sensitive land uses defined as "protected locations". A protected location is defined as:

> "Any location accessible by foot, on a parcel of land containing a residence or planned residence or approved residential subdivision, house of worship, academic school, college, library, duly licensed hospital or nursing home near the development site at the time a Site Location of Development application is submitted; or any location within a State Park, Baxter State Park, National Park, Historic Area, a nature preserve owned by the Maine or National Audubon Society or the Maine Chapter of the Nature Conservancy, The Appalachian Trail, the Moosehorn National Wildlife Refuge, federally-designated wilderness area, state wilderness area designated by statute (such as the Allagash Wilderness Waterway), or locally-designated passive recreation area; or any location within consolidated public reserve lands designated by rule by the Bureau of Public Lands as a protected location.
>
> At protected locations more than 500 feet from living and sleeping quarters within the above noted buildings or areas, the daytime hourly sound level limits shall apply regardless of the time of day.
>
> Houses of worship, academic schools, libraries, State and National Parks without camping areas, Historic Areas, nature preserves, the Moosehorn National Wildlife Refuge, federally-designated wilderness areas without camping areas, state wilderness areas designated by statute without camping areas, and locally-designated passive recreation areas without camping areas are considered protected locations only during their regular hours of operation and the daytime hourly sound level limits shall apply regardless of the time of day.
>
> Transient living accommodations are generally not considered protected locations; however, in certain special situations where it is determined by the Board that the health and welfare of the guests and/or the economic viability of the establishment will be unreasonably impacted, the Board may designate certain hotels, motels, campsites and duly licensed campgrounds as protected locations." (ref. MDEP Chapter 375.10 G(16))

Maine DEP Chapter 375.10 defines a "residence" as:

> "A building or structure, including manufactured housing, maintained for permanent or seasonal residential occupancy providing living, cooking and sleeping facilities and having permanent indoor or outdoor sanitary facilities, excluding recreational vehicles, tents and watercraft." (ref. MDEP Chapter 375.10 G(14))

Most of the protected locations in areas surrounding proposed turbine sites for the Revised Project are parcels containing a year-round residence. Other protected locations are parcels containing seasonal residences or "camps", and an approved residential subdivision.

Under Maine DEP 375.10, hourly sound level limits at protected locations range from 55 to 70 dBA during daytime hours (7 am to 7 pm) and from 45 to 60 dBA during nighttime hours. The lowest limits of 55 dBA daytime and 45 dBA nighttime apply where existing pre-development sound levels are at or below 45 dBA during the daytime and at or below 35 dBA during the nighttime. Ambient sound level measurements can be taken to demonstrate that existing pre-development sound levels are above these threshold values. In recognition of the rural nature of the project area, Evergreen II has elected to apply the more stringent limits of 55 dBA daytime and 45 dBA nighttime to the Revised Project. The nighttime limit of 45 dBA applies on portions of the protected location that are within 500 feet of a residence or other sleeping quarters. At locations greater than 500 feet from the residence or sleeping quarters, the daytime limit applies 24 hours a day. Consistent with the permitted Oakfield Wind Project, BEA assumes the 55 dBA nighttime limit also applies across the entire parcels within an approved residential subdivision where no residence exists and no residential building or plumbing permit has been issued. Sound from regular and routine maintenance of the project is subject to the same sound level limits as routine operation.

Maine DEP Chapter 375.10 requires that 5 dBA be added to tonal and short duration repetitive sounds when determining compliance with hourly sound level limits Further details and an assessment of these types of sound for the Revised Project are presented in Section 6.3 of this report.

Construction during daytime or daylight hours, whichever is longer, is exempt from the Maine DEP sound limits by Maine statute (ref. 38 MRSA 484). Sound from nighttime construction that occurs beyond daytime or daylight hours is subject to the nighttime limits that apply to routine operation. More information concerning construction of the Revised Project is presented in Section 6.1 of this report.

Sound associated with specific equipment and activities is exempt from Maine DEP noise regulation. Examples that may be associated with the proposed project include:

- Registered and inspected vehicles traveling to and from the project
- Forest management, harvesting and transportation
- Snow removal and landscaping
- Emergency maintenance and repairs, warning signals and alarms
- Major concrete pours when started before 3:00 pm
- Sounds from a regulated development received at a protected location when the generator of the sound has been conveyed a noise easement for that location
- A force majeure event and other causes not reasonably within control of the owners or operators of the development

When a development is located in a municipality that has duly enacted a quantifiable noise standard that (1) contains limits that are not higher than the Maine DEP limits by more than five dBA, and (2) limits or addresses the types of sounds regulated by the MDEP, then the MDEP is to apply the local standard rather than the Maine DEP standard. When noise produced by a facility is received in another

municipality, the quantifiable noise standards of the other municipality must be taken into consideration (ref. Maine DEP 375.10.B.1).

All but ten of the proposed wind turbines for the Revised Project are located in the Town of Oakfield, Maine. One of the two south groups (S10 to S19) is located in Township T4 R3 WELS south of Oakfield. Although the Town of Oakfield has not enacted a local quantifiable noise standard, the Town did form a Wind Energy Review Committee and held a series of public workshops that included a thorough review of the Maine DEP noise regulation and sound levels associated with the Original Project. The Committee issued a Final Report dated September 4, 2009 that provides additional guidelines for operations testing, low frequency sound, and complaint resolution. These guidelines are described in more detail in the remaining Sections of this report. The Maine DEP noise regulation applies in Township T4 R3 WELS.

6.0 Sound Assessment

A sound level prediction model was prepared to calculate the sound levels from daytime and nighttime operation of the Revised Oakfield Wind Project. The sound model for the Revised Project was created using Cadna/A software developed by DataKustik of Germany. Cadna/A provides the platform to construct topographic surface models of area terrain for calculating sound attenuation from multiple sound sources such as wind turbines. Mapping of proposed turbine locations, roads, parcels, land uses and water bodies has been entered into Cadna/A in order to calculate the resulting sound levels at points within the study area. Although substation transformers emit sound, they are not considered to be significant sound sources due to their relatively low sound output and distances from regulated protected locations.

Sound level predictions are calculated in accordance with ISO 9613-2, an international standard for calculating outdoor sound propagation. This method calculates sound levels as if the receiver locations were all simultaneously downwind from the sound sources, which is for calculation purposes and not a physical possibility. According to ISO 9613-2, the calculation method is also equivalent to sound propagation for a "well-developed moderate ground-based temperature inversion". The stated accuracy of the ISO 9613-2 method is $\pm$3 dBA for a source and receiver mean height of 5 to 30 meters and a distance of 100 to 1000 m. Although the mean source height between wind turbines (84 meters) and receivers (1.5 meters) is closer to 43 meters, use of Cadna/A and ISO 9613-2 has been found to be accurate for prediction of wind turbine sound levels at distances of the compliance locations.[3]

[3] K. Kaliski and E. Duncan, Propagation Modeling Parameters for Wind Power Projects.
Town of Oakfield, Wind Energy Review Committee, Final Report.
Stetson Wind, Operations Compliance Sound Level Study.
EnRad Consulting, Oakfield Wind Project Amendment, Sound Level Assessment – Peer Review.
Stetson II Wind Project, Operations Sound Testing.

The terrain for the surface model was mapped from USGS topographic contours at five meter intervals (16.4 ft) provided to BEA by TRC Consulting with turbine base elevations ranging from 722 to 1,427 feet above mean sea level. The parcel boundaries and dwelling locations for the model were provided to BEA by TRC, Stantec Consulting and First Wind. Dwellings locations were mapped through use of aerial photography and field verification with the parcel associations confirmed from review of tax assessor records. Parcels with approved residential building permits or that are part of an approved residential subdivision were identified by TRC, Stantec Consulting and First Wind from review of municipal records and interviews with local officials.

The following provides an assessment of sound levels associated with construction and operation of the Revised Oakfield Wind Project.

6.1 Construction Sound Levels

Construction of the Revised Project will involve the use of heavy machinery to clear and grade roads, turbine pads, erect the wind turbine towers, and assemble the nacelle and turbine blades. This equipment will include heavy trucks, excavators, loaders, bull dozers, portable generators and compressors among other machines. Construction staging yards will also be established in designated areas for storage of equipment, materials, and wind turbine components.

Depending upon whether aggregate material can be found on site or will be transported to the project, there may also be equipment operating at the project site to excavate gravel, crush rock and process aggregate. Sound levels from mobile construction and portable processing equipment is likely to generate sound levels in the range of 75 to 95 dBA at 50 feet. Due to the arrangement and size of the project site, most of this equipment will be well distributed and not focused in a single area.

Operation of heavy equipment for site work and other major construction activity between 7 am and 7 pm or during daylight hours is not subject to the Maine DEP noise control regulation as set forth by Maine statute (ref. 38 MRSA Section 484). Operation of construction equipment during nighttime non-daylight hours must comply with the nighttime limits applicable to routine facility operation. All construction equipment must also comply with applicable federal noise regulations and include environmental noise control devices in proper working condition as originally provided by the equipment manufacturer.

6.2 Operating Sound Levels

Wind turbine sound power levels were provided by Vestas Wind Systems A/S based on sound testing as set forth in IEC 61400-11 and proprietary computer models. The IEC method establishes detailed procedures for measurement of wind turbine sound and calculation methods for determining the sound power level of a wind turbine as a point source for the stated purpose of conducting community assessments of sound levels resulting from wind turbine operation. Vestas reports that the full rated sound power of the Vestas V112 is 106.5 dBA with an uncertainty of $\pm$2.0 dBA. Vestas has issued a Sound

Level Performance Standard for the V112, which is attached to this report as Exhibit 1. In its V112 Standard, Vestas warranties the overall sound power level of the V112. Adding the uncertainty to the full sound output yields a maximum continuous sound power level of 108.5 dBA for modeling purposes. At a hub height of 84 meters (275.6 ft) above ground, the resulting elevations of the turbine hubs (modeled point sources) range from 997 feet (E15) to 1703 feet (N04) above msl.

Cadna/A allows flexibility in defining model settings and adjustments related to calculation methods, ground absorption and other factors. Additionally, as discussed above, conservative assumptions are utilized with respect to each of these factors. Turbine sound measurements can be used to ensure that model is "calibrated" to actual sound levels for reliable model predictions. As the following describes, model settings have been applied to predict the highest wind turbine sound levels as measured under a wide variety of site and weather conditions at other projects in Maine.

Although the proposed Vestas wind turbines are different than the turbines operating at other projects in Maine, sound power levels are determined by the same international specification for wind turbine testing (IEC 61400-11). Results from other wind energy facilities in Maine where wind turbines are located on similar ridge top settings indicate that the high end of the measurement range can be predicted by adding the sound power level uncertainty and the stated accuracy of ISO 9613-2. For this reason, the sound power levels of the Vestas V112 were increased by 5.0 dBA for modeling purposes.

Other model settings were selected to calculate ground attenuation using the spectral method per ISO 9613-2 and using a default ground absorption factor of 0.5 to represent a mix of hard and soft ground. Surface water bodies were mapped and assigned a ground absorption factor of 0.0 similar to hard ground for an acoustically reflective surface. Attenuation resulting from intervening terrain and atmospheric absorption using standard day conditions (temperature 10^{o}C, relative humidity 70%) was also calculated. No attenuation was calculated due to trees or other foliage that could act to reduce sound levels at community locations.

Wind turbine sound level predictions were calculated for a height of 5 feet above ground level as specified by Maine DEP 375.10. Sound levels were calculated and presented specifically for community receptor points. "Receptor points" are the locations in each direction from the project with the greatest potential to exceed the Maine DEP sound level limits. In addition, sound level contours were calculated to provide model predictions at all locations within the study area. A grid spacing of 20 meters by 20 meters was used to calculate the sound level contours.

Initial sound level predictions for the Revised Project were calculated with all proposed wind turbines operating at full rated sound power output, and the addition of 5 dBA for modeling purposes, and are presented in Figure 7. The model predictions are presented for selected receptor points and as sound level contours at 1 dBA intervals. The sound level contours corresponding to Maine DEP quiet daytime and nighttime limits of 55 dBA and 45 dBA are shown as bold lines. Figure 7 also shows the turbine locations and number designations, parcel boundaries, dwelling locations, a residential subdivision,

public roads, and water bodies. Parcels that are owned or will be leased by Evergreen II and parcels with required sound easements are shown by hatching.

A review of predicted sound levels for proposed daytime operation indicates that when operating at full sound output, the Revised Oakfield Project will comply with Maine DEP daytime sound level limit of 55 dBA at all regulated protected locations. The model predictions further indicate that some curtailment of nighttime operations will be required in order to meet the nighttime limit of 45 dBA that applies within 500 feet of a dwelling at a regulated protected location. The Maine DEP limits do not apply to noise received within the project boundary or where Evergreen II has obtained a sound easement.

Curtailment options are: 1) limit the operation of a specific turbine to daytime hours only or 2) implement Noise Restricted Operation (NRO) to reduce turbine sound levels at night. Turbine specifications from Vestas provide warranted overall sound power levels for NRO modes that reduce sound output from 1 dBA to 4 dBA based on turbine settings. For example, when operating at NRO 2 (Mode 2), the sound power level of the Vestas V112 wind turbine is reduced by 2 dBA, from 106.5 dBA to 104.5 dBA. Figure 8 presents the octave band sound power levels at rated sound output for full operations and NRO modes including NRO 1, NRO 2 and NRO 4 as provided in the Vestas sound performance specification (see Exhibit 1). The sound level spectrum for each mode varies depending on wind speed and shear (see Section 4.0) and was selected to yield the highest predicted sound levels at the receptor points.

Sound level reductions for the NRO modes are accomplished by lowering the rotational speed of the turbine rotor to slow the blade tips. Although operating a turbine in NRO mode reduces turbine sound output, it also results in lower energy production from the wind turbine.

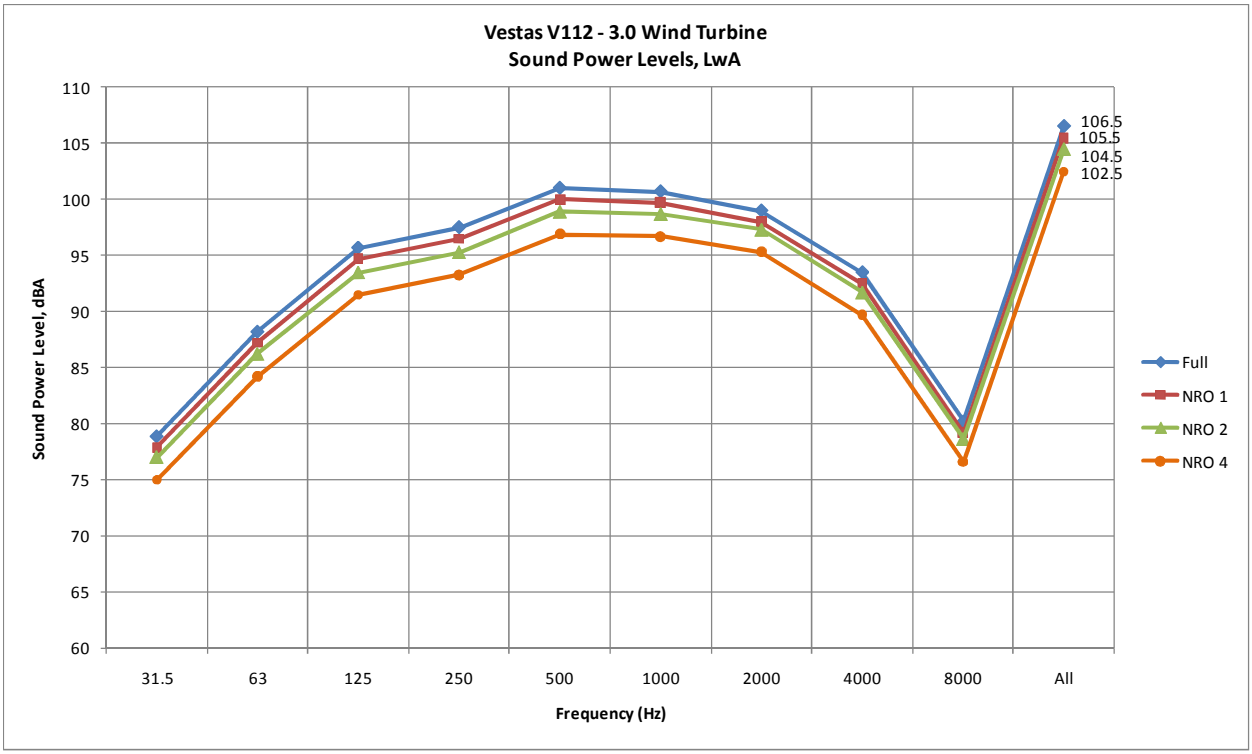


Figure 8. Sound Power Levels for Vestas V112 – Full Operation and NRO Modes

A nighttime operations plan for the Revised Oakfield Project was developed so that sound levels emitted from wind turbines would meet the nighttime sound level limit at all regulated protected locations. This plan consists of curtailing nighttime operation of five wind turbines in the north group, three turbines in the east group, and six in the Oakfield south group. Wind turbines with reduced nighttime operation are listed in Table 7. The facility operations plan will include provisions to implement NRO during nighttime hours as presented in Table 7.

Turbine No.	Nighttime Operation	Net Sound Power Level, dBA*
N11, N13 & N14	NRO 1	105.5
N15	NRO 2	104.5
N16	NRO 4	102.5
E01	NRO 1	105.5
E03	NRO 2	104.5
E04	NRO 2	104.5
S01 to S04	NRO 2	104.5
S05	NRO 1	105.5
S07	NRO 2	104.5
*Model predictions Include uncertainty of +2.0 dBA		

Table 7. Wind Turbines with Reduced Nighttime Operation

Predicted sound levels for nighttime operation are presented in Figure 9. Other than the nighttime operating modes and model predictions, the information on Figure 9 is the same as shown on Figure 7 for daytime operations. Sound level predictions were calculated at receptor points designated as P1 through P13 that represent the protected location(s), in each compass direction from wind turbines, with the greatest potential to exceed the Maine DEP nighttime sound level limits.

A summary of predicted sound levels at the receptor points for daytime and nighttime operation is provided in Table 8. This table also provides the distance from each receptor point to the nearest turbine operating at full output during daytime and nighttime periods, and the sound level reduction resulting from nighttime operation. Model predictions for the proposed nighttime operating mode, including curtailment of fourteen wind turbines, indicate that resulting sound levels will be at or below Maine DEP nighttime sound level limit of 45 dBA at all regulated protected locations.

Receptor Point	Approximate Distance to Nearest Turbine Operating at Full Output (ft)		Predicted Hourly Sound Level, dBA		
	Daytime	Nighttime	Daytime	Nighttime	Reduction
P1	2546	2864	44.5	44.2	0.3
P2	2621	2621	41.0	40.9	0.1
P3	3681	3996	43.7	43.3	0.4
P4	2431	3402	45.8	44.8	1.0
P5	1923	3629	45.5	44.7	0.8
P6	1804	2651	45.8	44.5	1.3
P7	2595	5276	46.2	44.4	1.8
P8	1982	5417	46.7	44.6	2.1
P9	2746	3638	45.8	44.5	1.3
P10	1860	4849	47.1	44.9	2.2
P11	2306	3881	46.4	45.0	1.4
P12	2835	3130	45.6	44.7	0.9
P13	2605	2605	44.9	44.7	0.2

Table 8. Predicted Daytime and Nighttime Sound Levels from Wind Turbine Operations at Receptor Points

6.3 Tonal and Short Duration Repetitive Sounds

The Maine DEP regulation requires an adjustment to the measured sound level at a protected location if sound from a development generates certain types of sound that are considered to be more annoying than relatively steady sound with no prominent tones or frequencies. These regulated types of sound are 1) tonal sounds and 2) short duration repetitive sounds.

6.3.1 Tonal Sounds

Tonal sounds are similar to prominent discrete tones that are audible from a development at a protected location. The Maine DEP defines a tonal sound as follows:

> "For the purpose of this regulation, a tonal sound exists if, at a protected location, the one-third octave band sound pressure level in the band containing the tonal sound exceeds the arithmetic average of the sound pressure levels of the two contiguous one-third octave bands by 5 dB for center frequencies at or between 500 Hz and 10,000 Hz, by 8 dB for center frequencies at or between 160 and 400 Hz, and by 15 dB for center frequencies at or between 25 Hz and 125 Hz. (ref. Maine DEP Chapter 375.10.G(24))."

The Vestas V112 Sound Level Performance Standard (Exhibit 1) warranties the overall sound power level of the V112 and further warranties that the V112 will not produce a tonal sound as defined by Maine DEP 375.10. Measurement reports by Delta for the V90 and V100 turbines, similar Vestas turbines, indicates potential for tonality in some frequencies but at levels well below the Maine DEP criteria for regulated tonal sounds. From the available turbine testing data (for the Vestas V90 and V100 turbines) and Vestas V112 Sound Level Performance Standard, the proposed V112 wind turbines are not expected to generate regulated tonal sounds during routine operation. [4]

6.3.2 Short Duration Repetitive Sounds

Maine DEP Chapter 375.10 defines short duration repetitive sounds as:

> "A sequence of repetitive sounds which occur more than once within an hour, each clearly discernible as an event and causing an increase in the sound level of at least 6 dBA on the fast meter response above the sound level observed immediately before and after the event, each typically less than ten seconds in duration, and which are inherent to the process or operation of the development and are foreseeable." (ref. Maine DEP Chapter 375.10.G(19)).

Concerning assessment of the 5 dBA penalty for SDR sounds, the Maine DEP noise regulation states:

> "For short duration repetitive sounds, 5 dBA shall be added to the observed sound levels of the short duration repetitive sounds that result from routine operation of the development for the purposes of determining compliance with the above sound level limits." (ref. MDEP Chapter 375.10.C.1.e.i.)

The 5 dBA penalty is added to the sound levels of the SDR sounds and not to the overall equivalent sound level (LAeq) for the time period.

For wind turbines, short duration changes in sound levels occur with the passage of rotor blades. This is commonly referred to as "amplitude modulation". The highest sound levels are generally recognized to occur on the down stroke of each rotor blade which occurs at a rate of just over once per second at full

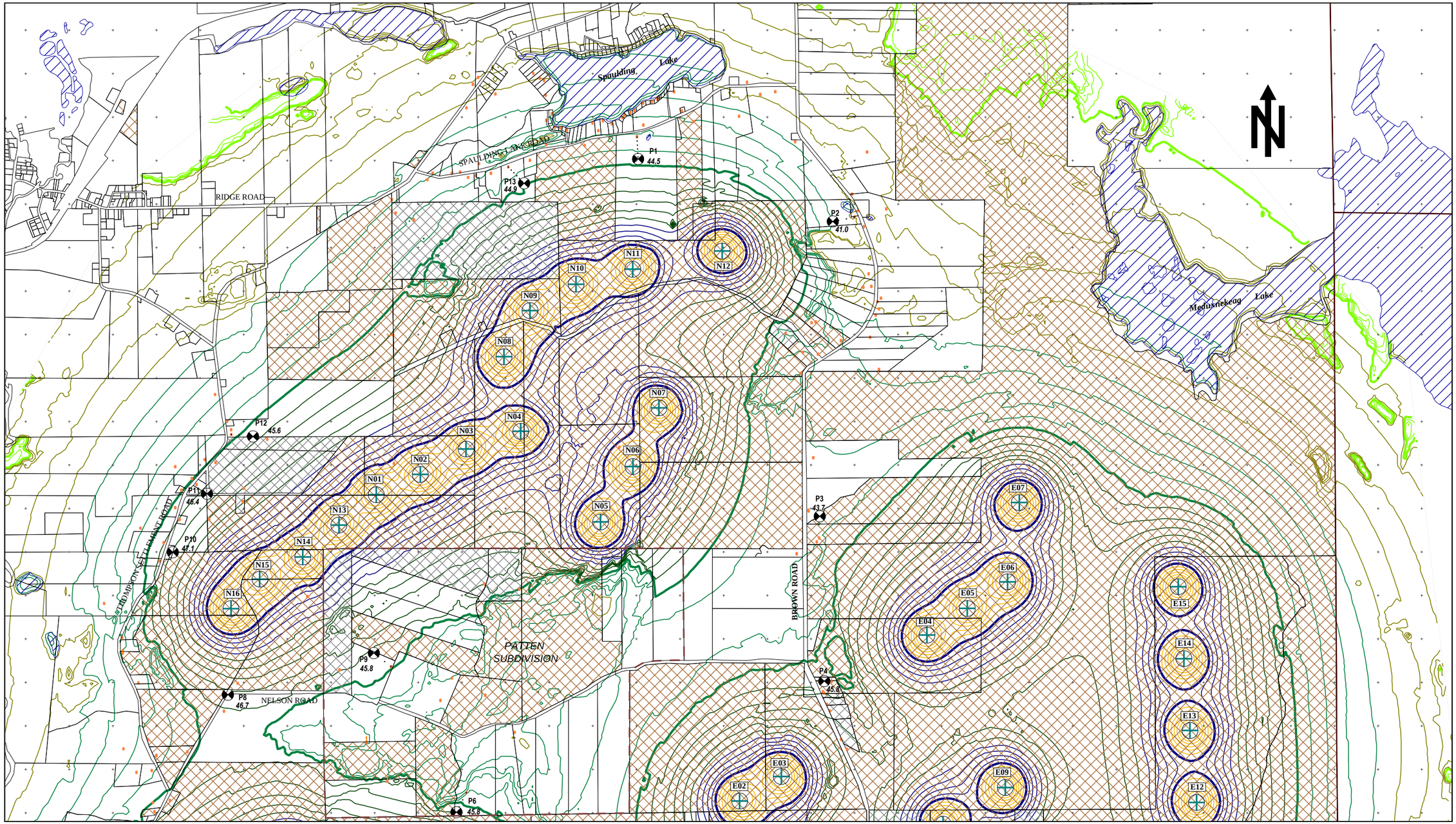
[4] Delta, Measurement of Noise Emission from a Vestas V90 1.815 MW Wind Turbine, AV 122/10, March 26, 2010.
Delta, Measurement of Noise Emission from a Vestas V100 1.8 MW VCS Wind Turbine, AV 172/10, 29 October 2010

rotational speed (17.7 rpm). The Delta reports on sound measurements of the Vestas V90 and V100 turbines do not specifically address the sound level change that occurs due to amplitude modulation. Measurements of operating wind turbines at other projects in Maine and published literature concerning amplitude modulation from wind turbines indicates that sound level fluctuations during the blade passage of wind turbines typically range from 2 to 5 dBA (see also Section 2.3), with occasional but infrequent events reaching 6 dBA or more. The occurrences of these higher fluctuations or SDR sound events are so small that they are not expected to affect the predicted sound levels.

6.4 Infrasound and Low Frequency Sound

Maine DEP does not specifically regulate infrasound or low frequency sound or vibrations and other impacts that may result from such sounds. Independent research and testing have indicated that impacts from infrasound and low frequency sounds from wind turbines are uncommon and not likely to be of concern from a properly sited, designed, and operated wind energy facility. The findings of several of these independent sources are outlined in the Site Location of Development Order issued by the Maine DEP for the original Oakfield Wind Project and therefore will not be discussed in this report. Further, the DEP found “that compliance with Chapter 375§10 is likely to ensure that there are no adverse health effects due to the proposed project.”

Figure 7 (1 of 2). Predicted Sound Levels from Daytime Operation (North)



Participating Landowner

Sound Easement

Wind Turbine

Dwelling

44.2 — 500 ft — Receptor Point & Predicted Sound Level

55 dBA (Daytime Limit)

45 dBA (Nighttime Limit)

35 dBA

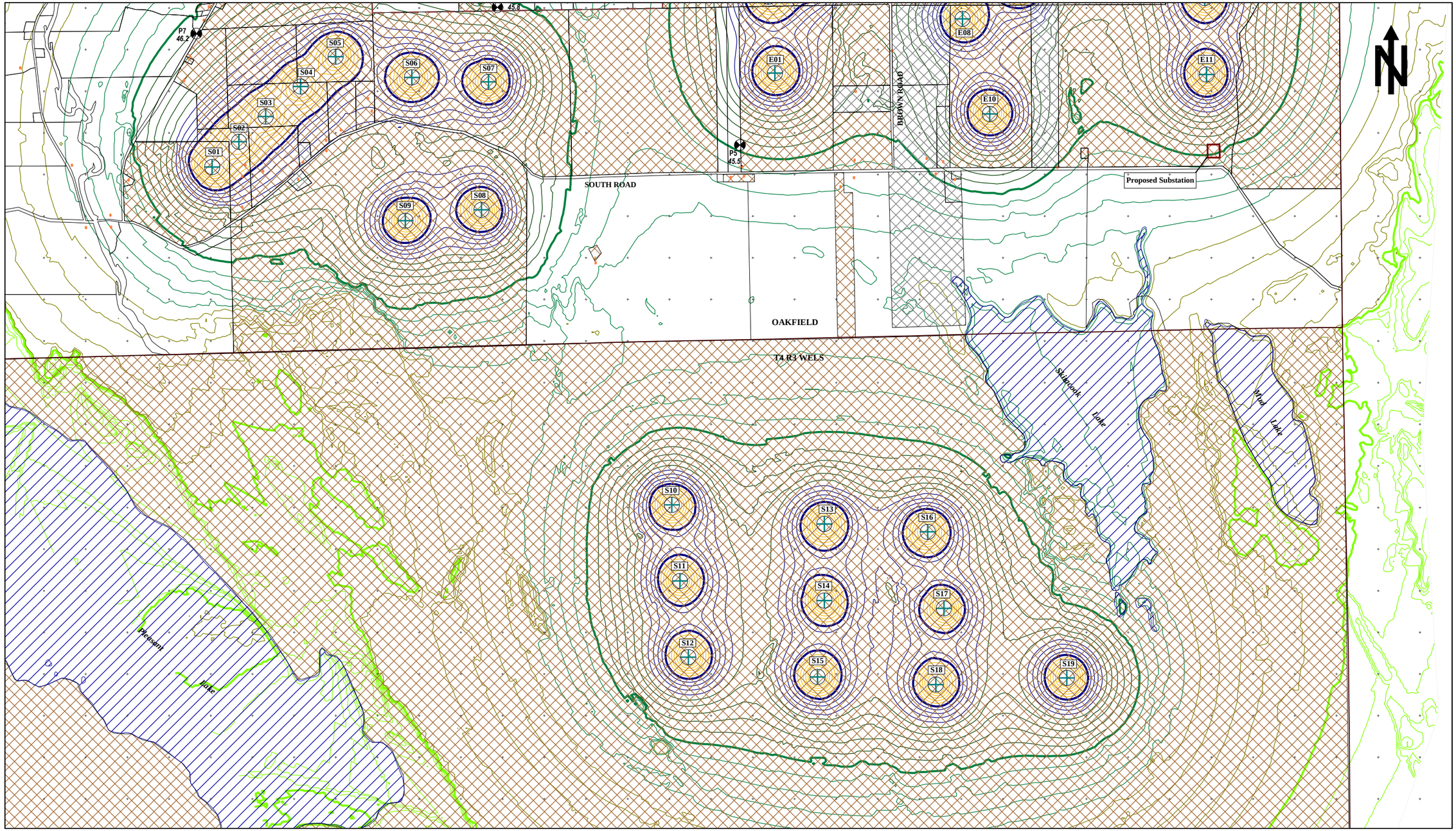
Coordinate Grid Spacing = 1000 ft

Sound Level Contour Interval = 1 dBA

Bodwell EnviroAcoustics LLC
R Scott Bodwell PE

June 2011

Figure 7 (2 of 2). Predicted Sound Levels from Daytime Operation (South)



Participating Landowner

Sound Easement

Wind Turbine

Dwelling

44.2
500 ft
Receptor Point & Predicted Sound Level

55 dBA (Daytime Limit)

45 dBA (Nighttime Limit)

35 dBA

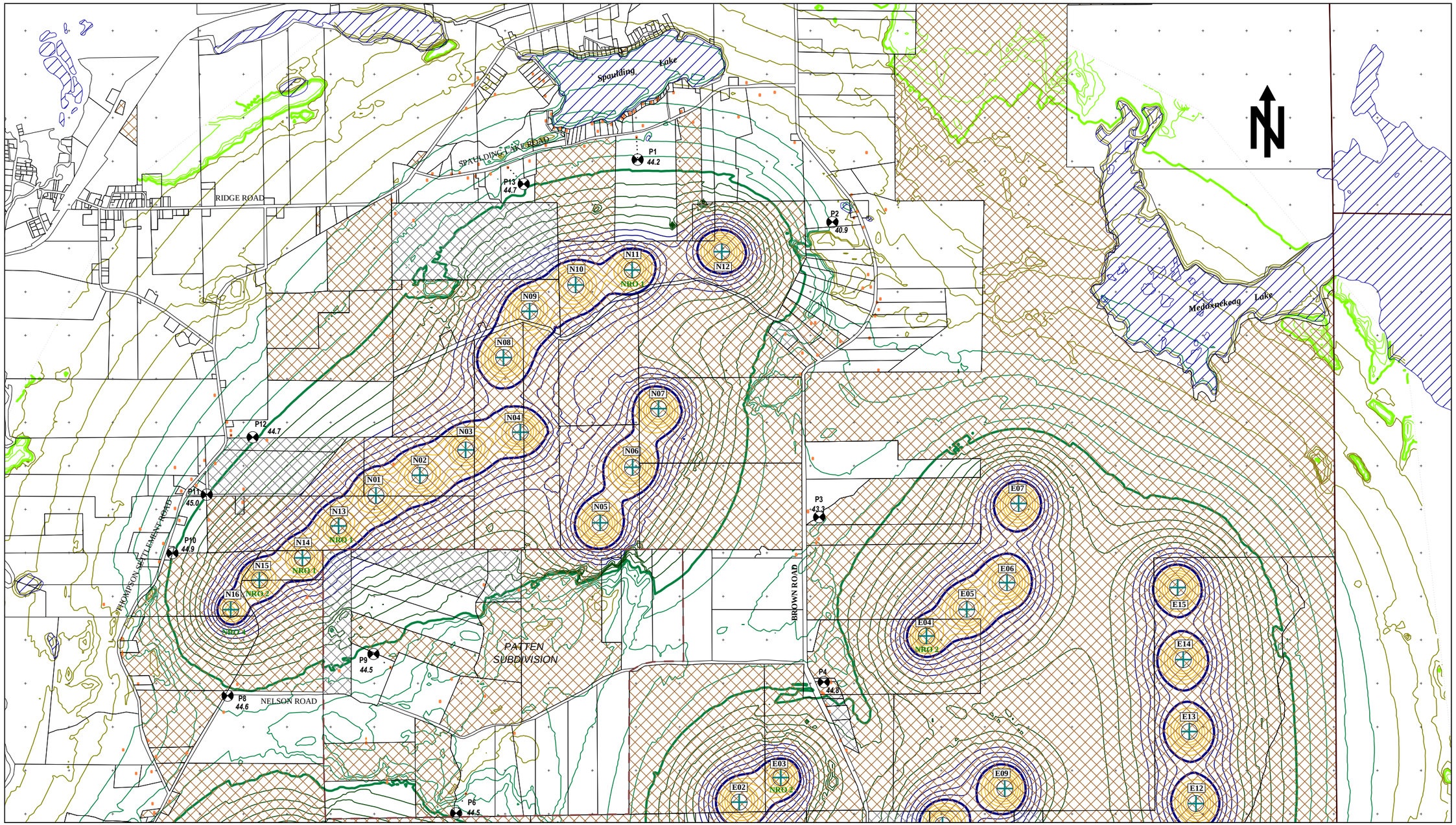
Coordinate Grid Spacing = 1000 ft

Sound Level Contour Interval = 1 dBA

June 2011

Bodwell EnviroAcoustics LLC
R Scott Bodwell PE

Figure 9 (1 of 2). Predicted Sound Levels from Nighttime Operation (North)



Participating Landowner

Sound Easement

Wind Turbine

Dwelling

44.2 ------- 500 ft

Receptor Point & Predicted Sound Level

55 dBA (Daytime Limit)

45 dBA (Nighttime Limit)

35 dBA

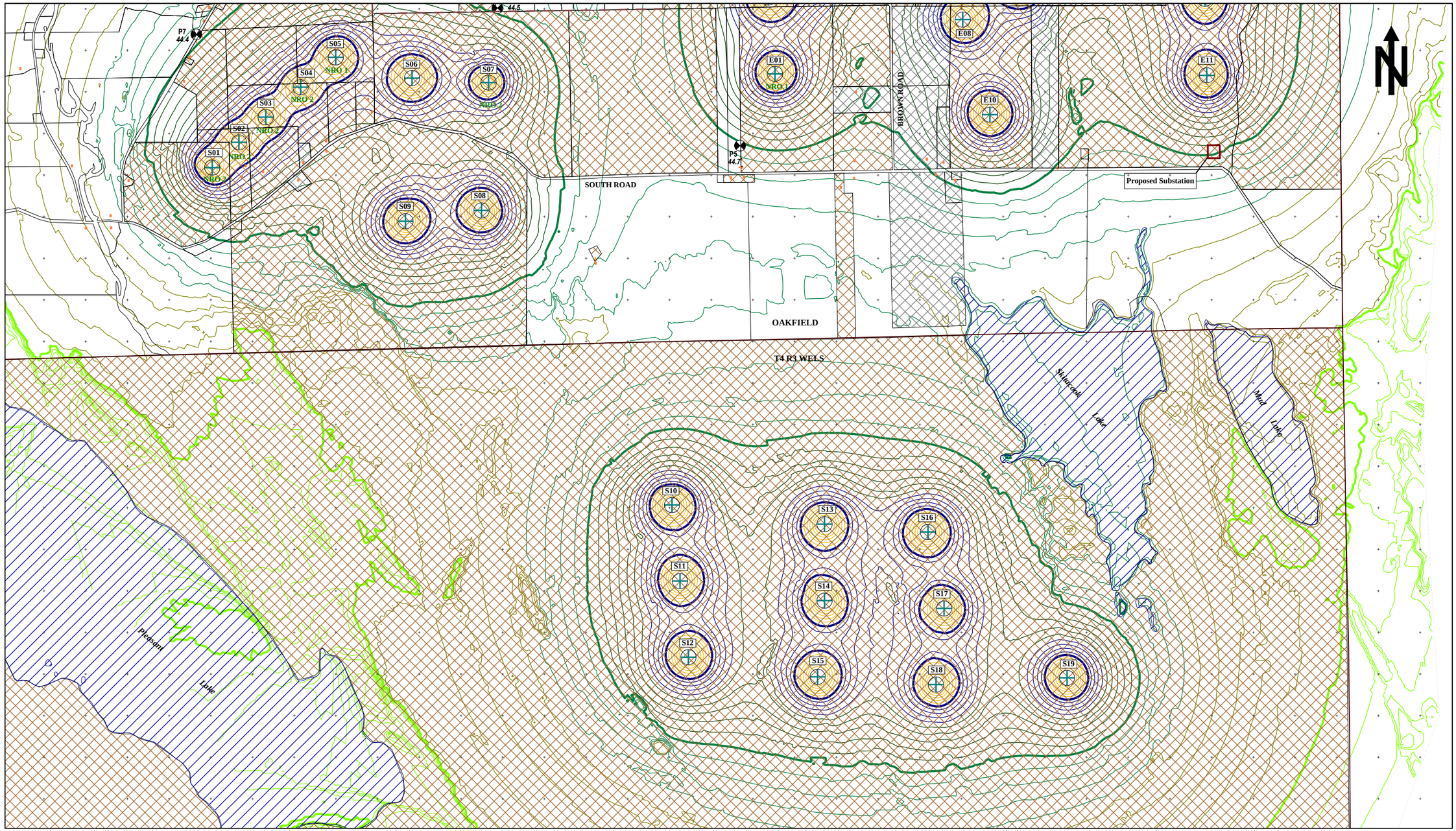
Coordinate Grid Spacing = 1000 ft

Sound Level Contour Interval = 1 dBA

Bodwell EnviroAcoustics LLC
R Scott Bodwell PE

June 2011

Figure 9 (2 of 2). Predicted Sound Levels from Nighttime Operation (South)



Participating Landowner

Sound Easement

Wind Turbine

Dwelling

44.2
500 ft

Receptor Point &
Predicted Sound Level

55 dBA (Daytime Limit)

45 dBA (Nighttime Limit)

35 dBA

Coordinate Grid Spacing = 1000 ft

Sound Level Contour Interval = 1 dBA

Bodwell EnviroAcoustics LLC
R Scott Bodwell PE

June 2011

7.0 Sound Level Testing

The purpose of sound level testing is to confirm by measurement that sound levels emitted by the Revised Oakfield Project are at or below the sound level limits applicable to all phases of the project.

7.1 Project Construction

Construction of the Revised Project is planned to primarily occur during daylight and daytime hours when sound levels generated by construction activity are exempt from the Maine DEP sound level limits by Maine statute. Therefore, no sound level testing is planned for the construction phase of the project.

If nighttime non-daylight construction occurs, such construction activity is required to comply with nighttime sound level limits for routine operation and maintenance of the project.

7.2 Wind Turbine Operations

Sound level testing of wind turbine operations is a complex and critical component of the proper and responsible operation of a wind energy facility. The most difficult aspect of wind turbine sound testing is to perform the required measurements under the proper site and weather conditions. Operation of wind turbines at full sound output requires a significant level of wind acting on the turbine hubs for an extended period of time. Often when hub wind speeds are at the required levels, surface winds will also be high enough to cause extraneous sound levels from wind forces acting on terrain and vegetation. These extraneous sound levels make it difficult to isolate turbine sound.

However, during nighttime periods, the winds aloft along the project ridges and wind turbine hubs can remain strong while the surface winds at lower elevations near protected locations can reduce to light or nearly calm. These conditions are commonly referred to as a “stable atmosphere” and are the best conditions under which to measure the sound level contributions of wind turbines for several reasons. First, the ambient (non-wind turbine) sound levels from wind and daytime activities are diminished so that the sound levels from wind turbines become more prominent and easier to quantify. Second, technical literature concerning wind turbine noise emissions indicates that the potential for amplitude modulation increases with wind shear. Therefore, full sound output under stable atmospheric conditions is the preferable for measuring sound levels for the presence of short duration repetitive sounds.

BEA has worked closely with the Maine DEP and EnRad Consulting, acoustical consultant to Maine DEP, to develop a specific and detailed testing protocol for measuring sound levels from wind turbines in Maine. The purpose of this protocol is to measure wind turbine sound levels to evaluate compliance with Maine DEP sound level limits including appropriate adjustments for tonal and short duration repetitive sounds.

The specific test protocol for the original Oakfield Project that will be used to develop a similar protocol for sound level testing of the Revised Oakfield Wind Project is presented as Exhibit 2. The test protocol for the Revised Project will contain provisions for conducting sound measurements with specific turbines operating at NRO levels established for nighttime operations per Section 6.2 (Table 7). Once operations sound testing demonstrates compliance with applicable limits, Evergreen II may implement a post-construction monitoring program to demonstrate that nighttime operation of some turbines at the proposed NRO levels is unnecessary.

8.0 Complaint Response Protocol

In collaboration with the Town of Oakfield Wind Energy Review Committee, Evergreen II has developed a formal protocol for addressing sound complaints from local residents during wind turbine operations. The purpose of this protocol is to ensure that local residents are informed on how to report a sound complaint and that each sound complaint is fully documented and resolved in a consistent manner. The Oakfield Wind Sound Complaint Response and Resolution Protocol can be found in Exhibit 3 of this report. It establishes guidelines for reporting, documenting, investigating, reporting and responding to sound complaints.

The response to each complaint will depend upon the circumstances involved in the complaint and may include a site visit, inspection of nearby wind turbines, and/or sound level measurements. An important aspect of the complaint process is to fully document the site, weather and operating conditions at the time of the complaint so that trends can be identified and any sound evaluation conducted under equivalent conditions.

As appropriate, Evergreen II will use the complaint information collected during operations to assist in selecting compliance monitoring locations for testing in accordance with the Maine DEP regulations. Complaint information will also be used to schedule monitoring to ensure it is conducted under weather and operating conditions when sound from the project is most noticeable.

If Evergreen II determines that there is a consistent pattern of complaints that suggest sound levels from wind turbine operations may exceed applicable DEP sound level limits, an appropriate operations plan and mitigation measures will be developed and implemented to ensure that turbine operations continue to meet applicable sound level limits.

9.0 Summary of Findings

This Sound Level Assessment establishes sound level limits to be applied to the Revised Oakfield Wind Project and provides sound level predictions for daytime and nighttime turbine operations using a terrain-based computer model. Model settings reflect the results of turbine sound level testing of similar wind energy facilities in Maine. The most stringent Maine DEP hourly sound level limits of 55 dBA daytime and 45 dBA nighttime will be applied to the Revised Project. Sound level predictions

indicate that with all wind turbines operating simultaneously at full capacity, Evergreen II will meet Maine DEP daytime sound level limit of 55 dBA at all regulated protected locations. During nighttime hours, Evergreen II will implement noise-restricted operation of specific turbines to meet the DEP nighttime sound level limit of 45 dBA at all regulated protected locations.

The Sound Level Assessment establishes procedures for sound level testing of turbine operations to evaluate compliance with applicable sound level limits, including methods for measurement and analysis of tonal and short duration repetitive sounds. A formal protocol for response and resolution of sound complaints is also established to reduce the potential for noise problems associated with long-term operation of the Revised Project.

10.0 References

Bodwell EnviroAcoustics, LLC, Stetson II Wind Project, Operations Sound Testing, March 2011

Danish Electronics, Light and Acoustics (Delta), Low Frequency Noise from Large Wind Turbines, 2008.

Delta, Measurement of Noise Emission from a Vestas V90 1.815 MW Wind Turbine, AV 122/10, March 26, 2010.

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Exponent, Inc., Evaluation of the Scientific Literature on the Health Effects Associated with Wind Turbines and Low Frequency Sound, October 2009.

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ISO 9613-2 Acoustics - Attenuation of Sound During Propagation Outdoors - Part 2: General Method of Calculation, 1996.

K. Kaliski and E. Duncan, Propagation Modeling Parameters for Wind Power Projects. Sound & Vibration, December 2008

Maine Department of Environmental Protection (DEP) Site Location of Development Regulations for Control of Noise (06-096 CMR c. 375.10), November 1989.

Maine Revised Statutes, Standards for Development, 38 MRSA 484, Subsection 3, 1993.

Mills, D.A., MD, MPH, Wind Turbine Neuro-Acoustical Issues, Maine CDC/DHHS, June 2009.

Resource Systems Engineering, Stetson Wind, Operations Compliance Sound Level Study, 2009.

Town of Oakfield, Wind Energy Review Committee, Final Report, September 4, 2009.

Van den Berg, G. P., The Sounds of High Winds, the effect of atmospheric stability on wind turbine sound and microphone noise, University of Groningen, 2006.

EXHIBIT 1: SOUND LEVEL PERFORMANCE STANDARD[5]

Sound Level Performance Standard and Testing Procedure

Warranted Sound Power Level V112 – 3.0 MW WTG

When measured in accordance with these testing procedures the **V112 – 3.0MW WTG IEC Class I** warranted maximum Sound Level Performance Standard is as follows:

Mode 0 Operation: Lwa = 106.5 dB(A).
Mode 1 Operation: Lwa = 106.5 dB(A).
Mode 2 Operation: Lwa = 104.5 dB(A).
Mode 4 Operation: Lwa = 102.5 dB(A).
Mode 5 Operation: Lwa = 105.5 dB(A).

This warranted sound level is subject to a tolerance for measurement uncertainties of the greater of (i) the actual measurement uncertainty determined in accordance with the Sound Level Test Standard and (ii) ± 2dB(A). If the measured sound power level is at or below the warranted sound power level plus the uncertainty, the standard has been met.

Supplier also warrants that the sound generated by any Wind Turbine shall not produce a Tonal Sound during operation in any mode when measured in accordance with the Sound Level Test Standard and on the linear scale for one-third octave bands with center frequencies ranging from 20 to 12,500 Hz. A Tonal Sound is defined to exist if the one-third (1/3) octave band sound pressure level in the band, including the tone, exceeds the arithmetic average of the sound pressure levels of the two (2) contiguous one-third (1/3) octave bands by five (5) dB for center frequencies between five hundred (500) Hz and ten thousand (10,000) Hz, by eight (8) dB for center frequencies between one hundred and sixty (160) Hz and four hundred (400) Hz, or by fifteen (15) dB for center frequencies twenty-five (25) Hz between one hundred and twenty-five (125) Hz.

"Sound Level Test Standard" means the test protocol as defined in IEC 61400-11-ed2:2002.

[5] Source: Oakfield Turbine Supply Agreement, Exhibit D.2, Vestas Wind Systems A/S

EXHIBIT 2: OPERATIONS SOUND TESTING PROTOCOL FOR THE ORIGINAL OAKFIELD WIND PROJECT[6]

Maine Department of Environmental Protection Department Order L-24572-24-A-N, January 2010:

C. Municipal Review Committee. The Town of Oakfield's Wind Energy Review Committee (WERC) retained the services of Resource Systems Group (RSG), a professional engineering noise consultant, to address sound and noise issues related to the proposed project. RSG performed an independent review of the sound modeling submitted by the applicant, as described in the WERC's Final Report dated September 4, 2009. That report found that "Under all circumstances, the Committee consultant's modeling scenarios showed predicted sound levels of 45 dBA or lower from the wind turbines at each non-participating residence." As a result of that review the Town of Oakfield's WERC concluded that the applicant's sound predictions and modeling are appropriate and may be conservative, and recommended additional measures to ensure compliance with the Department's quiet area sound level limits. The applicant, by letter dated September 15, 2009, agreed to the following measures and incorporated these measures into the proposed Oakfield Wind Project application before the Department:

i. The applicant proposes to implement a Sound Complaint Response and Resolution Protocol to provide a transparent process for identifying and responding to potential sound complaints. This protocol includes measures to ensure a consistent approach to documenting complaints, a process for the applicant to communicate with the Town and the Department regarding potential complaints, and flexibility for ensuring appropriate actions are taken in response to potential complaints. A copy of the protocol is attached to the September 15 letter.

ii. The applicant proposes to implement a post-construction monitoring protocol consistent with the following:

Within 12 months from when the project becomes operational, Evergreen shall conduct sound monitoring at two or more representative locations around the project. These locations shall be chosen in consultation with the Department and the Town based on how well they represent local meteorology and their relative noise impact from the wind turbines (highest potential to exceed the applicable noise standards). In addition, special consideration shall be given to landowners that have registered sound complaints. The April 6, 2009 Rollins protocol shall be followed except that the weather conditions in Section b of the protocol shall be relaxed if either A or B are met:

- A is met if (i), (ii) and (iii) are satisfied:

(i) the difference between the LA90 and LA10 during any 10-minute period is less than 5 dBA, and

(ii) the surface wind speed (10 meter height) is 6 mph or less for 80% of the measurement period and did not exceed 10 mph at any time or the turbines are shut down during the

[6] Town of Oakfield, Wind Energy Review Committee, FINAL REPORT, September 2009.

monitoring period and the difference in the observed LA50 after the shut down is equal to or greater than 6 dB, and

(iii) observer logs or recorded sound files clearly indicate the dominance of turbine sounds.

- B is met if (iv) is satisfied:

(iv) the overall 10 minute LAeq is 40 dBA or less.

iii. The applicant has agreed that if tonal sounds cause an exceedance of Chapter 375.10 sound limits, Evergreen will promptly notify the Department and the Town. Evergreen will then expedite an investigation of the sound level exceedance and the associated tonal sound and develop a mitigation plan and schedule to achieve compliance with the applicable sound level limits. Evergreen will provide copies of the mitigation plan to the Department and the Town, implement the mitigation plan, and provide a written report describing the actions taken and new measurement results that demonstrate compliance. Mitigation options could include reduction of the overall sound level and/or the tonal sound component. The Department reserves the right to order immediate actions to be taken to mitigate such sounds while this process is taking place, or to take such other enforcement action it finds appropriate.

iv. The applicant has restated its commitment that the project will comply with the 45 dBA quiet nighttime limit during nighttime hours at applicable regulatory locations even if the pre-development ambient sound level is more than 35 dBA. Similarly, the project will comply with the 55 dBA quiet daytime limit during daytime hours at applicable regulatory locations even if the pre-development ambient sound is greater than 45 dBA.

v. The applicant has stated its commitment that any future First Wind wind power project sited proximate to the project that is the subject of the application will be sited and operated in a manner to ensure that the combined sound, i.e. the sound associated with the existing project and potential future project, complies with the quiet noise limits (45 dBA) at applicable regulatory locations. The Department notes that this commitment waives the option of applying the 3 dBA allowance of Chapter 375.10 (C)(1)(c), and any future expansion would also be required to comply with any applicable Department standards on control of noise in effect at the time of application.

To confirm that the modeling accurately predicted sound levels and ensure that the sound level limits in this permit are met, EnRad Consulting recommended that the Oakfield Wind Project be required to conduct routine operational noise compliance measurements at a minimum of six protected locations designated in the application noise assessment as "Receiver Positions" R1, R4-7 and R9, and provided recommendations for addressing these locations in the final monitoring plan. EnRad stated that these particular sites not only represent the highest predicted sound levels, but also address both the northern and southern turbine arrays from multiple directions and elevations. EnRad recommended that the applicant should be required to demonstrate compliance at these locations based on following outlined conditions for 12, 10-

minute measurement intervals per monitoring location meeting 06-096 CMR 375.10 requirements.

EnRad further stated that background ambient monitoring may be required in the areas where extraneous sounds could potentially or do complicate routine operation compliance assessment. If required, background ambient monitoring locations and times will be determined with concurrence from the Department.

a. Compliance will be demonstrated when the required operating/test conditions have been met for twelve 10-minute measurement intervals at each monitoring location.

b. Measurements will be obtained during weather conditions when wind turbine sound is most clearly noticeable, i.e. when the measurement location is downwind of the development and maximum surface wind speeds are ≤6 mph with concurrent turbine hub-elevation wind speeds sufficient to generate the maximum continuous rated sound power from the five nearest wind turbines to the measurement location. Measurement intervals affected by increased biological activities, leaf rustling, traffic, high water flow or other extraneous ambient noise sources that affect the ability to demonstrate compliance will be excluded from reported data. A downwind location is defined as within 45° of the direction between a specific measurement location and the acoustic center of the five nearest wind turbines.

c. Sensitive receiver sound monitoring locations should be positioned to most closely reflect the representative protected locations for purposes of demonstrating compliance with applicable sound level limits, subject to permission from the respective property owner(s). Selection of monitoring locations should require concurrence from MDEP.

d. Meteorological measurements of wind speed and direction should be collected using anemometers at a 10-meter height above ground at the center of large unobstructed areas and generally correlated with sound level measurement locations. Results should be reported, based on 1-second integration intervals, and be reported synchronously with hub level and sound level measurements at 10 minute intervals. The wind speed average and maximum should be reported from surface stations. Department concurrence on meteorological site selection is required.

e. Sound level parameters reported for each 10-minute measurement period, should include A-weighted equivalent sound level, 10/90% exceedance levels and ten 1-minute 1/3 octave band linear equivalent sound levels (dB). Short duration repetitive events should be characterized by event duration and amplitude. Amplitude is defined as the peak event amplitude minus the average minima sound levels immediately before and after the event, as measured at an interval of 50 ms or less, A-weighted and fast time response, i.e. 125 ms. For each 10-minute measurement period short duration repetitive sound events should be reported by percentage of 50 ms or less intervals for each observed amplitude integer above 4 dBA. Reported

measurement results should be confirmed to be free of extraneous noise in the respective measurement intervals to the extent possible and in accordance with (b).

f. Compliance data collected in accordance with the assessment methods outlined above for representative locations selected in accordance with this protocol will be submitted to the Department for review and approval prior to the end of the first year of facility operation. Compliance data for each location will be gathered and submitted to the Department at the earliest possible opportunity after the commencement of operation, with consideration for the required weather, operations, and seasonal constraints.

… to confirm that the modeling accurately predicted sound levels and to ensure that the standards are met, the Department finds that the applicant must implement the assessment plan referenced above, including the modifications to which the applicant agreed in response to the Town of Oakfield's Wind Energy Review Committee and the additional requirements proposed by EnRad as described above. If the compliance data indicates that the Oakfield Wind Project is not in compliance with Department standards as described above, within 60 days of a determination of non-compliance by the Department, the applicant must submit, for review and approval, a compliance plan that proposes actions to bring the project into compliance at all the protected locations surrounding the development. This compliance plan must include, among other strategies, consideration and analysis of how potential turbine shutdown scenarios may the project into compliance with the terms of this permit. The Department will consult with sound engineering professionals in the review of any such compliance plan and reserves the right to require additional mitigation measures. The Department reserves the right to order immediate actions to be taken to mitigate such sounds while this process is taking place, or to take such other enforcement action it finds appropriate to ensure compliance with the applicable provisions of Chapter 375(10).

EXHIBIT 3: SOUND COMPLAINT RESPONSE AND RESOLUTION

Oakfield Wind Project Sound Complaint Response and Resolution Protocol

firstwind SM
OAKFIELD

Evergreen will complete the Sound Complaint Record Form by providing the following:

- Nearest turbine to complaint location
- Date and time call or form processed
- Power output (kW), wind speed and direction of closest turbines during sound event
- Local/surface weather conditions—cloud cover, precipitation, relative wind speed and direction, temperature, and relative humidity
- Ground conditions – field, wooded, snow, foliage, frozen/icing

A log of complaints will be kept and managed by the operational staff at the Project site. Evergreen will provide a copy of the complaint log to the Town and DEP on a quarterly basis or more frequently upon request by the Town or DEP.

The response to each complaint will depend on each situation, but may include, without limitation, a visit to the location of the complaint; inspection of the operating condition of the turbines closest to the complaint location to evaluate potential upset conditions that might increase sound levels; informal sound monitoring by Evergreen; an informal evaluation of the complaint by Evergreen's sound consultant; or formal sound monitoring. In the event that Evergreen conducts formal sound monitoring at a complaint location, it will notify the Town ahead of time, allow the Town Manager the opportunity to observe, and will provide the results to the Town. In addition, if Evergreen conducts a visit to a complainant or conducts informal sound monitoring at a complaint location, it will undertake best efforts to notify the Town Manager and allow him or her the opportunity to observe. In any event, a Sound Complaint Response Form and Follow-up Record will be completed by Evergreen staff.

Evergreen will use the information collected during the first three months of operation to assist in selecting compliance monitoring locations for testing in accordance with the DEP post-construction sound level compliance assessment plan, as well as timing to ensure monitoring is conducted under weather and operating conditions when sound from the project is most noticeable.

If Evergreen or the DEP determines that there is a consistent pattern of complaints that suggest sound levels from the Project may exceed applicable DEP sound level limits, Evergreen will develop and implement an appropriate protocol for ensuring that the Project continues to meet applicable sound level limits. Evergreen shall take reasonable steps to provide a copy of the protocol to the Town and DEP prior to its implementation, and will provide the results of testing undertaken as part of the protocol to the DEP and the Town. If the Project is not in compliance with the DEP standards, and as set forth in the DEP Site Law permit, Evergreen will submit a revised operation protocol to the DEP and provide a copy to the Town that demonstrates the Project will be in compliance at all the protected locations surrounding the Project.

Oakfield Wind Project Sound Complaint Response and Resolution Protocol

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- Nearest turbine to complaint location
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Oakfield Wind Project Sound Complaint Response and Resolution Protocol

firstwind OAKFIELD

Protocol Implementation:

Evergreen Wind will hold an initial public information meeting in conjunction with the Town to explain the complaint response and resolution process, including how to properly file complaints and complete the form(s).

Forms will be mailed to project abutters and will be available at the Town Office and the DEP.

The 24/7 hotline number will be mailed to abutters and posted at the Town Office.

For the first year of operations, Evergreen will hold quarterly meetings in conjunction with the Town to discuss complaints and their resolution. This process can also be used to report the results of compliance testing per the DEP protocol.

Evergreen Wind will develop and schedule in consultation with the DEP compliance testing to occur sometime after commercial operations but during the first year of routine operations so that complainant locations can be incorporated as appropriate.

The proactive and innovative measures identified in this sound complaint response and resolution protocol will facilitate a more complete understanding and evaluation of potential sound complaints and will ensure that those complaints are appropriately addressed. Evergreen invites the public to participate in this process to ensure that the Oakfield Wind Project remains a positive contributor to the community.

Appendix 5-2

Index	Tax Map	Lot(s)	Grantor Name(s)	EWPII, LLC Interest
1	OAK 1	15	Walter V. Mitchell and Patricia A. Mitchell	Easement
2	OAK 1	21	Vincent J. Franco	Easement
3	OAK 1	20	Brian Collins	Easement
4	OAK 2	7	MaryAnne S. Hare	Easement
5	OAK 2	8.1	Paul Mantegna	Easement
6	OAK 2	8.2	Gregory Scott McNally	Easement
7	OAK 2	8.9	Dave W. Kitchin and Dennis M. Kitchin	Easement
8	OAK 2	9	Kenneth Emerson and Janet Emerson	Easement
9	OAK 2	9.1	Howard I. Smith	Easement
10	OAK 2	10	Andrew M. Seder and Scott R. Althouse	Easement
11	OAK 3	1.1	Gary A. Martin	Easement
12	OAK 4	20	Joseph A. Gattuso, Jr. and Lori M. Gattuso	Easement
13	OAK 4	20-1	Gregory Scott McNally	Easement
14	OAK 4	36-A	Hiram White and Joan White	Easement
15	OAK 5	2-10	Alex Hutchinson and Lisa Hutchinson	Easement
16	OAK 5	2.15	Jon A. Provost and Tamara R. Greenlaw	Easement
17	OAK 5	2.18	Janine H. Michaud	Easement
18	OAK 6	4.1 and 5.3	Roger D. Hagan	Easement
19	OAK 6	5.1	Fred I. Sweet	Easement
20	OAK 6	5.2	Randall M. Gove	Easement
21	OAK 6	5.4	Larry A. Sanford	Easement
22	OAK 8	22	Gary C. Sico and Janine C. Sico	Easement
23	OAK 8	29.8	Steven C. Greenlaw and Sydney Greenlaw	Easement