

SECTION 5 NOISE

A. Introduction

Resource Systems Group, Inc. performed a sound analysis of anticipated sound levels associated with the Project in accordance with sound level limits as set forth by the MDEP Site Law Regulations for Control of Noise (ref. 06-096 Code of Maine Rules (CMR) Chapter 375.10), NRPA Title 38 M.S.R. § 480-D (1),³ the Town of Moscow Wind Energy Facility Ordinance (December 2, 2010) (Town of Moscow Ordinance), and the Town of Caratunk Noise Ordinance for “Energy Systems” (July 2020) (Town of Caratunk Ordinance). The analysis evaluates sound levels at nearby sensitive locations from construction activities and routine operation of sound-producing Project components, including turbines and the Substation transformer. The complete Sound Analysis for the Project is attached as Exhibit 5-1 (Sound Analysis).

B. Regulatory Standards

The Project is required to meet the noise requirements detailed in 06-096 CMR Chapter 375.10.C.I of Site Law Regulations. Although Site Law regulations specify a 75 dBA (A-weighted decibels) limit for a facility property line, the most restrictive limits apply to noise sensitive land uses that meet the definition of a “protected location”, as set forth in 06-096 CMR Chapter 375.10.C(2). However, 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 MDEP limits by more than 5 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 MDEP standard. In addition, when noise produced by a facility is received in another municipality, the quantifiable noise standard of the other municipality must be taken into consideration (ref. 06-096 CMR Chapter 375.10.B.1).

The Town of Moscow (Town) has noise restrictions similar, but not the same as the MDEP thresholds, as established in the Town of Moscow Ordinance (Exhibit 5-1 [Sound Analysis], Appendix A). The Project is designated as “Type 3” under the Town of Moscow Ordinance, which means a wind energy facility having a generating capacity of 100 kilowatt or greater and which requires a State permit issued by MDEP under Site Law regulations. Its noise section is based on MDEP’s Chapter 375 regulations prior to the addition of Chapter 375.10.I in 2012. In summary, the Town of Moscow Ordinance:

1. Requires the application to include the sound emission levels from the wind turbines;
2. Limits noise from the Project to 75 dBA L_{1h} ⁴ at the property line (Exhibit 5-1, Appendix B.A.1.a.i), 45 dBA L_{1h} during the night (7:00 pm to 7:00 am) at protected locations, and 55 dBA L_{1h} during the day (7:00 am to 7:00 pm) at protected locations⁵ (Appendix B.A.1.a.v);
3. Applies a 5 decibels (dB) penalty for tonal sound (Exhibit 5-1 [Sound Analysis], Appendix B.A.1.d);
4. Applies a 5 dB penalty for short duration repetitive sounds (SDRS) to events where there is an increase in the A-weighted fast response sound level of at least 6 dB (Exhibit 5-1 [Sound Analysis], Appendix B.A.1.e);

³ MDEP. NRPA. Title 38 M.R.S. §480-D(1). 2009.

⁴ “ L_{1h} ” is the equivalent continuous sound level (L_{eq}) for a one-hour period.

⁵ The 45 dBA and 55 dBA limits noted above are for areas where the background sound level is below 35 dBA L_{1h} nighttime and 45 dBA L_{1h} daytime. If the background sound levels are higher, then the noise standard is higher. However, rather than measuring the existing background sound levels, the Applicant has chosen to accept ‘quiet area’ noise limits of 45 dBA L_{1h} nighttime and 55 dBA L_{1h} daytime.

5. Limits noise from construction and overhaul as a function of duration, ranging from 105 dBA at a duration of 1 hour or less to 87 dBA for a duration of 12 hours (Exhibit 5-1 [Sound Analysis], Appendix B.A.2);
6. Designates a facility with impacts more than 5 dB below any applicable standard as “Minor” (Exhibit 5-1 [Sound Analysis], Appendix B.B.1); and
7. Requires the following submissions for non-minor applications (Exhibit 5-1 [Sound Analysis], Appendix B.B.2).
 - a. Maps and descriptions of the land uses, local zoning and comprehensive plans for the area potentially affected by sounds from the facility;
 - b. A description of major sound sources, including tonal sound sources and sources of SDRS, associated with the construction and O&M of the proposed facility, including their locations within the proposed facility;
 - c. A description of the daytime and nighttime hourly sound levels and, for SDRS, the maximum sound levels expected to be produced by these sound sources at protected locations near the proposed facility;
 - d. A description of the protected locations near the proposed facility;
 - e. A description of proposed major sound control measures, including their locations and expected performance; and
 - f. A comparison of the expected sound levels from the proposed facility with the sound level limits of this regulation.

Under the regulations, the noise impacts of this Project are “minor” as the locations with the highest noise impacts are more than 5 dB below their respective standards as described in more detail in Exhibit 5-1 (Sound Analysis, see Section 3.5 Comparison of Sound to Standards). However, the level of detail in the application is the same as if it were non-minor.

The Town of Caratunk Ordinance requires a 30 dBA limit at any occupied structure and 50 dBA at any property line. There are no occupied structures located in Caratunk near the Project and the highest predicted sound level at the nearest property line in Caratunk are below the respective standard, as described in more detail in Exhibit 5-1 (Sound Analysis, see Section 3.5 Comparison of Sound to Standards).

The applicable State regulations are described in MDEP Site Law Regulations for Control of Noise (ref. 06-096 CMR Chapter 375.10.I, Sound Level Standards for Wind Energy Developments). These standards are similar to the Town of Moscow Ordinance, with the following major exceptions:

1. The standards for protected locations are 55 dBA during daytime (7:00 am to 7:00 pm) and 42 dBA during the nighttime (7:00 pm to 7:00 am) (06-096 CMR Chapter 375.10.I.2);
2. The standard is based on the arithmetic average of 12 consecutive L_{10min} ⁶ measurements under worst case meteorological conditions, with an alternative method if the required meteorological conditions do not occur (06-096 CMR Chapter 375.10.I.4);
3. A 5 dB tonal penalty is applied if the 10-minute L_{eq} is defined as tonal (using the same tonality definition as the Town of Moscow Ordinance) (06-096 CMR Chapter 375.10.I.3);

⁶ “ L_{10min} ” is the equivalent continuous sound level (L_{eq}) for a 10-minute period.

4. A 5 dB SDRS penalty is applied when five SDRS events are found in any 10-minute period (06-096 CMR Chapter 375.10.1.4); and
5. Additional application materials are required as described in 06-096 CMR Chapter 375.10.1.7.

Since the noise thresholds are less than 5 dB apart and the Town of Moscow Ordinance incorporates the various types of noises in the MDEP regulations, only the Town of Moscow Ordinance noise limits will apply to the Project. Nevertheless, the sound report (Exhibit 5-1 [Sound Analysis]) references the applicable MDEP regulations and compares Project impacts to those regulations for information purposes.

Construction of the Project is expected to last approximately one construction season and will require blasting. During this time, noise from construction vehicles and equipment will likely be audible in the local vicinity of the Project. Construction activities will typically take place between 7:00 am and 7:00 pm, Monday through Saturday. No nighttime construction activities or activities on Sundays are planned for this Project, however, the Applicant may, if necessary, extend construction hours throughout the night or on Sundays for certain activities. The Project will comply with the sound level limits for construction activities outlined in the Town of Moscow Ordinance and 06-096 CMR Chapter 375, §10(C) as described in more detail in Exhibit 5-1 (Sound Analysis).

C. Predicted Sound Level

In accordance with the Town of Moscow Ordinance and 06-096 CMR Chapter 375, §10(C) the equivalent noise levels expected to be produced by the sound sources at protected locations located within 1 mi of the proposed Project were modeled. Modelling for the Project was conducted in accordance with the International Organization for Standardization standard 9613-2:1996, "Acoustics-Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation". The model considers source sound power levels, surface reflection and absorption, atmospheric absorption, geometric divergence, meteorological conditions, walls, barriers, berms, and terrain. The acoustical modeling software used was CadnaA, from Datakustik GmbH.

Summaries of the sound propagation model results are presented in Exhibit 5-1 (see Table 3 Modeled Project Sound Levels at Discrete Receivers and Figure 9 Modeled Project Sound Level Isolines). As shown, the highest sound level from the wind turbines at the closest protected location (D12) is 36 dBA. The highest sound level at a nonparticipating property boundary is 56 dBA, just to the east of Turbine 5.

The Substation transformer is the only source of tonal sound for the Project. The Substation is located 1,800 meters (m) from the nearest protected location, and the closest property line (that is not a utility right-of-way) is about 100 m to the east of the transformer. The modeling results for the transformer only are shown in Exhibit 5-1 (Sound Analysis, see Table 5). At a modeled sound level of 10 dBA at the nearest protected location (D12; see Exhibit 5-1, Appendix C Postconstruction Sound Protocol, Figure 10 Compliance Monitoring Location D12), the transformer sound will likely be masked by wind turbine sound, and likely by other background sound, as well. With a 5 dB tonal penalty added to the transformer sound level, the sound level from the transformer at the closest protected location (D12) is 15 dBA, which is well under the Town of Moscow Ordinance and MDEP regulatory noise limits.

A sound compliance monitoring and complaint response protocol for the Project is included in Exhibit 5-1 (Sound Analysis, see Appendix C Postconstruction Sound Protocol, Section C.8 Complaint Response).

Exhibits

- Exhibit 5-1 Sound Analysis

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EXHIBIT 5-1 SOUND ANALYSIS

WESTERN MAINE RENEWABLE ENERGY SOUND ANALYSIS



May 2021

Prepared for Patriot Renewables

 **RSG**
the science of insight

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CONTENTS

INTRODUCTION.....	1
1.0 PROJECT DESCRIPTION	2
2.0 APPLICABLE RULES.....	4
2.1 TOWN OF MOSCOW ORDINANCE	4
2.2 TOWN OF CARATUNK ORDINANCE	5
2.3 STATE REGULATIONS.....	5
2.4 FEDERAL REGULATIONS.....	6
3.0 REQUIRED SUBMISSIONS.....	7
3.1 MAP	7
3.2 DESCRIPTION OF MAJOR SOUND SOURCES.....	9
CONSTRUCTION SOURCES	9
OPERATIONAL SOURCES.....	10
OPERATIONAL SHORT DURATION REPETITIVE SOUNDS	11
MAINTENANCE SOURCES	20
3.3 PROJECT SOUND LEVELS	20
MODELING PROCEDURES.....	20
MODELING RESULTS	22
TONALITY	22
3.4 DESCRIPTION OF MAJOR SOUND CONTROL MEASURES.....	24
3.5 COMPARISON OF SOUND TO STANDARDS.....	24
3.6 COMPLAINT RESPONSE AND COMPLIANCE MONITORING PROTOCOL.....	24
4.0 CONCLUSIONS	25
APPENDIX A. TOWN OF MOSCOW NOISE LIMITS.....	A-1

APPENDIX B. SOUND PROPAGATION MODELING	
ASSUMPTIONS	B-1

APPENDIX C. POSTCONSTRUCTION SOUND PROTOCOL	C-1
C.1 INTRODUCTION	C-1
C.2 TIMING	C-1
C.3 PERSONNEL	C-1
C.4 MONITORING LOCATIONS.....	C-1
C.5 EQUIPMENT	C-2
C.6 DATA COLLECTION	C-3
C.7 REPORTING	C-4
C.8 COMPLAINT RESPONSE.....	C-4

LIST OF FIGURES

FIGURE 1: THE PROJECT AND SURROUNDING AREA.....	3
FIGURE 2: PROJECT AREA MAP	8
FIGURE 3: WIND PROFILE POWER LAW EXPONENT BY TIME OF DAY	13
FIGURE 4: TURBULENCE INTENSITY BY TIME OF DAY.	14
FIGURE 5: TURBULENCE INTENSITY BY WIND SPEED.....	14
FIGURE 6: KERNEL DENSITY PLOT OF SHEAR AND TURBULENCE	16
FIGURE 7: COMPARISON OF SHEAR EXPONENTS BETWEEN THE PROJECT (BLUE) AND SPRUCE MOUNTAIN WIND (ORANGE)	18
FIGURE 8: COMPARISON OF TURBULENCE INTENSITY BETWEEN SPRUCE MOUNTAIN WIND (ORANGE) AND THE PROJECT (BLUE) FOR WINDS GREATER THAN 4 M/S AT HUB HEIGHT.	19
FIGURE 9: MODELED PROJECT SOUND LEVEL ISOLINES.....	23
FIGURE 10: COMPLIANCE MONITORING LOCATION D12	C-2

LIST OF TABLES

TABLE 1: CONSTRUCTION EQUIPMENT SOUND LEVELS	10
TABLE 2: SPRUCE MOUNTAIN WIND YEAR 1 COMPLIANCE MONITORING RESULTS AS ASSESSED USING THE NEW CHAPTER 375 REGULATION	17
TABLE 3: MODELED PROJECT SOUND LEVELS AT DISCRETE RECEIVERS.....	22
TABLE 4: MODELED SUBSTATION-ONLY SOUND LEVELS AT DISCRETE RECEIVERS	22
TABLE 5: SOUND PROPAGATION MODELING ASSUMPTIONS	B-1

INTRODUCTION

The Western Maine Renewable Energy Project (the “Project”) is a proposed wind energy facility to be located in Moscow, Maine. The Project currently includes 14 wind turbines on and around the former Moscow Air Force Station. The Project will be capable of generating up to about 60 MW of AC power.

This study evaluates the sound generated by the project in accordance with applicable Moscow Town ordinances. This report is organized to address each section of the DEP regulations, including:

1. Applicable local, state, and federal noise standards,
2. A map of the relevant project features,
3. A description of major sound sources for construction, operation, and maintenance,
4. A summary of modeled project sound levels
5. A comparison to the modeled sound levels to Town of Moscow noise standards,
6. A description of major sound control measures, and
7. A complaint response and compliance monitoring protocol.

1.0 PROJECT DESCRIPTION

The Western Maine Renewable Energy Project is a proposed ±60 MW wind energy facility to be located in the Town of Moscow, Somerset County, Maine. The project is to be built, in part, on and around the former Moscow Air Force Station.

A map showing the project area and preliminary layout is provided in Figure 1. As shown, the surrounding landscape is largely remote, with two dwellings within a one-mile radius around the Project. These dwellings are on a single property along Stream Road. The closest of these homes is 0.8 miles (1.3 km) from the nearest turbine.

The Project substation will be constructed along an existing powerline right-of-way along Stream Road. The substation will be on land owned by Central Maine Power (CMP). The substation will include a 65 MVA 115 kV-34.5 kV step-up transformer.

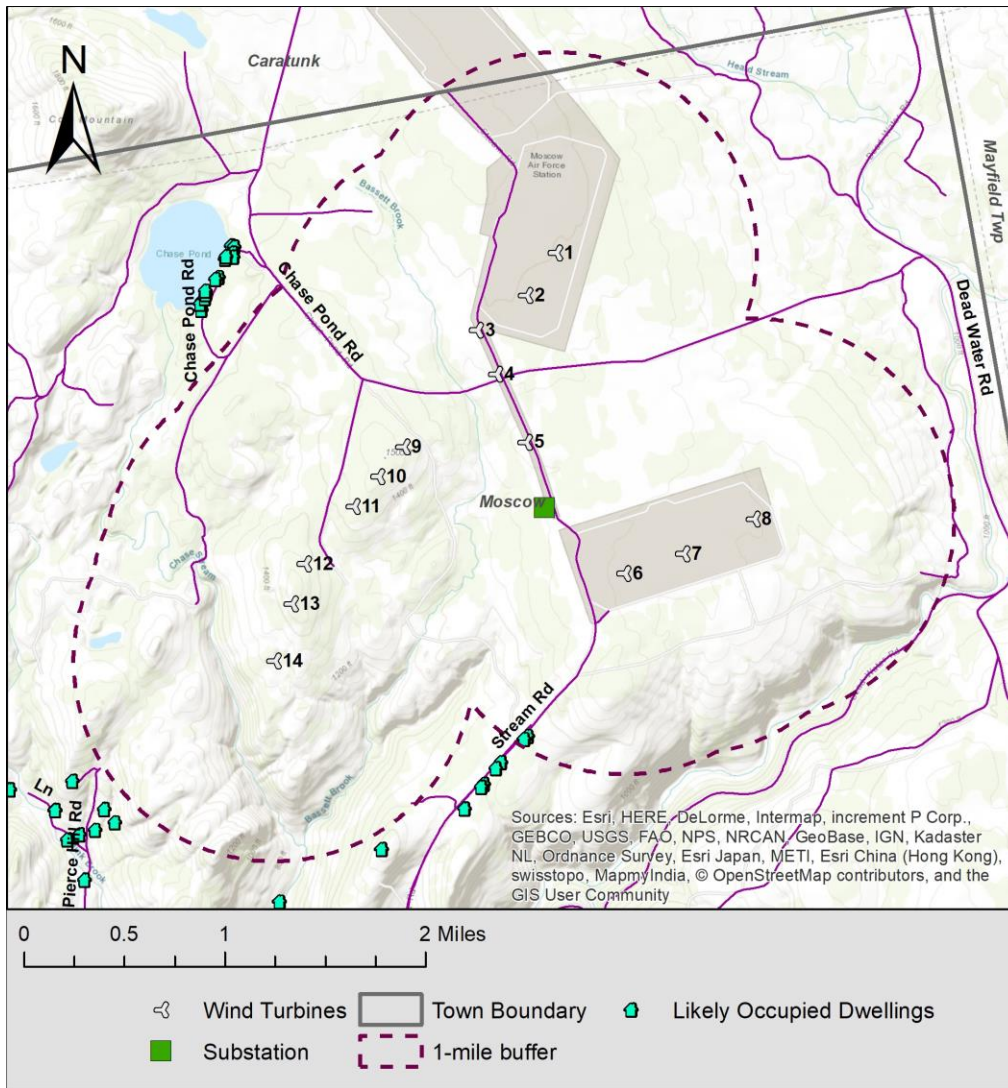


FIGURE 1: THE PROJECT AND SURROUNDING AREA

2.0 APPLICABLE RULES

This report section describes the local, state, and federal noise regulations that apply to this project.

2.1 TOWN OF MOSCOW ORDINANCE

The Town of Moscow adopted a Wind Energy Facility Ordinance on December 2, 2010. This ordinance is shown in Appendix A. This facility is designated as “Type 3” under the Ordinance, which means a wind energy facility having a generating capacity of 100 kW or greater and which requires a state permit issued by DEP under the Site Law regulations. Its noise section is based on the DEP’s Chapter 375 regulations prior to the addition of Chapter 375.10.I in 2012. In summary, the Ordinance:

1. Requires the application to include the sound emission levels from the wind turbines
2. Limits noise from the wind turbine project to 75 dBA L_{1h} at the property line (Appendix B.A.1.a.i), 45 dBA L_{1h} during the night at protected locations, and 55 dBA L_{1h} during the day at protected locations (Appendix B.A.1.a.v).
3. Applies a 5 dB penalty for tonal sound (Appendix B.A.1.d)
4. Applies a 5 dB penalty for short duration repetitive sounds (SDRS) (Appendix B.A.1.e)
5. Limits noise from construction and overhaul as a function of duration, ranging from 105 dBA at a duration of 1 hour or less to 87 dBA for a duration of 12 hours (Appendix B.A.2)
6. Designates a facility with impacts more than 5 dB below any applicable standard as “Minor” (Appendix B.B.1)
7. Requires the following submissions for non-minor applications (Appendix B.B.2)
 - a. Maps and descriptions of the land uses, local zoning and comprehensive plans for the area potentially affected by sounds from the facility.
 - b. A description of major sound sources, including tonal sound sources and sources of short duration repetitive sounds, associated with the construction, operation, and maintenance of the proposed facility, including their locations within the proposed facility.
 - c. A description of the daytime and nighttime hourly sound levels and, for short duration repetitive sounds, the maximum sound levels expected to be produced by these sound sources at Protected Locations near the proposed facility.
 - d. A description of the Protected Locations near the proposed facility.

- e. A description of proposed major sound control measures, including their locations and expected performance.
- f. A comparison of the expected sound levels from the proposed facility with the sound level limits of this regulation.

Under the regulations, the noise impacts of this project are “minor”. That is, the locations with the highest noise impacts are more than 5 dB below their respective standards (see Section 3.5). Nevertheless, this report provides the information required as if the impacts were non-minor.

Note that the 45 dBA and 55 dBA limits noted above are for areas where the background sound level is below 35 dBA L_{1h} nighttime and 45 dBA L_{1h} daytime. If the background sound levels are higher, then the noise standard is higher. However, rather than measuring the existing background sound levels, the Applicant has chosen to accept ‘quiet area’ noise limits of 45 dBA L_{1h} nighttime and 55 dBA L_{1h} daytime.

2.2 TOWN OF CARATUNK ORDINANCE

The one-mile buffer from the wind turbines extends 190 meters (625 feet) into the Town of Caratunk, to the north. That land is largely the continuation of the abandoned Moscow air base and is uninhabited. There are no protected locations within the Caratunk buffer.

Chapter 375.10.B.2 of the Maine DEP regulations allows for the Board to “take into consideration” noise standards from adjacent towns. In this case, the Caratunk noise ordinance for “energy systems”, adopted in July 2020, requires a 30 dBA limit at any occupied structure and 50 dBA at any property line. These limits are 12 dB and 25 dB lower than the Maine DEP regulations, respectively.

2.3 STATE REGULATIONS

The applicable State regulations are described in Maine “Site Law”, DEP Chapter 375.10.I, Sound Level Standards for Wind Energy Developments. These standards are similar to the Moscow ordinance, with the following major exceptions:

1. The standards for protected locations are 55 dBA during daytime (7 am to 7 pm) and 42 dBA during the nighttime (7 pm to 7 am) (Chapter 375.10.I.2)
2. The standard is based on the arithmetic average of 12 consecutive $L_{eq10min}$ measurements under worst case meteorological conditions, with an alternative method if the required meteorological conditions do not occur (Chapter 375.10.I.4).
3. The tonal penalty is applied if the 10-minute L_{eq} is defined as tonal. (Chapter 375.10.I.3)

4. The short-duration repetitive sound penalty is applied when five SDRS events are found in any 10-minute period (Chapter 375.10.I.4).
5. Additional application materials are required as described in Chapter 375.10.I.7

However, under Chapter 375.10.B, DEP is required to apply the local noise ordinance rather than its own under these conditions:

“When a proposed development is located in a municipality which has duly enacted by ordinance an applicable quantifiable noise standard, which (1) contains limits that are not higher than the sound level limits contained in this regulation by more than 5 dBA, and (2) limits or addresses the various types of noises contained in this regulation or all the types of noises generated by the development, that local standard, rather than this regulation, shall be applied by the Department within that municipality for each of the types of sounds the ordinance regulates.”

Since the noise standards are less than 5 dB apart and the Moscow ordinance incorporates the various types of noises in the DEP regulations, only the Moscow noise limits would apply to this project. Nevertheless, the report will reference the current DEP regulations and compare the project impacts to those regulations for information purposes.

2.4 FEDERAL REGULATIONS

There are no federal noise standards that apply to this project.

3.0 REQUIRED SUBMISSIONS

The section of the report details the required submissions. It follows the format of Chapter 375.10.I.7.

3.1 MAP

Chapter 375.10.I.7(a) requires a “depicting the location of all proposed sound sources associated with the wind energy development, property boundaries for the proposed wind energy development, property boundaries of all adjacent properties within one mile of the proposed wind energy development, and the location of all protected locations located within one mile of the proposed wind energy development.” This map is shown in Figure 2.

On the map, those properties the applicant either owns, has otherwise obtained development rights on, or has sound easements for are marked as “participant” and all others are marked as “non-participant.” Copies of the instruments conveying the applicant’s legal land rights are included in Section 2 (Title, Right, or Interest) and Section 27 (Public Safety) of the applicant’s Site Law application.

The only protected location within one mile of the project is the parcel with two homes on Stream Road, nearest to Turbine T6. This property is shown in more detail in Figure 10 of Appendix C.

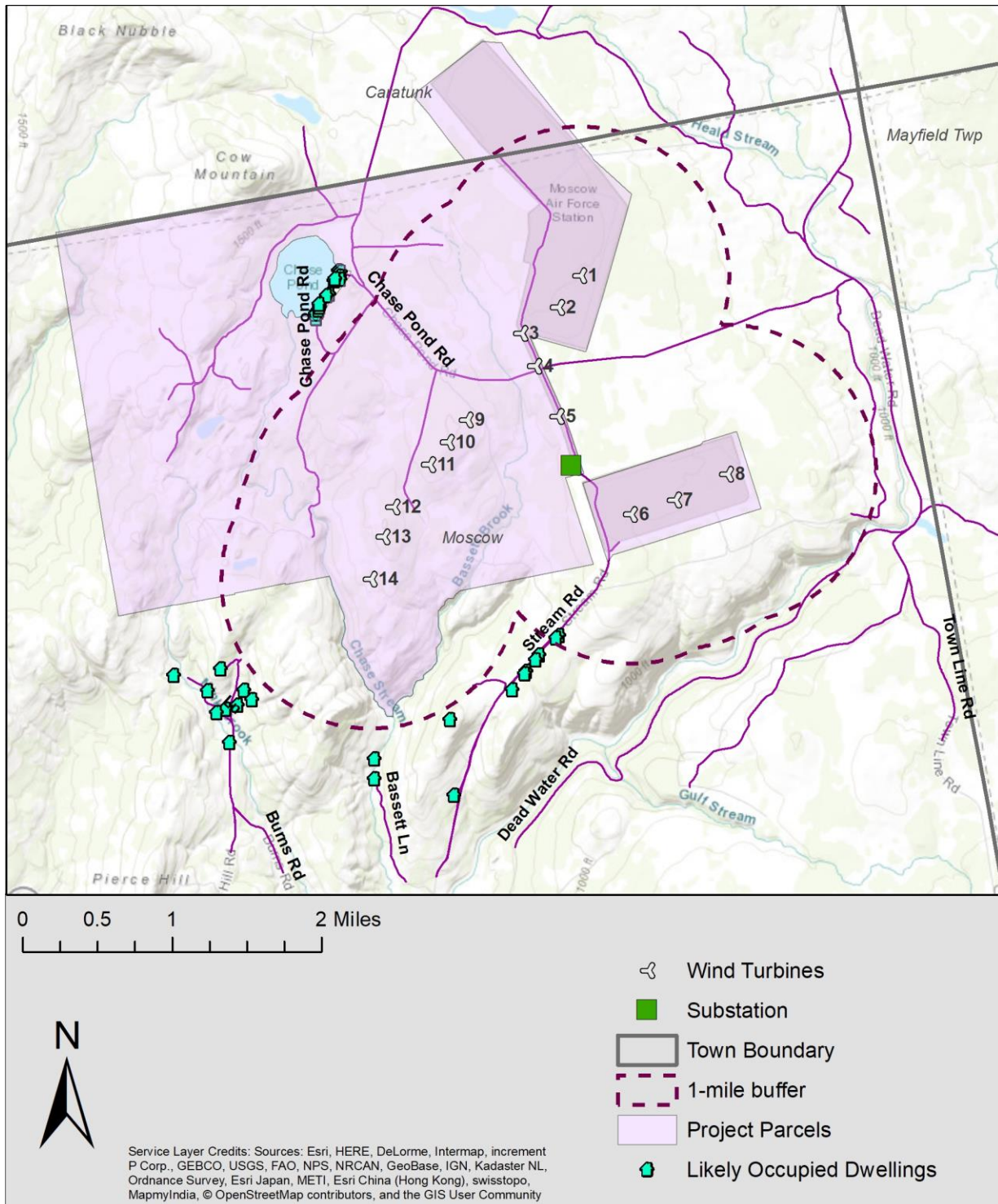


FIGURE 2: PROJECT AREA MAP

3.2 DESCRIPTION OF MAJOR SOUND SOURCES

Chapter 375.10.I.7(b) requires “a description of the major sound sources, including tonal sound sources and sources of short duration repetitive sounds, associated with the construction, operation and maintenance of the proposed wind energy development.”

These are described below.

Construction Sources

Sound Sources

Equipment used for construction will be varied. Sound pressure levels at 50 feet of some of the louder pieces of equipment are shown in Table 1.

Construction of the turbines will take place primarily away from nearby homes, as the closest home is about 4,000 feet from a wind turbine. While there may be activity closer to homes for road construction and utility work, such work will be of a relatively short duration.

Major construction work will occur during the hours as permitted by local laws. In addition, certain work, like tower section and blade erection could also extend into throughout night, depending on conditions.

Construction at each turbine site will take approximately 60 days, not including turbine erection. Due to the setbacks involved and the limited duration of the activities, construction noise should create minimal adverse impacts.

Each turbine location will require deliveries from approximately 40 concrete trucks, 20 gravel trucks, three trucks carrying the blades, four trucks carrying tower sections, and a truck each for each crane. This results in a total of approximately 138 truck trips, for a total of 276 total pass bys at a given location, occurring over a 60-day period.

Blasting may be required during construction. If blasting occurs, the Project is required to meet the sound limits found in Chapter 375.10.C.4.

Construction noise will meet the Town standard at all homes in the study area.

TABLE 1: CONSTRUCTION EQUIPMENT SOUND LEVELS

Equipment	Sound Pressure Level at 50 ft (dBA)
Bulldozer	82
Backhoe	78
Concrete Truck	79
Chipper	96
Dump Truck	77
Flat Bed Truck	74
2250 S3 Lift Crane	80
M250 Auxiliary Crane	76
Excavator	81
Drill Rig Truck	79

Tonal Sound

Construction activities are not expected generate audible tonal sounds, except for vehicle backup alarms. At 4,000 feet away, the backup alarm sound level will be approximately 35 dBA.

Short Duration Repetitive Sounds

Construction activities are not expected to generate short-duration repetitive sounds, except for vehicle backup alarms.

Operational Sources

Sound Sources

The major operational sound sources include 14 Vestas V150 wind turbines using serrated trailing edges as noise control. The 1/3 octave band sound power of the wind turbines are confidential, but can be provided to Maine DEP under an appropriate protective agreement.

In addition to the wind turbines, there will be a Project collector substation near the center of the project that will include a single step-up transformer. The maximum NEMA TR-1 sound rating for this transformer is 78 dBA with ONAF (fans-on) cooling. The rating without fans is 3 dB lower. The NEMA sound levels reflect what would be measured at six feet from operating fans and one foot from other surfaces.

Tonal Sound

The Chapter 375.10(I)(3) Maine DEP regulations define tonal sound for wind turbine as follows:

“For the purposes of this subsection, a tonal sound exists if, at a protected location, the 10 minute equivalent average 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. 5 dBA shall be added to any average 10 minute sound level ($Leq_{A, 10\text{-min}}$) for which a tonal sound occurs that results from routine operation of the wind energy development”

The manufacturer 1/3 octave band sound power spectrum for the V150 is not tonal.

The substation transformer generates tonal sound at 120 Hz and several of its harmonics; although the cooling fans and background sound are likely to mask the tones at protected locations, the closest of which is over one mile away (5,700 ft). A discussion of tonal penalties is found in Section 3.4.

Operational Short Duration Repetitive Sounds

The Chapter 375.10(I)(4) Maine DEP regulations define short duration repetitive sound as:

“... a sequence of repetitive sounds that occur within a 10-minute measurement interval, each clearly discernible as an event resulting from the development and causing an increase in the sound level of 5 dBA or greater on the fast meter response above the sound level observed immediately before and after the event, each typically ± 1 second in duration, and which are inherent to the process or operation of the development.

...

When routine operation of a wind energy development produces short duration repetitive sound, a 5 dBA penalty shall be arithmetically added to each average 10-minute sound level ($Leq_{A, 10\text{-min}}$) measurement interval in which greater than 5 SDRS events are present.”

SDRS in wind turbines is commonly referred to as “amplitude modulation” (AM). There are no models available to predict the level of amplitude modulation at a particular receiver and there are currently no ANSI, IEC, or other standards used to predict short-duration-repetitive-sounds (SDRS) from wind turbines.

However, in the subsections that follow, we focus on the possible causes of amplitude modulation in relation to the specific terrain and meteorological conditions at the Project, the turbine design, and measurements of short duration repetitive sound at Patriot Renewables’ nearby Spruce Mountain Wind project.

Causes of SDRS

Amplitude modulation (AM) is a fluctuation in sound level that occurs at the blade passage frequency. Fluctuations in individual 1/3 octave bands can sometimes synchronize and desynchronize over periods, leading to increases and decreases in magnitude of the A-

weighted fluctuations. Similarly, in wind farms with multiple turbines, fluctuations from individual turbines can synchronize and desynchronize, leading to variations in AM depth.¹ Most amplitude modulation is in the mid frequencies and most overall A-weighted AM is less than 4.5 dB in depth.²

The causes of AM may include: blade passage in front of the tower, blade tip sound emission directivity, wind shear, inflow turbulence, and turbine blade yaw error. It has recently been noted that although wind shear can contribute to the extent of AM, wind shear does not contribute to the existence of AM in and of itself. Instead, there needs to be detachment of airflow from the blades for wind shear to contribute to AM.³ This detachment is enhanced by turbulent airflow over the blade.

While factors like the blade passing in front of the tower are intrinsic to wind turbine design, other factors vary with turbine design, local meteorology, topography, and turbine layout. Mountainous or hilly areas, for example, are more likely to have turbulent airflow, less likely to have high wind shear, and less likely to have turbine layouts that allow for blade passage synchronization for multiple turbines. AM extent varies with the relative location of a receptor to the turbine. AM is usually experienced most when the receptor is between 45 and 60 degrees from the downwind or upwind position and is experienced least directly with the receptor directly upwind or downwind of the turbines. Studies have also shown that AM decreases with distance, most likely due to the flatter angle from the wind turbines to the observer and due to the lower signal to noise ratio (wind turbine sound relative to background sound) at greater distances.

Wind Shear

Wind shear is the change in wind speed with height above the ground. Terrain breaks up the tendency to create stable wind layers which contribute to shear. As a result, in hilly or mountainous locations such as those found around the Project, there tends to be fewer instances of excessive wind shear.

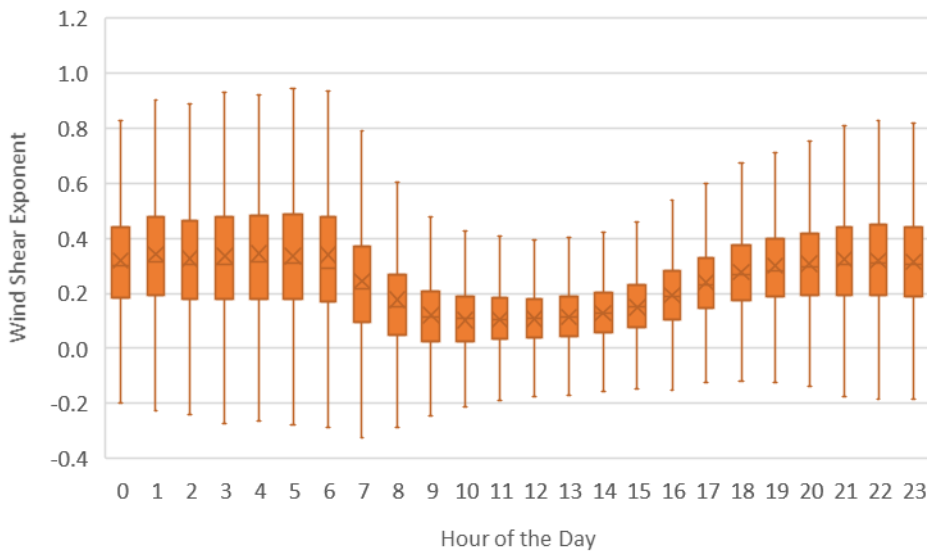
To evaluate whether this area is subject to very high wind shear, we reviewed two years of data from the Project meteorological tower, broken out into 105,264 ten-minute periods. The wind shear data by time of day is summarized in Boxes show *highest quartile of data and “whiskers” are the next highest and lowest quartile*

¹ McCunney, Robert, et al. “Wind Turbines and Health: A Critical Review of the Scientific Literature.” *Journal of Occupational and Environmental Medicine*. 56(11) November 2014: pp. e108-e130.

² RSG, et al., “Massachusetts Study on Wind Turbine Acoustics,” Massachusetts Clean Energy Center and Massachusetts Department of Environmental Protection, 2016

³ “Wind Turbine Amplitude Modulation: Research to Improve Understanding as to its Cause and Effect.” *RenewableUK*. December 2013.

Figure 3. Instances of high wind shear ($\alpha > 0.55$) occur about 9% of the time for all hours. This is higher than the 3.8% at Spruce Mountain Wind, 60 miles to the southwest. This higher value is most likely due to the less mountainous terrain around the Project.



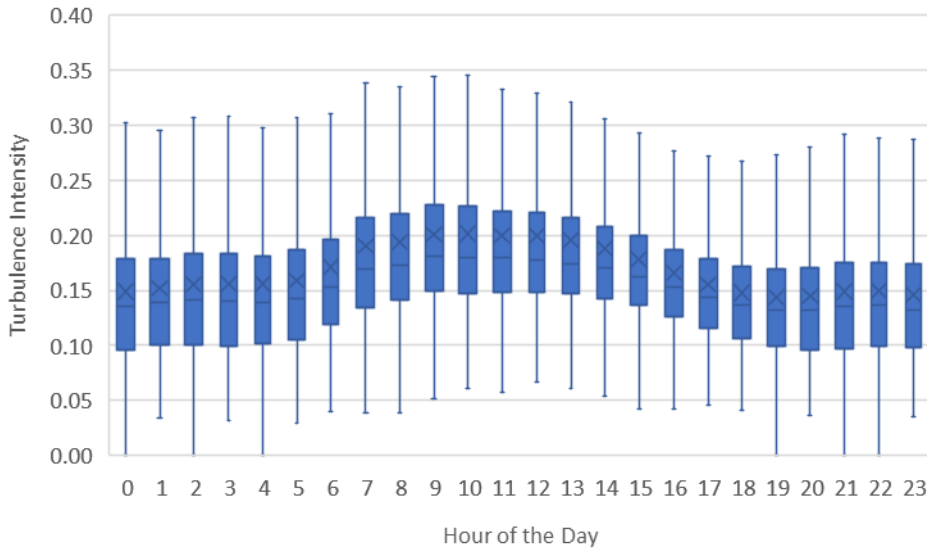
Boxes show highest quartile of data and “whiskers” are the next highest and lowest quartile

FIGURE 3: WIND PROFILE POWER LAW EXPONENT BY TIME OF DAY

Wind Turbulence

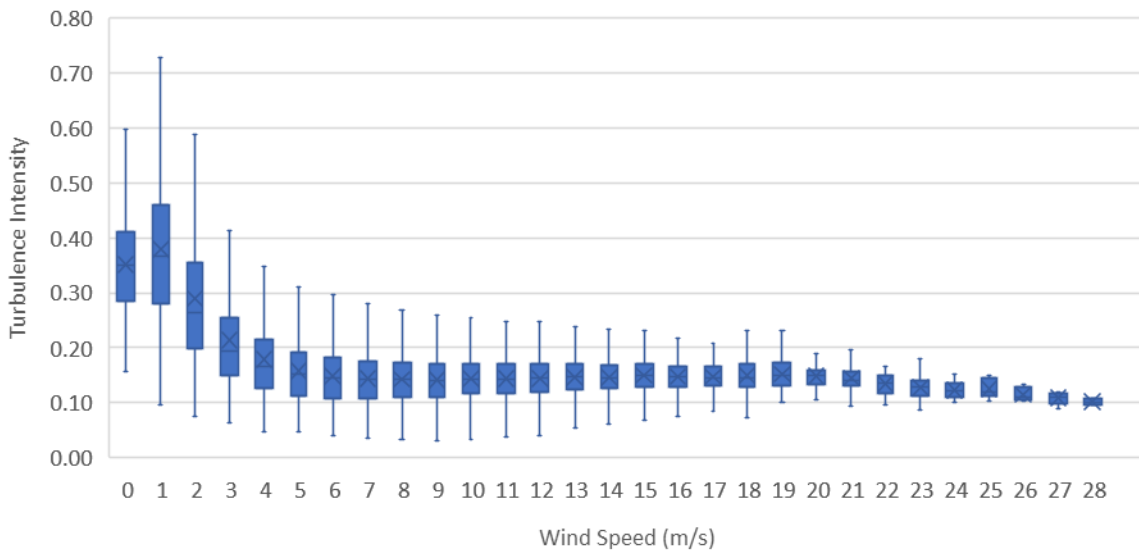
Turbulence in the wind may be naturally occurring, caused by thermal mixing and ground roughness, for example, or it can be caused by the wake from upwind turbines. To evaluate naturally occurring turbulence, we reviewed one year of meteorological data and plotted turbulence intensity for 105,264 10-minute data points. As shown on Figure 4, higher turbulence occurs during the day, due to higher solar radiation. Overall, 86 percent of the data points are below 0.20 turbulence intensity, with most of those periods above this figure occurring during the day. This is better than the 84 percent measured at Spruce Mountain Wind.

Turbulence intensity is highest at the lowest wind speeds, when sound output from the wind turbines is lower. Figure 5 shows turbulence intensity from the Project met tower plotted against wind speed.



Boxes show highest quartile of data and “whiskers” are the next highest and lowest quartile

FIGURE 4: TURBULENCE INTENSITY BY TIME OF DAY.



Boxes show highest quartile of data and “whiskers” are the next highest and lowest quartile

FIGURE 5: TURBULENCE INTENSITY BY WIND SPEED.⁴

⁴ Note that the wind turbines do not generate power below 3 m/s.

While it is not possible to precisely calculate the extent of SDRS at wind projects prior to construction, the analysis shown above indicates that the site characteristics at the Project are not conducive to common occurrences of SDRS.

Inflow turbulence between turbines in a turbine string can also affect noise from the wind farm. Proper turbine siting and operation minimizes this type of turbine wake impact.

Combination of High Turbulence and Wind Shear

As noted above, SDRS is likely caused more by a combination of higher turbulence and higher shear rather than one or the other individually. As such, we evaluated the data to look at the probability of both occurring at the same time. Figure 6 shows a “Kernel Density Plot”, evaluating the probability that two points of shear and turbulence would occur together. As shown, the incidence of higher shear and higher turbulence, shown in the upper right portion of the plot outlined in orange, is relatively low, on the order of 1 percent. Note that these periods are more conducive to SDRS, but there is no current data to suggest the fraction of the time SDRS would occur under these conditions.

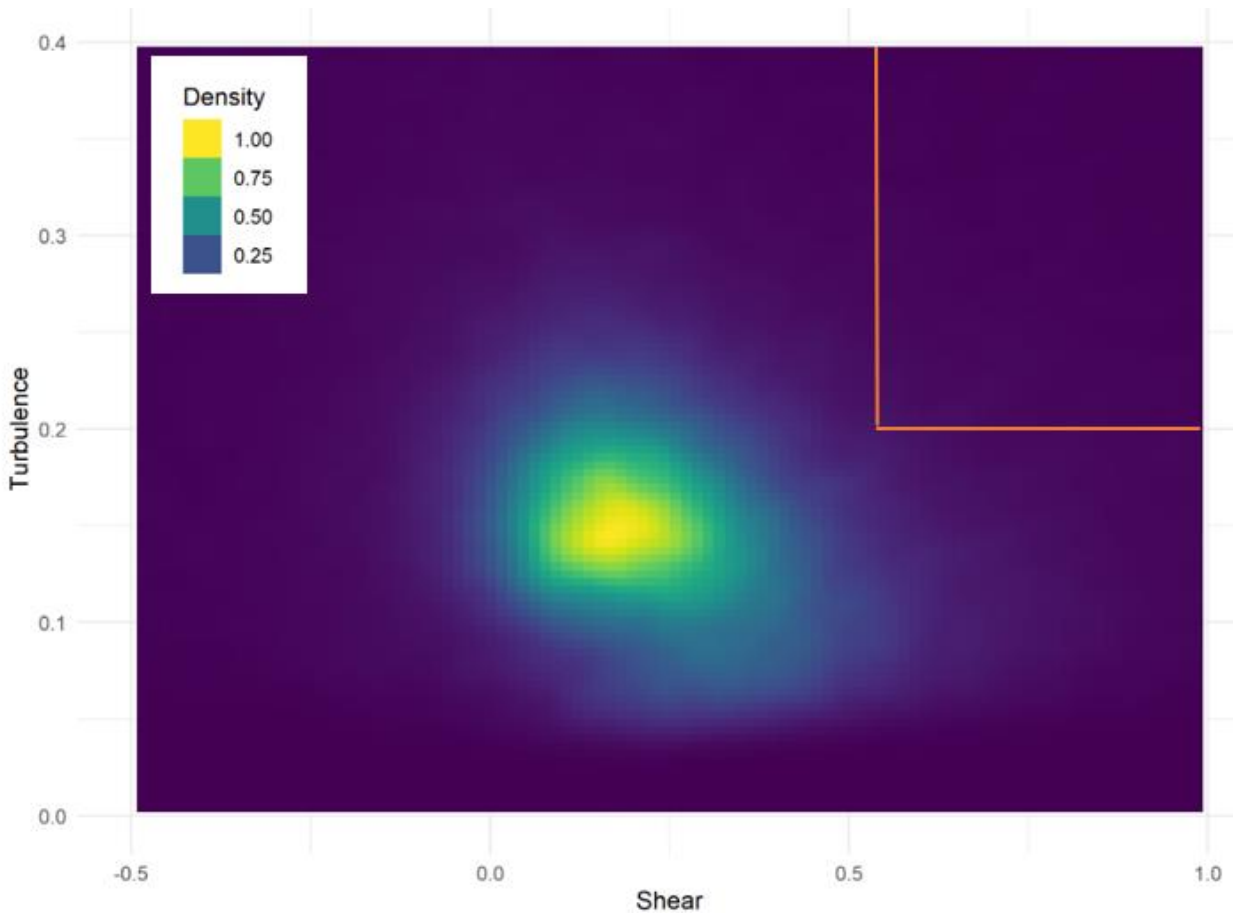


FIGURE 6: KERNEL DENSITY PLOT OF SHEAR AND TURBULENCE

Comparison with Spruce Mountain Wind Field Measurements

In 2012, RSG conducted compliance monitoring at Spruce Mountain Wind, an operating Patriot Renewables wind energy project in Woodstock, Maine.

Results from the first year of compliance monitoring at Spruce Mountain Wind, which took place in late March/early April 2012 are shown in Table 2.

TABLE 2: SPRUCE MOUNTAIN WIND YEAR 1 COMPLIANCE MONITORING RESULTS AS ASSESSED USING THE NEW CHAPTER 375 REGULATION⁵

Date/Time	Unadjusted Leq (dBA)	SDRS Seconds
3/30/2012 22:00	40.9	2
4/2/2012 8:20	40.6	5
4/2/2012 8:30	39.5	3
4/2/2012 8:40	36.9	1
4/2/2012 9:30	37.9	0
4/2/2012 23:20	39.9	1
4/3/2012 1:20	28.1	2
4/3/2012 2:20	29.5	0
4/3/2012 4:40	40.2	1
4/3/2012 6:20	39.1	0
4/3/2012 6:30	39.0	8*
4/3/2012 6:50	39.0	10*
4/3/2012 8:10	41.7	73*

*SDRS caused by birds

The higher levels of SDRS events that are shown during the 6:30, 6:50, and 8:20 am periods on April 3rd were found to be largely due to birds and were part of the morning chorus.

The results show that, generally, SDRS events are not a frequent occurrence at Spruce Mountain Wind, with all periods containing fewer than six events per 10-minute period. Using the current Moscow Town regulations, this would generally result in less than 0.1 dB of penalty for a single 10-minute period. Using the Maine DEP methodology, this would result in no SDRS penalty.

We note that the closest protected location to the Project is farther from the closest turbine than the monitoring location at Spruce Mountain Wind is to the closest turbine at that project. As one moves farther from a wind farm, the modulation of one turbine gets diminished as more turbines contribute to a greater degree to the overall sound level. In addition, as the distance increases, sound levels from the turbines are attenuated and the turbine sound level gets closer to the background sound level. At the Spruce Mountain Wind compliance monitor, the modeled sound level is 47.0 dBA compared to the modeled level at the worst-case nighttime protected location

⁵ Other than the last three periods, tonal minutes were not reviewed to assess whether they were caused by the wind turbine generators (WTGs) or by biogenic activity (birds and insects, in particular) at the time the Spruce Mountain Wind compliance report was released.

at the Project of 36 dBA. Therefore, all else equal, we would expect the instances of SDRS events to be even fewer at the Project monitoring location.

As noted in Section 10.1, SDRS will also be affected by turbulence and wind shear. Figure 7 compares the wind shear by time of day between Spruce Mountain Wind and this Project. The “box and whiskers” have the same meaning as in Figure 5. While Moscow has higher shear, most of the difference is at lower wind speeds when the turbines would be operating at a lower sound output.

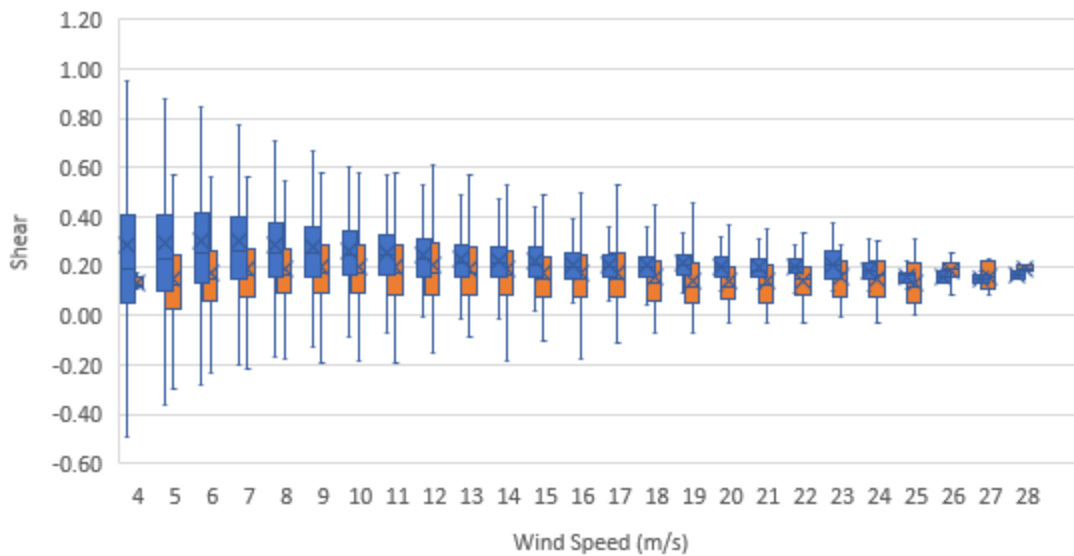


FIGURE 7: COMPARISON OF SHEAR EXPONENTS BETWEEN THE PROJECT (BLUE) AND SPRUCE MOUNTAIN WIND (ORANGE)

A comparison of turbulence between Spruce Mountain Wind and the Project is shown in Figure 8. Like wind shear, the two projects show very similar patterns, both with relatively little turbulence.

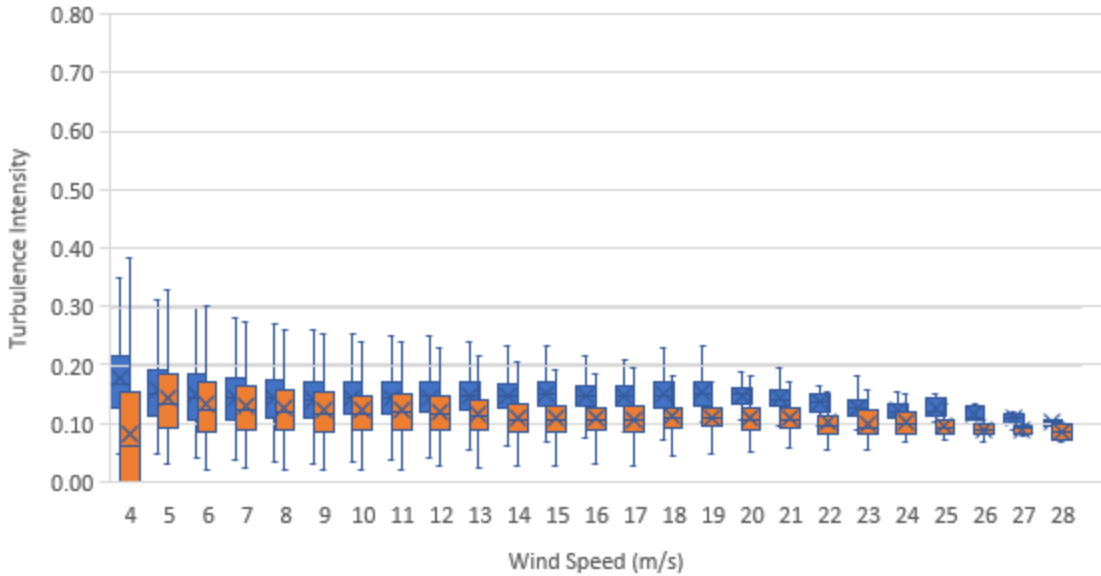


FIGURE 8: COMPARISON OF TURBULENCE INTENSITY BETWEEN SPRUCE MOUNTAIN WIND (ORANGE) AND THE PROJECT (BLUE) FOR WINDS GREATER THAN 4 M/S AT HUB HEIGHT.

Turbine Design Features to Reduce SDRS

The Vestas turbines proposed for this project include a relatively new technology that allows the pitch of each blade to operate independently. In older designs, including the design installed at Spruce Mountain Wind, where the angle of attack of each blade is identical, the blade pitch was optimized only for the wind speed at the hub. Using independent pitch control, each blade can react to changes in wind speed and turbulence intensity, and optimize its angle of attack to specific wind conditions, no matter where it is in the rotor path. Since noise increases with pitch error, we expect that this technology would result in lower occurrences of SDRS compared with other pitch control technologies (stall and common pitch control).

SDRS Penalty

We note that the Chapter 375 definition of SDRS requires that relatively small, temporary, short-term incidences of SDRS can lead to full five-dB SDRS penalties for select 10-minute periods. If SDRS does become an issue that creates violations of the noise standard, the Vestas turbines have the capability of implementing “Noise Reduced Operations”, which lowers the sound power and electric power output of selected turbines during specified periods.

Excessive SDRS is unlikely at the Project. If SDRS does occur, there is currently a 7 dB buffer between the highest modeled sound level and the 45 dBA nighttime standard for this project.

The level of turbine sound amplitude modulation is a dynamic process, dependent on instantaneous turbulence, shear, contribution from other turbines, and relative location of the

listener, among other factors. As a result, computer models that can predict the precise number, duration, and level of short duration repetitive sounds from a wind project in any 10-minute period do not exist. Currently, the best way to estimate the extent to which SDRS may occur is to make comparisons with other similar sites and to evaluate specific site characteristics that contribute to the amplitude modulation. In this case, based on comparisons with the nearby Spruce Mountain Wind project, consideration of the monitored shear and turbulence at the Project met tower, and our expectations of reduced amplitude modulation from independent pitch control turbines proposed to be used, we conclude that SDRS events are not expected to be a frequent occurrence at the Project, under the Moscow or Chapter 375.10 standard. Therefore, we have added no SDRS penalties into the results of our sound propagation modeling for the Project.

The applicant has stipulated that post-construction monitoring data will be collected to evaluate SDRS events.

Maintenance Sources

Sound Sources

Routine maintenance of the Project involves primarily pickup trucks and small vehicles. On occasion, cranes and other heavy equipment may be required to repair blades or lift heavy components.

Tonal Sound

Tonal sound is generally not associated with maintenance activities at the Project, except for occasional vehicle backup alarms.

Short Duration Repetitive Sounds

SDRS is not associated with maintenance activities at the Project except for occasional vehicle backup alarms.

3.3 PROJECT SOUND LEVELS

Chapter 375.10.I.7(c) requires a “description of the equivalent noise levels expected to be produced by the sound sources at protected locations located within one mile of the proposed wind energy development.”

Modeling Procedures

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

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

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

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

Model input parameters are listed in Appendix C including the modeled sound power spectra for each turbine model.

For this analysis, we utilized a ground absorption factor of $G=0.5$, which is appropriate for comparing modeled results to the L_{eq} metric used in the Town and DEP noise standards. The Chapter 375.10.I regulations require modeling of the “predictable worse case”. Normally, this would call for a 2-dB factor added to the turbine apparent sound power level to account for both modeling and sound power uncertainty.⁶ In this case, as the Chapter 375.10.I regulations require the manufacture uncertainty, which is typically 2 dB, plus 0 to 3 dB additional uncertainty added, we use a total of 3 dB for combined uncertainty.

A +3 dB uncertainty is more conservative than that recommended in “Regulating and predicting wind turbine sound in the U.S.”⁷. That paper took into account the actual monitoring results from several operating wind projects, including the Saddleback and Spruce Mountain projects in Maine, to show that $G=0.5 + 2$ dB, or, equivalently, $G=0 + 0$ dB yield conservative results. However, for the modeling of the Project turbines, we add an extra 1 dB uncertainty to be consistent with previous modeling we have done on wind projects in Maine.

Receivers, both discrete and grid, are modeled at a height of 4 meters. This is a conservative approach. All receivers within 1 mile of the Project are included, although the dB isoline maps shown Figure 9 go out to at least 1.5 miles beyond the Project.

⁶ Kaliski, et. al., Regulating and predicting wind turbine sound in the U.S., Inter-Noise 2018.

⁷ *ibid*

Modeling Results

Summaries of the sound propagation model results are presented in Table 3 and Figure 9. As shown, the highest sound level from the wind turbines at any Protected Location is 36 dBA, at the property boundary of the closest home on Stream Road. The highest sound level at a non-participating property boundary is 56 dBA, just to the east of Turbine T5.

TABLE 3: MODELED PROJECT SOUND LEVELS AT DISCRETE RECEIVERS

Receptor	Modeled Sound Level (dBA)	Applicable Limit (dBA)
Home at D12	36	45
Home at D13	35	45
D12 D13 Buffer (Closest Protected Location)	36	45
Closest Property Line (east of T5) *	56	75
Closest Property Line to Substation (at CMP RoW)*	48	75

* These property line locations are not protected locations.

Within the Town of Caratunk to the north, the highest sound level at the town line is 36 dBA. This is below the Caratunk property line standard of 50 dBA and well below the 75 dBA Maine DEP property line limit for undeveloped land. The Project sound level at all homes within the Town of Caratunk are below that town's 30 dBA occupied structures standard.

Tonality

The substation transformer is the only source of tonal sound in the Project. The substation is located 1,800 meters from the nearest residence, and the closest property line is about 100 meters to the east of the transformer. The modeling results for just the transformer are shown in Table 5. At the nearest protected location, the transformer sound will be masked by wind turbine sound, and likely other background, as well. However, even with a 5 dB tonal penalty added to the transformer sound level, it will not create a violation of the applicable DEP noise limits.

TABLE 4: MODELED SUBSTATION-ONLY SOUND LEVELS AT DISCRETE RECEIVERS

Receptor	Modeled Sound Level (dBA)	Plus 5 dB	Applicable limit (dBA)
D12 D13 Buffer (Closest Protected Location)	10	15	45
Closest Property Line to Substation (CMP RoW)*	46	51	75
Closest non-CMP Property Line to Substation*	39	43	75

* These property line locations are not protected locations.

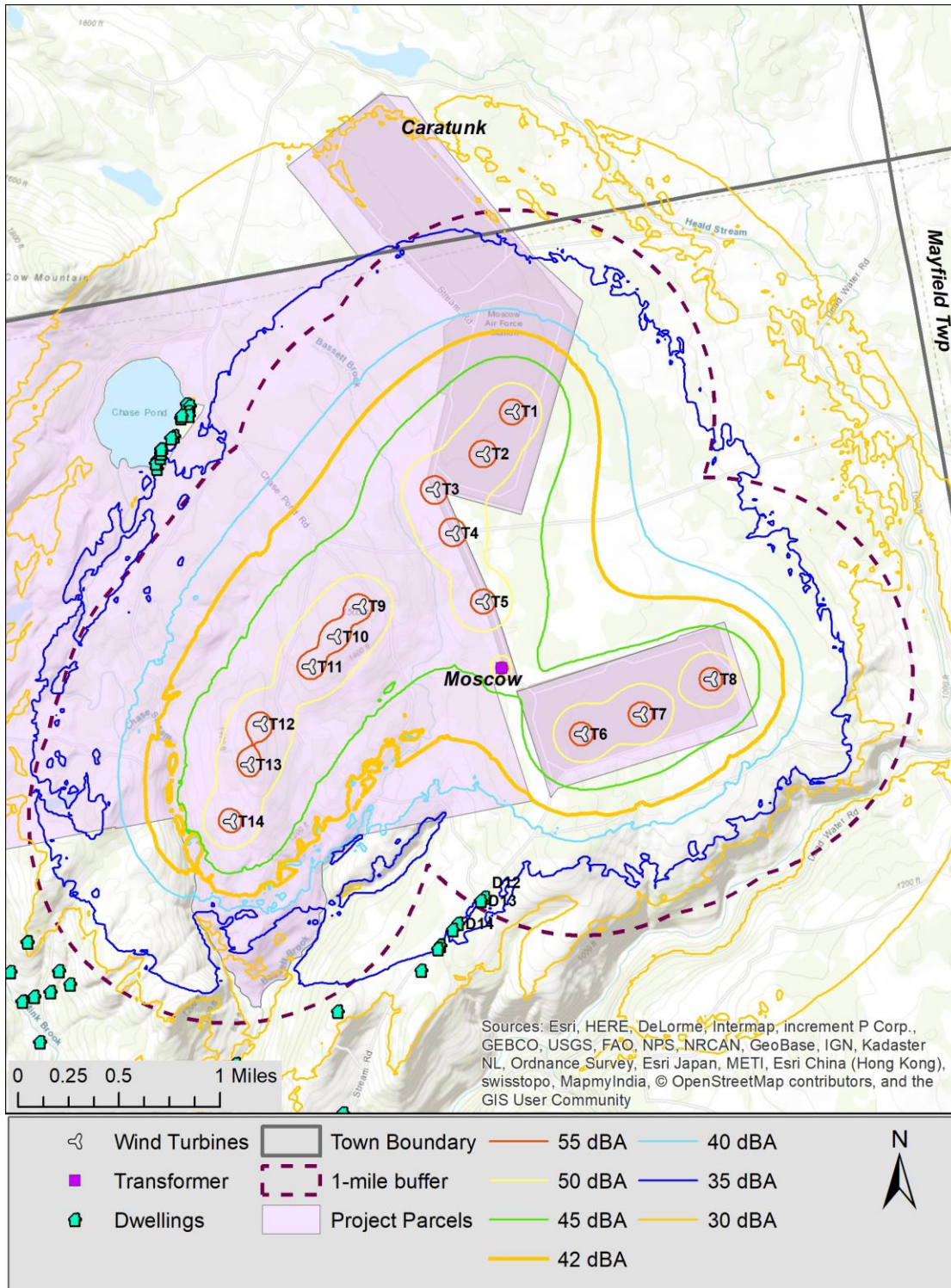


FIGURE 9: MODELED PROJECT SOUND LEVEL ISOLINES

3.4 DESCRIPTION OF MAJOR SOUND CONTROL MEASURES

The V150 wind turbines will be fitted with serrated trailing edges. These reduce the broadband sound emissions from the wind turbines.

Noise reduced operating models (NRO) are available for these wind turbines. However, they will not be implemented in this Project unless the Project is found to exceed applicable noise standards. While NRO reduces sound emissions, they also reduce the power output of the wind turbines, and thus are not used unless needed.

3.5 COMPARISON OF SOUND TO STANDARDS

At a maximum sound level at a protected location of 36 dBA at night and a maximum 56 dBA property line level, with no anticipated tonal or SDRS penalties, the noise limits from the Towns of Moscow and Caratunk, and State regulations are modeled to be met.

3.6 COMPLAINT RESPONSE AND COMPLIANCE MONITORING PROTOCOL

A compliance sound monitoring and complaint response protocol has been prepared for this project in Appendix C.

4.0 CONCLUSIONS

The Western Maine Renewable Energy Project is a proposed ±60 MW wind energy facility to be located in the Town of Moscow, Somerset County, Maine. The project is to be built, in part, on and around the former Moscow Air Force Station.

This study evaluated the expected sound levels from the project and compared them to the Maine Department of Environmental Protection standards in Chapter 375.10.I. for wind turbines and the Town of Moscow noise standards, of which only the latter apply to the Project. While no wind turbines are in the Town of Caratunk, the one-mile buffer of the Project extends into that town. As such, we also evaluate the Project against quantitative sound limits there.

The study found that the highest modeled daytime and nighttime sound levels at a protected location is 36 dBA, compared to a DEP standard of 42 dBA and Town standard of 45 dBA. In addition, the highest property line sound level at a non-participating, non-protected location is modeled at 56 dBA. This is lower than the DEP and Town standards of 75 dBA. Since the Project sound levels are more than 5 dB below all noise standards, it is considered a “minor” noise impact under the Town regulations.

In the Town of Caratunk, the highest modeled sound levels are less than 30 dBA at any home and less than 50 dBA at any property line, thus meeting the quantitative limits of the Town.

The study evaluated the tonality of both the wind turbines and substation equipment. The wind turbine manufacturer specifications show no tonal prominence according to Chapter 375.10.I.3. and Town regulations. The substation transformer will likely generate tonal sound at the source. However, the modeling results show that the transformer sound will be about 10 dBA at the nearest protected location and 46 dBA at the nearest property line. Thus, the tonality will be masked by wind turbine sound and/or background sound at the nearest residence. At the nearest property line, adding a 5 dB tonal penalty will still keep the sound below the 75 dBA noise limit.

An SDRS analysis was completed, using information from the Project meteorological towers. The analysis concludes that while it is not feasible to quantify the number of occurrences of SDRS in advance, the site is not conducive to combined periods of high turbulence and high shear under which SDRS tend to occur. In addition, the nearest protective locations are relatively far from the nearest turbines which reduce the potential for SDRS events. As such, no SDRS penalties are applied to the modeling results.

We conclude that the Project is modeled to meet all applicable noise limits of Maine DEP Chapter 375.10.I and the Towns of Moscow and Caratunk.

APPENDIX A. TOWN OF MOSCOW NOISE LIMITS

Town of Moscow

Wind Energy Facility Ordinance

Adopted December 2, 2010

Wind Energy Facility Ordinance for Moscow, Maine³

Wind Energy Facility Ordinance for Town of Moscow, Maine

- 1.0 Title
- 2.0 Authority
- 3.0 Purpose
- 4.0 Definitions
- 5.0 Applicability
- 6.0 Conflict and Severability
- 7.0 Effective Date
- 8.0 Classification of Wind Energy Facilities
- 9.0 Administration
- 10.0 Application Submission Requirements
- 11.0 Meteorological Towers (MET Towers)
- 12.0 General Standards
- 13.0 Special Standards for Type 1A and 1B Wind Energy Facilities
- 14.0 Special Standards for Type 2 and Type 3 Wind Energy Facilities
- Appendix A: Application Fees
- Appendix B: Type 2 and Type 3 Noise Control Standards
- Appendix C: Type 2 and Type 3 Decommissioning Plan Standard

1.0

Title

This Ordinance shall be known as the Wind Energy Facility Ordinance for Town of Moscow .

2.0

Authority

This Ordinance is adopted pursuant to the enabling provisions of Article VIII, Part 2, Section 1 of the Maine Constitution; the provisions of 30-A M.R.S. § 3001 (Home Rule), and the provisions of the Planning and Land Use Regulation Act, 30-A M.R.S. § 4312, et seq.

3.0

Purpose

The purpose of the Ordinance is to provide for the construction and operation of Wind Energy Facilities in the Town of Moscow , subject to reasonable conditions that will protect the public health, safety, and welfare.

4.0

Definitions

Applicant is the legal entity, including successors and assigns, that files an application under this Ordinance.

Approved Residential Subdivision means a residential subdivision for which all applicable land use permits have been issued, provided that the time for beginning construction under such permits has not expired.

Associated Facilities means elements of a Wind Energy Facility other than its Generating Facilities that are necessary to the proper operation and maintenance of the wind Energy Facility, including but not limited to buildings, access roads, Generator Lead Lines and substations.

DEP Certification means a certification issued by the Department of Environmental

Wind Energy Facility Ordinance for Moscow, Maine³

Protection

pursuant to 35-A M.R.S. § 3456 for a Wind Energy Development.

Generating Facilities means Wind Turbines and electrical lines, not including Generator Lead Lines, that are immediately associated with the Wind Turbines.

Generator Lead Line means a "generator interconnection transmission facility" as defined by 35A M.R.S. § 3132 (1-B).

Historic Area means an Historic Site administered by the Bureau of Parks and Recreation of the Maine Department of Conservation, with the exception of the Arnold Trail.

Historic Site means any site, structure, district or archaeological site which has been officially included on the National Register of Historic Places and/or on the Maine Historic Resource Inventory, or which is established by qualified testimony as being of historic significance

Locally-Designated Passive Recreation Area means any site or area designated by a municipality for passive recreation that is open and maintained for public use and which: a) has fixed boundaries, b) is owned in fee simple by a municipality or is accessible by virtue of public easement, c) is identified and described in a local comprehensive plan and, d) has been identified and designated at least nine months prior to the submission of the Applicant's Wind Energy Facility permit application.

Meteorological Tower (MET Tower) means a Tower used for the measurement and collection of wind data that supports various types of equipment, including but not limited to anemometers, data recorders, and solar power panels. MET Towers may also include wildlife related equipment such as ANABAT detectors, bird diverts and wildlife entanglement protectors.

Municipal Reviewing Authority means the municipal planning board, agency or office, or if none, the municipal officers.

Nacelle means the frame and housing at the top of the Tower that encloses the gearbox and generator.

Non-Participating Landowner means any landowner, other than a Participating Landowner whose land is located within the Town of Moscow.

Occupied Building means a residence, school, hospital, house of worship, public library or other building that is occupied or in use as a primary residence or is customarily frequented by the public at the time when the permit application is submitted.

Participating Landowner means one or more Persons that hold title in fee or a leasehold interest with sublease rights to property on which Generating Facilities or Associated

Wind Energy Facility Ordinance for Moscow, Maine³

Facilities are proposed to be located pursuant to an agreement with the Applicant or an entity that has entered into an appropriate agreement with the Applicant allowing the Applicant to demonstrate the requisite right, title and interest in such property.

Person means an individual, corporation, partnership, firm, organization or other legal entity.

Planned Residence means a Residence for which all applicable building and land use permits have been issued, provided that the time for beginning construction under such permits has not expired.

Protected Location means any location that is:

1) accessible by foot, on a parcel of land owned by a Non-Participating Landowner containing a residence or planned residence, or an approved residential subdivision, house of worship, academic school, college, library, duly licensed hospital or nursing home near the development site at the time an application for a Wind Energy Facility is submitted under this Ordinance;

2) within a State Park, Baxter State Park, a National Park, a nature preserve owned by a land trust, the Maine Audubon Society or the Maine chapter of the Nature Conservancy, the Appalachian Trail, the Moosehorn National wildlife refuge, a federally designated wilderness area, a state wilderness area designated by statute, a municipal park or a 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, or;

3) a hotel, motel, campsite or duly licensed campground that the municipal authority responsible for review and approval of the pending application under 9.1 has designated a Protected Location after making a determination that the health and welfare of the guests or the economic viability of the establishment will be unreasonably impacted by noise in excess of that allowed under section 13.1.3(b).

Residence means 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.

Scenic Resource means either a Scenic Resource of state or national significance, as defined in 35-A M.R.S § 3451(9) or a scenic resource of local significance located within the municipality and identified as such in a comprehensive plan, open space plan or scenic inventory adopted by

Wind Energy Facility Ordinance for Moscow, Maine³
the municipal legislative body.

Shadow Flicker means alternating changes in light intensity caused by the movement of wind Turbine blades casting shadows on the ground or a stationary object.

Short Duration Repetitive Sounds means 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.

Sight Line Representation means a profile drawing showing prominent features, including but not limited to topography, buildings, and trees, along and in relation to a line of sight extending from an observer's eye to the lowest point visible on a proposed Tower.

Significant Wildlife Habitat means a Significant Wildlife Habitat as defined in 38 M.R.S. § 480B 10).

Substantial Start means that construction shall be considered to be substantially commenced when any work beyond excavation, including but not limited to, the pouring of a slab or footings, the installation of piles, the construction of columns, or the placement of a Tower on a foundation has begun.

Tower means the free-standing structure on which a wind measuring or energy conversion system is mounted.

Turbine Height means the distance measured from the surface of the Tower foundation to the highest point of any turbine rotor blade measured at the highest arc of the blade.

Wind Energy Facility means a facility that uses one or more Wind Turbines to convert wind energy to electrical energy. A Wind Energy Facility includes Generating Facilities and Associated Facilities.

Wind Energy Facility, Type 1A means a Wind Energy Facility having a maximum generating capacity of less than 100kw, a maximum of one Wind Turbine and a maximum Turbine Height of 80 feet.

Wind Energy Facility, Type 1B means a Wind Energy Facility having a maximum generating capacity of less than 100kw and either more than one Wind Turbine, or one or more Wind Turbines with a Turbine Height greater than 80 feet.

Wind Energy Facility, Type 2 means a Wind Energy Facility having a maximum generating capacity of 100 kw or greater and which does not require a state permit issued by

Wind Energy Facility Ordinance for Moscow, Maine³

the
Department of Environmental Protection under the Site Location of Development Act,
38 M.R.S.
§481, et seq.

Wind Energy Facility, Type 3 means a Wind Energy Facility having a generating capacity of 100kw or greater and which requires a state permit issued by the Department of Environmental Protection under the Site Location of Development Act, 38 M.R.S. §481, et seq.

Wind Turbine means a system for the conversion of wind energy into electricity which is comprised of a Tower, generator, Nacelle, rotor and transformer.

5.0
Applicability

5.1
This Ordinance applies to any Wind Energy Facility proposed for construction in Town of Moscow after the effective date of this Ordinance. This Ordinance does not apply to Associated Facilities unless the Generating Facilities are located within Town of Moscow, in which case this Ordinance applies to both the Generating Facilities and the Associated Facilities.

5.1
A Wind Energy Facility that is the subject of an application determined to be complete by the Moscow Planning Board prior to the effective date of this Ordinance shall not be required to meet the requirements of this Ordinance; provided that any physical modifications after the effective date of the Ordinance shall be subject to the permitting requirements of Section 9.2.

6.0
Conflict and Severability

6.1
If there is a conflict between provisions in this Ordinance, the more stringent shall apply. If there is a conflict between a provision in this Ordinance and that of another Town of Moscow ordinance, the provision of this Ordinance shall apply.

6.2
The invalidity of any part of this Ordinance shall not invalidate any other part of this ordinance.

7.0
Effective Date

This ordinance becomes effective on _____ .

8.0
Classification of Wind Energy Facilities

All Wind Energy Facilities shall be classified in accordance with Table 1 below:

Table 1: Classification of Wind Energy Facilities and Corresponding Local Review and Approval Authority
Facility Aggregate Turbine Max. # of DEP Site Location Local Review

Type Capacity Height Turbines Permit Required and Approval

1A <100 kw < 80' 1 No Codes
Moscow Planning Board

Wind Energy Facility Ordinance for Moscow, Maine³

1B <100 kw > 80' NA No MOSCOW

Planning Board

2 =100 kw NA NA No 1 MOSCOW

Planning Board

3 = 100 kw NA NA Yes 2 MOSCOW

Planning Board

1 Per 35-A MRS §3456. DEP Certificate required if energy generated is for sale or use by a Person other than the generator.

2 Per 38 MRS §482(2)

9.0

Administration

9.1

Review and Approval Authority

1.

The Moscow Planning Board is authorized to review all applications for Type 1A Wind Energy Facilities and MET Towers pursuant to section 11.0, and may approve, deny or approve such applications with conditions in accordance with the standards of the Ordinance.

2.

The Moscow Planning Board is authorized to review all applications for Type 1B, Type 2, and Type 3 Wind Energy Facilities and may approve, deny or approve such applications with conditions in accordance with this Ordinance.

9.2

Permit Required

1.

No Wind Energy Facility shall be constructed or located within Town of Moscow without a permit issued in accordance with this Ordinance.

2.

Any physical modification to an existing Wind Energy Facility that materially alters the location or increases the area of development on the site or that increases the Turbine Height or the level of sound emissions of any wind Turbine shall require a permit modification under this Ordinance. Like-kind replacements and routine maintenance and repairs shall not require a permit modification.

9.3

Permit Applications

1.

Application components. A Wind Energy Facility permit application shall consist of the application form, application fee, and supporting documents, as described below:

a.

Application Forms. The municipality shall provide the application form which shall be signed by: 1) a Person with right, title and interest in the subject property or;

2) a

Person having written authorization from a Person with right, title and interest in the subject property. The signature shall be dated and the signatory shall certify that the information in the application is complete and correct and that the proposed facility will be constructed and operated in accordance with the standards of this ordinance and all approval and permit conditions, if any.

b.

Application Fees. Application fees shall be assessed and paid upon submission of the application in accordance with Appendix A of this Ordinance.

c.

Supporting Documents. The application shall include all additional documents necessary to satisfy the applicable submission requirements under section 10 of this ordinance.

Wind Energy Facility Ordinance for Moscow, Maine³

2. Application Submission. The Applicant shall submit its application for a Wind Energy Facility permit to the Moscow Planning Board who shall note on the application the date on which it was received.

3. Changes to a Pending Application

a. The Applicant shall promptly notify the municipal entity responsible for review and approval of a pending application under section 9.1 of any changes the Applicant proposes to make to information contained in the application.

b. If changes are proposed to a pending application after a public hearing has been held, the Moscow Planning Board may consider those changes and continue with the review and approval process without a renewed public hearing if it determines that the changes do not materially alter the application. If the Moscow Planning Board determines that the proposed changes do, the Moscow Planning Board shall consider whether the changes involve potential adverse effects different than or in addition to those addressed in the initial application.

9.4 Permit Application Procedures

1. Type 1A Wind Energy Facility Application

a. Within 10 days after receiving an application, the Moscow Planning Board shall notify the Applicant in writing either that the application is complete or, if the application is incomplete, the specific additional material needed to complete the application. The Moscow Planning Board may waive any submission requirement if the Moscow Planning Board issues a written finding that, due to special circumstances of the application, adherence to that requirement is not necessary to determine compliance with the standards of this Ordinance.

b. Within 30 days after determining the application to be complete, the Moscow Planning Board shall issue a written order: 1) denying approval of the proposed Wind Energy Facility, 2) granting approval of the proposed Wind Energy Facility or, 3) granting approval of the proposed Wind Energy Facility with conditions. In making the decision, the Moscow Planning Board shall make findings on whether the proposed Wind Energy Facility meets the applicable criteria described in sections 12 and 13.

c. With the agreement of the applicant, the Moscow Planning Board may extend the procedural time frames of this section.

2. Type 1B, Type 2 and Type 3 Wind Energy Facility Applications

a. The Applicant is strongly encouraged to meet with the Moscow Planning Board before submitting an application. At this pre-application meeting, the Moscow Planning Board will explain the Ordinance's provisions, application forms, and submission requirements. The Applicant should provide photos of the proposed site and written descriptions of the proposed facility and the proposed site, including its location and lot area.

b. An application shall be eligible for consideration at a regularly-scheduled meeting of the Moscow Planning Board only if the applicant submits it at least 14 days prior to the meeting.

c. Within 30 days after receipt of the application by the Moscow Planning Board, the Moscow Planning Board shall notify the Applicant in writing either that the application is complete or, if the application is incomplete, the specific additional material needed to complete the application. The Moscow Planning Board may waive any submission requirement if it issues a written finding that,

Wind Energy Facility Ordinance for Moscow, Maine³

due to special circumstances of the application, adherence to that requirement is not necessary to determine compliance with the standards of this Ordinance.

d. The Moscow Planning Board shall hold a public hearing for a Type 3 Wind Energy Facility application within 60 days after determining that the application is complete. The Moscow Planning Board may decide to hold a public hearing for a Type 1B or a Type 2 Wind Energy Facility application. If it decides to hold a public hearing for a Type 1B application, the Moscow Planning Board shall hold that hearing within 30 days after determining that application is complete. If it decides to hold a public hearing for a Type 2 application, the Moscow Planning Board shall hold that hearing within 60 days after determining that the application is complete.

e. within 60 days after determining that an application for a Type 1B Wind Energy Facility is complete or within 90 days after determining that an application for a Type 2 or Type 3 Wind Energy Facility is complete, the Moscow Planning Board shall issue a written order: 1) denying approval of the proposed wind Energy Facility, 2) granting approval of the proposed wind Energy Facility or, 3) granting approval of the proposed wind Energy Facility with conditions. In making its decision, the Moscow Planning Board shall make findings on whether the proposed wind Energy Facility meets the applicable criteria described in sections 12, 13, and 14.

f. With the agreement of the applicant, the Moscow Planning Board may extend the procedural time frames of this section.

Table 2:
Procedural Time Frames
Facility
Type
Application
Completeness
Public
Hearing
Final
Decision

1A <10 days 1 NA <30 days 2
1B <30 days 1 <30 days 2 <60 days 2
2 <30 days 1 <60 days 2 <90 days 2
3 <30 days 1 <60 days 2 <90 days 2

1 Days after receipt of the application by the Moscow Planning Board and the Codes Enforcement Officer
2 Days after the application is determined to be complete

9.5
Notice of Meetings
Ten days prior to any meeting at which an application for a Type 1B, Type 2, or Type 3 Wind Energy Facility is to be considered, the Moscow Planning Board shall send notice by first class mail, to the applicant and all owners of property abutting the property on which the Wind Energy Facility is proposed to be located. The notice shall state the date, time and place of the meeting and the proposed location and the classification of the proposed Wind Energy Facility.

9.6
Public Hearings

Wind Energy Facility Ordinance for Moscow, Maine³

The Moscow Planning Board shall have notice of the date, time, and place of any public hearing and the proposed location and the classification of the proposed Wind Energy Facility:

1. Published at least once in a newspaper having general circulation within the municipality.
The date of the first publication shall be at least 10 days before the hearing.
2. Mailed by first class mail to the Applicant and to owners of property within 500 feet of the property on which the Wind Energy Facility is proposed to be located, at least 10 days before the public hearing. The Moscow Planning Board shall maintain a list of property owners to whom notice is mailed in the application file. Failure of any of these property owners to receive a notice shall not invalidate the public hearing, nor shall it require the Moscow Planning Board to schedule another hearing.

9.7

Professional Services

In reviewing the application for compliance with this Ordinance, the Moscow Planning Board

may retain professional services, including but not limited to those of an attorney or

consultant, to verify information presented by the Applicant. The attorney or consultant shall

first estimate the reasonable cost of such review and the Applicant shall deposit, with the municipality, the full estimated cost, which the municipality shall place in an escrow account.

The municipality shall pay the attorney or consultant from the escrow account and reimburse the Applicant if funds remain after payment.

9.8

Expiration of Permits

Permits shall expire: 1) two years after the date of approval unless a substantial start on construction has occurred and; 2) three years after the date of approval unless construction

of the Wind Energy Facility has been completed. If a permit for a Type 2 or Type 3 Wind

Energy Facility expires, the Applicant shall implement pertinent provisions of the approved

decommissioning plan. Upon the Applicant's written request, the municipal entity responsible

for review and approval of the application under section 9.1 may extend either or both

expiration time limits by one year.

9.9

Access

The Codes Enforcement Officer shall have access to the site at all times to review the

progress of the work and shall have the authority to review all records and documents directly

related to the design, construction and operation of the facility.

9.10 Enforcement

1.

Wind Energy Facility Ordinance for Moscow, Maine³

It shall be unlawful for any Person to violate or fail to comply with or take any action that is contrary to the terms of the Ordinance, or to violate or fail to comply with any permit issued under the Ordinance, or to cause another to violate or fail to comply or take any action which is contrary to the terms of the Ordinance or any permit under the Ordinance.

2. If the Code Enforcement Officer or other Person charged with enforcement of municipal laws determines that a violation of the Ordinance or the permit has occurred, the Codes Enforcement Officer shall provide written notice to any Person alleged to be in violation of this Ordinance or permit. If the alleged violation does not pose an immediate threat to public health or safety, the Codes Enforcement Officer and the alleged violator shall engage in good faith negotiations to resolve the alleged violation. Such negotiations shall be conducted within thirty (30) days of the notice of violation and, with the consent of the alleged violator, may be extended.

3. If, after thirty (30) days from the date of notice of violation or further period as agreed to by the alleged violator, the Codes Enforcement Officer determines, in the officer's reasonable discretion, that the parties have not resolved the alleged violation, the

Codes Enforcement Officer may institute civil enforcement proceedings or any other remedy at law to ensure compliance with the Ordinance or permit.

9.11

Appeals

Any Person aggrieved by a decision of the Codes Enforcement Officer or the Moscow Planning Board under this Ordinance may appeal the decision to the Board of Appeals.

10.0

Application Submission Requirements

10.1

General Submission Requirements

1. A completed application form including:

- a. The Applicant and Participating Landowner(s)' name(s) and contact information.
- b. The address, tax map number, zone and owner(s) of the proposed facility site and any contiguous parcels owned by Participating Landowners.
- c. The tax map number, zone, current use, owner(s) and addresses of owner(s) of parcels that abut the proposed facility site or abut parcels of Participating Landowners that are contiguous with the proposed facility site (Not required for Type 1A applications)
- d. An affirmation, signed and dated by the Applicant, that the information provided in the application is correct and that the proposed wind Energy Facility, if approved and built, shall be constructed and operated in accordance with the standards of this ordinance and all conditions of approval, if any

2. Receipt showing payment of application fee in accordance with Appendix A.

3. A copy of a deed, easement, purchase option or other comparable documentation demonstrating that the Applicant has right, title or interest in the proposed facility site.

Wind Energy Facility Ordinance for Moscow, Maine³

4. Location map showing the boundaries of the proposed facility site and all contiguous property under total or partial control of the Applicant or Participating Landowner(s) and any Scenic Resource or Historic site within 2500 feet of the proposed development.
5. Description of the proposed Wind Energy Facility that includes the number and aggregate generating capacity of all wind Turbines, the Turbine Height and manufacturer's specifications for each wind Turbine (including but not limited to the make, model, maximum generating capacity, sound emission levels and types of overspeed controls) and a description of Associated Facilities.
6. Site plan showing the proposed location of each wind Turbine and Associated Facilities and any of the following features located within 500 feet of any wind Turbine:
parcel boundaries, required setbacks, topographic contour lines (maximum 20-foot interval), roads, rights-of-way, overhead utility lines, buildings (identified by use), land cover, wetlands, streams, water bodies and areas proposed to be re-graded or cleared of vegetation.
 - a. In addition to the information in 6, above, site plans for Type 1B, Type 2 and Type 3 Wind Energy Facilities shall show the location and average height of tree cover to be retained and the location, variety, planting height and mature height of proposed trees, if any.
7. Written evidence that the Environmental Coordinator of the Maine Department of Inland Fisheries and Wildlife (MDIFW) and that the Maine Natural Areas Program (MNAP) have both been notified of the pending application and the location and Turbine Height of all proposed Wind Turbines.
8. Written evidence that the provider of electrical service to the property has been notified of the intent to connect an electric generator to the electricity grid, if such connection is proposed.
9. Description of emergency and normal shutdown procedures.
10. Photographs of existing conditions at the site.
11. An application for a Type 1A or 1B Wind Energy Facility shall include structural drawings of the Tower foundation and anchoring system: a) prepared by the wind Turbine or Tower manufacturer, b) prepared in accordance with the manufacturer's specifications or, c) prepared and stamped by a Maine-licensed professional engineer.
12. An application for a Type 1A or Type 1B Wind Energy Facility shall include:
 - a. a written statement, signed by the Applicant, that certifies that the proposed facility is designed to meet the applicable noise control standards under section 13.1.3 and acknowledges the Applicant's obligation to take remedial action in accordance with section 13.1.6 if the Codes Enforcement Officer determines those standards are not being met or;

Wind Energy Facility Ordinance for Moscow, Maine³

b. a written request for review under section 14.1 along with information required under Appendix B, subsection B (Submissions).

13. An Application for Type 1B, Type 2 or Type 3 Wind Energy Facility shall include the following site line, photographic and, if applicable, screening information, provided that an Applicant for a Type 3 Wind Energy Facility may provide this information as part of a visual assessment if required pursuant to section 14.5:

a. Sight Line Representations of each wind Turbine from the nearest Occupied Building and from at least one other representative location within 500 feet of the Wind Turbine, such as a Scenic Resource or another Occupied Building. Each Site Line Representation shall be drawn at a scale sufficiently large to make it legible. If screening is proposed, the proposed screening device, such as trees, shrubs or fencing, shall be depicted on the drawing along with the sight line as altered by the screening.

b. A current four-inch by six-inch color photograph of the proposed site of the wind Turbine(s) taken from viewpoints corresponding to each of the Site Line Representations.

c. One copy of each of the photographs described in b, above, onto which is superimposed an accurately-scaled and sited representation of the wind Turbine(s).

14. An application for a Type 2 Wind Energy Facility that generates energy primarily for sale or use by a Person other than the generator, shall include, if issued at the time of application, certification from the Department of Environmental Protection pursuant to 35-A M.R.S. § 3456 that the Wind Energy Facility:

a. will meet the requirements of the noise control rules adopted by the Board of Environmental Protection pursuant to the Site Location of Development Act, 38 M.R.S. §481, et seq. ;

b. will be designed and sited to avoid unreasonable adverse Shadow Flicker effects; and

c. will be constructed with setbacks adequate to protect public safety. If such certification has not been issued at the time of application, the Applicant shall include written evidence that the Applicant has applied for certification.

10.2 Additional Submission Requirements for an Application for a Type 2 and 3 Wind Energy Facility

1. Certificates of design compliance obtained by the equipment manufacturers from Underwriters Laboratories, Det Norske Veritas, or other similar certifying organizations.

2. Decommissioning plan in conformance with Appendix C.

3. Written summary of operation and maintenance procedures for the wind Energy Facility and a maintenance plan for access roads, erosion and sedimentation controls and storm water management facilities.

4.

Wind Energy Facility Ordinance for Moscow, Maine³

standard boundary survey of the subject property stamped by a Maine-licensed surveyor. The Moscow Planning Board may waive this requirement if it determines that the Applicant has provided information sufficient to identify property boundaries to the extent necessary.

5. Visual impact assessment, if required pursuant to section 14.5.

6. Stormwater management plan stamped by a Maine-licensed professional engineer.

7. Sound level analysis, prepared by a qualified engineer, which addresses the standards of section 14.1.

8. Shadow Flicker analysis based on windPro or other modeling software approved by the Department of Environmental Protection.

9. Foundation and anchoring system drawings that are stamped by a Maine-licensed professional engineer.

10. Other relevant studies, reports, certifications and approvals as may be reasonably requested by the Moscow Planning Board to ensure compliance with this Ordinance.

11.0 Meteorological Towers (MET Towers)

Applications for Meteorological (MET) Towers shall be subject to the submission and review standards for a Type 1A Wind Energy Facility, as applicable, except that no height limitation shall apply. A permit for a MET Tower shall be valid for 2 years and 2 months from the date of issuance. The Moscow Planning Board may grant one or more one-year extensions of this permit period. Within 30 days following removal of a MET Tower, the Applicant shall restore the site to its original condition to the extent practicable. The provisions of this section do not apply to permanent MET Towers included as Associated Facilities in approved Wind Energy Facility applications.

12.0 General Standards

12.1 Safety Setbacks

Wind Turbines shall be set back a horizontal distance equivalent to 150% of the Turbine Height from property boundaries, public and private rights-of-way and overhead utility lines that are not part of the proposed Generating Facility except that the entity responsible for review and approval of the application may allow a reduced setback if the Applicant submits, in writing: 1) a waiver of the property boundary setback signed by the pertinent abutting landowner or; 2) evidence, such as operating protocols, safety programs, or recommendations from the manufacturer or a licensed professional engineer with appropriate expertise and experience with Wind Turbines, that demonstrates that the reduced setback proposed by the Applicant is appropriate.

a. WT will be setback 2,500 feet from any property line, scenic location or special resource.

Wind Energy Facility Ordinance for Moscow, Maine³

12.2 Natural Resource Protection

A Wind Energy Facility shall not have an unreasonable adverse effect on rare, threatened, or endangered wildlife, significant wildlife habitat, rare, threatened or endangered plants and rare and exemplary plant communities. In making its determination under this subsection, the municipal entity responsible for review and approval of the permit application under section

9.1 shall consider pertinent application materials and the written comments and/or recommendations, if any, of the Maine Department of Inland Fisheries and Wildlife (MDIFW)

Environmental Coordinator and the Maine Natural Areas Program (MNAP).

12.3 Building Permit

All components of the Wind Energy Facility shall conform to relevant and applicable local and state building codes.

12.4 Overspeed Controls and Brakes

Each wind Turbine shall be equipped with an overspeed control system that: 1) includes both an aerodynamic control such as stall regulation, variable blade pitch, or other similar system, and a mechanical brake that operates in fail safe mode; or 2) has been designed by the manufacturer or a licensed civil engineer and found by the municipal entity responsible for review and approval of the application under 9.1, based on its review of a written description of the design and function of the system, to meet the needs of public safety.

12.5 Electrical Components and Interconnections

All electrical components of the Wind Energy Facility shall conform to relevant and applicable local, state, and national codes.

12.6 Access

All ground-mounted electrical and control equipment and all access doors to a wind Turbine shall be labeled and secured to prevent unauthorized access. A wind Tower shall not be climbable up to a minimum of fifteen (15) feet above ground surface.

12.7 Blade Clearance

The minimum distance between the ground and all blades of a Wind Turbine shall be 25 feet as measured at the lowest arc of the blades.

12.8 Signal Interference

The Applicant shall make reasonable efforts to avoid and mitigate to the extent practicable any disruption or loss of radio, telephone, television, or similar signals caused by the wind Energy Facility.

12.9

Structure Type

With the exception of Meteorological (MET) Towers, Towers shall be monopoles with no guy

Wind Energy Facility Ordinance for Moscow, Maine³

wires. This requirement may be waived if the Applicant demonstrates to the satisfaction of the municipal entity responsible for review and approval of the permit application under section

9.1, that there is no practicable alternative. Bird flight diverters must be installed on any guy wires that are permitted.

12.10

Erosion Control

Erosion of soil and sedimentation shall be minimized by employing "best management practices" in the "Maine Erosion Control Handbook for Construction: Best Management Practices", March 2003.

12.11

Building-Mounted Wind Turbines

Building-mounted Wind Turbines are not permitted.

12.12

Visual Appearance

1.

A Wind Turbine shall be a non-obtrusive color such as white, off-white or gray, or as may otherwise be required by another governmental agency with jurisdiction over the Wind Energy Facility.

2.

A Wind Turbine shall not be lighted artificially, except to the extent consistent with Federal Aviation Administration recommendations or other applicable authority that regulates air safety or as is otherwise required by another governmental agency with

jurisdiction over the Wind Energy Facility.

3.

A Wind Turbine shall not be used to support signs and shall not display advertising except for reasonable and incidental identification of the turbine manufacturer, facility owner and operator, and for warnings.

12.13

Visibility of Wind Turbine

The following requirements apply, to the extent practicable, to Type 1B and Type 2 Wind Energy Facilities:

1.

To the extent that doing so does not inhibit adequate access to the wind resource, each wind Turbine shall be located to maximize the effectiveness of existing vegetation, structures and topographic features in screening views of the Wind Turbine

from Occupied Buildings and Scenic Resources.

2.

When existing features do not screen views of a Wind Turbine from Residences and Scenic Resources, screening may be required, where feasible and effective, through the planting of trees and/or shrubs. In order to maximize the screening effect and minimize wind turbulence near the Wind Turbine, plantings should be situated as near

as possible to the point from which the Wind Turbine is being viewed. Such plantings should be of native varieties.

13.0

Special standards for Type 1A and Type 1B Wind Energy Facilities

13.1 Noise emanating from a Type 1A or Type 1B Wind Energy Facility shall be controlled in

Wind Energy Facility Ordinance for Moscow, Maine³

accordance with the provisions of this section or, upon the written request of the applicant, the provisions of section 14.1. If the Applicant chooses review under section 14.1, the provisions of 13.1.1, 13.1.2 and 13.1.6 shall apply, but the provisions of 13.1.3, 13.1.4 and 13.1.5 shall not apply.

1. The sound level limits contained in this section apply only to areas that are defined as Protected Locations and to property boundaries that describe the outer limits of the facility site in combination with any parcel(s) owned by a Participating Land-Owner that are contiguous with the facility site .

2. The sound level limits contained in this section do not apply to the facility site or any parcel(s) owned by a Participating Land-Owner that are contiguous with the facility site.

3. The sound levels resulting from routine operation of a Wind Energy Facility, as measured in accordance with the procedures described in section 13.1.5 shall not exceed the limits specified for the following locations and times:

a. At a Protected Location with no living and sleeping quarters:
55 dBA during the Protected Location's regular hours of operation

b. At a Protected Location with living and sleeping quarters:
1. Area(s) within 500 feet of living and sleeping quarters:
45 dBA between 7:00 p.m. and 7:00 a.m.

55 dBA between 7:00 a.m. and 7:00 p.m.

2. Area(s) more than 500 feet from living and sleeping quarters:
55dBA at all times.

c. At property boundaries that describe the outer limits of the facility site combined with any parcel(s) owned by a Participating Land-Owner that are contiguous with the facility site:

75 dBA at all times.

If the Applicant submits the certification and acknowledgement required by section 10.1.12(1), the municipal entity responsible for review and approval of the application under Section 9.1 shall determine, for purposes of issuing its approval, that the pertinent sound-level limits under section 13.1.1 have been met, subject to the Applicant's obligation to take remedial action as necessary under section 13.1.4.

The Codes Enforcement Office may perform measurements of sound levels resulting from routine operation of an installed Type 1A or Type 1B Wind Energy Facility at the officer's own initiative or in response to a noise-related complaint to determine compliance with the pertinent standards in section 13.1.1. Such measurements shall be performed as follows:

a. Measurements shall be obtained during representative weather conditions when the sound of the Wind Energy Facility is most clearly noticeable. Preferable weather conditions for sound measurements at distances greater than about 500

Wind Energy Facility Ordinance for Moscow, Maine³

feet from the sound source include overcast days when the measurement location is downwind of the wind turbine and inversion periods (which most commonly occur at night).

b. Sound levels shall be measured at least four (4) feet above the ground by a meter set on the A-weighted response scale, fast response. The meter shall meet the latest version of American National Standards Institute (ANSI S1.4.) "American Standard Specification for General Purpose Sound Level Meters" and shall have been calibrated at a recognized laboratory within the past year.

c. 5 dBA shall be added to sound levels of any Short Duration Repetitive Sound measured in accordance with paragraphs a and b. The Applicant shall operate the proposed wind energy facility in conformance with the sound level limits of section 13.1 or section 14.1, as applicable. If, based on post-installation measurements taken in accordance with section 13.1.3 or section 14.1, as applicable, the Codes Enforcement Officer determines that the applicable sound-level

limits are not being met, the Applicant shall, at the Applicant's expense and in accordance with the Moscow Wind Energy Facility Ordinance and in consultation with the Codes Enforcement Officer, take remedial action deemed necessary by the Codes Enforcement Officer to ensure compliance with those limits. Remedial action that the Codes Enforcement Officer may require, includes, but shall not be limited to, one or more of the following:

a. modification or limitation of operations during certain hours or wind conditions;
b. maintenance, repair, modification or replacement of equipment

c. relocation of the wind turbine(s); and,
d.

removal of the wind turbine(s) provided that the Codes Enforcement Officer may require removal of the wind turbine(s) only if the Codes Enforcement Officer determines that there is no practicable alternative.

13.2

Discontinued Use

1. A Type 1A or Type 1B Wind Energy Facility that is not generating electricity for twelve (12) consecutive months shall be deemed a discontinued use and shall be removed from the property by the Applicant within 120 days of receipt of notice from the Codes Enforcement Officer, unless the Applicant provides information that the Moscow Planning Board deems sufficient to demonstrate that the project has not been discontinued and should not be removed. If the wind energy facility is not removed within this time period, the municipality may remove the turbine at the Applicant's expense. The Applicant shall pay all site reclamation costs deemed necessary and reasonable to return the site to its pre-construction condition, including the removal of roads and reestablishment of vegetation.

2. If a surety has been given to the municipality for removal of a Type 1B Wind Energy Facility, the Applicant may apply to the Moscow Planning Board for release of the surety when the wind energy facility has been removed to the satisfaction of the Codes Enforcement Officer.

14.0

Wind Energy Facility Ordinance for Moscow, Maine³

Special Standards for Type 2 and Type 3 Wind Energy Facilities

14.1

Control of Noise

Noise emanating from a Type 2 Wind Energy Facility, a Type 3 Wind Energy Facility, or, upon written request of the Applicant pursuant to section 13.1, a Type 1A or Type 1B Wind Energy Facility shall be controlled in accordance with the provisions of Appendix B

If there is a conflict between a provision of Appendix B and another provision of this ordinance, the provision of Appendix B shall apply.

14.2

Use of Public Roads

1.

The Applicant shall identify all state and local public roads to be used within Town of

Moscow to transport equipment and parts for construction, operation or maintenance of a Type 2 or Type 3 Wind Energy Facility.

2.

The Town Engineer, Road Commissioner or a qualified third-party engineer reasonably acceptable to both the Moscow Planning Board and the Applicant and paid for by the Applicant pursuant to Section 9.7 of the Ordinance, shall document

road conditions prior to construction. The Town Engineer, Road Commissioner or third-party engineer shall document road conditions again thirty (30) days after construction is complete or as weather permits.

3.

The Applicant shall demonstrate, to the satisfaction of the Moscow Planning Board, that it has financial resources sufficient to comply with subsection 4, below, and the Moscow Planning Board may require the Applicant to post a bond or other security in order to ensure such compliance.

4.

Any road damage caused by the Applicant or its contractors shall be promptly repaired

at the Applicant's expense.

14.3

Warnings

A clearly visible warning sign concerning voltage must be placed at the base of all pad-mounted transformers and substations.

14.4

Artificial Habitat

To the extent practicable, the creation of artificial habitat for raptors or raptor prey shall be minimized. In making its determination under this subsection the Moscow Planning Board

shall consider comments and recommendations, if any, provided by the Maine Department of Inland Fisheries and Wildlife.

14.5

Effect on Scenic Resources

1.

Except as otherwise provided in this subsection, if a Type 2 or Type 3 Wind Energy Facility is proposed for location in or is visible from a Scenic Resource, the Applicant

shall provide the Moscow Planning Board a visual impact assessment that addresses the evaluation criteria in subsection 14.5.3. There is a rebuttable presumption that a visual impact assessment is not required for those portions of a Type 2 or Type 3 Wind Energy Facility that are located more than 3 miles, measured

Wind Energy Facility Ordinance for Moscow, Maine³
horizontally, from a Scenic Resource. The Moscow Planning Board may require a visual impact assessment for portions of the Type 2 or Type 3 Wind Energy Facility located more than 3 miles and up to 8 miles from a Scenic Resource if it finds that a visual impact assessment is needed to determine if there is the potential for significant adverse effects on the Scenic Resource. Information intended to rebut the presumption must be submitted to the Moscow Planning Board by any interested Person within 30 days of acceptance of the application as complete. The Moscow Planning Board shall determine if the presumption is rebutted based on a preponderance of evidence in the record.

2. The Moscow Planning Board shall determine, based on consideration of the evaluation criteria in subsection 14.5.3, whether the Type 2 or 3 Wind Energy Facility significantly compromises views from a Scenic Resource such that the proposed facility has an unreasonable adverse effect on the scenic character or existing uses related to scenic character of that Scenic Resource.

In making its determination pursuant to subsection 14.5.2, and in determining whether an Applicant for a Type 2 or 3 Wind Energy Facility located more than 3 miles from a Scenic Resource must provide a visual impact assessment in accordance with subsection 14.5.1, the Moscow Planning Board shall consider:

- a. The significance of the potentially affected Scenic Resource;
- b. The existing character of the surrounding area;
- c. The expectations of the typical viewer;
- d. The Type 2 or Type 3 Wind Energy Facility's purpose and the context of the proposed activity;
- e. The extent, nature and duration of potentially affected public uses of the Scenic Resource and the potential effect on the public's continued use and enjoyment of the Scenic Resource; and
- f. The scope and scale of the potential effect of views of the Wind Energy Facility on the Scenic Resource, including but not limited to issues related to the number and extent of Wind Turbines visible from the Scenic Resource, the distance from the Scenic Resource and the effect of prominent features of the Wind Energy Facility on the landscape.

A finding by the Moscow Planning Board that the Type 2 or Type 3 Wind Energy Facility is a highly visible feature in the landscape is not a solely sufficient basis for determination that it has an unreasonable adverse effect on the scenic character and existing uses related to scenic character of a Scenic Resource. In making its determination under subsection 14.5.2, the Moscow Planning Board shall consider insignificant the effects of portions of a Type 2 or Type 3 Wind Energy Facility located more than 8 miles, measured horizontally, from a Scenic Resource.

14.6

Shadow Flicker

Type 2 and Type 3 Wind Energy Facilities shall be designed to avoid unreasonable adverse shadow flicker effect at any Occupied Building located on a Non-Participating Landowner's property.

Wind Energy Facility Ordinance for Moscow, Maine³

14.7

Relationship to DEP Certification and Permitting

1.

For a Type 2 Wind Energy Facility for which a DEP Certification has been submitted in accordance with section 10.1.14, the Moscow Planning Board shall consider, to the extent applicable, pertinent findings in that certification when making its determination under sections 12.1, 14.1, and 14.6. There is a rebuttable presumption

that a Wind Energy Facility that has obtained DEP Certification meets the requirements of sections 12.1, 14.1, and 14.6. The Moscow Planning Board may, as a condition of approval of a Type 2 Wind Energy Facility that generates energy for sale or use by a person other than the generator, deem DEP's issuance of a certificate for the development sufficient to meet, in whole or in part, as applicable, the requirements of sections 12.1, 14.1, 14.6.

2.

If DEP has issued a Site Location of Development Act permit for a Type 3 Wind Energy Facility pursuant to 38 M.R.S. § 484(3), there is a rebuttable presumption that the development meets the requirements of sections 12.1, 12.2, 14.1, 14.6, 14.12 and,

as it pertains to Scenic Resources of state or national significance as defined by 35-A

M.R.S. §3451(9), section 14.5. The Moscow Planning Board may, as a condition of approval of a Type 3 Wind Energy Facility, deem DEP's issuance of a permit for the development sufficient to meet, in whole or in part, as applicable, the requirements of sections 12.1, 12.2, 14.1, 14.6, 14.12 and, as it pertains to Scenic

Resources of state or national significance, section 14.5.

14.8

Local Emergency Services

1.

The Applicant shall provide a copy of the project summary and site plan to local emergency service providers, including paid or volunteer fire department(s).

2.

Upon request, the Applicant shall cooperate with emergency service providers to develop and coordinate implementation of an emergency response plan for a Type 2 or Type 3 Wind Energy Facility.

3.

A Wind Turbine shall be equipped with an appropriate fire suppression system to address fires within the Nacelle portion of the turbine or shall otherwise address the issue of fire safety to the satisfaction of the Moscow Planning Board.

14.9

Liability Insurance

The Applicant or an Applicant's designee acceptable to the Moscow Planning Board shall maintain a current general liability policy for the Type 2 or Type 3 Wind Energy Facility that covers bodily injury and property damage with limits in an amount commensurate with the scope and scale of the Facility. The Applicant or its designee shall make certificates of insurance available to the Moscow Planning Board upon request.

14.10

Design Safety Certification

Each Wind Turbine shall conform to applicable industry standards including those of the American National Standards Institute (ANSI) and at least one of the following:

Wind Energy Facility Ordinance for Moscow, Maine³

Underwriters
Laboratories, Det Norske Veritas, Germanischer Lloyd Wind Energies, or other
similar
certifying organization.

14.11 Public Inquiries and Complaints

1.
The Applicant or its designee shall maintain a phone number and identify a responsible Person for the public to contact with inquiries and complaints throughout the life of the Wind Energy Facility.

2.
The Applicant or its designee shall make reasonable efforts to respond to the public's inquiries and complaints and shall provide written copies of all complaints and the company's resolution or response to the Codes Enforcement upon request.

14.12 Decommissioning

The Applicant shall prepare a decommissioning plan in conformance with Appendix C.

APPENDIX

A
Application Fees
1. Preliminary Cost Agreement. At the time an Application for a WEF Site Permit is filed with the Town of Moscow, the Applicant shall execute for the benefit of the Town an agreement to pay and provide adequate surety guaranteeing payment of the cost of the investigation, review and processing of the Application, including without limitation by way of enumeration, legal, engineering, acoustical, planning, environmental, and staff administrative costs as provided in this Ordinance. The agreement shall provide for the establishment of an escrow account and cash deposit to be provided by the Applicant in an amount deemed sufficient by the Planning Board to begin review under this Ordinance. The Town may use the funds in the escrow account in connection with the application review as all owed by this Ordinance. In the event that the cash deposit in escrow is insufficient to complete the review, the Town shall notify the Applicant that additional funds are necessary and of the amount reasonably believed necessary to complete the review, and the Applicant shall provide the additional funds. The Planning Board shall not begin processing, or in the case of where additional funds are requested, shall not continue processing, the Application until the preliminary cost agreement is approved and signed and until the required surety, or additional surety, and/or funds are provided to the Town.

2. The application fee for a Site Permit shall consist of a base application fee of \$2,500.00, plus \$100.00 for every WT included in the project.

3. The application fee for an Operational License is \$1,000.00.

4. The annual fee for an Operational License is \$250.00.

APPENDIX

B
Control of Noise

Wind Energy Facility Ordinance for Moscow, Maine³

Pursuant to section 14.1, noise emanating from a Type 2 Wind Energy Facility, a Type 3 Wind Energy Facility, or, upon written request of the Applicant pursuant to section 13.1, a Type 1A or Type 1B Wind Energy Facility, shall be controlled in accordance with the following provisions:

A. Sound Level Limits

(1)

Sound from Routine Operation of Facility.

(a) Except as noted in subsections (b) and (c) below, the hourly sound levels resulting from routine operation of the facility and measured in accordance with the measurement procedures described

in subsection F shall not exceed the following limits:

(i)

At any property line of the facility site or contiguous property owned by the Applicant or Participating Land Owner(s), whichever is farther from the proposed facility's regulated sound sources:

75 dBA at any time of day.

(ii)

At any Protected Location in an area for which the zoning, or, if unzoned, the existing use or use contemplated under a comprehensive plan, is not predominantly commercial, transportation, or industrial;

60 dBA between 7:00 a.m. and 7:00 p.m.

(the "daytime hourly limit"), and

50 dBA between 7:00 p.m. and 7:00 a.m.

(the "nighttime hourly limit")

(iii) At any Protected Location in an area for which the zoning, or, if unzoned, the existing use or use contemplated under a comprehensive plan, is predominantly commercial, transportation, or industrial:

70 dBA between 7:00 a.m. and 7:00 p.m.

(the "daytime hourly limit"), and

60 dBA between 7:00 p.m. and 7:00 a.m.

(the "nighttime hourly limit")

(iv) For the purpose of determining whether the use of an unzoned area is predominantly

commercial, transportation, or industrial (e.g. non-residential in nature), the Codes

Enforcement Officer shall consider the municipality's comprehensive plan, if any.

Furthermore, the usage of properties abutting each Protected Location shall be determined, and the limits

applied for that Protected Location shall be based upon the usage occurring along the greater

portion of the perimeter of that parcel; in the event the portions of the perimeter are equal in

usage, the limits applied for that Protected Location shall be those for a Protected Location in

Wind Energy Facility Ordinance for Moscow, Maine³

an area for which the use is not predominantly commercial, transportation, or industrial.

(v)

When a proposed facility is to be located in an area where the daytime pre-development ambient hourly sound level at a Protected Location is equal to or less than 45 dBA and/or the nighttime pre-development ambient hourly sound level at a Protected Location is equal to or less than 35 dBA, the hourly sound levels resulting from routine operation of the facility and measured in accordance with the measurement procedures described in subsection F shall not exceed the following limits at that Protected Location:
55 dBA between 7:00 a.m. and 7:00 p.m.
(the "daytime hourly limit"), and
45 dBA between 7:00 p.m. and 7:00 a.m.
(the "nighttime hourly limit")

For the purpose of determining whether a Protected Location has a daytime or nighttime pre-development ambient hourly sound level equal to or less than 45 dBA or 35 dBA, respectively, the Applicant may make sound level measurements in accordance with the procedures in subsection F or may estimate the sound-level based upon the population density and proximity to local highways. If the resident population within a circle of 3,000 feet radius around a Protected Location is greater than 300 persons, or the hourly sound level from highway traffic at a Protected Location is predicted to be greater than 45 dBA in the daytime or 35 dBA at night, then the Applicant may estimate the daytime or nighttime pre-development ambient hourly sound level to be greater than 45 dBA or 35 dBA, respectively.

NOTE: Highway traffic noise can be predicted using the nomograph method of FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108, December, 1978.

(vi) Notwithstanding the above, the Applicant need not measure or estimate the pre-development ambient hourly sound levels at a Protected Location if he demonstrates, by estimate or example, that the hourly sound levels resulting from routine operation of the facility will not exceed 50 dBA in the daytime or 40 dBA at night.

(b) If the Applicant chooses to demonstrate by measurement that the daytime and/or nighttime pre-development ambient sound environment at any Protected Location near the facility site exceeds the daytime and/or nighttime limits in subsection 1(a)(ii) or 1(a)(iii) by at least 5 dBA, then the daytime and/or nighttime limits shall be 5 dBA less than the measured daytime and/or nighttime pre-development ambient hourly sound level at the location of the measurement for the corresponding time period.

(c)

For any Protected Location near an existing facility, the hourly sound level limit

Wind Energy Facility Ordinance for Moscow, Maine³

for routine operation of the existing facility and all future expansions of that facility shall be the applicable hourly sound level limit of 1(a) or 1(b) above, or, at the Applicant's election, the existing hourly sound level from routine operation of the existing facility plus 3 dBA.

(d) For the purposes of determining compliance with the above sound level limits, 5 dBA shall be added to the observed levels of any tonal sounds that result from routine operation of the facility.

(e) When routine operation of a facility produces short duration repetitive sound, the following limits shall apply:

(i) For short duration repetitive sounds, 5 dBA shall be added to the observed levels of the short duration repetitive sounds that result from routine operation of the facility for the purposes of determining compliance with the above sound level limits.

(ii) For short duration repetitive sounds which the municipal entity responsible for review and approval of a pending application under section 9.1 determines, due to their character and/or duration, are particularly annoying or pose a threat to the health and welfare of nearby neighbors, 5 dBA shall be added to the observed levels of the short duration repetitive sounds that result from routine operation of the facility for the purposes of determining compliance with the above sound level limits, and the maximum sound level of the short duration repetitive sounds shall not exceed the following limits:

(a) At any Protected Location in an area for which the zoning, or, if unzoned, the existing use or use contemplated under a comprehensive plan, is not predominantly commercial, transportation, or industrial:
65 dBA between 7:00 a.m. and 7:00 p.m., and
55 dBA between 7:00 p.m. and 7:00 a.m.

(b) At any Protected Location in an area for which the zoning, or, if unzoned, the existing use or use contemplated under a comprehensive plan, is predominantly commercial, transportation, or industrial:
75 dBA between 7:00 a.m. and 7:00 p.m., and
65 dBA between 7:00 p.m. and 7:00 a.m.

(c) The methodology described in subsection 1(a)(iv) shall be used to determine whether the use of an unzoned area is predominantly commercial, transportation, or industrial.

(d) If the Applicant chooses to demonstrate by measurement that the pre-development ambient hourly sound level at any Protected Location near the facility site exceeds 60 dBA between 7:00 a.m. and 7:00 p.m., and/or 50 dBA between 7:00 p.m. and 7:00 a.m., then

the maximum sound level limit for short duration repetitive sound shall be 5 dBA greater than the measured pre-development ambient hourly sound level at the location of the measurement for the corresponding time period.

Wind Energy Facility Ordinance for Moscow, Maine³

(e) For any Protected Location near an existing facility, the maximum sound level limit for short duration repetitive sound resulting from routine operation of the existing facility and all future expansions and modifications of that facility shall be the applicable maximum sound level limit of (e)(ii)(a) or (e)(ii)(b) above, or, at the Applicant's election, the existing maximum sound level of the short duration repetitive sound resulting from routine operation of the existing facility plus 3 dBA.
NOTE: The maximum sound level of the short duration repetitive sound shall be measured using the fast response [LAF_{max}]. See the definition of maximum sound level.

(2)

Sound from Construction of a Facility

(a) The sound from construction activities between 7:00 p.m. and 7:00 a.m. is subject to the following limits:

(i)

Sound from nighttime construction activities shall be subject to the nighttime routine operation sound level limits contained in subsections 1(a) and 1(b).

(ii)

If construction activities are conducted concurrently with routine operation of the facility, then the combined total of construction and routine operation sound shall be subject to the nighttime routine operation sound level limits contained in subsections 1(a) and 1(b).

(iii) Higher levels of nighttime construction sound are permitted when a duly issued permit authorizing nighttime construction sound in excess of these limits has been granted by the Codes Enforcement Officer.

(b) Sound from construction activities between 7:00 a.m. and 7:00 p.m. shall not exceed the following limits at any Protected Location:

Duration of Activity Hourly Sound Level Limit

12 hours	87 dBA
8 hours	90 dBA
6 hours	92 dBA
4 hours	95 dBA
3 hours	97 dBA
2 hours	100 dBA
1 hour or less	105 dBA

(c)

All equipment used in construction on the facility site shall comply with applicable federal noise regulations and shall include environmental noise control devices in proper working condition, as originally provided with the equipment by its manufacturer.

(3)

Sound from Maintenance Activities

(a) Sound from routine, ongoing maintenance activities shall be considered part of the routine operation of the facility and the combined total of the routine maintenance and operation sound

Wind Energy Facility Ordinance for Moscow, Maine³

shall be subject to the routine operation sound level limits contained in subsection 1.

(b) Sound from occasional, major, scheduled overhaul activities shall be subject to the construction sound level limits contained in subsection 2. If overhaul activities are conducted concurrently with routine operation and/or construction activities, the combined total of the overhaul, routine operation and construction sound shall be subject to the construction sound level limits contained in subsection 2.

B.
Submissions

(1)

Facilities with Minor Sound Impact.

An Applicant proposing facility with minor sound impact may choose to file, as part of the permit application, a statement attesting to the minor nature of the anticipated sound impact of their facility.

An applicant proposing an expansion or modification of an existing facility with minor sound impact may follow the same procedure as described above. For the purpose of this ordinance, a facility or an expansion or modification of an existing facility with minor sound impact means a facility where the

Applicant demonstrates, by estimate or example, that the regulated sound from routine operation of the facility will not exceed 5 dBA less than the applicable limits established under Section A. It is the intent of this subsection that an applicant need not conduct sound level measurements to demonstrate that the facility or an expansion or modification of an existing facility will have a minor sound impact.

(2)

Other Facilities

Technical information shall be submitted describing the Applicant's plan and intent to make adequate provision for the control of noise. The applicant's plan shall contain information such as the following, when appropriate:

(a) Maps and descriptions of the land uses, local zoning and comprehensive plans for the area potentially affected by sounds from the facility.

(b) A description of major sound sources, including tonal sound sources and sources of short duration repetitive sounds, associated with the construction, operation and maintenance of the proposed facility, including their locations within the proposed facility.

(c)

A description of the daytime and nighttime hourly sound levels and, for short duration repetitive sounds, the maximum sound levels expected to be produced by these sound sources at Protected Locations near the proposed facility.

(d)

A description of the Protected Locations near the proposed facility.

(e) A description of proposed major sound control measures, including their locations and expected

Wind Energy Facility Ordinance for Moscow, Maine³

performance.

(f)

A comparison of the expected sound levels from the proposed facility with the sound level limits of this regulation.

C.
Terms and Conditions
The municipal entity responsible for review and approval of the pending application under 9.1 may, as a term or condition of approval, establish any reasonable requirement to ensure that the Applicant has made adequate provision for the control of noise from the facility and to reduce the impact of noise on Protected Locations. Such conditions may include, but are not limited to, enclosing equipment or operations, imposing limits on hours of operation, or requiring the employment of specific design technologies, site design, modes of operation, or traffic patterns.

The sound level limits prescribed in this ordinance shall not preclude the municipal entity responsible for review and approval of the pending application under 9.1 from requiring an Applicant to demonstrate that sound levels from a facility will not unreasonably disturb wildlife or adversely affect wildlife populations in accordance with 12.2. In addition, the sound level limits shall not preclude the municipal entity responsible for review and approval of the pending application under 9.1, as a term or condition of approval, from requiring that lower sound level limits be met to ensure that the Applicant has made adequate provision for the protection of wildlife.

D. Waiver from Sound Level Limits

Town of Moscow recognizes that there are certain facilities or activities associated with facilities for which noise control measures are not reasonably available. Therefore, the municipal entity responsible for review and approval of the pending application under section 9.1 may grant a waiver from any of the sound level limits contained in this ordinance upon (1) a showing by the Applicant that he or she has made a comprehensive assessment of the available technologies for the facility and that the sound level limits cannot practicably be met with any of these available technologies, and (2) a finding by the municipal entity responsible for review and approval of the pending application under section 9.1 that the proposed facility will not have an unreasonable impact on Protected Locations. In addition, a waiver may be granted by the municipal entity responsible for review and approval of the pending application under section 9.1 if (1) a facility is deemed necessary in the interest of national defense or public safety and the Applicant has shown that the sound level limits cannot practicably be met without unduly limiting the facility's intended function, and (2) a finding is made by the municipal entity responsible for review and approval of the pending application under section 9.1 that the proposed facility will not have an unreasonable impact on Protected Locations. The municipal entity responsible for review and approval of the pending application under section 9.1 shall consider the request for a waiver as

Wind Energy Facility Ordinance for Moscow, Maine³

part of the review of a completed permit application. In granting a waiver, the municipal entity responsible for review and approval of the pending application under section 9.1 may, as a condition of approval, impose terms and conditions to ensure that no unreasonable sound impacts will occur.

E. Definitions

Terms used herein are defined below for the purpose of this noise regulation.

(1) AMBIENT SOUND: At a specified time, the all-encompassing sound associated with a given environment, being usually a composite of sounds from many sources at many directions, near and far, including the specific facility of interest.

(2) CONSTRUCTION: Activity and operations associated with the facility or expansion of the facility or its site.

(3) EMERGENCY: An unforeseen combination of circumstances which calls for immediate action.

(4) EMERGENCY MAINTENANCE AND REPAIRS: Work done in response to an emergency.

(5) ENERGY SUM OF A SERIES OF LEVELS: Ten times the logarithm of the arithmetic sum of the antilogarithms of one-tenth of the levels. [Note: See Section F(4.2).]

(6) EXISTING FACILITY: A Wind Energy Facility legally constructed before the effective date of this ordinance or a proposed Wind Energy Facility for which the Application is found complete on or before the effective date of this ordinance. Any facility with an approved permit application which has been remanded to the municipal entity responsible for review and approval of the application under 9.1 by a court of competent jurisdiction for further proceedings relating to noise limits or noise levels prior to the effective date of this ordinance shall not be deemed an existing facility and the ordinance shall apply to the existing noise sources at that facility.

(7) EXISTING HOURLY SOUND LEVEL: The hourly sound level resulting from routine operation of an existing facility prior to the first expansion that is subject to this ordinance.

(8) EQUIVALENT SOUND LEVEL: The level of the mean-square A-weighted sound pressure during a stated time period, or equivalently the level of the sound exposure during a stated time period divided by the duration of the period. (NOTE: For convenience, a one hour equivalent sound level should begin approximately on the hour.)

(9) HISTORIC AREAS: Historic sites administered by the Bureau of Parks and Lands of the Maine Department of Conservation, with the exception of the Arnold Trail.

(10) HOURLY SOUND LEVEL: The equivalent sound level for one hour measured or computed in accordance with this ordinance.

(11) LOCALLY-DESIGNATED PASSIVE RECREATION AREA: Any site or area designated by Moscow for passive recreation that is open and maintained for public use and which:

- (a) has fixed boundaries,
- (b) is owned in fee simple by Moscow or is accessible by virtue of public easement,
- (c) is identified and described in Moscow comprehensive plan, and
- (d) has been identified and designated at least nine months prior to submission of

Wind Energy Facility Ordinance for Moscow, Maine³

the Applicant's Wind Energy Facility permit application.

(12) MAXIMUM SOUND LEVEL: Ten times the common logarithm of the square of the ratio of the maximum sound to the reference sound of 20 micropascals. Symbol: LAFmax.

(13) MAXIMUM SOUND: Largest A-weighted and fast exponential-time-weighted sound during a specified time interval. Unit: pascal (Pa).

(14) RESIDENCE: 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.

(15) PRE-DEVELOPMENT AMBIENT: The ambient sound at a specified location in the vicinity of a facility site prior to the construction and operation of the proposed facility or expansion.

(16) PROTECTED LOCATION: any location that is:

1) accessible by foot, on a parcel of land owned by a Non-Participating Landowner containing a Residence or planned Residence, or an approved residential subdivision, house of worship, academic school, college, library, duly licensed hospital or nursing home near the facility site at the time an application for a Wind Energy Facility permit is submitted under this ordinance; or

2) within a State Park, Baxter State Park, a National Park, a nature preserve owned by a land trust, the Maine Audubon Society or the Maine chapter of the Nature Conservancy, the Appalachian Trail, the Moosehorn National wildlife refuge, a federally designated wilderness area, a state wilderness area designated by statute, a municipal park or a 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.

Transient living accommodations are generally not considered Protected Locations; however, in certain special situations where it is determined by the municipal entity responsible for review and approval of the application under 9.1 that the health and welfare of the guests or the economic

Wind Energy Facility Ordinance for Moscow, Maine³

viability of the establishment will be unreasonably impacted, the municipal entity responsible for review and approval of the application under 9.1 may designate certain hotels, motels, campsites and duly licensed campgrounds as protected locations.

(This term does not include buildings and structures located on leased camp lots, owned by the Applicant used for seasonal purposes.)

For purposes of this definition, (1) a Residence is considered planned when the owner of the parcel of land on which the Residence is to be located has received all applicable building and land use permits and the time for beginning construction under such permits has not expired, and (2) a residential subdivision is considered approved when the developer has received all applicable land use permits for the subdivision and the time for beginning construction under such permits has not expired.

(17)ROUTINE OPERATION: Regular and recurrent operation of regulated sound sources associated with the purpose of the facility and operating on the facility site.

(18)SHORT DURATION REPETITIVE SOUNDS: 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 facility and are foreseeable.

(19)SOUND COMPONENT: The measurable sound from an audibly identifiable source or group of sources.

(20)SOUND LEVEL: Ten times the common logarithm of the square of the ratio of the frequency-weighted and time-exponentially averaged sound pressure to the reference sound of 20 micropascals. For the purpose of this ordinance, sound level measurements are obtained using the A-weighted frequency response and fast dynamic response of the measuring system, unless otherwise noted.

(22)SOUND PRESSURE: Root-mean-square of the instantaneous sound pressures in a stated frequency band and during a specified time interval. Unit: pascal (Pa).

(23)SOUND PRESSURE LEVEL: Ten times the common logarithm of the square of the ratio of the sound pressure to the reference sound pressure of 20 micropascals.

(24)TONAL SOUND: for the purpose of this ordinance, 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.

Wind Energy Facility Ordinance for Moscow, Maine³

Additional acoustical terms used in work associated with this ordinance shall be used in accordance with the following American National Standards Institute (ANSI) standards:

ANSI S12.9-1988 -American National Standard Quantities and Procedures for Description and Measurements of Environmental Sound, Part 1;

ANSI S3.20-1973 -American National Standard Psychoacoustical Terminology;

ANSI S1.1-1960 -American National Standard Acoustical Terminology.

F.
Measurement Procedures
(1) Scope. These procedures specify measurement criteria and methodology for use, with applications, compliance testing and enforcement. They provide methods for measuring the ambient sound and the sound from routine operation of the facility, and define the information to be reported. The same methods shall be used for measuring the sound of construction and maintenance activities.

(2)
Measurement Criteria
2.1 Measurement Personnel
Measurements shall be supervised by personnel who are well qualified by training and experience in measurement and evaluation of environmental sound, or by personnel trained to operate under a specific measurement plan approved by the municipal entity responsible for review and approval of the pending application under 9.1.

2.2 Measurement Instrumentation
(a) A sound level meter or alternative sound level measurement system used shall meet all of the Type 1 or 2 performance requirements of American National Standard Specifications for Sound Level Meters, ANSI S1.4-1983.
(b) An integrating sound level meter (or measurement system) shall also meet the Type 1 or 2 performance requirements for integrating/averaging in the International Electrotechnical Commission Standard on Integrating-Averaging Sound Level Meters, IEC Publication 804 (1985).

(c)
A filter for determining the existence of tonal sounds shall meet all the requirements of American National Standard Specification for Octave-Band and Fractional Octave-Band Analog and Digital Filters, ANSI S1.11-1986 for Order 3, Type 3-D performance.
(d) An acoustical calibrator shall be used of a type recommended by the manufacturer of the sound level meter and that meets the requirements of American National Standard Specification for Acoustical Calibrators, ANSI S1.40-1984.

(e) A microphone windscreen shall be used of a type recommended by the manufacturer of the sound level meter.

2.3 Calibration
(a) The sound level meter shall have been calibrated by a laboratory within 12 months of the measurement, and the microphone's response shall be traceable to the National Bureau of Standards.

Wind Energy Facility Ordinance for Moscow, Maine³

(b) Field calibrations shall be recorded before and after each measurement period and at shorter intervals if recommended by the manufacturer.

2.4 Measurement Location, Configuration and Environment

(a) Except as noted in subsection (b) below, measurement locations shall be at nearby Protected Locations that are most likely affected by the sound from routine operation of the facility.

(b) For determining compliance with the 75 dBA property line hourly sound level limit described in subsection A(1)(a)(i), measurement locations shall be selected at the property lines of the proposed facility or contiguous property owned by the Applicant, as appropriate.

(c) The microphone shall be positioned at a height of approximately 4 to 5 feet above the ground, and oriented in accordance with the manufacturer's recommendations.

(d) Measurement locations should be selected so that no vertical reflective surface exceeding the microphone height is located within 30 feet. When this is not possible, the measurement location may be closer than 30 feet to the reflective surface, but under no circumstances shall it be closer than 6 feet.

(e) When possible, measurement locations should be at least 50 feet from any regulated sound source on the facility.

(f) Measurement periods shall be avoided when the local wind speed exceeds 12 mph and/or precipitation would affect the measurement results.

2.5 Measurement Plans. Plans for measurement of pre-development ambient sound or post-facility sound may be discussed with the Codes Enforcement Officer.

(3)

Measurement of Ambient Sound

3.1 Pre-development Ambient Sound

Measurements of the pre-development ambient sound are required only when the Applicant elects to establish the sound level limit in accordance with subsections A(1)(b) and A(1)(e)(ii)(d) for a facility in an area with high ambient sound levels, such as near highways, airports, or pre-existing facilities; or when the Applicant elects to establish that the daytime and nighttime ambient hourly sound levels at representative Protected Locations exceed 45 dBA and 35 dBA, respectively.

(a) Measurements shall be made at representative Protected Locations for periods of time sufficient to adequately characterize the ambient sound. At a minimum, measurements shall be made on three different weekdays (Monday through Friday) during all hours that the facility will operate. If the proposed facility will operate on Saturdays and/or Sundays, measurements shall also be made during all hours that the facility will operate.

(b) Measurement periods with particularly high ambient sounds, such as during holiday traffic activity, significant insect activity or high coastline waves, should generally be avoided.

(c) At any measurement location the daytime and nighttime ambient hourly sound level shall be

Wind Energy Facility Ordinance for Moscow, Maine³

computed by arithmetically averaging the daytime and nighttime values of the measured one hour equivalent sound levels. Multiple values, if they exist, for any specific hour on any specific day shall first be averaged before the computation described above.

3.2 Post-Facility Ambient Sound

(a) Measurements of the post-facility ambient one hour equivalent sound levels and, if short duration repetitive sounds are produced by the facility, the maximum sound levels made at nearby Protected Locations and during representative routine operation of the facility that are not greater than the applicable limits of subsection c clearly indicate compliance with those limits.

(b) Compliance with the limits of subsection A(1)(b) may also be demonstrated by showing that the post-facility ambient hourly sound level, measured in accordance with the procedures of subsection 3.1 above during routine operation of the facility, does not exceed the pre-development ambient hourly sound level by more than one decibel, and that the sound from routine operation of the facility is not characterized by either tonal sounds or short duration repetitive sounds.

(c) Compliance with the limits of subsection A(1)(e)(ii)(d) may also be demonstrated by showing that the post facility maximum sound level of any short duration repetitive sound, measured in accordance with the procedures of subsection 3.1 above, during routine operation of the facility, does not exceed the pre-development ambient hourly sound level by more than five decibels.

(d) .If any of the conditions in (a), (b) or (c) above are not met, compliance with respect to the applicable limits must be determined by measuring the sound from routine operation of the facility in accordance with the procedures described in subsection 4.

(4) Measurement of the Sound from Routine Operation of Facility.

4.1 General

(a) Measurements of the sound from routine operation of facilities are generally necessary only for specific compliance testing purposes in the event that community complaints result from operation of the facility, for validation of an Applicant's calculated sound levels when requested by the municipal entity responsible for review and approval of the pending application under 9.1, for determination of existing hourly sound levels for an existing facility or for enforcement by the Codes Enforcement Officer.

(b) Measurements shall be obtained during representative weather conditions when the facility sound is most clearly noticeable. Preferable weather conditions for sound measurements at distances greater than about 500 feet from the sound source include overcast days when the measurement location is downwind of the facility and inversion periods (which most commonly occur at night).

(c) Measurements of the facility sound shall be made so as to exclude the contribution of sound from facility equipment that is exempt from this regulation.

4.2 Measurement of the Sound Levels Resulting from Routine Operation of the

Wind Energy Facility Ordinance for Moscow, Maine³

Facility.

(a) When the ambient sound levels are greater than the sound level limits, additional measurements can be used to determine the hourly sound level that results from routine operation of the facility. These additional measurements may include diagnostic measurements such as measurements made close to the facility and extrapolated to the Protected Location, special checkmark measurement techniques that include the separate identification of audible sound sources, or the use of sound level meters with pause capabilities that allow the operator to exclude non-facility sounds.

(b) For the purposes of computing the hourly sound level resulting from routine operation of the facility, sample diagnostic measurements may be made to obtain the one hour equivalent sound levels for each sound component.

(c) Identification of tonal sounds produced by the routine operation of a facility for the purpose of adding the 5 dBA penalty in accordance with subsection A(1)(d) requires aural perception by the measurer, followed by use of one-third octave band spectrum analysis instrumentation. If one or more of the sounds of routine operation of the facility are found to be tonal sounds, the hourly sound level component for tonal sounds shall be computed by adding 5 dBA to the one hour equivalent sound level for those sounds.

(d) Identification of short duration repetitive sounds produced by routine operation of a facility requires careful observations. For the sound to be classified as short duration repetitive sound, the source(s) must be inherent to the process or operation of the facility and not the result of an unforeseeable occurrence. If one or more of the sounds of routine operation of the facility are found to be short duration repetitive sounds, the hourly sound level component for short duration repetitive sounds shall be computed by adding 5 dBA to the one hour equivalent sound level for those sounds. If required, the maximum sound levels of short duration repetitive sounds shall be measured using the fast response [LAFmax]. The duration and the frequency of occurrence of the events shall also be measured. In some cases, the sound exposure levels of the events may be measured. The one hour equivalent sound level of a short duration repetitive sound may be determined from measurements of the maximum sound level during the events, the duration and frequency of occurrence of the events, and their sound exposure levels.

(e) The daytime or nighttime hourly sound level resulting from routine operation of a facility is the energy sum of the hourly sound level components from the facility, including appropriate penalties, (see (c) and (d) above). If the energy sum does not exceed the appropriate daytime or nighttime sound level limit, then the facility is in compliance with that sound level limit at that Protected Location.

(5) Reporting Sound Measurement Data. The sound measurement data report should include

Wind Energy Facility Ordinance for Moscow, Maine³

the following:

- (a) The dates, days of the week and hours of the day when measurements were made.
- (b) The wind direction and speed, temperature, humidity and sky condition.
- (c) Identification of all measurement equipment by make, model and serial number.
- (d) The most recent dates of laboratory calibration of sound level measuring equipment.
- (e) The dates, times and results of all field calibrations during the measurements.
- (f) The applicable sound level limits, together with the appropriate hourly sound levels and the measurement data from which they were computed, including data relevant to either tonal or short duration repetitive sounds.
- (g) A sketch of the site, not necessarily to scale, orienting the facility, the measurement locations, topographic features and relevant distances, and containing sufficient information for another investigator to repeat the measurements under similar conditions.
- (h) A description of the sound from the facility and the existing environment by character and location.

APPENDIX C

Decommissioning Plan

Pursuant to section 14.12, the Applicant shall provide a plan for decommissioning a Type 2 or Type 3 Wind Energy Facility. The decommissioning plan shall include, but shall not be limited to the following:

1. A description of the trigger for implementing the decommissioning plan. There is a rebuttable presumption that decommissioning is required if no electricity is generated for a continuous period of twelve (12) months. The Applicant may rebut the presumption by providing evidence, such as a force majeure event that interrupts the generation of electricity, that although the project has not generated electricity for a continuous period of 12 months, the project has not been abandoned and should not be decommissioned.

2. A description of the work required to physically remove all wind Turbines, associated foundations to a depth of 24 inches, buildings, cabling, electrical components, and any other Associated Facilities to the extent they are not otherwise in or proposed to be placed into productive use. All earth disturbed during decommissioning must be graded and re-seeded, unless the landowner of the affected land requests otherwise in writing.

[Note: At the time of decommissioning, the Applicant may provide evidence of plans for continued beneficial use of any or all of the components of the Wind Energy Facility. Any changes to the approved decommissioning plan shall be subject to review and approval by the Codes

Wind Energy Facility Ordinance for Moscow, Maine3
Enforcement Officer.]

3.
An estimate of the total cost of decommissioning and itemization of the estimated major expenses, including the projected costs of measures taken to minimize or prevent adverse effects on the environment during implementation of the decommissioning plan. The itemization of major costs may include, but is not limited to, the cost of the following activities: turbine removal, turbine foundation removal and permanent stabilization, building removal and permanent stabilization, transmission corridor removal and permanent stabilization and road infrastructure removal and permanent stabilization.

4.
Demonstration in the form of a performance bond, surety bond, letter of credit, parental guarantee or other form of financial assurance as may be acceptable to the Moscow Planning Board that upon the end of the useful life of the wind Energy Facility the Applicant will have the necessary financial assurance in place for 100% of the total cost of decommissioning, less salvage value. The Applicant may propose securing the necessary financial assurance in phases, as long as the total required financial assurance is in place a minimum of 5 years prior to the expected end of the useful life of the wind Energy Facility.

APPENDIX B. SOUND PROPAGATION MODELING ASSUMPTIONS

TABLE 5: SOUND PROPAGATION MODELING ASSUMPTIONS

Chapter 375.10.I.7(c) Requirement	Parameters Used
1. The maximum rated sound power output (IEC 61400-11) of the sound sources operating during nighttime stable atmospheric conditions with high wind shear above the boundary layer and consideration of other conditions that may affect in-flow airstream turbulence	104.9 dBA apparent sound power plus 2 dB manufacturer uncertainty. Additional data can be obtained given a proper protective agreement.
2. Attenuation due to geometric spreading, assuming that each turbine is modeled as a point source at hub height	ISO 9613-2
3. Attenuation due to air absorption	ISO 9613-1, based on 10°C, 70% relative humidity
4. Attenuation due to ground absorption/reflection	ISO 9613-2, G=0.5 (half hard, half porous ground)
5. Attenuation due to three dimensional terrain	ISO 9613-2, using USGS DTM (10-meter spacing height points)
6. Attenuation due to forestation	No forest cover is assumed
7. Attenuation due to meteorological factors such as but not limited to relative wind speed and direction (wind rose data), temperature/vertical profiles and relative humidity, sky conditions, and atmospheric profiles	ISO 9613-2, $C_{met} = 0$
8. Inclusion of an “uncertainty factor” adjustment to the maximum rated output of the sound sources based on the manufacturer’s recommendation	+2 dB
9. Inclusion, at the discretion of the Department, of an addition to the maximum rated output of the sound sources to account for uncertainties in the modeling of sound propagation for wind energy developments. This discretionary uncertainty factor of up to 3 dBA may be required by the Department based on the following conditions: inland or coastal location, the extent and specificity of credible evidence of meteorological operating conditions, and the extent of evaluation and/or prior specific experience for the proposed wind turbines. Subject to the Department’s discretion based on the information available, there is a rebuttable presumption of an uncertainty factor of 2 to 3 dBA for coastal developments and of 0 to 2 dBA for inland developments.	+1 dB

APPENDIX C. POSTCONSTRUCTION SOUND PROTOCOL

C.1 INTRODUCTION

This appendix describes a protocol to conduct postconstruction sound measurements of Western Maine Renewable Energy (the “Project”) to assess conformance with both the Town of Moscow noise limits with respect to the operation of the Project.

C.2 TIMING

Sound monitoring will be conducted within the first six months of Project operation. A report will be provided to the Town and DEP within two months of the end of the sound monitoring field campaign.

Compliance sound monitoring will take place every five years thereafter until the facility is decommissioned.

Noise compliance as a result of complaints or through the request of the Town or DEP outside of those compliance periods may be addressed through sound monitoring. This is discussed in Section D.8.

C.3 PERSONNEL

Sound monitoring will be conducted by or under the direction of personnel who are well qualified by training and experience in measurement and evaluation of environmental sound or by personnel trained to operate under a specific measurement plan approved by the DEP. Board Certification through the Institute of Noise Control Engineering (INCE) is an example of a preferred certification required of such personnel to meet this criterion.

C.4 MONITORING LOCATIONS

There are two protected location dwellings within one mile of the Project, D12 and D13 as shown in Figure 10. D14 is on the same property as D12 and D13, but outside the one mile buffer. Compliance sound monitoring would take place at the northern corner of the property along Stream Road, as this represents the closest protected location to the project.

If landowner permission is not obtained, then the monitoring position can be moved to the north side of that property line which is on Project land.

A met tower site is proposed in Figure 10, between T6 and T7. However, this site can be moved to suit actual field conditions.

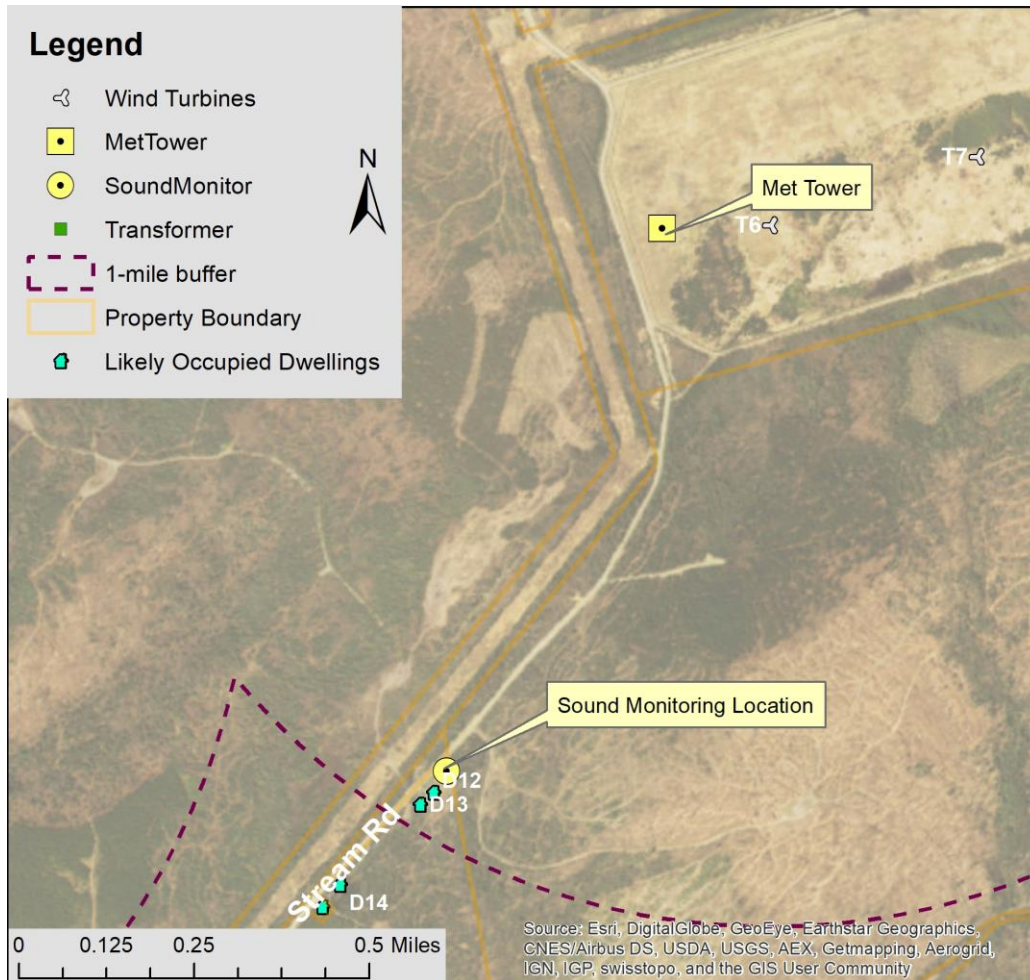


FIGURE 10: COMPLIANCE MONITORING LOCATION D12

C.5 EQUIPMENT

Sound monitoring will be conducted with an IEC/ANSI Class I sound level analyzer, measuring 1/3 octave band L_{eq} and/or L_{AF} , logging each 0.050 seconds.⁸ The sound monitor will be fitted with a 7-inch wind screen, and mounted at a height of 1.2 to 1.5 meters. The sound level meter microphone will be field calibrated before setup, during battery checks, and after removal. Calibration adjustments will be done according to ANSI S12.9 Part 3. The sound level meter will either record continuous internal audio in wav or .mp3 format, or the analog output from the

⁸ Measurement instrumentation shall meet the requirements of DEP Chapter 375.1.9.b. and 375.1.9.c.

sound level meter will be hooked up to an external audio recorder to record continuous .mp3 or .wav audio.

An anemometer will be co-located with the sound level meter, mounted at the same height as the microphone. The anemometer will log wind and gust speeds no less than every one minute.

A meteorological tower will be set up in a clear area within five miles of the monitor (if feasible). A suggested location is shown in Figure 10. To the greatest extent possible, the met tower shall be at the center of open flat terrain, inclusive of grass and a few isolated obstacles less than 6 feet in height for a 250-foot radius around it. The tower will have a single anemometer set at a height of 10 meters off the ground. The anemometer will log wind speed and wind direction every one second.

Temperature and precipitation will be collected onsite or from the nearest National Weather Service station.

C.6 DATA COLLECTION

Measurements will follow DEP Chapter 375.1.8, parts of which are copied below:

7. Measurement shall be obtained during weather conditions when the wind turbine sound is most clearly noticeable, generally when the measurement location is downwind of the wind energy development and maximum surface wind speeds < 6 miles per hour (mph) with concurrent turbine hub-elevation wind speeds sufficient to generate the maximum continuous rated sound power from the nearest wind turbines to the measurement location. 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.

[Note: These conditions typically occur during inversion periods usually between 11 pm and 5 am.]

8. In some circumstances, it may not be feasible to meet the wind speed and operations criteria due to terrain features or limited elevation change between the wind turbines and monitoring locations. In these cases, measurement periods are acceptable if the following conditions are met:

- (a) The difference between the LA90 and LA10 during any 10-minute period is less than 5 dBA; and
- (b) The surface wind speed (10 meter height) (32.8 feet) is 6 mph or less for 80% of the measurement period and does not exceed 10 mph at any time, or the turbines are shut down during the monitoring period and the difference in the observed LA50 after shut down is equal to or greater than 6 dBA; and

(c) Observer logs or recorded sound files clearly indicate the dominance of wind turbine(s).

9. Measurement intervals affected by increased biological activities, leaf rustling, traffic, high water flow, aircraft flyovers or other extraneous ambient noise sources that affect the ability to demonstrate compliance shall be excluded from all compliance report data. The intent is to obtain 10-minute measurement intervals that entirely meet the specific criteria.

10. Measurements of the wind energy development sound shall be made so as to exclude the contribution of sound from other development equipment that is exempt from this regulation.

Because the measurement location is not downwind of the prevailing wind (depending on the acoustic center of the project), it may take one to two weeks of continuous unattended monitoring to achieve the proper meteorological conditions for measurement. If during the first week of monitoring the proper conditions do not occur for at least 12 valid ten minute periods during the night, then, during the second week of sound monitoring, the Operator will conduct at least one wind park shutdown for a 15 minute period during a period when hub-height winds are at or above 8 m/s. This will allow a for the measurement of background adjusted wind park sound at the receptor. Sound measurements will be limited to 14 days, whether or not sufficient valid periods are obtained during this time, so long as at least one shutdown is conducted as specified above. If fewer than 12 valid periods are obtained after 14 days using primary, secondary, and tertiary methods, then compliance will be determined based on the available valid periods.

C.7 REPORTING

Results will be detailed in a report to the DEP and Town no later than two months after the field work is completed. The report will include all requirements of DEP Chapter 375.10.I.8.f.

C.8 COMPLAINT RESPONSE

At least 30 days prior to start of operations of the Project, the Permittee will submit a complaint response protocol with details as required in DEP Chapter 375.10.I.7.j. including:

1. A 24-hour contact for complaints,
2. A complaint log accessible by the Department,
3. For those complaints that include sufficient information to warrant an investigation, the protocol will provide for an analysis as set forth in (a) through (c) below. Sufficient information includes, at a minimum: the name and address of the complainant; the date, time and duration of the sound event; a description of the sound event, indoor or

outdoor, specific location and a description of any audible sounds from other sources outside or inside the dwelling of the complainant. Analysis of the complaint by the licensee must include:

- a. documentation of the location of the nearest turbines to the complaint location and ground conditions in the area of the complaint location
 - b. weather conditions at the time of the complaint and surface and hub height wind speed and direction
 - c. power output and direction of nearest turbines; and
 - d. notification of complaint findings to the Department and the complainant
4. A plotting of complaint locations and key information on a project area map to evaluate complaints for a consistent pattern of site, operating and weather conditions; and,
 5. A comparison of these patterns to the compliance protocol to determine whether testing under additional site and operating conditions is necessary and, if so, a testing plan that addresses the locations and the conditions under which a pattern of complaints had occurred.

Note that for complaints outside of a one-mile radius of any Project wind turbine, complaints will be addressed according to the complaint response plan, except that noise testing under this Protocol will not be required.

