

## SOUND

A. REVIEW CRITERIA (*selected passages*)

## 12 MRSA §685-B

**4-B. Special provisions; wind energy development or project.** In the case of a wind energy development, as defined in Title 35-A, section 3451, subsection 11, with a generating capacity greater than 100 kilowatts, or a community-based offshore wind energy project, the developer must demonstrate, in addition to requirements under subsection 4, that the proposed generating facilities, as defined in Title 35-A, section 3451, subsection 5:

A. Will meet the requirements of the Board of Environmental Protection's noise control rules adopted pursuant to Title 38, chapter 3, subchapter 1, article 6; .....

12 MRSA §685-B (*and 10.24, Land Use districts and Standards*)

**4. Criteria for approval.** In approving applications submitted to it pursuant to this section, the commission may impose such reasonable terms and conditions as the commission may consider appropriate.

The commission may not approve an application, unless:

- A. Adequate technical and financial provision has been made for complying with the requirements of the State's air and water pollution control and other environmental laws, and those standards and regulations adopted with respect thereto, including without limitation the minimum lot size laws, sections 4807 to 4807-G, the site location of development laws, Title 38, sections 481 to 490, and the natural resource protection laws, Title 38, sections 480-A to 480-Z, and adequate provision has been made for solid waste and sewage disposal, for controlling of offensive odors and for the securing and maintenance of sufficient healthful water supplies;
- B. Adequate provision has been made for loading, parking and circulation of land, air and water traffic, in, on and from the site, and for assurance that the proposal will not cause congestion or unsafe conditions with respect to existing or proposed transportation arteries or methods;
- C. Adequate provision has been made for fitting the proposal harmoniously into the existing natural environment in order to ensure there will be no undue adverse effect on existing uses, scenic character, and natural and historic resources in the area likely to be affected by the proposal;
- D. The proposal will not cause unreasonable soil erosion or reduction in the capacity of the land to absorb and hold water and suitable soils are available for a sewage disposal system if sewage is to be disposed on-site;

- E. The proposal is otherwise in conformance with this chapter and the regulations, standards and plans adopted pursuant thereto; and
- F. In the case of an application for a structure upon any lot in a subdivision, that the subdivision has received the approval of the commission.

The burden is upon the applicant to demonstrate by substantial evidence that the criteria for approval are satisfied, and that the public's health, safety and general welfare will be adequately protected. Except as otherwise provided in Title 35-A, section 3454, the commission shall permit the applicant and other parties to provide evidence on the economic benefits of the proposal as well as the impact of the proposal on energy resources.

*See also at end of this section: DEP site law sound rules and Town of Eastbrook Wind Energy Facility Ordinance*

### 38 §484. STANDARDS FOR DEVELOPMENT

The department shall approve a development proposal whenever it finds the following.

**3. No adverse effect on the natural environment.** The developer has made adequate provision for fitting the development harmoniously into the existing natural environment and that the development will not adversely affect existing uses, scenic character, air quality, water quality or other natural resources in the municipality or in neighboring municipalities.

A. In making a determination under this subsection, the department may consider the effect of noise from a commercial or industrial development. Noise from a residential development approved under this article may not be regulated under this subsection, and noise generated between the hours of 7 a.m. and 7 p.m. or during daylight hours, whichever is longer, by construction of a development approved under this article may not be regulated under this subsection.

## B. LIST OF KEY EVIDENCE

- Development Application DP4886; Narrative Section 17 Sound Analysis
- BSE Consultant Bodwell Sound Level Assessment Exhibit 17 of application
- Applicant Testimony & Correspondence: Pre-filed and public hearing testimony and rebuttals
- LURC Consultant Warren Brown Peer Review of Application Sound Level Assessment
- LURC Consultant Warren Brown Peer Review Addendum of Results applying Eastbrook Ordinance
- Town of Eastbrook Wind Energy Facility Ordinance (Attached at back of Sound Section as part (I.))
- DEP Chapter 375.10 rules for sound level standards (attached at back of this section as part (H.))
- BSE Consultant Bodwell pre-filed testimony and exhibits
- Public Testimony of David Boulter
- Public Testimony of Kate Donahoe
- BSE - Applicant Response to Public Comments 6-7-11
- Applicant BSE Post-hearing Brief
- Intervenor CCRHC Final Brief

### ISSUE SUMMARY:

The review process for sound level assessment as directed by statute is to apply the standards of DEP Chapter 375.10 B rules of the Site Location of Development Act. The applicant models the potential sound impacts from the turbines based on accepted acoustical engineering standards and manufacturer's information on sound outputs. In addition to the familiar audible sounds in the dBA register, tonal and short duration repetitive sounds (SDRS) that can be associated with wind power facilities are analyzed. Public testimony has also raised concerns over the project's construction noise, including noise associated with blasting, which is no longer directly regulated by this DEP rule but is addressed by a limit on nighttime sound output.

This Bull Hill Wind Project is different from prior LURC wind energy development projects because the project abuts the Town of Eastbrook, which has adopted its own noise standard. If an abutting municipality has a noise standard, the DEP Chap. 375.10 rules directs that the LURC Commissioners '*will also take into consideration the municipalities' quantifiable noise standards, if any ...*'. An abutting municipality's ordinance standards can be more restrictive but cannot be more than 5 dBA less restrictive and must be 'quantifiable'. The DEP rule defines '*Quantifiable*' as '*A numerical limit governing noise from developments that has been duly enacted by ordinance of by a local municipality*'. The Town of Eastbrook Wind Energy Facility Ordinance was adopted January 19, 2011, which was prior to the submission of this development application. The sound impacts section of the ordinance has more restrictive sound level impacts than the DEP and additionally includes some provisions in excess of the DEP rule including: both construction and maintenance standards, measurement protocols, ongoing monitoring and reporting criteria, and planning board involvement in oversight, enforcement, and mitigation. The Town of Eastbrook Wind Energy Facility Ordinance is attached at the end of this issues section in its entirety. Section 20 and 20.1 of the ordinance cover grid scale wind energy sound compliance and Appendix B of the ordinance specifically deals with the sound level impact standards.

Two protected locations for sound impact are located in the Town of Eastbrook on Sugar Hill at approximately 3800 and 4800 feet from the nearest turbine across the Town boundary with T16-MD. In the initial development application the applicant's consultant Scott Bodwell noted the existence of the Eastbrook ordinance but limited the sound modeling to the DEP Chapter 375.10 standards. LURC staff

requested that the applicant also submit an analysis of sound level impact modeling based on the more restrictive local Eastbrook standards. The Town of Eastbrook discussion below reviews how the local ordinance applies, and compares the application of the DEP rule to the applicant's predicted sound level impacts with the application of the Eastbrook ordinance to the predicted sound levels. The additional local standards for construction, compliance monitoring, and oversight authority given to Town officials will be summarized. The staff sound issue analysis poses a deliberation question to the Commissioners about what parts of the local ordinance should be included in its 'consideration' directed by the DEP 375.10 rule.

### **C. ASSESSMENT UNDER DEP CHAPTER 375.10 RULE**

#### **SUMMARY OF DEP RULE CRITERIA**

(Summarized by LURC staff from the application, agency consultant submissions, and the DEP rule)

#### **Overview of DEP sound impact level rule**

The Maine DEP regulation Chapter 375.10 of its Site Location of Development Law specifies sound level limits based on land use and existing ambient sound levels. Rural areas have the quietest limits for daytime and evening impacts versus urban areas with higher background noise. Nighttime limits apply up to 500 feet from a residence on a protected location so that the resulting sound levels at the residence will be below the limit. Beyond 500 feet from the residence, the daytime limit applies 24 hours a day. Both day and night sound level limits are on an averaged hourly basis with no averaging over daytime, nighttime or longer periods. There are special provisions and "penalties" that apply when the sound level generated by a development results in a tonal or short duration repetitive sound. Rules for daytime construction sound levels were superseded in statute (even though they still appear in the DEP chapter 375 rules). The nighttime rules still apply.

#### **DEP applicable limits**

In recognition of the quiet rural area, Blue Sky has based its modeling on lower ambient sound levels and is applying the more stringent "quiet" area limits of 45 dBA during the nighttime and 55 dBA during the daytime.

As a result, the relevant hourly equivalent sound level limits include the following:

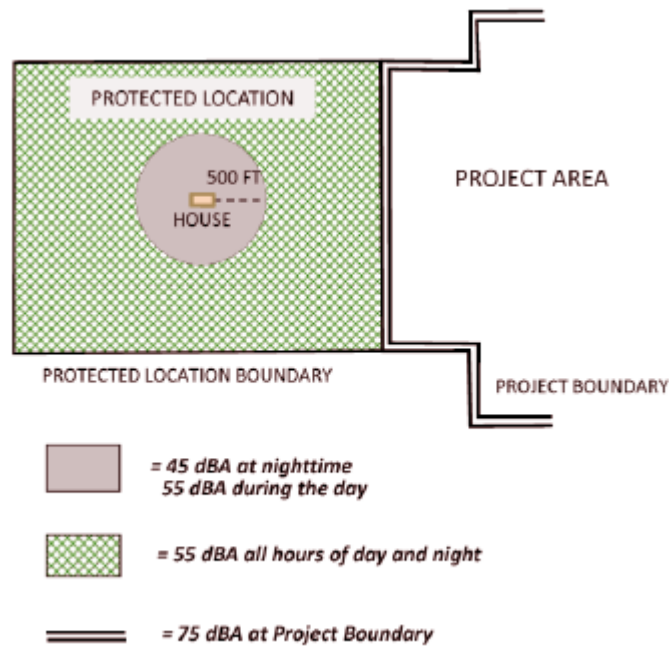
- 75 dBA at the Project boundary;
- 55 dBA during the daytime at protected locations;
- 45 dBA during the nighttime at locations within 500 feet of a residence on a protected location.

#### **Sound Level Prediction Model Assumptions (DEP methodology used by BSE & LURC staff)**

- The turbines are assumed to be operating at full sound output with a sound power level of 105.0 dBA, plus an additional 2 dBA uncertainty factor, for an assumed sound power level of 107.0 dBA.
- Manufacturers of utility-scale wind turbines follow the industry IEC 61400-11 method to determine the sound output and uncertainty factor for their turbines for use in modeling sound level impacts.
- For the new Vestas 100 an additional 3 dBA was added to take into account potential uncertainty in the modeling calculation method, resulting in an effective sound power level of 110.0 dBA, which is 5 dBA more than the full sound power level specified and warranted by Vestas.

- Sound levels are calculated as if the receiver locations were all simultaneously downwind from the sound sources, which is not a physical possibility.
- Although foliage has the effect of reducing sound levels at receiver points, no attenuation was calculated due to trees or other foliage.
- Ground attenuation was calculated based on a ground absorption factor of 0.5, which represents a mix of hard and soft ground; surface water bodies, however, were mapped and assigned a ground absorption factor of 0.0, similar to hard ground for an acoustically reflective surface.
- BSE consultant Bodwell, based upon comparing modeling to fields tests at Stetson, have confirmed that the above-described model is exceeding actual sound in most cases by 2 to 4 dBA.

### DEP Hourly Sound Level Limits from a Protected Location



IMPACTS ACCORDING TO THE BSE- BODWELL APPLICATION & EXHIBITS AND SUBMITTALS:  
(Note: Sound Level Assessments as paraphrased by LURC staff unless quoted. Quotes appear in italics)

#### Summary of Findings by BSE Consultant Scott Bodwell: Conclusion

*'This Sound Level Assessment establishes sound level limits to be applied to the Bull Hill Wind Project and provides sound level predictions for daytime and nighttime turbine operations using a terrain-based computer model. Model settings reflect the results of turbine sound level testing of similar wind energy facilities in Maine. The most stringent Maine DEP hourly sound level limits of 55 dBA daytime and 45 dBA nighttime will be applied to the Project. Sound level estimates indicate that with all wind turbines operating simultaneously at full capacity, Bull Hill Wind will be approximately 5 dBA or more below the applicable Maine DEP nighttime sound level limits at all protected locations. The Sound Level Assessment establishes guidelines for sound level testing of turbine operations to evaluate compliance with applicable sound level limits, including methods for measurement and analysis for tonal and short duration repetitive sounds.'*

## FROM BSE CONSULTANT SCOTT BODWELL'S PRE-FILED TESTIMONY

Description of Area Topography Relevant to Sound Level Assessment:

*'The project area is primarily low elevation commercial forest and the surrounding land uses consist mostly of undeveloped and commercial forestry land with sparse rural residential and seasonal properties. The majority of residential and seasonal properties nearest to the project are located west of the proposed wind turbines along Sugar Hill Road in the Town of Eastbrook, Maine. Exhibit B is a Project Location Map that shows the locations of the proposed wind turbines and other facilities in relation to surrounding topography and land uses.'* (Project Location map, Exhibit B, can be referenced in Bodwell's Pre-filed Testimony)

Protected Locations included in Sound Level Assessment:

Protected locations include parcels of land that include a residence, seasonal camps, and conservation land. The Exhibit D map (below after Exhibit detail map F) shows these areas and the predicted sound levels from the wind turbines. Excluding properties with a lease or sound easement, there are only four dwellings located within one mile of a proposed wind turbine. They are the following:

- There are several year-round and seasonal dwellings located on Molasses Pond, which at its closest point is approximately 1.9 miles west of the nearest proposed turbine.
- TNC conservation area is listed as a protected location per the DEP rule.

The two closest are represented and are shown in below map Exhibit F:

- These dwellings are all on Sugar Hill Road with the nearest one at a distance of approximately 3,880 feet from the closet proposed wind turbine labeled (P2).
- And the second protected location at 4,860 feet labeled (P1).

**BSE Sound Level Modeling Results based on DEP 375.10**From BSE Consultant Scott Bodwell Pre-filed Testimony:

Exhibit F (Next Page) is a detailed map showing the two protected locations nearest any turbine.

**EXHIBIT F. Sound Model Estimates at Nearest Protected Locations**

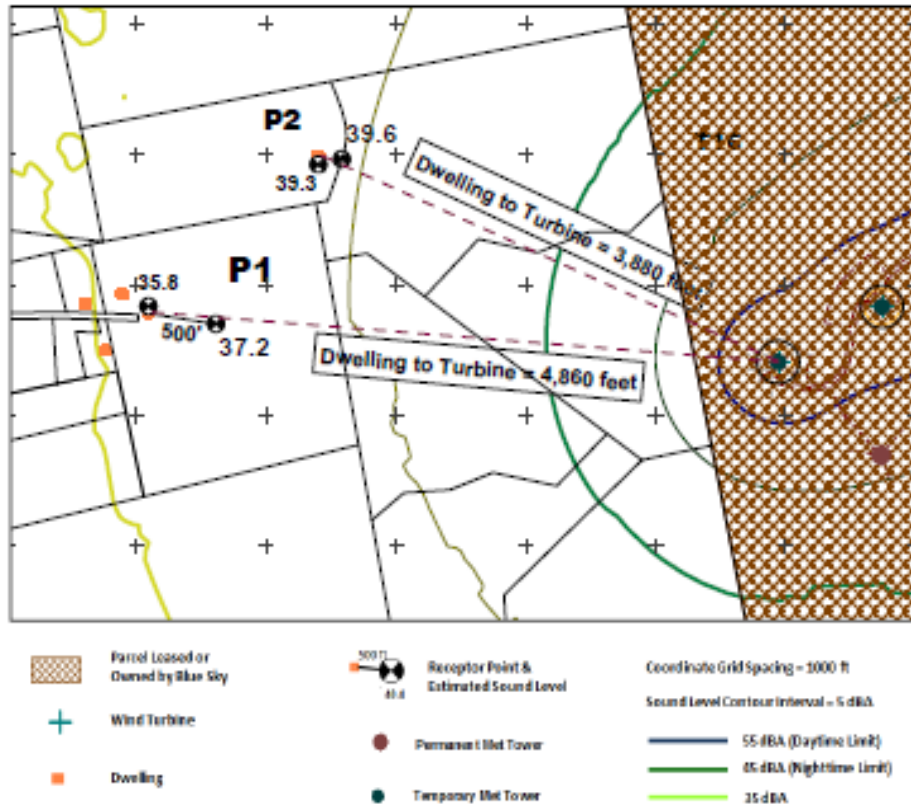
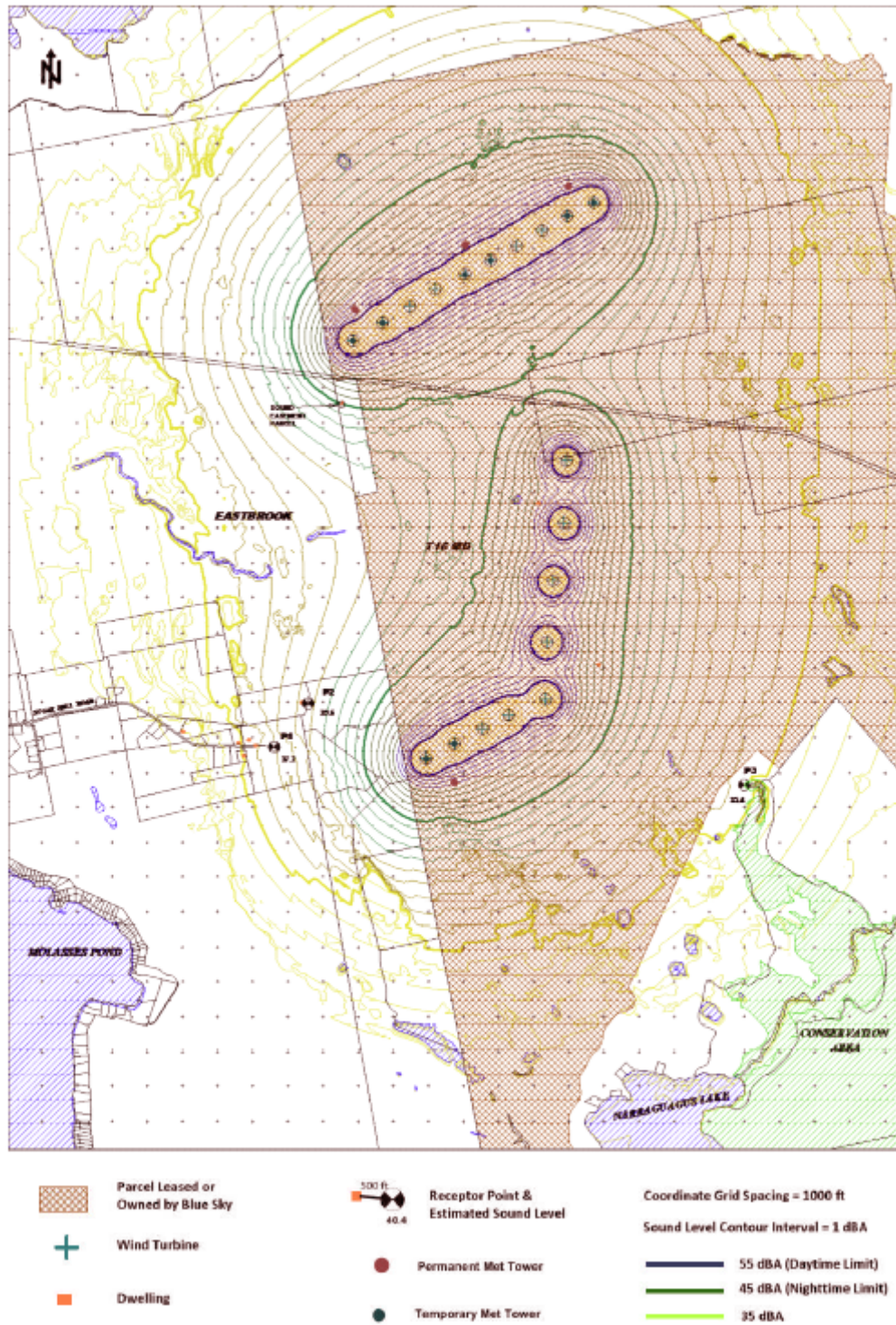




EXHIBIT D. Predicted Sound Levels from Wind Turbine Operation





BSE Sound Level Modeling Results based on DEP 375.10 (cont.)

Cited from BSE Consultant Scott Bodwell Pre-filed Testimony

*'The maximum predicted sound levels from the Project are reflected in the sound contour maps attached as Exhibit D hereto. Receptor points are the locations in any direction from the Project with the greatest potential to exceed the applicable Maine DEP sound limits, and are identified as P1, P2, and P3 on Exhibit D. As depicted in Exhibit D and shown in the Table 1 below, when operating at full sound output, the Project will meet the DEP quiet nighttime limits at all protected locations.'*

Receptor Point	Description	Distance to Nearest Turbine (ft)	Estimated Hourly Sound Level, dBA	Maine DEP Sound Level Limit, dBA	
				Daytime	Nighttime
P1	500 feet from Dwelling	4,340	37.2	55	45
P2 <sup>2</sup>	Lot Line of Residential Parcel	3,705	39.6	55	45
P3	Conservation Area	6,160	35.4	55	55

**Table 1. Estimated Daytime and Nighttime Sound Levels from Wind Turbine Operations at Receptor Points**

<sup>2</sup> P2 represents the closest protected location. The dwelling is 3,880 feet to the closest turbine, and the quiet nighttime limit applies.

*'The sound level estimates in Table 1 indicate that the highest expected sound levels downwind from full operation of Bull Hill Wind will be approximately 5 dBA below the 45 dBA nighttime limit at the lot line of the nearest dwelling on a protected location as represented by receptor point P2. Further, the sound level estimates indicate that sound levels from Bull Hill Wind will be nearly 8 dBA below the daytime and nighttime limit of the nearby regulated protected location represented by receptor point P1. The nighttime limit at the Conservation Area represented by receptor point P3 is 55 dBA because this point is more than 500 feet from sleeping quarters. Estimated sound levels at P3 are approximately 20 dBA below the applicable limit of 55 dBA.'*

### Other regulated sounds – Tonal & Short Duration Repetitive Sounds (Summarized by LURC Staff)

The Maine DEP regulation requires an adjustment to the measured sound level at a protected location if the development generates certain types of sound that are considered to be more annoying than relatively steady sound with no prominent tones or frequencies. These regulated types of sound are 1) tonal sounds and 2) short duration repetitive sounds. Refer to the definitions in the DEP Chapter 375.10 Rules for further information.

### Conclusions on Tonal and SDRS Cited from BSE Consultant Scott Bodwell Pre-filed Testimony:

- (Tonal) V100 turbines are not expected to generate regulated tonal sounds during routine operation.
- (SDRS) Measurements of operating wind turbines at other projects in Maine and published literature concerning amplitude modulation from wind turbines indicates that sound level fluctuations during the

*blade passage of wind turbines typically range from 2 to 5 dBA, with occasional but infrequent events reaching 6 dBA or more. The Vestas V100 turbines are not expected to generate regulated tonal sounds during routine operation. Even assuming that occasional SDR events over 6 dBA occur, and 5 dBA is added to the observed sound level for those events, the Project would still comply with the relevant sound level limits at all protected locations.*

### LURC EnRad Consulting Peer Review of BSE Sound Level Modeling Results (per DEP)

(Summarized by LURC staff or cited)

EnRad Consulting reviewed the Sound Level Assessment and concluded that:

- The BSE-Bodwell Sound Level Assessment is “reasonable and technically correct according to standard engineering practices required by LURC under 12 MRSA §685(4-B)(A) Regulations on Control of Noise (06-096 CMR 375.10)”.
- The hourly daytime and night time “sound levels from the project would be 5 dBA or more below applicable quiet limits of 45 dBA and 55 dBA.”
- “Tonal sounds are not expected to occur.”
- “SDRS events are not expected to be frequently produced but if they were, the project has a buffer of at least 5 dBA between predicted levels and the applicable limits”.

### SOUND MONITORING PROGRAM OF OPERATIONS FOR COMPLIANCE

BSE-Bodwell proposed monitoring program in Pre-filed Testimony:

(For details of Stetson II monitoring protocols see Exhibit 2 & 3 with pre-filed testimony)

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

*“The most recent version of this Sound Testing Protocol was prepared by BEA and submitted to and approved by LURC in support of the Stetson II Wind Project in Washington County, Maine. It is contained in this report as Exhibit 2. The Stetson II Protocol was supplemented by Protocol Details & Calculation Methods prepared by BEA that provides details and examples for assessing penalties for short duration repetitive and tonal sounds. This supplement was reviewed and approved by LURC and EnRad Consulting and is contained in this report as Exhibit 3. These approved test protocols will be used to develop a similar protocol for sound level testing of turbine operations for Bull Hill Wind. ... ”*

*“Stetson II will report the status of compliance monitoring to LURC staff on a quarterly basis. A compliance assessment report providing sound level and meteorological data, and analysis of results shall be submitted to LURC for review and approval prior to the end of the first year of facility operation. Additional sound level testing beyond the first year of operations is not planned but could be initiated if deemed appropriate in response to a consistent pattern of community sound complaints.”*

LURC consultant Warren Brown Monitoring Plan Comments in Peer Review:

(Cited portions of a list of monitoring measurement and location details)

- *“I recommend required routine operation noise compliance measurements at a minimum of two protected locations designated in the application noise assessment as “Receiver Points” P2 and P3. These particular sites represent the southern turbine array from two directions and elevations. Please note specific recommendations (pending landowner agreement) for some locations. The reviewer notes that the northern array of turbines has no nearby protected locations.”*
- *“Compliance should be demonstrated, based on following outlined conditions for 12, 10-minute measurement intervals per monitoring location meeting 06-096 CMR 375.10 requirements.”*
- *“Measurements will be obtained during weather conditions when wind turbine sound is most clearly noticeable, i.e. when the measurement location is downwind of the development and maximum surface wind speeds  $\leq 6$  mph with concurrent turbine hub-elevation wind speeds sufficient to generate the maximum continuous rated sound power from the five nearest wind turbines to the measurement location. Measurement intervals affected by increased biological activities, leaf rustling, traffic, high water flow or other extraneous ambient noise sources that affect the ability to demonstrate compliance will be excluded from reported data. A downwind location is defined as within  $45^\circ$  of the direction between a specific measurement location and the acoustic center of the five nearest wind turbines.”*
- *“Compliance data collected in accordance with the assessment methods outlined above for representative locations selected in accordance with this protocol will be submitted to the Department for review and approval prior to the end of the first year of facility operation. Reported and unreported compliance data for each location will be submitted to the Department at the earliest possible opportunity after the commencement of operation, with consideration for the required weather, operations, and seasonal constraints.”*

#### D. EASTBROOK ORDINANCE CONTENT AND APPLICABILITY

The Town of Eastbrook Wind Energy Facility Ordinance was adopted January 19, 2011 prior to the submission of this development application. The sound impacts section of the ordinance has more restrictive sound level impacts than the DEP and additionally includes both construction and maintenance standards, measurement protocols, ongoing monitoring and reporting criteria, and planning board involvement in oversight, enforcement, and mitigation. The Town of Eastbrook Wind Energy Facility Ordinance is attached to this issues section in its entirety. Section 20 and 20.1 covers grid scale wind energy sound compliance and Appendix B specifically deals with the sound level impact standards.

The following discussion will examine each component of the ordinance that the Commission may or may not wish to apply in this case. Since the Commission “will also take into consideration” the ordinance, there seems to be flexibility as to how provisions of the ordinance are used in making the Commission’s decision.

#### Applicability of the Ordinance:

- DEP Chapter 375.10 B.1:  
*B. Applicability*  
*(1) This regulation applies to proposed developments within municipalities without a local quantifiable noise standard and in unorganized areas of the State. 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 Board within that municipality for each of the types of sounds the ordinance regulates. **This regulation applies to developments located within one municipality when the noise produced by the development is received in another municipality and, in these cases, the Board will also take into consideration the municipalities' quantifiable noise standards, if any....***

- Eastbrook Ordinance section on Conflict and Severability  
*6.2 If there is a conflict between the provisions of this Ordinance and any state rule or law applying to wind energy facilities, the more stringent provision shall govern.*

## Comparison of Key Provisions

Provisions	DEP 375.10	Town of Eastbrook	Implications
Measurement location	500 ft from residence or parcel boundary, whichever is less	660 ft from parcel boundary, even if extends on to project parcel	Very different – Eastbrook extends protection past resident's property boundary
Project Boundary limit	75 dBA	75 dBA	No difference
Daytime Hr limit	55 dBA	50 dBA	Project meets both standards
Nighttime hr limit	45 dBA	40 dBA	Project meets DEP standard, slightly above Eastbrook standard for one turbine and one location.
SDRS (repetitive)	5 dBA penalty	5 dBA penalty plus possible additional 5 dBA penalty if planning board determines it meets a particular standard in the rule (refer to Eastbrook ordinance)	Double penalty under Eastbrook standards is not predictable and was not modeled by either applicant or LURC consultant.
Tonal	Standard exists	Standard more restrictive	Project can meet both standards
Construction Noise	No standard	Specific standard	Daytime construction sounds would be regulated only under the Eastbrook ordinance.
2 mile standard	None	35 dBA	Project meets both standards
Reporting requirements	Typically one year of testing according to LURC-approved procedures	Two years plus every third year and as determined by planning board	Significantly more testing under Eastbrook plan.

**Measurement location, hourly limits for daytime and nighttime maximum sound, short duration repetitive sounds and tonal sounds:**

Below is the language from the Eastbrook ordinance Appendix B that details the limits and measurement locations contained in the chart above:

**A. Sound Level Limits for Type 2 and 3 Wind Energy Facility (WEF)***(1) Sound from Routine Operation of Facility.*

*(a) The hourly sound levels resulting from routine operation of the facility and measured in accordance with the measurement procedures described in subsection F may 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 further from the proposed facility's sound sources:*

*75 dBA at any time of day or night.*

*(ii) Within 660 feet of any Protected Location:*

*55 dBA between 7:00 a.m. and 6:00 p.m.*

*(the "daytime hourly limit"), and*

*40 dBA between 6:00 p.m. and 7:00 a.m.*

*(the "nighttime hourly limit").*

*(b) For the purposes of determining compliance with the above sound level limits, 5 dBA must be added to the observed measurements of any tonal sounds that result from routine operation of the facility. For example, if sound from the facility is measured to be 50 dBA, then the sound level for the purposes of determining compliance with the sound level limits set forth in (a) above is 55 dBA.*

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

*(i) For short duration repetitive sounds, 5 dBA must be added to the observed measurements 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.*

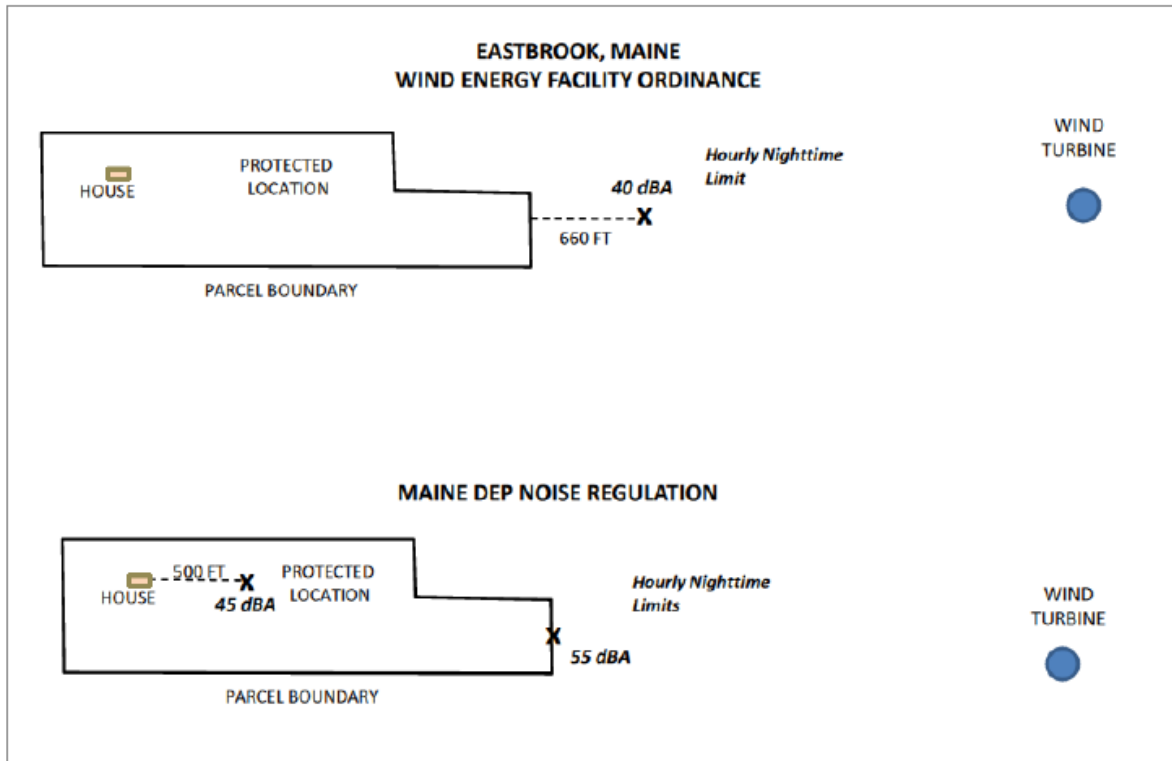
*(ii) For short duration repetitive sounds which the Planning Board determines are particularly annoying or pose a threat to the health and welfare of other persons due to their character or duration, a second 5 dBA increment must be added to the observed levels of the short duration repetitive sounds 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) Within 660 feet of any Protected Location 55 dBA at any time of day or night.*

### APPLICANT'S SOUND LEVEL ASSESSMENT BASED ON EASTBROOK STANDARDS

(Summarized by LURC staff from Applicant Letter 3/15/11, Rebuttal to public comments, Pre-filed testimony and Post-hearing brief and Warren Brown's Peer Review and Addendum.)

Graphic from Pre-filed testimony is Figure 2 depicting a comparison of the Eastbrook and DEP limits.



- The closest dwellings in Eastbrook are: # P1 at 4,860 feet and # P2 at 3,880 feet from the nearest same turbine. The daytime and nighttime hourly limits are modeled from these protected locations.
- Hourly sound levels shown on the applicant's Exhibit F estimated at both of these protected locations meets the nighttime 45 dBA DEP noise standard with P1 at 37.2 dBA at 500 feet from the residence and P2 at 39.6 dBA at the parcel boundary.
- According to LURC's consultant the more stringent 40 dBA nighttime limit set in the Eastbrook ordinance is not met at P1 at 660 feet from the protected location parcel boundary at 41.5 dBA.
- The applicant states sound levels will not exceed 40 dBA at any location on the P1 or P2 parcels.
- Bodwell asserts because of the conservative nature of the model, it is likely that actual sound levels at locations 660 feet beyond these two parcels will also be 40 dBA or less based on actual post monitoring results that run 2-4 dBA less than modeling. The applicant uses Warren Brown's generated 41.5 dBA prediction for P1 at 660 feet from the parcel boundary line.
- The applicant states sound levels will be below 35 dBA at locations two miles from a turbine.
- It was concluded by both the applicant and LURC's consultant that no tonal sound violations are expected at the protected locations.
- Likely SDRS events over 6 dBA may occur, resulting in 5 dBA added to the observed level for those events. Both the applicant and LURC's consultants state the project would still comply with the relevant sound level limits at all protected locations with the first 5 dBA penalty. No discussion was presented regarding the second 5 dBA penalty potentially imposed by the Planning Board by either consultant.



BSE Consultant Scott Bodwell pre-filed testimony:

*“These same modeling assumptions have been used in a number of other wind power projects in Maine, including the Stetson I and Stetson II projects previously approved by LURC, and the Rollins, Record Hill, and Oakfield projects, each of which was approved by the Maine DEP. Importantly, we now have post-construction monitoring data from the Stetson I and Stetson II projects, which allow us to compare the predicted levels with the operating levels and, in effect, allow us to calibrate the model. The post-construction monitoring data from the Stetson I and II projects demonstrates that the model typically over predicts actual hourly sound levels by 2-4 dBA. This is not surprising in light of the conservative assumptions built into the model.*

*If SDR events occur, a 5 dBA penalty is applied to the measured levels to determine compliance with the applicable limits. The post-construction monitoring program as described in Section 7.2 of the Sound Level Assessment is designed to measure compliance in conditions that are most likely to result in SDR events and, if they occur, the penalty will be applied when determining compliance. Even assuming that occasional SDR events over 6 dBA occur, and 5 dBA is added to the observed sound level for those events, the Project would still comply with the relevant sound level limits at all protected locations.”*

## PEER REVIEW BY WARREN BROWN OF APPLICANT’S STUDY

- Warren Brown’s findings indicate that 660 ft from the parcel boundaries that at P1, the noise level is modeled at 41.5 dBA, and for P2, the noise level is modeled at 39.6 dBA.
- *“The proposed project as designed does not comply with the ordinance quantifiable nighttime limit of 40 dBA for protected location P1 at 660 feet from property boundary.”*
- *“The project boundary hourly sound level limit of 75 dBA (Leq) was satisfactorily demonstrated in the LURC application noise assessment.”*
- *“Additional subjective SDRS compliance requirements cannot be anticipated at this time.”*
- *“Vestas has issued a Sound Level Performance Standard that warrants the V 100 will not produce a steady tonal sound as defined by the MDEP 375.10 standard. The proposed Vestas V 100 are not expected to generate regulated tonal sounds during routine operation.”*

## CONSTRUCTION AND MAINTENANCE NOISE

DEP does not regulate construction noise for daytime hours. The Eastbrook Ordinance does regulate it.

Eastbrook Wind Energy Facility Ordinance**(2) Sound from Construction of a Facility**

*(a) Sound from construction activities at the facility location occurring between 6:00 p.m. and 7:00 a.m. is subject to the following limits:*

*(i) Sound from construction activities, including construction activities conducted concurrently with routine operation of the facility, may not exceed the limit set forth in 1(a) (ii) above.*

*(b) Sound from construction activities occurring between 7:00 a.m. and 6:00 p.m. shall not exceed the following limits within 660 feet of any Protected Location:*

*Duration of Activity Hourly Sound Level Limit**>6 hours 80 dBA**2 to 6 hours 85 dBA**>1 hour but <2 hours 95 dBA**1 hour or less 105 dBA*

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

**(3) Sound from Facility Maintenance Activities**

*(a) Sound from routine, ongoing maintenance activities is considered part of the routine operation of the facility.*

*(b) Sound from occasional, major, scheduled overhaul activities, including overhaul activities conducted concurrently with routine operation of the facility, are subject to the construction sound level limits contained in subsection 2 above.*

From the Warren Brown Peer Review Addendum on Construction Levels

**Table 2 Ordinance Daytime Construction Sound Level Limits Compared With Previously Held MDEP Limits**

<b>Eastbrook Ordinance</b>		<b>Repealed Chapter 375.10</b>	
<b>Duration of activity</b>	<b>Hourly Sound Level Limit</b>	<b>Duration of activity</b>	<b>Hourly Sound Level Limit</b>
<b>&gt;6 hours</b>	<b>80 dBA</b>	<b>12 hours</b>	<b>87 dBA</b>
		<b>8 hours</b>	<b>90 dBA</b>
<b>2 to 6 hours</b>	<b>85 dBA</b>	<b>6 hours</b>	<b>92 dBA</b>
		<b>4 hours</b>	<b>95 dBA</b>
		<b>3 hours</b>	<b>97 dBA</b>
<b>&gt;1 hour but &lt;2 hours</b>	<b>95 dBA</b>	<b>2 hours</b>	<b>100 dBA</b>
<b>One hour or less</b>	<b>105 dBA</b>	<b>1 hour or less</b>	<b>105 dBA</b>

*“Since daytime construction sounds are exempt from chapter 375.10 (38 MRSA 484), the applicant made no estimates of impact. Hence, the reviewer has insufficient construction information and must also follow suit. It is noted that the ordinance daytime construction sound level limits are markedly below those of the former application of chapter 375.10.”*

Summarized by LURC staff from Application Exhibit 17

Sound from nighttime construction that occurs beyond daytime or daylight hours is subject to nighttime limits that apply to routine operation. Primarily construction of the Project will involve heavy and light equipment for road construction, erection of turbines by crane, excavation of underground collector line trenching, and O & M building construction with accompanying substation. It is anticipated that moderate blasting will occur on site and there is potential for use of a portable rock crusher. All construction equipment must also comply with federal noise standards and environmental noise control devices. Refer to Exhibit 17 of the application Section 6.1 *Construction Sound Levels* for further detail.

## TWO MILE HOURLY SOUND LEVEL STANDARD

Project would meet the Eastbrook Ordinance, so there is no need to address this.

## REPORTING REQUIREMENTS

When working with DEP regulations, reporting requirements are controlled by permit conditions. Typically this has been for one year, studying situations in which the sounds are likely to be loudest, and the methodology has been refined with each project. Currently LURC approves the monitoring plan before it is implemented and then receives a report about the results. The applicant proposes to continue this practice and includes the Stetson II monitoring report in the application as the model.

The Eastbrook ordinance has substantially more specific measurement and reporting protocols, as well as municipal oversight of those practices. It also has a requirement for more frequent and longer monitoring.

### Eastbrook Ordinance Reporting:

Excerpt from Section 20.0 Special Standards for Type 2 and Type 3 Wind Energy Facilities

#### 20.1 Noise Standards

- *Beginning during the period **April through December of the 1st year of commencement of operation of an approved Wind Energy Facility, the applicant shall arrange a post-construction sound study with all wind turbines operating to be performed by a qualified firm to determine actual noise levels from the WEF and assess compliance with noise standards set forth in the facility permit and this ordinance. The Applicant shall notify the Planning Board at least 30 days prior to conducting the study and the town may observe all field work and shall be given an opportunity to review the study's methodology and results. A second sound study must be performed during the same period in the second year and at least every 3 years thereafter.***

### Eastbrook Ordinance Measurement:

See section D – measurement. This is a very detailed section with extensive methods specified.

## E. SELECTED COMMENTS

### CCRHC Intervenor Attorney Lynne Williams' Final Brief:

*“As was testified to, the Town of Eastbrook passed an ordinance regulating wind turbines, and that ordinance includes a noise standard. The Eastbrook ordinance is more restrictive than the state noise regulations, permissible under state law. (“Nothing in this subsection may be construed to prohibit a municipality from adopting noise regulations stricter than those adopted by the board.”) This Commission is required, under Title 12, to find that the project will have no undue adverse affects on existing uses. The Commission is also permitted to consider “quantifiable noise standards” in an adjacent municipality's ordinance. BSE concedes that the Eastbrook Ordinance includes “quantifiable noise standards,” and that Eastbrook is an adjacent municipality. They object, however, to the locations at which the noise measurements must be taken, to wit within 660 feet of the property line of a protected location.”*

BSE Verrill Dana Attorney Kelly Boden's Post-hearing Brief:

Finding. *"When operating at full sound output, the estimated hourly sound limit at the lot line of the nearest residence is 39.6 dBA (at a distance of 3,705 feet from the nearest turbine), which is below the required DEP nighttime limit of 45 dBA and the Project will meet all other DEP requirements at all protected locations. (Bodwell Pre-Filed Direct Test. at 6). EnRad also determined that the sound levels from the Project would be 5 dBA or more below applicable quiet limits, tonal sounds were not expected to occur, and SDR events were not expected frequently. In the event SDR events occurred, the Project has a buffer of at least 5 dBA between predicted levels and the applicable limits. (EnRad Peer Review at Section 6.3. and 8.0, p. 5)."*

Finding. *"The adjacent Town of Eastbrook has enacted a municipal ordinance with three quantifiable noise standards: (1) a nighttime sound limit of 40 dBA applied at all locations on a parcel containing a residence and extending 660 feet beyond the parcel boundary; (2) an hourly sound limit of 35 dBA at any location greater than two miles from any turbine; and (3) 5 dBA may be added to measured sound levels for purposes of determining compliance if there are certain tonal sounds."*

Finding. *"Blue Sky's sound modeling predicts that the Project will comply with Eastbrook's 40 dBA standard at all protected locations, 35 dBA standard two miles from any turbine, and will not generate tonal sounds that would trigger application of Eastbrook's tonal penalty. Operation of the Stetson I and Stetson II projects has shown that actual sound levels have been 2-4 dBA below the models used for these projects, including Bull Hill. (Tr. Vol. II at 113-114)."*

Public Hearing Testimony of Interested Person David Boulter:

*"... The sound standards established in chapter 375.10 of the DEP Rules for Site Location of Development are not adequate to protect areas from undue noise impacts of wind turbines. It is my understanding that these standards were developed for a completely different set of site conditions, in urbanized, areas of Maine. The nighttime sounds standard is simply too high to be protective, and there are no sound limits at all for the project during construction ... The town of Eastbrook lawfully adopted quantifiable noise standards as part of its Wind Energy Facility Ordinance. These standards were fully vetted over a period of months during ordinance development and were a large reason for ultimate community acceptance of the ordinance. I strongly urge the commission to apply the Eastbrook noise standards to this project. ..."*

*Neither the DEP rules nor the Eastbrook ordinance adequately protects against noise levels from a wind project on undeveloped land where there is not a residence or other "protected location", allowing 75dBA day or night (OSHA requires issuance of hearing protection at 85dBA in an 8 hour day). This substantially reduces the ability of property owners to place dwellings on their undeveloped land in the future, even on large lots comprising 80 or more acres such as in Eastbrook. ..."*

*Furthermore, the commission should condition any approval on reducing maximum wind turbine speeds when the wind is blowing from the southeast toward the dwellings and in non-winter months when the wind is blowing from the northeast. These measures are achievable since the prevailing winds (and the winds for which the project is designed) are from the northwest and southwest. ... dampening peak power generation (and thus noise) during those limited periods is not only feasible but keep would noise levels low at protected locations.*

*Alternatively, due to both visual and noise impacts to dwellings at the end of Sugar Hill Road the commission should give serious consideration to disallowing construction of turbines 1 and 2 and perhaps 3, the 3 turbines that would be constructed closest to the dwellings."*

Public Hearing testimony 5/18/11 of Kathleen Donahoe (Vol. III pg 58, 61-62)

Kathleen Donahoe: *"Hi. My name is Kathleen Donahoe. I live at the last house on the Sugar Hill Road in Eastbrook, which is designated P-1 on the applicant's material. I'm here to just represent myself and my property and to voice my concerns as the closest resident of Eastbrook to the proposed wind project. ...*

*Within one day of seeing this simulation, I was offered an easement, a good neighbor agreement, from the company, which was a 45-year commitment. This contract would have silenced me from speaking to you today and every day, for the next 45 years, regardless of any potential negative impact created by the turbines.*

*The sound data that was created sets my residence at a decibel level of 37.2. Actually, it's ambiguous. It goes -- I thought that was the level, but it could be 500 feet from my house; it could be -- it was hard to read the material to understand exactly which study was what. But that's -- that's what I'm assuming. My house is situated in very close proximity to the 16 turbines, but on the west side of my land. The majority of my land is exposed to higher decibel levels.*

*The way the proposed project is situated, any noise from the turbines would dissipate as it traveled over my land. My plan for a camp, which I established a spot for years ago, would be in an area of my property that would be too loud to reside in. If the wind company applied the ordinance that was created using all of this data for my house and all the others in this area of town, we would be better protected. There are three other dwellings right at the edge of Eastbrook. It seems to me that proposing to erect 480-foot turbines within hundreds of feet of a town that has worked hard to establish an ordinance that would protect its residents is unfair at best. And this is just the topic of operating sound levels. ..."*

Public Hearing testimony 5/18/2011 of John Fernandez (Vol. III pg 19)

MR. FERNANDEZ: *"Good evening. My name's John Fernandez, and I'm here on behalf of my wife and I, Linda. And we are the adjacent property holders to this development. We own 40 acres on Sugar Hill. And not that I have anything against windmills; I think it's something that's part of the future. My biggest concern is that we own property on each side of the access road to this development on the Sugar Hill end, and we are concerned as far as the noise level goes.*

*Now, I've been told by First Wind, which I respect their opinion, that the decibel level in our area is supposed to be within reason, but there's different seasons where that wind can change a little bit, and I'm just -- my wife and I are concerned very much that this may be a problem for us. We bought this property six years ago in 2004 -- actually almost seven years ago now -- to be a retirement home for us. And it's peaceful and quiet up there, and we don't hear much traffic. We like to do hiking and put trails through our property, you know, just so we can go out and enjoy nature. And not that that's going to be a problem, but my biggest concern is the noise level. Thank you."*

MR. NADEAU: *"John, how far are you from the nearest turbine?"*

MR. FERNANDEZ: *"I'm about 3,400 feet, I think it is, isn't it, Dave?"*

UNIDENTIFIED SPEAKER: *"3,880."*

MR. FERNANDEZ: *"3,880"*

MR. NADEAU: *"Okay."*

MR. FERNANDEZ: *"I notice they did a resurvey just recently here and put some survey stakes down our driveway, so -- but we are -- we are close on that end."*

BSE Response to Public Comments 6-7-11:

*"As noted in the March 15th filing and in Scott Bodwell's pre-filed testimony, the modeling shows that the Project will meet the 40 dBA nighttime standard at the Eastbrook dwellings and at all locations on their*

*property, sound will not exceed 35 dBA two miles from any turbine, and the Project is not expected to generate tonal sounds that would trigger application of the tonal penalty. See Bodwell Pre-Filed Testimony, pp. 8-10. Both Kathleen Donahoe (the owner of lot "P-1") and David Boulter testified that their concerns regarding sound impacts were related to their continued use and enjoyment of their property. Donahoe Testimony, Transcript Vol. III, pp. 58-67; Boulter Testimony, Transcript Vol. III, pp. 41-42, 55-56. As noted above, the Project will meet the Eastbrook 40 dBA standard at every location on Ms. Donahoe's and Mr. Boulter's properties. There is no rational reason, therefore, to apply this standard on land not owned by these residents (and upon which no houses exist). The fact that predicted sound levels are in compliance with the 40 dBA limit at protected locations ensures both that the intent of the Eastbrook ordinance, which is to protect residential properties from unreasonable sound impacts will be satisfied, and also that the Project will meet the more general requirement that there be no undue adverse effect on existing uses."*

*"There is one location 660 feet from the property line of P1 where the modeling does not show compliance with the 40 dBA standard set forth in the Eastbrook Wind Ordinance. See Bodwell Pre-Filed Testimony, p. 10 n. 5. Compliance with the nighttime limit 660 feet beyond the protected locations should not, however, be considered by the Commission. The purpose behind the requirement to consider quantifiable sound limits in adjacent communities is to protect existing uses and, in particular, residents in adjacent towns. The 660-foot provision, however, requires compliance with the nighttime limit at locations beyond the property line where such residences are located and in some instances extends beyond the municipal boundaries. There is no reason for the Commission to apply the Eastbrook 40 dBA limit to locations that extend beyond the property lines of residential parcels in Eastbrook, particularly where, as here, it is not necessary to ensure protection of existing uses in Eastbrook."*

BSE Response to Public Comments 6-7-11:

**APPLICABILITY OF EASTBROOK WIND ORDINANCE, LAND USE ORDINANCES AND COMPREHENSIVE PLAN:** *"A petition has been filed with the Commission requesting that LURC "adhere to" the Eastbrook Comprehensive Plan, Eastbrook's Land Use Ordinances, and the Eastbrook Wind Ordinance. As a threshold matter, communities ordinarily do not have the ability to regulate activities that occur outside their municipal boundaries and, as a result, by their express terms, the Eastbrook ordinances, including both the land use and wind ordinances, apply only to development within the Town of Eastbrook. There is a limited exception to this general principle under the Site Law sound regulations that govern this proceeding, and which allows the review agency to "consider" quantifiable sound limits in an adjacent community. Blue Sky East previously provided an assessment of both the legal applicability of the Eastbrook Wind Ordinance and compliance with its terms and, although summarized below, will not be repeated in its entirety. See March 15, 2011 Geoffrey West Letter ("March 15<sup>th</sup> Filing"). ...*

*"There are only three (3) quantifiable noise standards in the Eastbrook Wind Ordinance:*

- Nighttime sound limit of 40 dBA, applied within 660 ft. of a protected location;*
- Hourly sound limit of 35 dBA at any location greater than two miles from any turbine; and*
- 5 dBA may be added to measured sound levels for purposes of determining compliance if there are certain tonal sounds."*

*"Finally, there is no legal basis for requiring Blue Sky East to comply with Eastbrook's Comprehensive Plan or other Land Use Ordinances. The DEP sound regulations provide a limited exception that allows the*

*Commission to consider “quantifiable noise standards,” but there is no regulatory or other basis for the Commission to consider more general provisions set forth in an adjacent municipality’s comprehensive plan or any other adjacent town ordinance. To do otherwise would allow one town to regulate growth and uses in an adjacent town.”*

#### **Warren Brown Peer Review Addendum - Eastbrook Ordinance Review Conclusion**

*“The Eastbrook ordinance parallels chapter 375.10 in many aspects. The reviewer has attempted to highlight only areas of marked exception between the two regulations.*

*It is the reviewer's opinion that the Eastbrook ordinance is not entirely quantifiable and provides an insufficient basis for estimating acceptable wind project design.”*



## F. ANALYSIS

Based on the application materials and the Commission's third-party peer review by Warren Brown, the proposal meets the current DEP standards that are the minimum legal standard. There is a local ordinance in the neighboring municipality, so the Commission must consider it to the extent it is quantifiable. Once that determination is made, the Commission's choice is whether to apply all, part, or none of the quantifiable sections of the Eastbrook ordinance regarding noise from wind energy developments. That decision rests on a few factors.

First, is any portion of the ordinance "quantifiable" as specified in the DEP rule? The definition of "Quantifiable Noise Standard" is: "A numerical limit governing noise from developments that has been duly enacted by ordinance by a local municipality." The opinion of the commission's expert is that portions of the ordinance are quantifiable, but other portions are not. According to the expert review, the hourly sound limits and tonal penalty are quantifiable; however, the subjective nature of the planning board decision regarding a double-penalty for SDRS may not be quantifiable.

Provisions	Town of Eastbrook	Quantifiable?
Measurement location	660 ft from parcel boundary, even if extends on to project parcel	Yes (although the applicant disagrees – see post-hearing brief)
Project Boundary limit	75 dBA	No difference
Daytime Hr limit	50 dBA	Yes, but project meets both standards
Nighttime hr limit	40 dBA	Yes, and the evidence indicates this standard would not be met at one protected location
SDR (repetitive)	5 dBA penalty plus possible additional 5 dBA penalty if planning board determines it meets a particular standard in the rule	No
Tonal	Standard more restrictive	Yes, but project can meet both standards
Construction Noise	Specific daytime standard	Yes, but no analysis available as to whether the proposal would meet the Eastbrook standard
2 mile standard	35 dBA	Project meets both standards
Reporting requirements	Two years plus every third year and as determined by planning board	Unclear whether this is a "numerical limit governing noise".

Second, if the standard is quantifiable, then the Commission is directed to consider it in making its determination as to whether the project would have an undue adverse impact on existing uses, and would protect the public's health, safety and general welfare. In this case, some of the standards are met either way, so it is not necessary to make a determination for them. For the others, where there truly is a difference, the Commission must determine the appropriate means to consider the standards.

- **Measurement location** – this would extend limits on noise onto un-built parcels at the edge of any protected location. That has significant implications that the Commission may want to consider, as it is a major policy departure from the DEP rule.
- **Nighttime hr limit** – the model indicates a nighttime sound level slightly above the Eastbrook allowed level for one residence. However, the model is conservative given that wind conditions and safety margins have been built in. The Commission must decide if affording the higher protection to the nearest landowners, i.e. the lower dBA limit, must be applied to ensure there is no undue adverse impact and the public's health, safety and general welfare is protected.
- **Construction noise** – Nighttime noise levels cannot be exceeded in any case, so the question is whether sound from a daytime construction activity of a finite duration should be regulated. The current practice at the state level is no. The consideration here is whether there the Eastbrook standards are necessary in order to protect the public's health, safety and welfare.
- **Reporting requirements** – The reporting requirements are detailed, but a prominent difference is the frequency of testing. LURC may want the flexibility to adapt the proposed monitoring protocol with the help of a consultant as the body of professional knowledge about wind turbine sound advances.

Third, are there practical implications with respect to LURC enforcing a locally designed ordinance, namely, with respect to construction noise and reporting requirements? Measurement location, daytime and nighttime sound limits, the 2 mile standard and tonal sound standard would be implementable and enforceable. Construction noise would be measurable, but may be very difficult to enforce. The reporting requirements are specific and may be difficult to implement and enforce with the limited LURC staff to the degree there are any differences from the standard DEP reporting requirements.

## G. QUESTIONS

What portions, if any, of the Eastbrook ordinance should be applied to this project? Why?

**H. Department of Environmental Protection Chapter 375:  
NO ADVERSE ENVIRONMENTAL EFFECT STANDARD OF THE SITE LOCATION LAW**

**10. Control of Noise**

**A. Preamble.** The Board recognizes that the construction, operation and maintenance of developments may cause excessive noise that could degrade the health and welfare of nearby neighbors. It is the intent of the Board to require adequate provision for the control of excessive environmental noise from developments proposed after the effective date of this regulation.

**B. Applicability**

- (1) This regulation applies to proposed developments within municipalities without a local quantifiable noise standard and in unorganized areas of the State. 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 Board within that municipality for each of the types of sounds the ordinance regulates. This regulation applies to developments located within one municipality when the noise produced by the development is received in another municipality and, in these cases, the Board will also take into consideration the municipalities' quantifiable noise standards, if any.
- (2) This regulation applies to expansions and modifications of developments when such expansions and modifications are proposed after the effective date of this regulation and subject to site location approval, but only to the noise produced by the proposed expansion or modification of the development, unless (1) the existing development was constructed since 1-1-70 and (2) at the time of construction, the existing development was too small to require site location approval. In situations where conditions (1) and (2) above apply, then this regulation applies to the whole development (both existing facility and proposed expansion or modification). This regulation also applies to expansions and modifications of existing developments when such expansions and modifications require an amendment to the development's Site Law permit, but only to the noise produced by the expansion or modification.
- (3) This regulation does not apply to existing developments or portions of existing developments constructed prior to 1-1-70 or approved under the Site Law prior to the effective date of this regulation. This regulation does not apply to relicensing of existing solid waste facilities previously approved under the Site Law.
- (4) The sound level limits contained in this regulation apply only to areas that are defined as protected locations, and to property lines of the proposed development or contiguous property owned by the developer, whichever are farther from the proposed development's regulated sound sources.
- (5) The sound level limits contained in this regulation do not apply to noise received within the development boundary.

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NOTE: The Board will reconsider the effect and operation of the regulation one year from its effective date.

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### C. Sound Level Limits

#### (1) Sound From Routine Operation of Developments.

(a) Except as noted in subsections (b) and (c) below, the hourly sound levels resulting from routine operation of the development and measured in accordance with the measurement procedures described in subsection H shall not exceed the following limits:

(i) At any property line of the development or contiguous property owned by the developer, whichever is farther from the proposed development'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 Department 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 an area for which the use is not predominantly commercial, transportation, or industrial.

(v) When a proposed development 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 development and measured in accordance with the

measurement procedures described in subsection H 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 developer may make sound level measurements in accordance with the procedures in subsection H 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 (as appropriate for the anticipated operating schedule of the development), then the developer may estimate the daytime or nighttime pre-development ambient hourly sound level to be greater than 45 dBA or 35 dBA, respectively.

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

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- (vi) Notwithstanding the above, the developer 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 development will not exceed 50 dBA in the daytime or 40 dBA at night.
- (b) If the developer chooses to demonstrate by measurement that the daytime and/or nighttime pre-development ambient sound environment at any protected location near the development 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 development, the hourly sound level limit for routine operation of the existing development and all future expansions of that development shall be the applicable hourly sound level limit of 1(a) or 1(b) above, or, at the developer's election, the existing hourly sound level from routine operation of the existing development 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 development.
- (e) When routine operation of a development 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 development for the purposes of determining compliance with the above sound level limits.
- (ii) For short duration repetitive sounds resulting from scrap metal, drop forge and metal fabrication operations or developments which the Board 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 development 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 developer chooses to demonstrate by measurement that the pre-development ambient hourly sound level at any protected location near the development 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.
  - (e) For any protected location near an existing development, the maximum sound level limit for short duration repetitive sound resulting from routine operation of the existing development and all future expansions and modifications of that development shall be the applicable maximum sound level limit of (e)(ii)(a) or (e)(ii)(b) above, or, at the developer's election, the existing maximum sound level of the short duration repetitive sound resulting from routine operation of the existing development plus 3 dBA.

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NOTE: The maximum sound level of the short duration repetitive sound shall be measured using the fast response [ $L_{AFmax}$ ]. See the definition of maximum sound level.

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## (2) Sound From Construction of Developments

- (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, 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:
    1. the local municipality when the duration of the nighttime construction activity is less than or equal to 90 days,
    2. the local municipality and the Board when the duration of the nighttime construction activity is greater than 90 days.
- (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 development sites 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 development and the combined total of the routine maintenance and operation sound 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.

### (4) Sound From Production Blasting



Sound exceeding the limits of subsection 1 and resulting from production blasting at a mine or quarry shall be limited as follows:

- (a) Blasting shall not occur in the period between sundown and sunrise the following day or in the period between the hours of 7:00 p.m. and 7:00 a.m., whichever is greater. In addition, no routine production blasting shall be allowed in the daytime on Sundays.
- (b) Blasting shall not occur more frequently than four times per day.
- (c) Sound from blasting shall not exceed the following limits at any protected location:

Number of Blasts Per Day	Sound Level Limit
1	129 dBL
2	126 dBL
3	124 dBL
4	123 dBL.

Blast sound shall be measured in peak linear sound level (dBL) with a linear response down to 5 Hz.

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NOTE: See Bureau of Mines Report of Investigations 8485 for information on airblast sound levels and pertinent scaled distances.

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#### (5) Exemptions

Sound associated with the following shall be exempt from regulation by the Board:

- (a) Railroad equipment which is subject to federal noise regulations.
- (b) Aircraft operations which are subject to federal noise regulations.
- (c) Registered and inspected vehicles:
  - (i) while operating on public ways, or
  - (ii) which enter the development to make a delivery or pickup and which are moving, starting or stopping, but not when they are parked for over 60 minutes in the development.
- (d) Watercraft while underway.
- (e) Residential developments, except during construction of such developments.
- (f) Bells, chimes and carillons.
- (g) occasional sporting, cultural, religious or public events allowed by the local municipality where the only affected protected locations are contained within that municipality.
- (h) The unamplified human voice and other sounds of natural origin.

- (i) Firming, fishing and aquacultural activity.
  - (j) Forest management, harvesting and transportation activities.
  - (k) Making, maintaining and grooming snow where the only affected protected locations are contained within the general boundaries of a ski area development.
  - (l) Snow removal, landscaping and street sweeping activities.
  - (m) Emergency maintenance and repairs.
  - (n) Warning signals and alarms.
  - (o) Safety and protective devices installed in accordance with code requirements.
  - (p) Test operations of emergency equipment occurring in the daytime and no more frequently than once per week.
  - (q) Boiler start-up, testing and maintenance operations occurring no more frequently than once per month.
  - (r) Major concrete pours that must extend after 7:00 p.m., when started before 3:00 p.m.
  - (s) Sounds from a regulated development received at a protected location when the generator of the sound has been conveyed a noise easement for that location. This exemption shall only be for the specific noise, land and term covered by the easement.
  - (t) A force majeure event and other causes not reasonably within the control of the owners or operators of the development.
- (6) Noise Abatement Structures.

Noise abatement structures of a non-permanent nature in any one location for a duration of less than one year and erected for the sole purpose of noise control shall not be considered structures as defined in 38 MRSA subsection 482(6).

#### **D. Submissions**

- (1) Developments with Minor Sound Impact.

An applicant for a proposed development with minor sound impact may choose to file as part of the site location application a statement attesting to the minor nature of the anticipated sound impact of their development. An applicant proposing an expansion or modification of an existing development with minor sound impact may follow the same procedure as described above. For the purpose of this regulation, a development or an expansion or modification of an existing development with minor sound impact means a development where the developer demonstrates, by estimate or example, that the regulated sound from routine operation of the development will not exceed 5 dBA less than the applicable limits established under subsection C. It is the intent of this subsection that an applicant need not

conduct sound level measurements to demonstrate that the development or an expansion or modification of an existing development will have a minor sound impact.

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NOTE: Examples include subdivisions without structures, office buildings, storage buildings which will not normally be accessed at night, and golf courses.

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## (2) Other Developments

Technical information shall be submitted describing the applicant's plan and intent to make adequate provision for the control of sound. 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 development.
- (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 development, including their locations within the proposed development.
- (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 development.
- (d) A description of the protected locations near the proposed development.
- (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 development with the sound level limits of this regulation.
- (g) A comparison of the expected sound levels from the proposed development with any quantifiable noise standards of the municipality in which the proposed development will be located and of any municipality which may be affected by the noise.

## E. Terms and Conditions

The Board may, as a term or condition of approval, establish any reasonable requirement to ensure that the developer has made adequate provision for the control of noise from the development 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 regulation shall not preclude the Board under Chapter 375.15 from requiring a developer to demonstrate that sound levels from a development will not unreasonably disturb wildlife or adversely affect wildlife populations. In addition, the sound level limits shall not preclude the Board, as a term or condition of approval, from requiring that lower sound level limits be met to ensure that the developer has made adequate provision for the protection of wildlife.

## **F. Variance From Sound Level Limits**

The Board recognizes that there are certain developments or activities associated with development for which noise control measures are not reasonably available. Therefore, the Board or Commissioner may grant a variance from any of the sound level limits contained in this rule upon (1) a showing by the applicant that he or she has made a comprehensive assessment of the available technologies for the development and that the sound level limits cannot practicably be met with any of these available technologies, and (2) a finding by the Board that the proposed development will not have an unreasonable impact on protected locations. In addition, a variance may be granted by the Board or Commissioner if (1) a development 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 development's intended function, and (2) a finding is made by the Board or Commissioner that the proposed development will not have an unreasonable impact on protected locations. The Board or Commissioner shall consider the request for a variance as part of the review of a completed Site Location of Development Law application. In granting a variance, the Board or Commissioner may, as a condition of approval, impose terms and conditions to ensure that no unreasonable sound impacts will occur.

## **G. 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 development of interest.
- (2) **CONSTRUCTION:** Activity and operations associated with the development or expansion of a project 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 H(4.2).]
- (6) **EXISTING DEVELOPMENT:** A development constructed before 1-1-70 or a development approved under the Site Law prior to the effective date of this regulation or a proposed development for which the site location application is complete for processing on or before the effective date of this regulation. Any development with a site location approval which has been remanded to the Board by a court of competent jurisdiction for further proceedings relating to noise limits or noise levels prior to the effective date of these regulations shall not be deemed an existing development and these regulations shall apply to the existing noise sources at that development.
- (7) **EXISTING HOURLY SOUND LEVEL:** The hourly sound level resulting from routine operation of an existing development prior to the first expansion that is subject to this regulation.

- (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.

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NOTE: For convenience, a one hour equivalent sound level should begin approximately on the hour.

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- (9) **HISTORIC AREAS:** Historic sites administered by the Bureau of Parks and Recreation 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 regulation.
- (11) **LOCALLY-DESIGNATED PASSIVE RECREATION AREA:** 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 filing of the applicant's Site Location of Development 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:  $L_{AFmax}$ .
- (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 development site prior to the construction and operation of the proposed development or expansion.
- (16) **PROTECTED LOCATION:** Any location, accessible by foot, on a parcel of land containing a residence or planned residence or approved residential subdivision, house of worship, academic school, college, library, duly licensed hospital or nursing home near the development site at the time a Site Location of Development application is submitted; or any location within a State Park, Baxter State Park, National Park, Historic Area, a nature preserve owned by the Maine or National Audubon Society or the Maine Chapter of the Nature Conservancy, The Appalachian Trail, the Moosehorn National Wildlife Refuge, federally-designated wilderness area, state wilderness area designated by statute (such as the Allagash Wilderness Waterway), or locally-designated passive recreation area; or any

location within consolidated public reserve lands designated by rule by the Bureau of Public Lands as a protected location.

At protected locations more than 500 feet from living and sleeping quarters within the above noted buildings or areas, the daytime hourly sound level limits shall apply regardless of the time of day.

Houses of worship, academic schools, libraries, State and National Parks without camping areas, Historic Areas, nature preserves, the Moosehorn National Wildlife Refuge, federally-designated wilderness areas without camping areas, state wilderness areas designated by statute without camping areas, and locally-designated passive recreation areas without camping areas are considered protected locations only during their regular hours of operation and the daytime hourly sound level limits shall apply regardless of the time of day.

Transient living accommodations are generally not considered protected locations; however, in certain special situations where it is determined by the Board that the health and welfare of the guests and/or the economic viability of the establishment will be unreasonably impacted, the Board may designate certain hotels, motels, campsites and duly licensed campgrounds as protected locations.

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)QUANTIFIABLE NOISE STANDARD: A numerical limit governing noise from developments that has been duly enacted by ordinance by a local municipality.
- (18)ROUTINE OPERATION: Regular and recurrent operation of regulated sound sources associated with the purpose of the development and operating on the development site.
- (19)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 development and are foreseeable.
- (20)SOUND COMPONENT: The measurable sound from an audibly identifiable source or group of sources.
- (21)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 regulation, 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 regulation, a tonal sound exists if, at a protected location, the one-third octave band sound pressure level in the band containing the tonal sound exceeds the arithmetic average of the sound pressure levels of the two contiguous one-third octave bands by 5 dB for center frequencies at or between 500 Hz and 10,000 Hz, by 8 dB for center frequencies at or between 160 and 400 Hz, and by 15 dB for center frequencies at or between 25 Hz and 125 Hz.

Additional acoustical terms used in work associated with this regulation 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.

## H. 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 development, and define the information to be reported. The same methods shall be used for measuring the sound of construction, maintenance and production blasting activities. For measurement of the sound of production blasting activities for comparison with the limits of subsection C(4)(c), these same methods shall be used with the substitution of the linear sound level for the A-weighted sound level.

### (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 Board or Commissioner.

#### 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.
- (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 development.
- (b) For determining compliance with the 75 dBA property line hourly sound level limit described in subsection C(I)(a)(i), measurement locations shall be selected at the property lines of the proposed development or contiguous property owned by the developer, 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 development.
- (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-development sound may be discussed with the Department staff.

### (3) Measurement of Ambient Sound

#### 3.1 Pre-Development Ambient Sound

Measurements of the pre-development ambient sound are required only when the developer elects to establish the sound level limit in accordance with subsections C(1)(b) and C(1)(e)(ii)(d) for a development in an area with high ambient sound levels, such as near highways, airports, or pre-existing developments; or when the developer 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 development will operate. If the proposed development will operate on Saturdays and/or Sundays, measurements shall also be made during all hours that the development 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 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-Development Ambient Sound

- (a) Measurements of the post-development ambient one hour equivalent sound levels and, if short duration repetitive sounds are produced by the development, the maximum sound levels made at nearby protected locations and during representative routine operation of the development that are not greater than the applicable limits of subsection C clearly indicate compliance with those limits.
- (b) Compliance with the limits of subsection C(1)(b) may also be demonstrated by showing that the post-development ambient hourly sound level, measured in accordance with the procedures of subsection 3.1 above during routine operation of the development, does not exceed the pre-development ambient hourly sound level by more than one decibel, and that the sound from routine operation of the development is not characterized by either tonal sounds or short duration repetitive sounds.
- (c) Compliance with the limits of subsection C(1)(e)(ii)(d) may also be demonstrated by showing that the post development 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 development, 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 development in accordance with the procedures described in subsection 4.

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

4.1 General

- (a) Measurements of the sound from routine operation of developments are generally necessary only for specific compliance testing purposes in the event that community complaints result from operation of the development, for validation of an applicant's calculated sound levels when requested by the Board or Commissioner, for determination of existing hourly sound levels for an existing development or for enforcement by the Department.
- (b) Measurements shall be obtained during representative weather conditions when the development 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 development and inversion periods (which most commonly occur at night).
- (c) Measurements of the development sound shall be made so as to exclude the contribution of sound from development equipment that is exempt from this regulation.

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

- (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 development. These additional measurements may include diagnostic measurements such as measurements made close to the development 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-development sounds.
- (b) For the purposes of computing the hourly sound level resulting from routine operation of the development, 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 development for the purpose of adding the 5 dBA penalty in accordance with subsection C(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 development 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 development 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 development and not the result of an unforeseeable occurrence. If one or more of the sounds of routine operation of the development 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 [ $L_{AFmax}$ ]. 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 development is the energy sum of the hourly sound level components from the development, 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 development is in compliance with that sound level limit at that protected location.
- (5) Reporting Sound Measurement Data. The sound measurement data report should include 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 development, 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 development and the existing environment by character and location.

#### I. Town of Eastbrook Wind Energy Facility Ordinance

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