

# **Black Nubble Wind Farm Project**

## **Blasting Narrative**

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**Related Sections**

Appendix 2.11 Civil Engineering Design Specifications appended at the end of the  
Basis of Road Design Narrative

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**1.0 Introduction**

DeLuca-Hoffman Associates, Inc. was retained to prepare designs and portions of the permit applications for a series of wind turbines proposed to be sited on Black Nubble. DeLuca-Hoffman Associates, Inc. designed the primary access roads and summit roads, which will be used to access the wind turbines from existing roadway systems; and also prepared the Stormwater Management Report, Erosion and Sedimentation Control Plans, Road Maintenance Plan, Solid Waste Narrative, and Blasting Narrative associated with the primary access roads and summit roads. Note that the term “summit road” is synonymous with “ridgeline road” within this application. The work of DeLuca-Hoffman Associates, Inc. is summarized in a series of reports as follows:

- ❑ Basis of Design for Primary Access Roads and Summit Roads;
- ❑ Erosion and Sedimentation Control Plan for Roadway Construction;
- ❑ Stormwater Management for Primary Access Roads and Summit Roads;
- ❑ Road Maintenance;
- ❑ Blasting Narrative;
- ❑ Erosion and Sedimentation Control Plan for Transmission Line Corridor Construction; and
- ❑ Solid Waste Narrative.

The narratives prepared by DeLuca-Hoffman Associates, Inc. are supported by the project Civil Engineering Design Drawings included with this submission. Please refer to Cover Sheet C-1 for a complete list of the project drawings.

The designs and reports prepared by DeLuca-Hoffman Associates, Inc. rely upon baseline information provided for this project by other consultants of Maine Mountain Power.

Civil Engineering Design Specifications for the project are provided in Appendix 2.11.

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**2.0 Overview**

DeLuca-Hoffman Associates, Inc. has prepared the following Blasting Narrative.

**Note: This blasting narrative and appended specification will require review by the Contractor, the Geotechnical Consultant and the turbine footing designer prior to project implementation.**

Blasting of open rock and trench rock removal is anticipated to be required for the project. Blasted rock or boulders may be broken into a well-graded mixture of the size recommended by the geotechnical engineer and used as follows:

- Used for deeper fills as specified in the project's Geotechnical Engineering Report accompanying this submission.
- Crushed for topping gravel.
- Processed and used as riprap.

This project is located in a remote area of the state. The Black Nubble Parcel, which turbines are proposed to be located upon, is abutted by only two entities: Department of the Navy and Dallas Corporation.

Blasting is expected to be required for most of the eighteen (18) turbine foundations, the proposed access roads in areas requiring significant cut, the powerline trenches and for above ground transmission line poles. The shallow nature of the soils in the project area suggests that blasting will be required for this project. Soil boring information will be provided in the project's Geotechnical Engineering Report to be provided in the project's Final Development Plan.

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The anticipated blasting procedure for the removal of rock material at turbine foundation locations will consist of implementing line control to full depth and then the use of controlled blasting techniques in several benches to create minimum breakage outside the line control but create maximum rock fragmentation.

Maine Drilling and Blasting Inc., were consulted to gain insight into the blasting techniques used for this type of project and to review and gain advice on this narrative and appended specification. The measures of paragraphs 3.0 and 4.0 of this section will become part of the contract documents for construction to address the proper method for blasting encountered during construction. LURC Chapter 10 provides only a small amount of blasting guidance. This application section has therefore been written in accordance with the requirements of MeDEP.

**3.0 Preblast Survey**

Qualification information will be required from the blasting subcontractor and a public meeting will be conducted prior to any blasting activity. The general contractor will be required to prepare a blasting plan and preblast survey prior to any rock removal. A written report of the preblast survey and blasting plan will be provided to the Permittee by the contractor and will be available for review by LURC in accordance with MeDEP requirements. The scope of the blasting plan and preblast survey will be required to conform to the following specifications and the requirements of Section 4.0 of this Blasting Narrative:

- All structures within a minimum distance of 2,000 feet from any blasting activity shall be surveyed as part of the preblast survey. The extent beyond the 2,000-foot minimum shall be determined by the contractor, their blasting subcontractor, and their insurance companies.
- A blasting plan shall be prepared which addresses:
  - ◆ Airblast limits,
  - ◆ Ground vibrations, and
  - ◆ Maximum peak particle velocity.

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- The blasting plan shall meet criteria established in Chapter 3 (Control of Adverse Effects) in the **Blasting Guidance Manual** of the United States Department of the Interior Office of Surface Mining Reclamation and Enforcement.
- The blasting plan should include provisions and measures to monitor and assure compliance with airblast, PPV and frequency limits.

**4.0 Blasting**

Blasting shall be performed only after approval has been given by the applicant for such operations and must comply with the following provisions set by MeDEP:

- A. The contractor or any subcontractor shall use sufficient stemming, matting or natural protective cover to prevent fly rock from leaving property owned or under control of the Permittee or operator or from entering protected natural resources or natural buffer strips. Crushed rock or other suitable material must be used for stemming when available; native gravel, drill cuttings or other material may be used for stemming only if no other suitable material is available.*
- B. The maximum allowable airblast at any inhabited building not owned or controlled by the developer may not exceed 129 decibels peak when measured by an instrument having a flat response (+ or – 3 decibels) over the range of 5 to 200 hertz.*
- C. The maximum allowable airblast at an uninhabited building not owned or controlled by the developer may not exceed 140 decibels peak when measured by an instrument having a flat response (+ or – 3 decibels) over the range of 5 to 200 hertz.*
- D. Monitoring of airblast levels is required in all cases for which a preblast survey is required by paragraph F. The contractor may file a MeDEP permit modification requesting LURC waive the monitoring requirement if the contractor or subcontractor secures the permission of affected property owners to increase allowable airblast levels on their property and the Department determines that no protected natural resource will be adversely affected by the increased airblast levels. The cost to prepare the permit modification and the effect of*

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*project delay while LURC reviews the request shall be borne solely by the contractor or his subcontractor.*

*E. If a blast is to be initiated by detonating cord, the detonating cord must be covered by crushed rock or other suitable cover to reduce noise and concussion effects.*

*F. A preblast survey is required and must extend a minimum radius of 2,000 feet from the blast site. Notification that blasting will occur should be provided to all owners of structures to be surveyed at least 10 but not more than 30 days prior to commencement of blasting. Pre-blast surveys should include both the interior and exterior of each structure. The preblast survey must document any preexisting damage to structures and buildings and any other physical features within the survey radius that could reasonably be affected by blasting. Assessment of features such as pipes, cables, transmission lines and wells and other water supply systems must be limited to surface conditions and other readily available data, such as well yield and water quality. The preblast survey must be conducted prior to the initiation of blasting at the operation. The contractor or subcontractor shall retain a copy of all preblast surveys for at least one year from the date of the last blast on the development site.*

*(1) The contractor or the subcontractor is not required to conduct a preblast survey on properties for which the Permittee or operator documents the rejection of an offer by registered letter, return receipt requested, to conduct a preblast survey. Any person owning a building within a preblast survey radius may voluntarily waive the right to a survey.*

*G. Blasting timeframes shall be coordinated with the local emergency responders, or as otherwise restricted by the local Fire Department. No blasting shall be completed on weekends, holidays or other weekday times until written permission is received by the local Fire Department and the Permittee.*

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H. Sound from blasting may not exceed the following limits at any protected location:

<i>Number of Blasts Per Day</i>	<i>Sound Level Limit</i>
<i>1</i>	<i>129 dbl</i>
<i>2</i>	<i>126 dbl</i>
<i>3</i>	<i>124 dbl</i>
<i>4 or more</i>	<i>123 dbl</i>

I. The maximum peak particle velocity at inhabitable structures not owned or controlled by the developer may not exceed the levels established in Table 1 in paragraph J and the graph published by the United States Department of the Interior in “Bureau of Mines Report of Investigations 8507,” Appendix B, Figure B-1. The contractor or subcontractor may apply for a project modification to LURC to request a variance to allow ground vibration levels greater than 2 inches per second on undeveloped property not owned or controlled by the applicant if LURC determines that no protected natural resource, unusual natural area or historic site will be adversely affected by the increased ground vibration levels. If inhabitable structures are constructed on the property after approval of the LURC and prior to completion of blasting, the contractor immediately must notify LURC and modify blasting procedures to remain in compliance with the standards of this subsection. The cost to prepare the permit modification and the effect of project delay while LURC reviews the request shall be borne solely by the contractor or his subcontractor.

J. Table 1 of this paragraph or the graph published by the United States Department of the Interior in “Bureau of Mines Report of Investigations 8507”, Appendix B, Figure B-1 must be used to evaluate ground vibration effects for all blasts.

(1) Either Table 1 of this paragraph or graph published by the United States Department of the Interior in “Bureau of Mines report of Investigations 8507”, Appendix B, Figure B-1 may be used to evaluate ground vibration when blasting is to be monitored by seismic instrumentation.

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- (2) *Blasting measured in accordance with Table 1 of this paragraph must be conducted so that the peak particle velocity of any one of the 3 mutually perpendicular components of motion does not exceed the ground vibration limits at the distances specified in Table 1 of this paragraph.*
- (3) *Seismic instruments that monitor blasting in accordance with Table 1 of this paragraph must have the instrument's transducer firmly coupled to the ground.*
- (4) *An Permittee or Operator using Table 1 of this paragraph must use the scaled-distance equation,  $W=(D/D_s)^2$ , to determine the allowable charge weight of explosives to be detonated in any 8 millisecond or greater delay period without seismic monitoring, where  $W$  is equal to the maximum weight of explosives, in pounds, and  $D$  and  $D_s$  are defined as in Table 1 of this paragraph. The contractor may apply for a permit modification to LURC to authorize the use of a modified scaled-distance factor for production blasting if the contractor can demonstrate to a 95% confidence level, based upon records of seismographic monitoring at the specific site of the mining activity covered by the permit, that use of the modified scaled-distance factor will not cause the ground vibration to exceed the maximum allowable peak particle velocities of Table 1 of this paragraph. The cost to prepare the permit modification and the effect of project delay while LURC reviews the request shall be borne solely by the contractor or his subcontractor.*
- (5) *Blasting monitored in accordance with the graph published by the United States Department of the Interior in "Bureau of Mines Report of Investigations 8507", Appendix B, Figure B-1 must be conducted so that the continuously variable particle velocity criteria are not exceeded.*

The contractor may apply to LURC for a permit modification for a variance of the ground vibration monitoring requirement prior to conducting blasting at the development site if the contractor agrees to design all blasts so that the weight of explosives per 8 millisecond or greater delay does not exceed that determined by the equation  $W=(D/D_s)^2$ , where  $W$  is the maximum allowable weight of explosives per delay of 8 milliseconds or greater,  $D$  is the shortest distance between any area to be blasted and any inhabitable structure not owned or controlled by the

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developer, and  $D_s$  equals  $70 \text{ ft./lb.}^{1/2}$ . As a condition of the variance, LURC may require submission of records certified as accurate by the blaster and may require the Permittee or operator to document compliance with the conditions of this paragraph. The cost to prepare the permit modification and the effect of project delay while LURC reviews the request shall be borne solely by the contractor or his subcontractor.

*The following is Table 1.*

<i>Distance Versus Peak Particle Velocity Method</i>		
<i>Distance (D) from the blast area</i>	<i>Maximum allowable peak particle velocity (Vmax) for ground vibration (in./sec.)</i>	<i>Scaled-distance factor (Ds) to be applied without seismic monitoring</i>
<i>0 to 300</i>	<i>1.25</i>	<i>50</i>
<i>301-5000</i>	<i>1.00</i>	<i>55</i>
<i>Greater than 5000</i>	<i>0.75</i>	<i>65</i>

K. *A record of each blast, including seismographic data, must be kept for at least one year from the date of the last blast, must be available for inspection at the development or at the offices of the Permittee or Operator if the development has been closed, completed or abandoned before the one-year limit has passed, and must contain at a minimum the following data:*

- (1) Name of blasting company or blasting contractor;*
- (2) Location, date and time of blast;*
- (3) Name, signature and social security number of blaster;*
- (4) Type of material blasted;*
- (5) Number and spacing of holes and depth of burden or stemming;*
- (6) Diameter and depth of holes;*
- (7) Type of explosives used;*
- (8) Total amount of explosives used;*
- (9) Maximum amount of explosives used per delay period of 8 milliseconds or greater;*
- (10) Maximum number of holes per delay period of 8 milliseconds or greater;*
- (11) Method of firing and type of circuit;*
- (12) Direction and distance in feet to the nearest structure neither owned nor controlled by the developer;*
- (13) Weather conditions, including such factors as wind direction and cloud cover;*
- (14) Height or length of stemming;*

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- (15) *Amount of mats or other protection used;*
- (16) *Type of detonators used and delay periods used;*
- (17) *The exact location of each geophone and the distance of each geophone from the blast;*
- (18) *Seismographic readings, including peak particle velocity and frequency measured in the horizontal, vertical and longitudinal directions, and airblast data*
- (19) *Name and signature of the person operating each seismograph; and*
- (20) *Names of the person and the firm analyzing the seismographic data.*
- (21) *The stratum or structure on which the geophone is located during each blast.*

*L. All field seismographs must record the full analog wave form of each of the 3 mutually perpendicular components of motion in terms of particle velocity and frequency. All seismographs must be capable of sensor check and must be calibrated according to the manufacturer's recommendations.*

*M. Appropriate signs and barricades must be provided at all access points to prevent recreational users and forest management personnel from entering areas affected by blasting activities.*

**5.0 Related Sections**

Blasting specifications are provided in Appendix 2.11, Civil Engineering Design Specifications.