

Section 20
Blasting

1.0 INTRODUCTION

This narrative is supported by the Civil Engineering and Electrical Collector System Design Drawings (Exhibit 1) that have been included with this submission.

2.0 OVERVIEW

The nature of the soils in the amended Oakfield Wind Project (Project) area suggests that blasting will be required for the amended Project (see Section 11 of this application for detailed soils information). Supplemental soil boring information will be obtained during the amended Project's geotechnical investigation.

Blasting is anticipated for many of the 50 turbine foundations and the associated underground power line trenches, the proposed access roads in areas requiring significant cut, and other specific areas where limited blasting will be necessary to set pole structures (pole) for the 34.5-kilovolt (kV) collector system. Blasting is not anticipated for the construction of the operations and maintenance (O&M) building or at the substation. As discussed in Section 3.0 of this Blasting Narrative, a pre-blast survey will be required for any structure or bedrock well within 2,000 feet of these potential blast sites, and will be performed in accordance with the applicable requirements of Title 38 of the Maine Revised Statutes, as annotated, (38 M.R.S.A. §490-Z(14)).

The anticipated blasting procedure for the removal of rock material at turbine foundation and road cut locations will consist of implementing line control to full depth and using controlled blasting techniques in several benches to create minimum breakage outside the line control while creating maximum rock fragmentation. Rock anchor foundations may also be considered for the turbines and will be utilized where feasible. If a rock anchor design is recommended as a result of the geotechnical investigation and structural engineer's analysis, then much less blasting may be required.

If additional blasting is required along the collector system routes, a blasting contractor will precede the construction crews and will probe designated pole and anchor locations using a tracked drilling machine. If bedrock is detected at structure locations, two to four 4-inch diameter pilot holes will be drilled, the explosives will be placed and stemmed in the holes, and the blast will be conducted. Blasting to accommodate such pole construction will only require small charges because of the limited removal of rock required. The shattered rock will then be excavated and the pole installed and backfilled. When bedrock is detected at an anchor location, a two- to four-inch hole will be drilled, and a mechanical-expansion steel rockbolt anchor will then be installed.

In a few areas, blasting may be required for breaking or moving large boulders that restrict construction equipment from accessing construction locations. However, the relative size of the charge in these circumstances will be very small considering the limited amount of excavation required to allow for vehicle or equipment movement.

Blasted rock or boulders may be broken into a well-graded mixture of the size recommended by the geotechnical engineer and may be used for deeper fills as specified in the project's Geotechnical Engineering Report, crushed for roadway surface, topping gravel, and slope protection, and/or used as riprap and erosion control.

No adverse effects from blasting on either sensitive natural resources or private landowners are anticipated because the majority of the Project is in remote locations and because of the minimal size of the individual charges used. In all cases, blasting will be conducted in general conformance with the U.S. Department of Interior Rules 816.61-68 and 817.61-68, and the Blasting Guidance Manual, Office of Surface Mining, Reclamation and Enforcement, U.S. Department of Interior, to limit peak particle velocity and ground vibration to safe levels. For any blast at which ground vibration is monitored, the applicable limit on ground vibration at inhabitable structures not owned or controlled by the developer is the frequency-dependent standard in Figure B-1 of Appendix B, U.S. Bureau of Mines Report of Investigations 8507 (USBM Figure B-1). Noise and air blast effects will be mitigated by use of proper

stemming techniques, and the occurrence of flyrock will be limited by using stemming or blasting mats, as appropriate.

3.0 PRE-BLAST SURVEY

Qualification information will be required from the blasting subcontractor. The general contractor will be required to prepare a blasting plan and pre-blast survey prior to any rock removal. A written report of the pre-blast survey and blasting plan will be provided to the Permittee by the contractor and will be available for review in accordance with Maine Department of Environmental Protection (MDEP) requirements. The scope of the blasting plan and pre-blast survey will be required to conform to the following specifications and the requirements of Section 4.0 of this Blasting Narrative.

- All structures and associated bedrock wells within a minimum distance of 2,000 feet from any blasting activity shall be surveyed as part of the pre-blast 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 that addresses airblast limits, ground vibrations, and maximum peak particle velocity.
- 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 the airblast limits described below, and the peak particle velocity and frequency limits established in USBM Figure B-1.

4.0 Blasting

Blasting shall be performed only after approval has been given by the Permittee for such operations and must comply with the following provisions which are intended to comply with those set forth in 38 M.R.S.A. §490-Z(14). By agreement with the Town of Oakfield, Evergreen agrees to modify these provisions by providing written notice to the Town and all landowners with structures within 2,000 feet of any blasting area at least 3 days prior to commencing any blasting operation.

14. Blasting. *The applicant must ensure that the blasting is conducted in accordance with Title 25, chapter 318.*

- A. The owner or operator shall use sufficient stemming, matting or natural protective cover to prevent flyrock from leaving property owned or under control of the owner 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 department may waive the monitoring requirement if the owner or operator 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.*

- 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 for all production blasting and must extend a minimum radius of 1/2 mile from the blast site. 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 owner or operator 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 owner or operator is not required to conduct a preblast survey if the department determines that no protected natural resource within the limits of the otherwise required survey is likely to be affected by blasting and production blasting will not occur within 2000 feet of any building not owned or under the control of the developer.*
- (2) *The owner or operator is not required to conduct a preblast survey on properties for which the owner 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.*
- (3) *The owner or operator is not required to conduct a preblast survey if the owner or operator 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 developer and D_s equals 70 ft./lb.)^{1/2}.*
- G. *Blasting may not occur in the period between sundown and sunrise the following day or in the period between 7:00 p.m. and 7:00 a.m., whichever is greater. Routine production blasting is not allowed in the daytime on Sunday. Detonation of misfires may occur outside of these times but must be reported to the department within 5 business days of the misfire detonation. Blasting may not occur more frequently than 4 times per day. Underground production blasting may be exempted from these requirements provided that a waiver is granted by the department.*
- 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 decibels</i>
<i>2</i>	<i>126 decibels</i>
<i>3</i>	<i>124 decibels</i>
<i>4</i>	<i>123 decibels</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 K 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 department may grant a variance to allow ground vibration levels greater than 2 inches per second on undeveloped property not owned or controlled by the applicant if the department 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 development and prior to completion of blasting,*

the developer immediately must notify the department and modify blasting procedures to remain in compliance with the standards of this subsection.

- J. *Based upon an approved engineering study, the department may grant a variance to allow higher vibration levels for certain buildings and infrastructures. In reviewing a variance application, the department shall take into account that the standards in this paragraph and paragraph I are designed to protect conventional low-rise structures such as churches, homes and schools. In cases of practical difficulty, the department may grant a variance from paragraph I if it can be demonstrated that no adverse impacts on existing infrastructures or protected natural resources, unusual natural areas or historic sites will result.*
- K. *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 those blasts for which a preblast survey is required.*

(1) Either 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 may be used to evaluate ground vibration effects when blasting is to be monitored by seismic instrumentation.

(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 owner 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 department may authorize use of a modified scaled-distance factor for production blasting if the owner or operator 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.

(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 owner or operator may apply for a variance of the ground vibration monitoring requirement prior to conducting blasting at the development site if the owner or operator 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 developer and D_s equals 70 ft./lb.^{1/2}. As a condition of the variance, the department may require submission of records certified as accurate by the blaster and may require the owner or operator to document compliance with the conditions of this paragraph.

The following is Table 1.

Distance versus Peak Particle Velocity Method

<i>Distance (D) from the blast area (feet)</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>

Greater than 5000

0.75

65

- L. *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 owner 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 dwelling, public building, school, church or commercial or institutional building neither owned nor controlled by the developer;*
 - (13) Weather conditions, including factors such as wind direction and cloud cover;*
 - (14) Height or length of stemming;*
 - (15) Amount of mats or other protection used;*
 - (16) Type of detonators used and delay periods used;*
 - (17) The exact location of each seismograph and the distance of each seismograph from the blast;*
 - (18) Seismographic readings;*
 - (19) Name and signature of the person operating each seismograph; and*
 - (20) Names of the person and the firm analyzing the seismographic data.*
- M. *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. All seismographs must be capable of sensor check and must be calibrated according to the manufacturer's recommendations.*
- N. *If any blasting activity exceeds the standards in this subsection, the department must be notified within 48 hours of the blast event. Notification must include the name of the blasting operator, the location, date and time of the blasting event and a description of the specific occurrence that is in noncompliance with this subsection. Use of explosives at the quarry may be suspended by the department until the cause of the noncompliance is identified and appropriate steps are implemented to reduce, prevent or eliminate reoccurrence.*
- O. *Prior to blasting, the owner or operator shall develop and implement a plan that provides an opportunity for prior notification of a planned blast for all persons located within 1,000 feet of the blast site. Notification may be by telephone, in writing, by public notice in a newspaper of general circulation in the area affected or by other means identified in the plan. The plan must be in writing and available for inspection by the department.*