Grand Bend Wind Farm

Design and Operations Report

Grand Bend Wind Limited Partnership

Northland Power Inc., as agent

NORTHLAND POWER

NEEGAN BURNSIDE

July 2013

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Design and Operations Report

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Northland Power Inc., as agent

July 2013

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Record of Revisions

Revision	Date	Description
0	August 27, 2012	Initial Draft Submission to Municipal and Aboriginal Communities as well as Selected Government Agencies
1	February 15, 2013	Application for Renewable Energy Approval
2	July 5, 2013	Updated Appendix D

Executive Summary

Grand Bend Wind Limited Partnership, with Northland Power Inc. ("Northland") as agent, are proposing to develop, construct and operate a 100 MW wind facility located north of Grand Bend, Ontario. An application for approval is being prepared under Ontario Regulation 359/09 of the *Environmental Protection Act*. The project is classified as a Class 4 Wind facility under the Regulation. The Grand Bend Wind Farm ("the Project") is located in Huron County, spanning the lower-tier municipalities of Bluewater and Huron South. Portions of the transmission line also traverse the municipality of Huron East and municipality of West Perth in Perth County.

The Design and Operations Report defines the Site Plan for the Project, describes Project activities during the operational phase, outlines the Environmental Effects Monitoring Plan, and provides detail on communications and emergency response plans.

The Site Plan for the Project has been designed in conformance with the requirements of O.Reg. 359/09 including regulated setbacks from noise receptors, property lines, public roads and railways. A Property Line Setback Assessment Report has been prepared and included in **Appendix B**, which illustrates that turbines sited near property lines will not result in any adverse impacts on neighbouring businesses, infrastructure, or land use activities.

An Environmental Noise Impact Assessment has been provided under a separate cover. The assessment concludes that the noise impact from the Project does not exceed the most restrictive noise limits that apply for areas with acoustic designation of Class 3 (Rural) as defined by the Ministry of the Environment.

The facility design generally consists of site works and electrical works. The majority of site works design components are related to the construction phase of the Project, and are therefore described in the Construction Plan Report. Site works design components relating to the operational phase of the facility generally consist of:

- tile drain modifications;
- watercourse crossings;
- access roads;
- turbine foundations;
- Parts and Storage building;
- stormwater management;
- sewage management; and,
- water taking.

Electrical works design components of the facility generally consist of:

- safety measures;
- up to 48 turbines (Siemens SWT-2.3-113 direct drive wind turbine generators with a total name plate capacity of 100 MW);
- one or two meteorological towers that will collect data during Project operation;
- a 36 kV electrical collection system;
- a transformer substation;
- a 230 kV transmission line within municipal road right-of ways ("ROWs") along Sararas Road, Rodgerville Road, and Road 183;
- a 230 kV switchyard and connection to the provincial power grid at the 230 kV transmission line south of the Seaforth Transformer Station;
- communications lines; and,
- commissioning.

A comprehensive operations and maintenance plan will be developed during detailed design to ensure safe and reliable operation of the Project. Operations and maintenance procedures will be performed by approximately 5 to 10 full time staff based at the Parts and Storage building. The operations and maintenance plan will include procedures for scheduled and unscheduled maintenance, as well as regular monitoring and inspection of Project components.

An environmental effects monitoring plan has been prepared in accordance with the requirements of O.Reg. 359/09. Each potential negative environmental effect during operation of the Project is identified and assessed for performance objectives, mitigation strategies, monitoring, and contingency measures.

Emergency Response and Communications Plans will be developed and implemented during construction, operation, and decommissioning of the Project. These plans will ensure members of the community, Aboriginal communities, local municipalities and government ministries are kept appraised of pertinent Project activities, in addition to any emergencies in the unlikely event that one should occur.

This Design and Operations Report has been prepared in accordance with O.Reg. 359/09, and is one component of the Renewable Energy Approval application for the Project.

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1.0 Introduction

1.1 Project Overview

Grand Bend Wind Limited Partnership, with Northland Power Inc. ("Northland") as agent, are proposing to develop, construct and operate a 100 MW wind facility located north of Grand Bend, Ontario. An application for approval is being prepared under Ontario Regulation 359/09 of the *Environmental Protection Act*. The project is classified as a Class 4 Wind facility under the Regulation. The Grand Bend Wind Farm ("the Project") is located in Huron County, spanning the lower-tier municipalities of Bluewater and Huron South. Portions of the transmission line also traverse the municipality of Huron East and municipality of West Perth in Perth County.

The basic project components will include up to 48 turbines (Siemens SWT-2.3-113 direct drive wind turbine generators with a total name plate capacity of 100 MW), turbine access roads, a 36 kV electrical collection system, substation, a parts and storage (office/maintenance) building, a new transmission line within municipal road right-of ways ("ROWs") along Sararas Road, Rodgerville Road, and Road 183 with connection to the provincial power grid at the 230 kV transmission line south of the Seaforth Transformer Station. During construction temporary components will include access roads and work/storage areas at the turbine locations and transmission connections.

1.2 Report Requirements

The Design and Operation Report is the principle document where the details of a renewable energy project are presented. Aspects of the Project outside of the operation phase such as construction and decommissioning are addressed within separate reports as part of the REA application.

This Design and Operations Report is one component of the REA Application for the Project, and has been prepared in accordance with Item 4, Table 1 of O.Reg. 359/09 which sets out specific content requirements as provided in **Table 1.1**.

O.Reg. 359/09 and its corresponding Table 1 requirements were amended on July 1 and November 2, 2012, with project transition provisions. Under provisions of the Regulation, Northland has elected to submit in accordance with the July 1 and November 2, 2012 provisions.

Table 1.1 Design and Operation Report Requirements

Requirements	Completed	Reference This Report Section #
1. Set out a Site Plan of the project location at which the renewable energy project will be engaged in including,		
i) One or more maps or diagrams of,		
A. All buildings, structures, roads, utility corridors, rights of way and easements required in respect of the renewable energy generation facility and situated within 300 m of the facility.	Yes	Appendix A
B. Any ground water and surface water supplies used at the facility.	Yes	Appendix A
C. Any things from which contaminants are discharged into the air	N/A	N/A
D. Any works for the collection, transmission, treatment and disposal of sewage.	Yes	Appendix A
E. Any areas where waste, biomass, source separate organics and farm material are stored, handled, processed or disposed of,	N/A	N/A
F. The project location in relation to any of the following within 125 m: the portion of the Oak Ridges Moraine Conservation Plan Area that is subject to the Oak Ridges Moraine Conservation Plan, the area of the Niagara Escarpment Plan, the Protected Countryside, the Lake Simcoe watershed.	N/A	N/A
G. Any noise receptors or odour receptors that may be negatively affected by the use or operation of the facility.	Yes	Appendix D
ii) A description of each item diagrammed under subparagraph i.	Yes	Section 3.0
iii) One or more maps or diagrams of land contours, surface water drainage and any of the following, if they have been identified in complying with this Regulation: properties described in Column 1 of Table 19 to Section 19, heritage resources, archaeological resources, water bodies, significant or provincially significant natural features	Yes	Appendix A

Requirements	Completed	Reference This Report Section #
and any other natural features identified in the Protected Countryside or the portion of the Oak Ridges Moraine Conservation Plan Area that is subject to the Oak Ridges Moraine Plan.		
iv) A description, map or diagram of the distance between the base of any wind turbines and any public road rights of way or railway rights of way that are within a distance equivalent to the length of any blades of the wind turbine, plus 10 m.	Yes	Appendix B
v) A description, map or diagram of the distance between the base of any wind turbines and all boundaries of the parcel of land on which the wind turbine is constructed, installed or expanded within a distance equivalent to the height of the wind turbine, excluding the length of any blades.	Yes	Appendix B
vi) A description, map or diagram of the distance between the base of each wind turbine and the nearest noise receptor.	Yes	Appendix D
2. Set out conceptual plans, specifications and descriptions related to the design of the renewable energy generation facility, including a description of:		
i) Any works for the collection, transmission, treatment and disposal of sewage, including details of any sediment control features and storm water management facilities.	Yes	3.0 & 4.0
ii) Any things from which contaminants are discharged into the air.	N/A	N/A
iii) Any systems, facilities and equipment for receiving, handling, storing and processing any waste, biomass, source separated organics, farm material and biogas.	N/A	N/A
iv) If the facility includes a transformer substation, the works, facilities and equipment for secondary spill containment.	Yes	3.0
3. Set out conceptual plans, specifications and descriptions related to the operation of the renewable energy generation facility, including: i) In respect of any water takings		
A. A description of the time period and duration of water takings expected to	Yes	4.0

Requirements	Completed	Reference This Report Section #
be associated with the operation of the facility.		
B. A description of the expected water takings, including rates, amounts and an assessment of the availability of water to meet the expected demand.	Yes	4.0
C. An assessment of and documentation showing the potential for the facility to interfere with existing uses of the water expected to be taken.	Yes	4.0
ii) A description of the expected quantity of sewage produced and the expected quality of that sewage at the project location and the manner in which it will be disposed of, including details of any sediment control features and storm water management facilities.	Yes	4.0
iii) A description of any expected concentration of air contaminants discharged from the facility.	N/A	N/A
iv) In respect of any biomass, source separated organics and farm material at the facility.	N/A	N/A
A. The maximum daily quantity that will be accepted.	N/A	N/A
B. The estimated annual average quantity that will be accepted.	N/A	N/A
C. The estimated average time that it will remain at the facility.	N/A	N/A
D. The estimated average rate at which it will be used.	N/A	N/A
v) In respect of any waste generated as a result of processes at the project location, the management and disposal of such waste, including:	Yes	4.0
A. The expected types of waste to be generated.	Yes	4.0
B. The estimated annual average quantity that will be accepted.	Yes	4.0
C. The estimated average time that it will remain at the facility.	Yes	4.0
D. the estimated average rate at which it will be used.	Yes	4.0
vi) If the facility includes a transformer substation:	Yes	4.0

Requirements	Completed	Reference This Report Section #
A. a description of the processes in place to prevent spills.	Yes	4.0
B. a description of the processes to prevent, eliminate or ameliorate any adverse effects in the event of a spill.	Yes	4.0
C. a description of the processes to restore the natural environment in the event of a spill.	Yes	4.0
4. Include an environmental effects monitoring plan in respect of any negative environmental effect that may result from engaging in the renewable energy project, setting out:		
i) Performance objectives in respect of the negative environmental effects.	Yes	5.0
ii) Mitigation measures to assist in achieving the performance objectives mentioned in subparagraph i.	Yes	5.0
iii) A program for monitoring negative environmental effects for the duration of the time that the project is engaged in, including a contingency plan to be implemented if any mitigation measures fail.	Yes	5.0
5. Include a response plan setting out a description of the actions to be taken while engaging in the renewable energy project to inform the public, aboriginal communities and municipalities, local roads boards and Local Service Boards with respect to the project, including:		
i) Measures to provide information regarding the activities occurring at the project location, including emergencies.	Yes	6.0
ii) Means by which persons responsible for engaging in the project may be contacted.	Yes	6.0
iii) Means by which correspondence directed to the persons responsible for engaging in the project will be recorded and addressed.	Yes	6.0
6. If the project location is in the Lake Simcoe watershed, a description of whether the project requires alteration of the shore of Lake Simcoe, the shore of a fresh water estuary of a stream connected to Lake Simcoe or other lakes or any permanent or intermittent stream, and		
i) How the project may impact any shoreline, including ecological functions of the shoreline.	N/A	N/A
ii) How the project will be engaged in to:	N/A	N/A

Requirements	**Completed**	**Reference This Report Section #**
A. Maintain the natural contour of the shoreline through the implementation of natural shoreline treatments, such as planting of natural vegetation and bioengineering.	N/A	N/A
B. Use of vegetative riparian areas, unless the project location is used for agricultural purposes and will continue to be used for such purposes.	N/A	N/A
7. If it is determined that the project location is not on a property described in Column 1 of the Table to Section 19, provide a summary of the matters addressed in making the determination.	Yes	Appendix F
8. If Section 20 applies in respect of the project and it is determined that the project location does not meet one of the descriptions set out in subsection 20 (2) or that the project location is not in an area described in subsection 20 (3), provide a summary of the matters addressed in making the determination.	Yes	Appendix F
9. If subsection 21 (3) or 23 (2) applies, provide a summary of the matters addressed in making the determination:		
i) under subsection 21 (3) or clause 23 (2) (a) as the case may be, including a copy of the document completed under the applicable provision.	Yes	Appendix F
ii) under clause 23 (3) (b), if applicable.	Yes	Appendix F

2.0 Site Plan

2.1 Site Plan Requirements

Site Plan information is provided in **Appendix A**. The Site Plan was prepared in accordance with O.Reg. 359/09 and the guidance provided in Chapter 6 of the Technical Guide to Renewable Energy Approvals (MOE, 2011). Site Plans are required to include one or more maps or diagrams that depict any of the following at the wind facility or within 300 m of the facility:

- buildings or structures;
- proposed transportation systems such as access roads;
- electrical transmission/distribution lines, transformers, other electrical equipment, and associated right of ways or easements;
- existing roads, utility corridors, right of ways and easements;
- groundwater wells, water bodies, and infrastructure related to water and sewage;
- works that collect, transmit, treat, or dispose of sewage related to the Project;
- noise receptors that may be negatively affected by the use or operation of the facility; and,
- land contours indicating surface water drainage.

In addition to the site plan figures in **Appendix A**, the following supplemental information has been provided in **Appendix D** and **Appendix E**:

- maps and UTM coordinates of noise receptors within a 2 km distance of the Project turbines;
- UTM coordinates of all turbines of the Project;
- UTM coordinates of turbines from other existing or proposed facilities;
- a table summarizing the distance between the base of each turbine and the nearest noise receptor; and,
- visual simulations of the turbines in the Project vicinity.

Detailed figures identifying archaeological, cultural, natural heritage features, and water bodies are provided in the 2012 Heritage Assessment of the Proposed Grand Bend Wind Farm, the Natural Heritage Assessment Environmental Impact Study Report, and the Water Assessment and Water Body Report under separate covers as part of the Renewable Energy Approval application.

2.2 Setbacks

In order to comply with the setback requirements of O.Reg. 359/09, Northland is required to identify noise receptors and existing or proposed turbines of other projects. As outlined in the Technical Guide to Renewable Energy Approvals (MOE, 2011), the issuance of a Draft Site Plan defines a point in time in which existing noise receptors will be considered. Consequently, as the Notice of Draft Site Plan was published in local newspapers on April 18, 2012, Northland will take into account noise receptors as defined by the Act that existed on April 17, 2012. An extension was granted on October 17, 2012 by the director of Environment Approvals Access and Service Integration Branch. The effect of the extension was such that the noise receptors identified above will remain those considered as long as an application for Renewable Energy Approval is made on or before July 31, 2013.

For an analysis of the impact on noise receptors resulting from the Project, refer to the Environmental Noise Impact Assessment under a separate cover. The analysis concludes that the noise impact from the Project does not exceed the most restrictive noise limits that apply for areas with acoustic designation of Class 3 (Rural) as defined by the Ministry of the Environment.

In addition to setbacks related to noise receptors, O.Reg. 359/09 provides setback distances between the wind turbine base and:

- property lines;
- public road right-of-ways; and,
- railway right-of-ways.

A Property Line Setback Assessment Report has been prepared and included in **Appendix B**, which illustrates that turbines sited near property lines of non-participating lands will not result in any adverse impacts on neighbouring businesses, infrastructure, or land use activities.

2.3 Site Plan Consultation

In addition to the requirements of O.Reg. 359/09, Project infrastructure was carefully sited to reduce potential negative environmental effects and incorporate stakeholder input.

Additional approvals with authorities having jurisdiction will be obtained during detailed design. For further information on additional approvals and stakeholder consultation, refer to the Project Description Report.

2.4 Cultural and Archaeological Heritage

Cultural and archaeological heritage assessments have been completed for the Project, and are described in detail in the following reports under separate covers:

- The 2012 Heritage Assessment of the Proposed Grand Bend Wind Farm
- The 2011-2012 Stage 1-2 Archaeological Assessment of the Proposed Grand Bend Wind Farm

O.Reg. 359/09 requires cultural and archaeological heritage commentary to be included in the Design and Operations Report to satisfy its Table 1 reporting requirements. As such, Design and Operations Report items 7, 8, and 9 of O.Reg. 359/09 Table 1 have been addressed by D.R. Poulton & Associates Inc. in Appendix F of this report.

3.0 Facility Design Plan

The design information provided in this report is provided for the purpose of identifying and mitigating potential negative environmental effects. Approvals from authorities having jurisdiction will be required in addition to Renewable Energy Approval administered by the Ministry of the Environment. As such, the details described in the following sections are subject to change during the course of detailed design and permitting.

Design components for the Project can generally be categorized as site works or electrical works, and are described in detail in the following sections. Conceptual plans are provided in **Appendix C.**

3.1 Site Works

The majority of site works design components are related to the construction phase of the Project, and are therefore described in the Construction Plan Report. Site works design components relating to the operational phase of the facility generally consist of:

- tile drain modifications;
- watercourse crossings;
- access roads;
- turbine foundations;
- Parts and Storage building;
- stormwater management;
- sewage management; and,
- water taking.

3.1.1 Tile Drain Modifications

The majority of private land designated for access roads and turbine installation areas is currently serviced by agricultural tile drain. Tile drains are typically 2 to 4 feet below surface, and are not designed to withstand loads imparted by heavy construction equipment. As such, tile drains will be modified around construction areas to maintain agricultural drainage during and after construction. A licensed drainage contractor will ultimately be responsible for the design and construction of the tile modifications, but conceptual designs are detailed in **Figures C1** and **C2** of **Appendix C** for the purpose of identifying potential negative effects and mitigation measures proposed in association with the work.

The construction phasing of tile drain modifications will be sequenced to divert tile drainage around excavations during construction. This approach will reduce the water

taking requirements of the Project in the form of dewatering as explained in the Construction Plan Report.

3.1.2 Watercourse Crossings

In locations where access roads intersect a watercourse, culverts will be required. A preliminary culvert design has been developed and submitted to the Ausable Bayfield Conservation Authority (ABCA) for review. The preliminary design is detailed in **Figure C3** of **Appendix C**, and includes the use of rip-rap and geotextile materials to minimize erosion of the watercourse banks and provide for flow conditions as required. Further development and approval of this design by the ABCA will be required prior to construction.

Collector line and transmission line watercourse crossings will be installed according to the applicable Fisheries and Oceans Canada Operational Statements and procedures approved by the ABCA. It is anticipated that a combination of Punch & Bore, Horizontal Directional Drilling, Isolated or Dry Open-cut, and Overhead Line Construction methods will be employed. For further details on these methods, refer to the Construction Plan Report, or the Operational Statements available online at www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/provinces-territories-territoires/on/index-eng.htm.

3.1.3 Access Roads

Existing provincial, county, and municipal roads will be used to transport project-related components, equipment and personnel to the Study Area during construction and as required during operation. The Project will be situated exclusively on municipal road allowances and privately owned land. Access to these lands will be required for installation and operation of the wind turbines and lease agreements have previously been signed with each of the landowners involved. Some agricultural laneways are present in the vicinity of the Project and will be utilized where possible. New laneways will be constructed as required and in consultation with landowners to provide access to the individual turbine sites. Construction access laneways will vary from 5 to 11 m wide during construction, depending on the passing lane and crane movement requirements of the laneway. Permanent access laneways will be approximately 5 m wide, with the exception of entrances off municipal roads and all turning areas which require wider turning radii.

The access road layout illustrated in **Appendix A** incorporates crane paths, passing lanes, and wide turning radii required by wind turbine delivery trucks during construction. Further detail on construction access roads and turbine installation areas is provided in the Construction Plan Report.

Detailed design of the access roads will take place after a geotechnical investigation has been performed. The geotechnical investigation will provide recommendations on road materials and depths, as well as identification of areas that may require subsoil reinforcement with geotextile. At this time, it is anticipated that the access roads will likely be constructed with Granular 'B' sub-base and Granular 'A' base materials, and will be approximately 0.3 m to 0.7 m deep.

3.1.4 Turbine Foundations

A foundation for wind turbine generators having a rated output of more than 3 kW is considered a Designated Structure in the Ontario Building Code (OBC). As such, the foundations for the Grand Bend Wind Farm will be designed as "buildings" according to the requirements of the latest OBC. Foundations will also require proper electrical grounding according to the requirements of the latest Ontario Electrical Safety Code.

Detailed design of the foundations will take place after a geotechnical investigation of the subsurface soils. At this time, based on a desktop study of soils in the area and preliminary discussions with local geotechnical engineers, the turbines will likely be supported by shallow reinforced concrete spread footings. Approximate dimensions of the foundations are anticipated to be 3 m in depth and 18 to 22 m in diameter.

The foundations will be constructed on site, and will require the installation of formwork, ground wiring, rebar, and the pouring of high-strength concrete under a lean concrete base. For further information on the construction of the turbine foundations, refer to the Construction Plan Report.

3.1.5 Parts and Storage Building

A Parts and Storage building for Project operation and maintenance is proposed on privately held lands near the intersection of Sararas Road and Blackbush Line in the Municipality of Bluewater. Refer to **Figure A5** of **Appendix A** for the proposed location of the building. The building will be approximately 15 m x 36 m (540 m^2) and will be designed in accordance with the requirements of the latest OBC. There will also be a parking lot, well and septic system servicing the building. For conceptual drawings of the building, refer to **Figures C4** to **C9** of **Appendix C**.

Northland is also investigating the possibility of locating the Parts and Storage building near the village of Zurich.

3.1.6 Stormwater Management

During construction, site drainage will be addressed according to the methods described in the Construction Plan Report, including the use of erosion and sediment control measures.

During Project operation, fundamental site drainage patterns and stormwater management is anticipated to be unaffected. Temporary lands used for construction will be restored to predevelopment conditions, and permanent features that could have an impact on stormwater management will be designed as follows:

- gravel access roads will be designed such that surface water will either infiltrate directly into the subsurface soils, or flow freely across the surface to adjacent agricultural land;
- tile drain modifications will be made to preserve agricultural drainage around access roads and turbine foundations;
- culverts will be designed to convey flows in accordance with the requirements of authorities having jurisdiction;
- the transformer substation and switchyard will be constructed on granular foundations, which will promote infiltration to subsurface soils;
- the transformer substation will include an oil containment system around the transformer (refer to Section 3.2.5 for further details); and,
- the Parts and Storage building will have a drainage plan which will be approved by the authorities having jurisdiction.

3.1.7 Sewage Management

Sewage generation during Project operation will be limited to the use of washroom facilities at the Parts and Storage building. Sewage will be disposed of in a septic bed or through a municipal sewer connection depending on the chosen location of the facility. The septic bed or sewer connection will be designed in accordance with the applicable municipal and provincial standards. An analysis of sewage generation and treatment during Project operation is described in the Facility Operations Plan of this report.

3.1.8 Water Taking

Water taking during Project operation will also be limited to the use of the Parts and Storage building. Potable water will be supplied by a well or a locally available municipal water system depending on the chosen location of the facility. The well or municipal water connection will be designed in accordance with the applicable municipal and provincial standards. An analysis of well water taking activities during Project operation is described in the Facility Operations Plan of this report.

3.2 Electrical Works

Electrical design components of the facility generally consist of:

- safety measures;
- up to 48 turbines (Siemens SWT-2.3-113 direct drive wind turbine generators with a total name plate capacity of 100 MW);
- two meteorological towers that will collect data during Project operation;
- a 36 kV electrical collection system;
- a transformer substation;
- a 230 kV transmission line within municipal road right-of ways ("ROWs") along Sararas Road, Rodgerville Road, and Road 183;
- a 230 kV switchyard and connection to the provincial power grid at the 230 kV transmission line south of the Seaforth Transformer Station;
- communications lines; and,
- commissioning.

Electricity generated by the turbines at 60 Hz and 690 V will be transformed to higher voltages in two stages for efficient distribution to the grid. The first stage will be the transformers located at the base of each turbine, which will transform 690 V electricity to 36 kV. A 36 kV collector line will then convey electricity from each turbine to the transformer substation. The second stage occurs at the substation, where electricity will be transformed from 36 kV to 230 kV. A new 230 kV transmission line will then convey electricity along Sararas Road, Rodgerville Road, and Road 183 to the connection point with the provincial 230 kV transmission line, south of Seaforth Transformer Station.

3.2.1 Electrical Works Safety Measures

All electrical works will be designed in conformance with the requirements of the authorities having jurisdiction, including the Ontario Electrical Safety Code administered by the Electrical Safety Authority. In addition to proper electrical design, a rigorous system of monitoring equipment, inspections, and maintenance will be developed to ensure safe and reliable operation of the facility.

3.2.2 Wind Turbine Generators

The turbines generally consist of a foundation, step-up transformer, tower, blades, and the nacelle, which houses the gearbox, electrical generator and brake assembly.

General turbine specifications are summarized in **Table 3.1**. Subject to availability and costing, an alternative turbine type may be utilized.

Table 3.1 Siemens SWT-2.3-113 Specifications

Manufacturer	Siemens
Model	SWT-2.3-113
Nameplate Capacity	2.3 MW
Hub Height	99.5m
Blade Length	55m
Rotor diameter	113m
Rotor sweep area	10,000m^2
Speed Range	6-13 rpm
Nominal Noise Level	100-105 dBA
Frequency	60 Hz

Additional specifications from the manufacturer are provided in the Wind Turbine Specification Report.

Each turbine will be equipped with communications and safety equipment which will be monitored during operation. Examples of these features include fire, ice, lightning and extreme wind protection, supervisory control and data acquisition (SCADA), electrical grounding, and turbine tower lighting in accordance with Transport Canada requirements.

As described in Section 2.2, the turbine layout provided in **Appendix A** has been designed to accommodate setbacks required by OReg. 359/09. For further details on turbine siting, refer to the Property Line Setback Assessment in **Appendix B** and the Environmental Noise Impact Assessment issued under a separate cover.

3.2.3 Meteorological Towers

Northland currently operates one meteorological tower in the area. This tower will be replaced by a taller tower which will operate during Project operation to collect meteorological data at the Project location in addition to the meteorological instruments and data collected at each turbine. A second permanent meteorological tower may also be required, subject to the requirements of the Independent Electricity System Operator (IESO).

3.2.4 36 kV Electrical Collection System

The transformers at the base of each turbine, converting electricity from 690 V to 36 kV, will be designed according to the applicable standards for outdoor pad-mounted distribution transformers. They will be approximately 3 m long x 2 m wide x 3 m high and will likely use mineral-oil for insulation and cooling. During detailed design, the

transformer manufacturer will provide inspection and maintenance details. Proper inspection and maintenance of the transformers will reduce the likelihood of transformer failure and potential oil spills or fires.

The 36 kV collector lines will be buried directly underground, typically under the access roads and existing local roads as shown on the Site Plan (**Appendix A**). The collector lines will be connected in a string, or "daisy chain" configuration from the turbines to the transformer substation. The collector lines will be designed according to the applicable standards for buried 36 kV power cable, and will be installed at an approximate depth of 0.5 m to 1.6 m depending on the requirements of the authorities having jurisdiction. In areas where the collector lines intersect watercourses, directional drilling, punch and bore, and/or Isolated or Dry Open-cut construction procedures will be employed, as outlined in Section 3.1.2.

If underground construction is not possible due to site constraints or regulatory requirements, the 36 kV collector line will be installed overhead on utility poles for the designated segments.

3.2.5 Transformer Substation

A transformer substation to convert electricity from 36 kV to 230 kV is proposed on privately held lands near the intersection of Sararas Road and Blackbush Line in the Municipality of Bluewater. Refer to **Figure A5** of **Appendix A** for the proposed location of the substation, and **Figures C10 – C13** of **Appendix C** for conceptual drawings. The substation will occupy an area approximately 91 m x 54 m (4,914 m^2), and will be constructed on a granular foundation. The substation will be designed in accordance with the requirements of the authorities having jurisdiction, and will include safety measures such as a transformer oil containment system, lightning and surge arrestors, a shunt reactor (if required), fire protection, electrical grounding, perimeter fencing, and appropriate warning signage. Inspection and maintenance details will be supplied by equipment suppliers during detailed design. Proper inspection and maintenance of the substation will reduce the likelihood of system failure and potential oil spills or fires.

As a contingency to mitigate negative environmental effects associated with potential oil spills from the transformer at the substation, the secondary spill containment system will be designed by a competent Professional Engineer licensed in Ontario, and will include the following:

- adequate storage volume to contain the oil from the transformer; and,
- impervious walls and floor, sloped towards an oil control device at the outlet.

Further design details of the secondary spill containment system will be issued to the Ministry of the Environment prior to its construction.

The transformer station will include a standby generator that will only be operated in the following circumstances as described in O.Reg. 359/09, s7(1):

1. for the purposes of testing or maintenance of the standby generator or the start up or shut down of the facility, and:
    i. the standby generator has not operated for more than 60 hours in the past 12 months for those purposes, and
    ii. the standby generator is operated only on weekdays between the hours of 7 a.m. and 7 p.m for those purposes.
2. due to:
    i. a serious risk to the health or safety of a person,
    ii. a serious risk of harm to the natural environment, plant life or animal life, or
    iii. a serious risk of injury or damage to property.

3.2.6 230 kV Transmission Line

A new 230 kV transmission line will connect the transformer substation to the switchyard at the connection point to the provincial power grid, south of the Seaforth Transformer Station. As shown on the Site Plan (**Appendix A**), it will be built within municipal road right-of ways ("ROWs") along Sararas Road, Rodgerville Road, and Road 183. The transmission line will be installed either above ground on utility poles or underground in a trench according to the requirements of the authorities having jurisdiction. In areas where the transmission lines intersect watercourses, directional drilling, punch and bore, isolated or dry open-cut, or overhead line construction procedures will be employed, as described in Section 3.1.2. If installed above ground, it is anticipated that the utility poles will be approximately 25 to 35 m high, at a spacing of approximately 100 m. A conceptual drawing of the utility pole is shown in **Figure C13** of **Appendix C**.

3.2.7 Electrical Interconnection and Switchyard

The interconnection plan and revenue metering for the Project to connect with the provincial 230 kV transmission system will be designed in accordance with the requirements of the authorities having jurisdiction. A switchyard will be required at the connection point to the provincial grid as shown on **Figure A11** of **Appendix A**. For the purposes of Renewable Energy Approval investigations, a large area on both sides of the existing 230 kV provincial transmission line has been studied to allow for alternative switchyard layouts. The final detailed layout of the switchyard will be determined during detailed design in coordination with the landowner and Hydro One. For conceptual drawings of the switchyard, refer to **Figures C14** to **C15** of **Appendix C**.

The switchyard will include a standby generator that will only be operated in the following circumstances as described in O.Reg. 359/09, s7(1):

1. for the purposes of testing or maintenance of the standby generator or the start up or shut down of the facility, and:

    i. the standby generator has not operated for more than 60 hours in the past 12 months for those purposes, and
    ii. the standby generator is operated only on weekdays between the hours of 7 a.m. and 7 p.m for those purposes.

2. due to:

    i. a serious risk to the health or safety of a person,
    ii. a serious risk of harm to the natural environment, plant life or animal life, or
    iii. a serious risk of injury or damage to property.

3.2.8 Communication Lines

Fiber optic communication lines will be installed in conjunction with the 36 kV collector lines and 230 kV transmission line in accordance with the requirements of the authorities having jurisdiction. The communication lines will transfer supervisory control and data acquisition (SCADA) information from each turbine to the Parts and Storage building, where comprehensive Project monitoring data will be collected. Further detail on monitoring is provided in the Facility Operations Plan of this report.

3.2.9 Commissioning

Electrical infrastructure will require commissioning by the authorities having jurisdiction to ensure safe and reliable operation of the Project. Commissioning requirements will be confirmed during detailed design, and will be implemented upon completion of construction.

4.0 Facility Operations Plan

A comprehensive operations and maintenance plan will be developed during detailed design to ensure safe and reliable operation of the Project. Operations and maintenance procedures will be performed by approximately 5 to 10 full time staff based in the Parts and Storage building. There will be one site supervisor who will be responsible for ensuring proper operation and maintenance procedures are being implemented, as well as ensuring all staff are appropriately trained. Additional support staff will assist with remote monitoring of the Project.

An outline of the procedures that will be included in the operations and maintenance plan are described below.

4.1 Wind Turbine Operation

The turbines will be continuously monitored during operation through Supervisory Control and Data Acquisition (SCADA). The data obtained from SCADA and monitored by full time staff will ensure that the turbines are operating efficiently and only when it is safe to do so. Each turbine is equipped with sensors and gauges which can detect unsafe conditions and trigger control systems to disable turbine operation and alert maintenance staff. Some examples of unsafe conditions and the associated turbine design and response mechanisms are described below.

4.1.1 Extreme Winds

Each turbine is equipped with a wind gauge (anemometer) and a mechanical brake system that shuts down turbine operation when local wind speeds exceed 90 km/hr. If left uncontrolled in these extreme wind conditions, turbine operation would result in stresses that exceed design limits. This anemometer and mechanical brake safety mechanism therefore protects the structural integrity of the turbine, and the public by reducing the risk of structural failure.

4.1.2 Fire

Each turbine is equipped with both passive and active fire prevention features to prevent, detect, and alert an occurrence of fire.

Passive measures are incorporated into the physical design of the turbine. The weather screen and housing around the machinery in the nacelle is made of fibreglass-reinforced laminated panels with multiple fire-protecting properties. The brake system is shielded around the moving parts to ensure sparks will not spread into the nacelle. Grease and spilt oil collected in reservoirs will be cleaned out during scheduled maintenance to

reduce exposure to flammable materials. Other passive fire prevention measures associated with lightning are described in the following section.

Active measures include ion-based smoke detectors, which will be located in all important electrical panels and connected to the wind turbine control system. If a smoke detector triggers an alarm or is removed, the turbine will automatically stop, and cooling fans in all cubicles will be switched off to reduce the admission of air to a possible fire and to prevent spreading of smoke and gasses in the tower and nacelle. The main turbine circuit breaker will also be switched off to deactivate all electrical systems that might contribute to a fire.

All fire detection information and automatic turbine response actions will be monitored through SCADA, and full time staff will be alerted in the event of a fire. A detailed fire response procedure will be outlined in the operations and maintenance plan.

4.1.3 Lightning

The turbines are designed with fully integrated lightning and EMC protection. Both the nacelle and the tower act as a Faraday Cage, reducing the likelihood of an internal turbine fire caused by lightning strikes. The turbine foundation design will also be designed with proper electrical grounding to safely conduct electricity from a lightning strike.

4.1.4 Ice

Ice accumulation on the rotor blades and anemometers can cause a public safety risk from ice throw, and can cause unnecessary operational stops due to inaccurate meteorological data. A turbine's power production is also significantly reduced when ice accumulates on the rotor blades. As a result, the turbines will be monitored and controlled to minimize the risks associated with ice accumulation. Each turbine is equipped with vibration and meteorological equipment that is capable of detecting icing conditions. In the event of unsafe ice build-up, the turbine will automatically stop and report the conditions through SCADA. The full time staff will then implement a safety procedure that restores operation when it is safe to do so.

4.1.5 Aircraft Visibility

The turbines will be equipped with lighting in accordance with Transport Canada's requirements for air traffic safety. If feasible and approved by Transport Canada, a radar technology may be used which only operates the lights when an aircraft is near.

4.2 Planned/Scheduled Maintenance

Full time staff based in the Parts and Storage building will be responsible for regular inspections and maintenance of the Project. The details and frequency of inspections and maintenance will be outlined in the operations and maintenance plan, but will generally include thorough biannual inspections and maintenance of the following:

- turbine mechanical and electrical components;
- turbine tower and foundation connection;
- turbine step-up transformers;
- substation electrical equipment and oil containment system;
- transmission line and associated tree/vegetation clearance; and,
- switchyard electrical equipment.

Inspections and maintenance activities will be performed by qualified workers who will access Project components with service vehicles via local provincial and municipal roads, and Project access roads. Any work performed above a 3 m height such as turbine tower climbing or transmission line maintenance will be performed with appropriate safety equipment and procedures in accordance with the requirements of the Occupational Health and Safety Act.

4.3 Unscheduled Maintenance

Unscheduled maintenance will typically be related to standard operating procedures outlined in Section 4.1. Minor maintenance arising from standard operating procedures will be serviced by full time staff and equipment based in the Parts and Storage building. In the unlikely event that a major component requires maintenance or replacement, additional technicians and equipment may be required. Depending on the extent of required maintenance, new access roads and equipment used for Project construction may be required, or a helicopter may be used. Any potential negative environmental effects and mitigation measures would be the same as those outlined in the Construction Plan Report.

Emergency procedures will be outlined in the operations and maintenance plan, and will include staff responsibilities in responding to an emergency.

4.4 Waste Management

Turbine mechanical components such as the turbine gearbox and bearings will require oil changes and greasing approximately every 1 to 3 years. Each turbine gearbox contains approximately 350 L of oil, and the frequency of oil change will depend on the results of inspections. Electrical components such as transformers will require regular

inspection for potential leaks and oil changes as required. The application, collection, transportation, storage, and authorized disposal of any hazardous material such as oil and grease will be performed in a manner that will minimize potential spills. Hazardous materials such as oils and grease will be properly stored in labelled containers at the Parts and Storage building with appropriate Materials Safety Data Sheets. In the event of a spill, the procedure outlined in Section 6.1.3 of this report will be implemented.

At the transformer substation, a secondary spill containment system will be constructed as described in Section 3.2.5 of this report. In addition to the oil detection system, regular monitoring will take place to ensure the system is in proper working condition to control a potential spill from the transformer. The same procedure in Section 6.1.3 of this report will be followed in the event of a spill from the transformer at the substation, including support from spill response contractors to clean up the secondary spill containment system and restore its functionality to control potential future spills. Any soils contaminated from a spill will be excavated and disposed of at an approved facility, and replaced with clean soils of the same type (i.e., topsoil, gravel, etc.).

4.5 Stormwater Management

As outlined in Section 3.1.6, there will be no permanent stormwater management facilities required during the operation phase of the Project. All Project drainage components will be monitored during operation to confirm their suitability with respect to stormwater management. The oil containment system of the transformer substation will also be inspected and maintained on a regular basis. Any oil encountered in the containment system will be removed by a vacuum truck and disposed of at an approved facility. Transformer equipment will also be inspected and serviced to mitigate potential spills.

4.6 Sewage Management

Sewage generated from the Parts and Storage building during operation will be disposed of in a septic bed or through a municipal sewer connection depending on the chosen location of the facility. If a septic bed is required, it will be designed to exceed the minimum size required for the use of the building. For the purpose of estimating this minimum size, it has been assumed that a maximum of 10 people will be working an 8 hour shift, with a loading rate of 750 L/day (75 L/day per person). The percolation time for the underlying St. Joseph Till will likely be greater than 50 min/cm, requiring a raised bed with a loading rate of 4 L/m^2/day. This translates to a minimum septic bed area of 190 m^2. It will be the Project owner's responsibility to ensure proper maintenance of the septic system during operation.

4.7 Water Taking

4.7.1 Water Demand Assessment

Water taking activities during operation are limited to the use of the Parts and Storage building in the event that a new structure is constructed in a location where a municipal water supply is not locally available. Other water taking activities associated with the Project are required as dewatering during construction. Refer to the Construction Plan Report for an analysis of water taking activities during construction.

In order to estimate water taking requirements of the well for the Parts and Storage building, the D-5-5 Private Wells procedure developed by the Ministry of the Environment was used. The Parts and Storage building will be expected to support up to 10 workers who would spend most of their time out of the building servicing the wind farm, however several office/supervisory staff would likely be based at the building. The average daily water taking quantity based on 450 L/person/day would be 4,500 L/day. Based on a peak flow requirement of 3.75 L/min per person plus one additional person, the total peak flow requirement for the building would be 41.25 L/min for 120 minutes, however the actual usage will likely be significantly lower. To supply this rate, a well would be required at an approximate depth of 45 m. If the well at the building has low productivity or water quality issues, other measures such as water storage and/or treatment would be designed and implemented.

4.7.2 Groundwater Impact Assessment

The bedrock that underlies the study site consists of Dundee Formation Limestone, Dolostone and Shale. This formation is the primary source of water for domestic wells in the area. Although the static water level is relatively deep (over 30 m) in some areas, the wells are generally relatively high capacity and are suitable for individual residences and communal water takings.

The Dundee Formation bedrock aquifer found at a depth of 30 to 40 m below grade at the proposed well site is the proposed source of water for the maintenance facility. This Formation consists of relatively soft limestone bedrock that has an average thickness of 35 to 45 m. The estimates of water demand are conservatively calculated to be equivalent to four or five domestic wells, a farm or a well supplying an open loop heat pump. The well will be equipped to pump at a rate of less than 45 L/min. It is expected that a well drilled into the Dundee Formation will have no difficulty meeting this demand. The low water level requires a pump capable of lifting water from below 30 m due to the relatively low water level. This is typical for domestic wells in the area.

Review of regional studies on the Dundee Bedrock Formation Aquifer indicate that the majority of wells drilled in to the formation are capable of 45 L/min. A number of community, communal and agricultural wells completed in the Dundee Formation in the surrounding area produce in excess of 200 L/min. The geometric mean transmissivity of the Dundee Formation is 27.1 m^2/day. Considering the aquifer characteristics, a well drilled for the maintenance facility will not have an adverse impact on the water levels in the closest existing wells located over 200 m to the south.

5.0 Environmental Effects Monitoring Plan

An environmental effects monitoring plan has been prepared in accordance with the requirements of O.Reg. 359/09. The guiding principles that were used to establish the plan are summarized below. The details of the environmental effects monitoring plan are provided in **Tables 5.1 to 5.5**.

5.1 Potential Negative Environmental Effects

Any potential negative environmental effect that may result from engaging in the Project has been identified in **Tables 5.1 to 5.5**. These effects were identified from the operations and maintenance activities described in this report in conjunction with other investigations undertaken. For details relating to the natural heritage, water, archaeological, and cultural heritage features of the study area, refer to the Natural Heritage Assessment Environmental Impact Study, Water Assessment and Water Body Report, and The 2012 Heritage Assessment of the Proposed Grand Bend Wind Farm issued under separate covers as part of the application for Renewable Energy Approval.

A number of considerations for each potential negative environmental effect were considered to understand the extent of the effect and to develop appropriate performance objectives, mitigation and monitoring strategies, and contingency measures. Key considerations included:

- the magnitude of the effect both in intensity and spatial scale;
- the proximity of the effect in relation to the Project;
- the likelihood of occurrence and reoccurrence of the effect;
- the timing and duration of the effect; and,
- the permanence or irreversibility of the effect.

5.2 Performance Objectives and Mitigation Strategies

The ultimate performance objective for each potential negative environmental effect was to avoid occurrence of the effect. In cases where avoidance was not possible, an appropriate mitigation strategy was developed to minimize the magnitude, likelihood, duration and permanence of the potential effect. Mitigation strategies were typically developed according to the following approach:

- design Project siting to avoid occurrence of the effect;
- develop operational procedures to mitigate the effect; and,
- develop rehabilitation measures to restore affected features.

Mitigation will be implemented through a variety of mechanisms, including:

Contract Documents
Northland is committed to operating the Project in an environmentally responsible manner and in compliance with all applicable environmental laws, regulations, and guidelines. All of Northland's operations and maintenance contractors and subcontractors will be accountable for actions that have an adverse effect on the environment. As such, any contract documents executed by Northland will incorporate appropriate provisions from the Renewable Energy Approval documents. Additionally, all contractors, subcontractors, and other associates of the Project will follow the guiding principles of the monitoring program. These organizations will also comply with all relevant municipal, provincial, and federal legislation.

Management Structures
Northland, the turbine manufacturer, and the Contractor will take steps to ensure that they have appropriately skilled personnel to carry out the environmental responsibilities as defined in this Report. All organizations associated with Project development activities will develop responsive reporting systems that clearly assign responsibility and accountability for development actions. As appropriate, Northland will review these reporting documents.

Change Management
During Project operation, changes may be required to address unforeseen or unexpected conditions or situations. Northland, the turbine manufacturer, and/or the contractor will be responsible for ensuring environmental and safety issues are addressed. Northland will put into effect any significant changes to Project programs, procedures, and plans throughout the life of the Project.

Environmental Procedures
Northland, the turbine manufacturer, and the Contractor will be responsible for implementing all approved environmental procedures during operation. Individual personnel responsibilities will be assigned as necessary to support the full and effective implementation of the environmental procedures. Environmental procedures will address the following issues to prevent environmental contamination:

- Spills and releases: to identify the specific procedures for the prevention, response, and notification of spills. In addition it should establish the general procedures for spill clean-up, personnel training, and material handling and storage to prevent spills.
- Hazardous waste management: to outline the procedures for the proper identification of hazardous waste and its proper storage, handling, transport, and disposal. In addition, the procedures should outline specific requirements for personnel training, emergency response, product review and approval, and record keeping.

- Solid waste management: to establish alternative procedures for the management and disposal of used lubricants, used drums, and general office waste.

These procedures will ensure internal and external risks are fully evaluated and the information communicated to personnel in advance of any accident or malfunction.

Training Program
As appropriate, Northland and/or the Contractor should develop a training program to ensure personnel receive appropriate training in relation to operation and maintenance activities, environmental procedures, and the emergency preparedness and response plan. With respect to the environment and natural heritage, training may cover the following issues:

- Environmental Protection, including:
  - Important/sensitive environmental features and areas;
  - Incident reporting (spills, wildlife incidents); and,
  - Materials disposal.

- Facility Safety, including:
  - Accident reporting; and,
  - Chemical and hazardous materials handling.

- Emergency Preparedness, including:
  - Fire preparedness and response;
  - Natural disasters (i.e., extreme weather events); and,
  - Hazardous materials and spill response.

Training should begin as the initial staff complement is hired. There should also be on-going training for personnel as well as specific training sessions for new hires.

5.3 Project Monitoring and Contingency Measures

Project monitoring was designed to ensure performance objectives will be achieved through proper implementation of mitigation strategies. Where Project monitoring reveals that a mitigation strategy is not achieving its performance objective, contingency measures will be employed. Contingency measures have been developed to achieve the following:

- rehabilitate or correct a negative environmental effect;
- notify the applicable agencies and public, if required; and,
- develop alternative mitigation strategies that could prevent the same negative environmental effect from occurring again.

5.4 Environmental Effects Monitoring Plan

The environmental effects monitoring plan is detailed in **Tables 5.1 to 5.5** as follows:

- **Tables 5.1 to 5.3** include all potential effects associated with the Natural Heritage Assessment Environmental Impact Study for the Project;
- **Table 5.4** includes all potential effects associated with the Water Assessment and Water Body Report for the Project; and,
- **Table 5.5** includes all potential effects associated with land use and socio-economic features. These effects are informed by all other investigations undertaken for the Project.

Each potential negative environmental effect is identified and assessed for performance objectives, mitigation strategies, monitoring, and contingency measures. For details relating to the natural heritage, water, archaeological, and cultural heritage features of the study area, refer to the Natural Heritage Assessment Environmental Impact Study, Water Assessment and Water Body Report, and The 2012 Heritage Assessment of the Proposed Grand Bend Wind Farm issued under separate covers as part of the application for Renewable Energy Approval.

Table 5.1 Environmental Effects Monitoring Plan – Environmental Impact Study General Features

Project Activity	Potential Effects (D=Direct) (I=Indirect)	Mitigation Strategy	Residual Effect (magnitude/frequency/duration)	Performance Objective	Monitoring Plan and Contingency Measures
Installation and removal of 36 kV collector lines, 230 kV transmission line, communication lines	• Sediment and erosion impacts associated with open cut trenching and directional drilling/punch and bore activities (I).	• All work zones should be clearly marked to indicate that no work should occur outside the work zone. • To ensure that work zones are not within significant natural features, the boundaries of significant natural features are to be delineated in the field by a qualified environmental technician based on the following definitions: – Wetlands: OWES methodology (50% wetland vegetation rule); – Woodlands: Edge of the drip line; and, – SWH: As per criteria detailed in the EOS report. • Implementation of the erosion and sediment control measures will conform to industry best management practices and recognized standard specifications such as Ontario Provincial Standards Specifications (OPSS). • Sediment and erosion control measures will be implemented prior to construction and maintained during the construction phase in accordance with the erosion and sediment control plan developed during detailed design. • All sediment and erosion control measures will be inspected prior to construction and maintained during the construction phase to prevent entry of sediment into natural features. • If the sediment and erosion control measures are not functioning properly, no further work in the affected areas will occur until the sediment and/or erosion problem is addressed. • All disturbed areas of the construction site will be stabilized and re-vegetated as soon as conditions allow. • Sediment and erosion control measures will be left in place until all areas of the construction site have been stabilized. • Trenching along straight sections will be within the disturbed portion of the municipal road ROW.	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• No erosion and sediment impacts on natural features including wildlife habitats.	• A plan for addressing impacts associated with “frac-out” during directional drilling will be prepared in accordance with the Operational Statement. • Erosion and sediment control measures will be regularly inspected to ensure they are functioning and are maintained as required. • If erosion and sediment control measures are not functioning properly, alternative measures will be implemented and prioritized above other construction activities.

Project Activity	Potential Effects (D=Direct) (I=Indirect)	Mitigation Strategy	Residual Effect (magnitude/frequency/duration)	Performance Objective	Monitoring Plan and Contingency Measures
		• Directional drilling and/or punch and bore options will be undertaken in accordance with the Department of Fisheries and Oceans' Operational Statement. • Horizontal directional drilling and/or punch and bore operations will be designed with launching and receiving pits that will minimize tree loss and disturbance of natural vegetation wherever possible. • Launch and receiving pits will be designed by the drilling contractor in accordance with the operational statement, and will not extend beyond the disturbed portion of the municipal road ROW. To the extent possible, pits will be located at least 30m from significant natural features as delineated by a qualified Environmental Inspector. In some instances, pits may need to be less than 30m (but no less than 5m) from a natural feature. This will be determined during detailed design and will be documented in the sediment and erosion control plan.			
All Construction and Decommissioning Activities	• Accidental encroachment of equipment, stockpiles etc. into natural areas (I).	• All work zones (as detailed in Figures A1 – A19 in Appendix A) should be clearly marked to indicate that no work should occur outside the work zone. • Silt fencing will be installed in accordance with an erosion and sediment control plan which will be prepared during detailed design to further protect significant natural features adjacent to work areas. • To ensure that work zones are not within significant natural features, the boundaries of significant natural features are to be delineated in the field by a qualified environmental technician based on the following definitions: – Wetlands: OWES methodology (50% wetland vegetation rule); – Woodlands: Edge of the drip line; and, – SWH: As per criteria detailed in the EOS report.	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• No disturbance to natural areas.	• An Environmental Inspector will perform regular inspection to ensure that mitigation is implemented and all silt fencing is maintained and functioning properly. If they are not functional, they should be repaired immediately. • If accidental encroachment occurs the offending material or equipment will be immediately removed and restoration of the area conducted as needed.

Project Activity	Potential Effects (D=Direct) (I=Indirect)	Mitigation Strategy	Residual Effect (magnitude/frequency/duration)	Performance Objective	Monitoring Plan and Contingency Measures
All Construction and Decommissioning Activities	• Potential soil compaction (D).	• Heavy equipment and material stockpiles will be limited to marked construction areas. • To ensure that work zones are not within significant natural features, the boundaries of significant natural features are to be delineated in the field by a qualified environmental technician based on the following definitions: – Wetlands: OWES methodology (50% wetland vegetation rule); – Woodlands: Edge of the drip line; and, – SWH: As per criteria detailed in the EOS report. • Temporary construction staging areas and construction roads which have been compacted will be rehabilitated upon completion of construction.	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• Minimize the geographical extent of soil compaction to the extent possible. • Rehabilitate any compacted soils within temporary construction areas.	• An Environmental Inspector will perform regular inspection to ensure that equipment and stockpiles do not extend beyond construction areas. • Northland and the contractor will work with participating landowners to ensure that soils in construction areas are rehabilitated to restore agricultural uses..
All Construction and Decommissioning Activities	• Mortality of wildlife inadvertently moving through construction zones (I).	• Silt fencing will be properly installed and maintained in accordance with the erosion and sediment control plan to keep wildlife out of work areas. • Speed limit signage will be posted along construction travel routes to ensure that construction vehicles respect appropriate speeds.	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• No wildlife mortality.	• An environmental inspector will regularly monitor fenced areas to ensure that fencing is properly keyed/toed in to the ground to ensure that wildlife cannot gain access under fenced area. • If wildlife inadvertently moves into a construction area, the Environmental Inspector will move the species outside of the work area, if possible, using gloves and a bucket or plastic tub, as appropriate. • If any species at risk are encountered that are not identified on relevant permits, all work will cease within the immediate work area and the Ministry of Natural Resources will be contacted.
Site Restoration	• Introduction of invasive species into natural areas (I).	• All disturbed areas of the construction site will be re-vegetated as soon as conditions allow. • Where re-vegetation is required in the municipal road allowance, as a result of transmission line installation, standard roadside seed mixes, which do not contain invasive species, will be used.	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• No introduction of invasive species.	• An Environmental Inspector will perform regular inspection to ensure that mitigation is implemented. • If extensive invasion of non-native species is identified as a result of the Project, contingency measures may include an applicable herbicide application. An herbicide application plan will be developed as required.
Turbine assembly	• Effects on groundwater levels/seepage areas and wetlands due to dewatering for construction of turbine foundations (I).	• Any discharge from dewatering will be outlet to a vegetated or agricultural area at least 30m from a significant natural feature or watercourse utilizing a sediment filter bag.	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• No effect on groundwater levels.	• An Environmental Inspector should be on-site during any dewatering within 120m of natural features. The Monitor should ensure that the filter bag is working appropriately and ensure that no sediment is entering significant natural features or watercourse. • In the event of sediment discharge, all operations should stop immediately until the problem can be

Project Activity	Potential Effects (D=Direct) (I=Indirect)	Mitigation Strategy	Residual Effect (magnitude/frequency/duration)	Performance Objective	Monitoring Plan and Contingency Measures
					resolved. • If significant changes in water levels/seepage areas are noted, operations should cease until water levels recover.
All Construction and Decommissioning Activities	• Spills from equipment fueling, oiling, greasing of project components (I).	• All materials and equipment used for the purpose of site preparation and project construction shall be operated and stored in a manner that prevents any deleterious substances (petroleum products, silt, etc.) from entering natural features. • Any stockpiled materials will be stored away from the feature. • Refueling and maintenance of construction equipment should occur a minimum of 30 m from a natural feature. • Hazardous material transportation and application will occur in designated areas according to operational procedures. Proper spill containment equipment will be used and maintained on site.	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• Minimize potential for indirect effects from accidental spills.	• As appropriate, spills will be reported to the MOE Spills Action Centre.
All Construction and Decommissioning Activities	• Impacts of construction noise on wildlife (I).	• Environmental noise will be reduced through the standard operating practices. A traffic plan will be developed and implemented by the Construction Contractor. • Work within 120 m of Amphibian Breeding Habitats (GCSWH-ABH & GCSWH-ABH(WE)) will not occur after dusk during the breeding season (April, May and June). • Work within 120m of bird habitats (GCSWH-WRN, GCSWH-WASBB, GCSWH-WNA, GCSWH-WSSA, GCSWH-SESBB, GCSWH-SCC) will not occur in the early morning hours (between dawn and 1.5 hours after dawn) during the breeding season (May 15 to July 30).	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• Minimize effects of noise.	• The Environmental Inspector will ensure that all operational plans and construction timing associated with noise reduction are being followed. • If work must occur in these areas during the noted time periods due to an emergency or critical phase of construction, work may be permitted if conditions for amphibian breeding are not ideal. Specifically, work may occur if temperatures are below 6^{o}C, there has been no rain in the previous 24 hours or wind speeds are higher than 3 on the Beaufort Scale. The Environmental Inspector will track weather conditions and determine if suitable amphibian breeding conditions are or are not present. • Similarly, emergency work may occur in the vicinity of bird habitats if conditions are not suitable for bird breeding (i.e. if temperatures are below 10^{o}C, if there is rain or fog or if winds are greater than 3 on the Beaufort Scale). The Environmental Inspector will track weather conditions and determine if suitable bird breeding conditions are or are not present.
All Construction and Decommissioning Activities	• Dust effects on wildlife habitat (I).	• As appropriate, dust from the work areas will be controlled through suppressants (e.g., water).	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• Minimize effects from dust on wildlife habitats.	• Dust emissions will be monitored daily during construction to ensure dust control watering frequency and rates are adequate.

Table 5.2 Environmental Effects Monitoring Plan – Environmental Impact Study Significant Features

Affected Environmental Feature(s)	Project Activity	Potential Effects (D=Direct) (I=Indirect) Potential effect on the size, diversity, health, connectivity, functionality and resilience of the natural feature.	Mitigation Strategy	Residual Effect (magnitude/frequency/ duration)	Performance Objective	Monitoring Plan and Contingency Measures
CONSTRUCTION AND DECOMMISSIONING						
All Significant Features	• All Construction and Decommissioning Activities	• General construction and decommissioning effects. • Refer to effects listed under Generalized Significant Wildlife Habitat.	• Refer to mitigation listed under Generalized Significant Wildlife Habitat.	• Refer to Residual Effects listed under Generalized Significant Wildlife Habitat.	• Refer to Performance Objectives listed under Generalized Significant Wildlife Habitat.	• Refer to monitoring and contingency measures listed under Generalized Significant Wildlife Habitat.
Significant Woodlands, Provincially Significant Wetlands, Wetlands Assumed Significant, Deer Yarding Areas W-038, W-039, W-079, W-081, W-086, W-088, W-094,W-102, W-103, W-123, W-128 Wetland Complex B WE-013, WE-014, WE-015, WE-017, WE-020, WE-026 Individual Wetlands WE-022, WE-027, WE-029, WE-030, WE-031, WE-033, WE-034, WE-038 DYA-001, DYA-002	• Installation and removal of 36 kV and 230 kV transmission line and communication lines along straight road sections.	• Inadvertent loss of, or disturbance to, vegetation within the wetlands/deer yards through encroachment of equipment or stockpiles (I). • Movement of exposed sediment into the features (I). • The effects identified above could have minor effect on the size of woodlands and wetlands and on the function of the wetland as surface water storage.	• Cables will be installed using open trenching methods within the disturbed municipal road ROW. • Significant features will be clearly marked with sediment and/or tree protection fencing to ensure the equipment and material stockpiles do not encroach into any significant woodlands, wetlands or deer yards adjacent to the ROW. • The boundaries of the features are to be delineated in the field by a qualified environmental technician based on the following definitions: – Woodlands: Edge of the drip line – Wetlands: OWES methodology (50% wetland vegetation rule) • Silt and/or tree protection fencing will be installed along the boundaries of significant features.	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• No vegetation loss or disturbance associated with sediment and erosion on woodlands or wetlands.	• An Environmental Inspector will regularly monitor operations to ensure that activities do not encroach into significant natural features.
Significant Woodlands, Provincially Significant Wetlands, Wetlands Assumed Significant, Deer Yarding Areas W-038, W-039, W-079, W-081, W-086, W-088, W-094,W-102, W-103, W-123, W-128 Wetland Complex B WE-013, WE-014, WE-015, WE-017, WE-020, WE-026 Individual Wetlands WE-022, WE-027, WE-029, WE-030, WE-031, WE-033,	• Installation and removal of 230 kV transmission line and communication lines at watercourse and bridge crossings and road bends.	• Inadvertent loss of, or disturbance to, vegetation within the wetlands/deer yards through encroachment of launch or receiving pits into or adjacent to significant features D). • Movement of exposed sediment into the features (I). • The effects identified above could have minor effect on the size of woodlands and wetlands and on the function of the wetland as surface water storage.	• Lines will be installed using directional drilling, punch and bore, or open-cut techniques at watercourse, bridge, road, and utility crossings. • Significant woodlands and wetlands will be clearly demarcated with sediment and/or tree protection fencing to ensure the equipment and material stockpiles do not encroach into the features. • The boundaries of the features are to be delineated in the field by a qualified environmental technician based on the following definitions: – Wetlands: OWES methodology (50% wetland vegetation rule) – Woodlands: Edge of the drip line – SWH: As per criteria detailed in the EOS report • Silt and/or tree protection fencing will be installed along the boundaries of the natural features. • Vegetated buffers will be left in place to the extent	• Duration is expected to be moderate (10 to 15 years until replacement trees have matured); however magnitude, frequency and geographic scope are very limited. • No residual effect anticipated. May also be residual effect associated with frac-out during directional drilling; likelihood is low, limited duration,	• No vegetation loss or disturbance associated with sediment and erosion on woodlands or wetlands.	• An Environmental Inspector will regularly monitor operations to ensure that activities do not encroach into wetland areas. • If directional drilling is used, an Environmental Inspector will be on-site during drilling activities. • Erosion and sediment control measures will be regularly inspected to ensure they are functioning and are maintained as required. • If erosion and sediment control measures are not

Affected Environmental Feature(s)	Project Activity	Potential Effects (D=Direct) (I=Indirect) Potential effect on the size, diversity, health, connectivity, functionality and resilience of the natural feature.	Mitigation Strategy	Residual Effect (magnitude/frequency/ duration)	Performance Objective	Monitoring Plan and Contingency Measures
WE-034, WE-038 DYA-001, DYA-002			possible. • Any cleared areas adjacent to significant features will be re-vegetated using a native seed mix and/or native shrub and tree plantings • Trenching along straight sections will be within the disturbed portion of the municipal road ROW. • Directional drilling and/or punch and bore options will be undertaken in accordance with the Department of Fisheries and Oceans' Operational Statement. • Horizontal directional drilling and/or punch and bore operations will be designed with launching and receiving pits that will minimize tree loss and disturbance of natural vegetation wherever possible. • Launch and receiving pits will be designed by the drilling contractor in accordance with the operational statement, and will not extend beyond the disturbed portion of the municipal road ROW. To the extent possible, pits will be located at least 30 m from significant natural features as delineated by a qualified Environmental Inspector. In some instances, pits may need to be less than 30 m (but no less than 5 m) from a natural feature. This will be determined during detailed design and will be documented in the sediment and erosion control plan.	frequency and geographic extent.		functioning properly, alternative measures will be implemented and prioritized above other construction activities. • An emergency frac-out plan will be prepared and implemented by the Contractor. The Environmental Inspector will hold the Contractor accountable to implementation of the emergency frac-out plan. • Undertake monthly site inspections during the Site Preparation stage to ensure that trees are not damaged during construction activities.
Significant Wetlands Wetland Complex A WE-008, WE-009, WE-010, WE-011 Individual Wetlands WE-001, WE-002,	Turbine Assembly	• Localized effects on wetland water levels due to dewatering for construction of turbine foundations (I). • Water from the dewatering process could be outlet into a wetland causing scour within the wetland and deposition of sediment from the pumped water (I). • The effects identified above could affect habitat for aquatic species if standing water is drawn down. • Sedimentation could affect wetland functions associated with surface water storage and flood control.	• Dewatering will be minimized to the extent possible. • Any discharge from dewatering will be outlet to an agricultural or vegetated area at least 30m from a significant natural feature or watercourse utilizing a sediment filter bag. • Significant natural features boundaries are to be delineated in the field by a qualified environmental technician based on the following definitions: – Wetlands: OWES methodology (50% wetland vegetation rule) – Woodlands: Edge of the drip line – SWH: As per criteria detailed in the EOS report.	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• No effect on wetland water levels. • No sediment discharge into wetlands.	• An Environmental Monitor should be on-site during any dewatering within 120m of wetlands. The Monitor should ensure that the filter bag is working appropriately. • In the event of sediment discharge, all operations in the affected area should stop immediately until the problem can be resolved. • Although no effects on water levels is anticipated, the Environmental Monitor should also monitor water levels in the vicinity of dewatering activities during

Affected Environmental Feature(s)	Project Activity	Potential Effects (D=Direct) (I=Indirect) Potential effect on the size, diversity, health, connectivity, functionality and resilience of the natural feature.	Mitigation Strategy	Residual Effect (magnitude/frequency/ duration)	Performance Objective	Monitoring Plan and Contingency Measures
						the dewatering process. If significant changes in water levels are noted, operations should cease until water levels recover.
Significant Woodlands W-04, W-020, W-21, W-23, W-026, W-29, W-30, W-31, W-34, W-036, W-37, W-042, W-053,	• Construction and removal of access roads adjacent to the following woodlands: – W-053 (access road to T-16); – W-042 (access road to T-18); – W-036 (access road to T-25 and T-28); – W-026 (access road to T-31); and, – W-020 (access road to T-40). • Installation of 36 kV collector lines adjacent to the following woodlands: – W-04 and W-037 (collector line along Sararas Road); – W-029, W-030, W-034, W-031 (collector line along Shipka Road); – W-023 and W-026 along Schadeview Road; – W-020 along Turnbull's Road; and, – W-021 along the	• Inadvertent loss of, or disturbance to, vegetation along the edge of woodlands during construction of adjacent access roads and below ground collector lines (I). • The effects identified above could have minor effect on the size of woodlands and their function in providing edge habitat for a variety of species including Red-headed woodpecker (Special Concern species).	• Construction areas are to correspond to those areas detailed on **Figures A1-A19, Appendix A** • Access road and collector lines will be no closer than the dripline of each significant woodland edge. • The significant woodland edge should be demarcated by a silt fence and/or tree protection fencing. • Below ground collector lines will be located within the access road allowance and will not extend into wooded areas. • Additional, taller tree protection fencing (tree hoarding) should be installed in these areas to protect tree limbs from equipment in adjacent areas. • Any tree roots which extend into the construction area should be cut and re-packed into soil to avoid desiccation.	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• No disturbance to woodlots.	• Silt fencing and/or tree protection fencing will be installed as per the construction areas detailed in **Figures A1-A19, Appendix A**. Further to this silt fencing and/or tree protection fencing will installed no closer than the dripline and monitored regularly by an Environmental Inspector to ensure they are functioning and are maintained as required. • If the silt fencing and tree hoarding are not functioning properly, alternative measures will be implemented and prioritized above other construction activities.

Affected Environmental Feature(s)	Project Activity	Potential Effects (D=Direct) (I=Indirect) Potential effect on the size, diversity, health, connectivity, functionality and resilience of the natural feature.	Mitigation Strategy	Residual Effect (magnitude/frequency/ duration)	Performance Objective	Monitoring Plan and Contingency Measures
	field edge between T-37 and T-39.					
Turtle Nesting Area, Turtle Overwintering Habitat* and Amphibian Breeding Habitat ABH-001 TNA-002 TWA-003*	All Construction and Decommissioning Activities	• Accidental mortality due to wildlife moving through the construction zone (I). • The effect identified above may affect individual animals but unlikely to affect population health or resiliency. No effect on habitat functionality.	• During construction wildlife fencing (sediment fencing) will be installed around all work areas within 120m of these habitats prior to any earth movement, stockpiling or other activities on the site. Fencing must be keyed in correctly and monitored for proper installation and maintenance by the contractor. • The boundary of the construction compound will be fenced to limit the ability for wildlife to enter the area. • Construction areas are to correspond to those areas detailed on **Figures A1 – A19, Appendix A**. • Work within 120 m of Amphibian Breeding Habitats (ABH-001) will not occur after dusk during the breeding season (April, May and June).	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• No accidental mortality. • No reduced amphibian breeding due to noise impacts.	• The contractor will be responsible for ensuring fencing is maintained and inspected regularly for signs of wildlife in the work zone while work is occurring these areas. • The Environmental Inspector will be on-site as required to ensure proper maintenance of wildlife fencing. • If any turtles are found within the TNA-002 and TWA-003 adjacent work zones, the Environmental Inspector should relocate them to the nearest habitat area outside of the work zone. When relocating snapping turtles, care should be taken to avoid injury by wearing gloves and placing turtles into a bucket or large plastic tub for relocation. • Sediment/wildlife fencing within 120 m of Amphibian Breeding Habitat (ABH-001) should also be inspected by the Environmental Inspector at least once a week during the breeding season April, May and June) to ensure they are functioning and are maintained as required. • If the sediment/wildlife fencing is not functioning properly, alternative measures will be implemented and prioritized

Affected Environmental Feature(s)	Project Activity	Potential Effects (D=Direct) (I=Indirect) Potential effect on the size, diversity, health, connectivity, functionality and resilience of the natural feature.	Mitigation Strategy	Residual Effect (magnitude/frequency/ duration)	Performance Objective	Monitoring Plan and Contingency Measures
						above other construction activities. • Contractor and Environmental Inspector to monitor work schedules to ensure that no work occurs within the restricted timing window.
Amphibian Breeding Habitat ABH-001	Construction of turbines T-21, T-22, T-23, T-24 and T-25, their access roads and all associated components	• Inhibition of amphibian breeding patterns and reproductive success due to disruptions of breeding calling patterns from turbine construction noise (I). • The effect identified above could affect the size and diversity of the amphibian population in this pond.	• Construction of turbines T-21, T-22, T-23, T-24 and T-25, their access roads and all associated components should not occur after dusk during the breeding season (April, May and June).	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• No significant decrease in amphibian populations.	• Contractor and Environmental Inspector to monitor work schedules to ensure that no work occurs within the restricted timing window. • If work must occur in these areas during the noted time periods due to an emergency or critical phase of construction, work may be permitted if conditions for amphibian breeding are not ideal. Specifically, work may occur if temperatures are below 6^{o}C, there has been no rain in the previous 24 hours or wind speeds are higher than 3 on the Beaufort Scale. The Environmental Inspector will track weather conditions and determine if suitable amphibian breeding conditions are or are not present.
Species of Conservation Concern* SCC-001, SCC-002, SCC-003, SCC-004, SCC-005, SCC-006, SCC-007, SCC-008, SCC-009, SCC-010, SCC-011, SCC-012, SCC-013, SCC-014, SCC-015, SCC-016, SCC-017	Site Preparation All Decommissioning Activities	• Inadvertent loss of, or disturbance to, vegetation within significant habitat areas as a result of unauthorized encroachment into the habitat (I). • Movement of exposed sediment into the habitat (I). • The effects identified above could have minor effect on the size of habitat and could affect individuals	• Significant habitats will be clearly demarcated with sediment and/or tree protection fencing to ensure the equipment and material stockpiles do not encroach into any features. • Significant habitats to be demarcated by a qualified Environmental Inspector based on the boundary of the finest applicable ELC unit. • Construction areas are to correspond to those areas detailed on **Figures A1-A19, Appendix A**.	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• No disturbance to significant habitat areas.	• An Environmental Inspector will perform regular inspection to ensure that mitigation is implemented and all silt fencing and/or tree protection fencing is maintained and functioning properly. If they are not functional, they should be repaired immediately.

Affected Environmental Feature(s)	Project Activity	Potential Effects (D=Direct) (I=Indirect) Potential effect on the size, diversity, health, connectivity, functionality and resilience of the natural feature.	Mitigation Strategy	Residual Effect (magnitude/frequency/ duration)	Performance Objective	Monitoring Plan and Contingency Measures
		if sediment washes out or buries vegetation.				• If accidental encroachment occurs the offending material or equipment will be immediately removed and restoration of the area conducted as needed.
Bat Maternity Colonies* BMC-001, BMC-002, BMC-003, BMC-004, BMC-005, BMC-006, BMC-007, BMC-008, BMC-009, BMC-010, BMC-011, BMC-012,	All Construction and Decommissioning Activities	• Disturbance due to construction activity and noise could result in bats avoiding habitat (I). • Inadvertent loss of, or disturbance to, vegetation within significant habitat areas as a result of unauthorized encroachment into the habitat (I). • The effect could impact the use of the habitat by bats.	• No construction will occur immediately adjacent to significant bat maternity colony habitats within the timing window of May 1 to July 30. • Significant habitats will be clearly demarcated with sediment and/or tree protection fencing to ensure the equipment and material stockpiles do not encroach into any features. • Significant habitats to be demarcated by a qualified Environmental Inspector based on the boundary of the finest applicable ELC unit. • Construction areas are to correspond to those areas detailed on **Figures A1-A19, Appendix A**.	• Limited duration and magnitude. • No residual effect anticipated.	• No disturbance to significant bat maternity colonies.	• An Environmental Inspector will perform regular inspection to ensure that work does not occur within specified timing windows. • An Environmental Inspector will perform regular inspection to ensure that mitigation is implemented and all silt fencing and/or tree protection fencing is maintained and functioning properly. If they are not functional, they should be repaired immediately. • If accidental encroachment occurs the offending material or equipment will be immediately removed and restoration of the area conducted as needed.
OPERATION						
Bat Maternity Colonies* BMC-001, BMC-002, BMC-003, BMC-004, BMC-005, BMC-006, BMC-007, BMC-008, BMC-009, BMC-010, BMC-011, BMC-012,	Wind Turbine Operation	• Bats may avoid habitat areas once turbines are operational (I). • The effect noted above could reduce the available habitat for bats and could therefore reduce populations in the area.	• Develop contingency measures as required.	• Duration of the effect could be experienced throughout entire operating period of the turbines. • Effect most significant during spring season. • Potential for residual effects exists.	• Minimize impacts to Bat Maternity Colony habitat. No significant reduction in use by bats.	• Contingency measures may include additional monitoring to determine cause of decline, possible turbine shut-down or blade feathering during breeding season. • Contingency measures will be developed and confirmed with the MNR as required, subject to the level of effect identified. • Additional three years of monitoring if mitigation is applied. • Refer to EEMP for more

Affected Environmental Feature(s)	Project Activity	Potential Effects (D=Direct) (I=Indirect) Potential effect on the size, diversity, health, connectivity, functionality and resilience of the natural feature.	Mitigation Strategy	Residual Effect (magnitude/frequency/ duration)	Performance Objective	Monitoring Plan and Contingency Measures
						information.

Amphibian Breeding Habitat
 	
ABH-001
	Wind Turbine Operation	• Inhibition of amphibian breeding patterns and reproductive success due to disruptions of breeding calling patterns from turbine noise (I).
		• The effect identified above could affect the size and diversity of the amphibian population in this pond.
			• Post-construction monitoring will be undertaken and contingency measures developed as required.	• Duration of the effect could be experienced throughout entire operating period of the turbines.
				• Effect most significant during spring breeding season.
				• Potential for residual effects exists.
					• Minimize impacts to amphibian breeding. Baseline amphibian calling index to be maintained at 3 for both spring peeper and grey tree frog.	• Conduct an Amphibian Monitoring Program for two years following construction of the wind farm. Amphibian surveys to be undertaken in accordance with Marsh Monitoring Program Manual (Bird Studies Canada, 1994). Surveys will be conducted between one-half hour after sunset and midnight during each of the following three periods:
						  • April 15-30;
						  • May 15-30; and,
						  • June 15-30.
						• Contingency measures will be developed and confirmed with the MNR as required, subject to the level of mortality identified.
						• Additional two years of monitoring if significant effects are observed.
						• Refer to EEMP for more information.

Turtle Nesting Area and Turtle Overwintering Habitat* TNA-002 TWA-003*	Planned and Unplanned Maintenance	• Maintenance vehicles may collide with migrating turtles crossing Turnbull's Road or the turbine access road to T-40 (D).	Turtle crossing signs will be erected along Turbull's Road to remind drivers to be mindful of turtles in the area.	• Effect most significant during spring and fall migration periods. • Potential for residual effects exists.	• Minimize turtle/vehicle collisions.	• Maintenance crews will report any turtle collisions to Northland and/or their consultant. Findings will be reported to the MNR for the first two years of operation. • Contingency measures will be developed with the MNR as required, subject to the level of mortality identified. • Refer to EEMP for more information

Affected Environmental Feature(s)	Project Activity	Potential Effects (D=Direct) (I=Indirect) Potential effect on the size, diversity, health, connectivity, functionality and resilience of the natural feature.	Mitigation Strategy	Residual Effect (magnitude/frequency/ duration)	Performance Objective	Monitoring Plan and Contingency Measures
All Significant Features	Planned and Unplanned Maintenance	• Maintenance activities may have impacts associated with spills and the accidental release of hazardous materials. • General effects such as those described under listed under Generalized Significant Wildlife Habitat may occur if earth movement is required. • Refer to effects listed under Generalized Significant Wildlife Habitat. • Maintenance activities are not anticipated to affect size, diversity, heath, connectivity or function of natural features.	• Procedures will be in place for the handling of hazardous materials, disposal of waste and management of dust and noise. • Any maintenance requiring earth movement will use the same mitigation measures described under Generalized Significant Wildlife Habitat.	• Refer to Residual Effects listed under Generalized Significant Wildlife Habitat. • No residual effect anticipated.	• Refer to Performance Objectives listed under Generalized Significant Wildlife Habitat.	• Refer to monitoring and contingency measures listed under Generalized Significant Wildlife Habitat.
Individual Birds and Bats	Wind Turbine Operation	• Impacts due to collisions with turbines or mortality due to pressure variations during operation (D). • The effect identified above has the potential to affect the population size and health if mortality exceeds limits set out by the province.	• Refer to mitigation provided in the separate EEMP for birds and bats.	• Refer to the separate EEMP for birds and bats.	• Refer to the separate EEMP for birds and bats.	• Refer to the separate EEMP for birds and bats.

* Wildlife habitat treated as significant. These are features which may be significant and which are being treated as such until habitat use study can confirm the relative use of each habitat. If it is found that wildlife are not using the habitat in significant numbers, then the mitigation identified will not be required.

Table 5.3 Environmental Effects Monitoring Plan – Environmental Impact Study Significant/Provincially Significant Features Potentially Affected During Operation

Feature(s)	Distance to Project Locations (components)	Potential Negative Environmental Effects	Mitigation Strategy	Performance Objective	Environmental Effects Monitoring Plan					Contingency Measure
					Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
BMC-001* BMC-002* BMC-003* BMC-004* BMC-005* BMC-005* BMC-006* BMC-007* BMC-008* BMC-009* BMC-010* BMC-011* BMC-012*	2 m to 119 m	Habitat displacement or avoidance Note: Post-construction mortality of bats and detailed monitoring plan is addressed in the Environmental Effects Monitoring Plan as part of the Design and Operations Report.	Infrastructure sited outside of the significant wildlife habitat feature	Continued use of the habitat by the species (Little brown bat, Eastern Small-footed bat, Northern Long-eared bat or Tricolored Bat, Silver-haired Bat) that currently inhabits the feature. White nose syndrome may have an impact on the abundance of bats, specifically Northern long-eared and Little Brown bats.	Apply same methodology followed during pre-construction monitoring (exit count surveys coupled with acoustic monitoring using broadband bat detector to identify species). See Appendix B for detailed survey methods.	At snags/tree cavities to be identified and monitored during pre-construction surveys.	Pre-construction Survey (baseline): June 2013 Post-construction Survey: • June 2015 • June 2016 • June 2017	Determine if there is a displacement or avoidance effect caused by turbines located in proximity to bat maternity colonies	Annual Reports submitted to MNR. Estimated Report Submission Dates: • Summer 2013 (preconstruction data) • Summer 2015 (yr 1 post-construction) • Summer 2016 (yr 2 post-construction) • Summer 2017 (yr 3 post-construction)	Upon submission of annual post-construction monitoring reports to MNR it will be determined in consultation with MNR whether contingency measures are required and the contingency measures to be undertaken.
ABH-001	33 m to 103 m	Habitat displacement or avoidance.	Strategy to site turbines outside of habitat.	Minimize impacts to amphibian breeding. Baseline amphibian calling index to be maintained at 3 for both spring peeper and grey tree frog.	Conduct an Amphibian Monitoring Program for two years following construction of the wind farm. Amphibian surveys to be undertaken in accordance with Marsh Monitoring Program Manual (Bird Studies Canada, 1994). See Appendix E for detailed survey methods	At survey station monitored during EOS surveys in ABH-001. See Figure E in Appendix E of the Natural Heritage Assessment Environmental Impact Study under a separate cover.	Surveys will be conducted between one-half hour after sunset and midnight during each of the following three periods in 2015and 2016: • April 15-30; • .....May 15-30; and, • .....June 15-30.	Determine if there is a displacement or avoidance effect caused by turbines located in proximity to amphibian breeding habitat.	Annual Reports submitted to MNR. Estimated Report Submission Dates: • Summer 2015(yr 1 post-construction) • Summer 2016 (yr 2 post-construction).	Upon submission of annual post-construction reports to MNR it will be determined in consultation with MNR whether contingency measures are required. Contingency measures may include additional monitoring to determine cause of decline, possible turbine shut-down or blade feathering during breeding season. Additional two years of monitoring if significant effects are observed.

Feature(s)	Distance to Project Locations (components)	Potential Negative Environmental Effects	Mitigation Strategy	Performance Objective	Environmental Effects Monitoring Plan					Contingency Measure
					Methodology	Monitoring Locations	Frequency and Duration of Sample Collection	Technical and Statistical Value of Data	Reporting Requirements	
TNA-002 **TWA-003***	2 m to 113 m	Collisions between turtles and maintenance vehicles.	Vehicle drivers will be given training and awareness related to this location and will be told to monitor speeds and driving conditions in this area. Drivers will be given a log book with which to enter information about any collisions with turtles or other wildlife. Signage will be erected to notify drivers of turtle crossing area.	Minimize vehicle/turtle collisions.	Drivers will record any turtle or other wildlife collisions in log book. Conduct turtle nesting and overwintering monitoring for two years following construction of the wind farm. See Appendix C for detailed survey methods.	Records will be kept of any collision on any roadway in the vicinity of the Project Location. Signage will be posted in close proximity to TNA-003 and TWA-002 on Turnbull's Road. Two-year monitoring at TNA-002 and TWA-003* survey stations. See Figure E in Appendix C of the Natural Heritage Assessment Environmental Impact Study under a separate cover.	• Records of collisions will be kept only if collisions occur. Two years of habitat monitoring will be conducted on three separate occasions in late March, mid-April and early-May on days without rain or fog.	Determine if there is significant mortality related to turtle/vehicle collisions during first two years of operations. Determine if there is any change in the use of the habitat.	Annual summary of logs submitted to MNR. Estimated Report Submission Dates: • Summer 2015 (yr 1 post-construction) • Summer 2016 (yr 2 post-construction).	Upon submission of annual post-construction monitoring reports to MNR it will be determined in consultation with MNR whether contingency measures are required and the contingency measures to be undertaken.

*pre-construction survey required to verify significance of this feature. If significant the following mitigation measures, monitoring plan and contingency measures will be implemented

Table 5.4 Environmental Effects Monitoring Plan – Water Assessment and Water Body Features

Affected Environmental Feature(s)	Project Phase	Potential Effects	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures
Aquatic Species and Aquatic Habitat Watercourse Crossings: CR-013, CR-018, CR-023, CR-031, CR-032, CR-041	Construction Decommissioning	• Potential direct effects to aquatic habitat quality from sedimentation during construction activities (i.e., culverts for access roads). • Effects to riparian vegetation during construction • Effects to fish during in-water works • Potential failure of slopes – impacts to bed/banks of stream during culvert construction.	• Minimize indirect effects from dust, sedimentation and erosion. • Minimize direct effects to fish and fish habitat during construction.	• Erosion and sediment control measures (i.e., silt fence, straw bales, wooden stakes, sand bags, filters, pumps, snow fencing) will be installed and will be maintained during the construction work phase and until the site has been stabilized. Implementation of the erosion and sediment control measures will conform to industry best management practices and recognized standard specifications such as Ontario Provincial Standards Specifications (OPSS). • Minimize footprint for culvert crossings at access roads. • Culvert construction will take place outside fish and fish habitat timing windows, and will be designed and installed according to the requirements of the Ausable Bayfield Conservation Authority. • Directional drilling and/or punch and bore operations will be designed with launching and receiving pits with appropriate setbacks from watercourses wherever possible. • Dewatering from open excavations will take place on tile-drained agricultural land to promote infiltration and settling of suspended solids prior to entering a watercourse. • Fish salvage will be conducted by a qualified biologist under a Scientific Collection Permit from MNR and all fish captured within the work area will be released downstream unharmed. • Operational Statements (OS) provided by DFO will be used where appropriate to ensure that no impact to fish and fish habitat will occur during construction (i.e., punch and bore, directional drilling, open-cut watercourse crossings and isolated dam and pump).	• Regular weekly site inspection will occur by designated Environmental Monitor for sediment and erosion control measures. Severe weather conditions may require additional site visits depending on the proximity of the watercourse. • The level of monitoring and reporting would be based on the severity of the spill and may be discussed with the MOE Spills Action Center and MNR. **Contingency Measures** • Environmental Monitor will be responsible for “stop works” if mitigation measures are not incorporated into the construction activities or performance objectives are not achieved • Changes to the mitigation measures to best suit the current conditions will be adopted to achieve overall performance objective.
Aquatic Species and Aquatic Habitat	Construction Operation Decommissioning	• Potential contamination from accidental spills.	• Minimize potential for indirect effects from accidental spills.	• Hazardous material transportation and application will occur in designated areas according to operational procedures. Proper spill containment equipment will be used and maintained on site. • No fuelling within 30 m of any watercourse. • No fuel storage within 30 m of any watercourse. • A spill containment kit will be available during construction for every location that heavy equipment is operated.	• Regular site inspections will occur by designated Environmental Monitors for in-water works and work adjacent to sensitive areas. • The level of monitoring and reporting would be based on the severity of the spill and may be discussed with the MOE Spills Action Center and MNR. **Contingency Measures** • Additional sediment and erosion control measure (silt fence, erosion control blankets , etc.) will be on site a ready for use if original measures are not suitable • Refer to Spill Contingency Plan. • Contaminated soil will be removed and disposed of at an approved facility.
Surface Water/Soils	Construction Operation Decommissioning	• Short-term degradation of soil/water quality and fisheries habitat due to accidental spills or releases.	• Minimize indirect effects from dust, sedimentation and erosion. • Minimize potential for indirect effects from accidental spills.	• Erosion and sediment control measures (i.e., silt fence, straw bales, wooden stakes, sand bags, filters, pumps, snow fencing) will be installed and will be maintained during the construction work phase and until the site has been stabilized. Implementation of the erosion and sediment control measures will conform to industry best management practices and recognized standard specifications such as Ontario Provincial Standards Specifications (OPSS). • Culvert construction will take place outside fish and fish habitat timing windows, and will be designed and installed according to the requirements of the Ausable Bayfield Conservation Authority. • Directional drilling and/or punch and bore operations will be designed with launching and receiving pits with appropriate setbacks from watercourses wherever possible.	• Regular site inspection will occur by designated Environmental Monitors. The level of monitoring and reporting would be based on the severity of the occurrence and may be discussed with the MOE Spills Action Center and MNR. **Contingency Measures** • Contaminated soil will be removed and disposed of at an approved facility.

Affected Environmental Feature(s)	Project Phase	Potential Effects	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures
				• Dewatering from open excavations will take place on tile-drained agricultural land to promote infiltration and settling of suspended solids prior to entering a watercourse. • Hazardous material transportation and application will occur in designated areas according to operational procedures. Proper spill containment equipment will be used and maintained on site.	
Groundwater	Construction Operation Decommissioning	• Potential direct impacts to groundwater quality and quantity due to water taking at Parts and Storage Building. • Water quality impacts due to potential fuel and oil spills. • Dewatering operations during construction are not expected to impact groundwater quantity or quality. Refer to the Construction Plan Report for further details.	• Minimize impacts to groundwater quality and quantity. • No spills.	• Confirmation of water supply needs and capacity for the Part and Storage Building will be verified at the detailed design phase. If required, detailed design and implementation plans will include measures for water storage and/or water treatment. • An Emergency Response and Communications Plan will be developed during detailed design to ensure proper mitigation and notification procedures are in place regarding groundwater quality during Project operation.	• Regular site inspection will occur by designated Environmental Monitors. The level of monitoring and reporting would be based on the severity of the occurrence and may be discussed with the MOE Spills Action Center and MNR. **Contingency Measures** • All spills that could potentially have an adverse environmental effect, are outside the normal course of events, or are in excess of the prescribed regulatory levels would be reported to the MOE's Spills Action Centre.

Table 5.5 Environmental Effects Monitoring Plan – Land Use and Socio-Economic Features

Affected Environmental Feature(s)	Project Phase	Potential Effects	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures
Provincial Land Use Plans	Construction, Operation, and Decommissioning	• The Project is not protected under the Greenbelt Plan, Lake Simcoe Protection Plan, Niagara Escarpment Plan or Oak Ridges Moraine Conservation Plan. No impacts under provincial plans or policies are anticipated.	N/A	N/A	N/A
Petroleum, Oil and Gas Resources	Construction, Operation, and Decommissioning	• Fires and explosions from disturbance of existing oil and gas resources. • Methane and sour gas releases from disturbance of existing oil and gas resources.	• No fires or explosions from existing oil and gas resources as a result of Project activities. • No methane and sour gas releases from existing oil and gas resources as a result of Project activities.	• Project infrastructure has been sited with a clearance of over 75 m from existing active wells. • For Project infrastructure located within 75 m of abandoned wells, a visual search will be conducted to confirm the condition of the abandoned well. If required, the abandoned well will be properly decommissioned prior to construction within 75 m of the abandoned well. • An engineer's report will be prepared outlining risks, mitigation, and emergency response procedures for wells within 75 m of Project activities.	• Contingency Measures • Existing well records indicate 2 abandoned wells are located within 75 m of an access road and the collector line. The wells have been decommissioned and are not likely to be affected by Project activities. If a fire, explosion, or release of sour gas occurs during Project activities, the Emergency Response Plan will be implemented.
Existing Land Uses - Agriculture and Rural Resources	Construction, Operation, and Decommissioning	• Loss of lands required for the lease period and farming practices. • Potential impacts to drainage systems. • Potential impact from soil compaction. • Potential impact to crop production and yields.	• Minimize disturbance to agricultural lands, drainage systems, soil compaction and crop production.	• Siting of Project components in discussion with landowners. • Compensation provided to the landowners who have Land Lease Agreements. • Construction methods have been included that will avoid impacts to drainage systems and soil compaction thereby minimizing impacts to normal crop production and yields.	• During construction the environmental inspector will monitor the drainage and soil remediation measures to be implemented. • A landowner complaint procedure will be established. • Following construction all site areas will be monitored by qualified professionals for a two year period to ensure that drainage systems are functioning properly and normal crop production is not reduced. **Contingency Measures** • Additional drainage system repairs as required. • Additional soil compaction relief measures as required. • Crop compensation, if necessary, to landowners.
Game and Fisheries Resources	Construction, Operation, and Decommissioning	• Disturbance to game species from noise and maintenance activities.	• Minimize disturbance.	• Keep equipment in good working condition and regularly maintained to minimize noise. • Minimize impacts to aquatic resources see protection and mitigation measures under water bodies and natural heritage. • Schedule construction periods to avoid impacts.	• Complaint response protocol will be followed.

Affected Environmental Feature(s)	Project Phase	Potential Effects	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures
Provincial and Local Infrastructure and Local Traffic	Construction, Operation, and Decommissioning	• Negligible increase in traffic during operational phases. • Traffic impacts during construction phases. • Impacts to structures (i.e., culverts, bridges, watermain, gas, sewers) due to construction traffic loading.	• Minimize traffic disturbance. • Prevent damage to structures.	• The Contractor will implement a traffic management plan. • Road user agreement anticipated with local municipalities. • Permits will be obtained for applicable oversize / overweight loads. • Public notification of non-conventional load movements (if required). Escort vehicles will be used as appropriate. • Roads will be maintained and any additional repairs necessary will be completed immediately following construction to pre-development conditions or better.	• Complaint response protocol will be followed. • Monitor road conditions weekly during construction and decommissioning. **Contingency Measures** • Road maintenance, repair crews and materials to be on standby for repairs as required.
Telecommunication Networks	Construction and Operation	• Potential interference to communication systems, including radar, cellular and broadcasting systems.	• Minimize disturbance.	• Possible adjustment of turbine locations • Curtailment of operations during selected periods • Possible location adjustment of turbines, transmission or telecommunication systems or radar installation. • During construction, position crane on north side of T-21 to avoid interference with nearby microwave tower. • During construction, position crane on east or south side of T-04 to avoid interference with microwave tower.	• Additional studies to confirm non interference. • Ongoing communication with impacted agencies to resolve any outstanding issues.
Aeronautical Systems	Construction and Operation	• Aeronautical obstruction.	• Minimize hazards.	• Turbine lighting must conform to Transport Canada standards. Lights would be selected with the minimal allowable flash duration, narrow bean and would be synchronized • Nav Canada would be responsible for updating all aeronautical charts with the turbine locations. • Consideration of radar detection system to eliminate night lights except when aircraft are in the vicinity of the wind farm. Radar detection system would likely require 2 radar stations in the vicinity of the Project location.	• Routine maintenance and repair.
Viewscape / Aesthetics	Construction and Operation	• Change in viewscape as a result of Project infrastructure.	• Minimize disturbance to viewscape.	• Northland will consider a tree planting program in selected locations to assist local residents who wish to block views and shadow flicker effects of the wind farm from their properties. • Many views of the wind farm cannot be mitigated and changes to the local viewscape cannot be avoided.	• A formal complaints procedure will be established. Communication links to service will be provided. Follow-up action and investigation as required.
Air, Odour, Dust	Construction, Operation, and Decommissioning	• Air and dust emissions from operation and maintenance vehicles. No odour effects anticipated.	• Minimize emissions.	• The Contractor would implement good site practices with regard to air which may include: – multi-passenger vehicles would be utilized to the extent practical; – company and contractor personnel would avoid idling of vehicles when not necessary; – equipment and vehicles would be turned off when not in use unless required for activities and/or effective operation of the equipment or vehicle; – equipment and vehicles would be maintained in good working order with functioning mufflers and emission control systems as available; and – all vehicles would be fitted with catalytic converters as required. • The Contractor would implement good site practices with regard to dust which may include: – protecting stockpiles of friable material with a barrier; – dust suppression (e.g., water) of source areas; and, – covering loads of friable materials during transport.	• Complaint Response Protocol will be followed.

Affected Environmental Feature(s)	Project Phase	Potential Effects	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures
Environmental Noise	Construction and Operation	• Noise associated with the operation of turbines and transformer station (all turbines are expected to meet the 40 dBA limit for non-participating noise receptors). • Noise emitted from operation/maintenance vehicles.	• Minimize noise impacts to meet MOE standards.	• Noise levels have been extensively modeled with performance standards established to meet MOE requirements at all facilities • Turbines can be adjusted for noise, power levels and operational schedules. • Sound limitations have been developed for equipment to be used at the transformer substation to satisfy the 40 dBA limit at all non-participating noise receptors. • Construction equipment to be maintained with normal noise attenuation. • Schedule construction work to minimize noise impacts.	• Noise levels will be monitored in the field as required • Complaints protocol will be established with follow-up investigations and action, as required. **Contingency Measures** • Adjustments to turbine noise levels and scheduled operations as required.
Public Safety – Turbine Blade and Structure Failure	Construction and Operation	• Collapse of turbine tower and/or blade detachment.	• No failure of components.	• Adherence to setbacks from receptors. • Design, install, operate and maintain turbines according to applicable industry standards. • Use of lightening protection system.	• Regular maintenance and monitoring activities. • Emergency Response Plan will be followed.
Public Safety – Ice Fall and Shed	Operation	• Accumulation of ice on turbine blades.	• Limit ice accumulation.	• Adherence to setbacks from receptors. • Design of turbine to reduce ice accumulation. • Automatic turbine shutdown due to weight imbalances.	• Regular maintenance and monitoring activities. • Emergency Response Plan will be followed.
Public Safety – Stray Voltage and Infra Sound	Operation	• Potential impacts on public health.	• No stray voltage.	• Electric and Magnetic Fields - the Project will operate within the range of voluntary standards in North America and as the potential effects themselves from Electric and Magnetic Fields remain inconclusive, no adverse effects on human health are expected from operation of the Project. • Research to date has not shown any biological health effects at levels of Low Frequency Noise normally associated with operational turbines. Infrasound is generally much lower than Low Frequency Noise. Infrasonic levels created by wind turbines are often similar to the ambient levels prevalent in the natural environment due to wind. There is no evidence of adverse health effects caused by infrasound.	• Complaints Response Protocol will be followed.
Public Safety – Extreme Weather Events	Construction, Operation, and Decommissioning	• Potential damage to Project infrastructure.	• No damage or structural failure.	• Project components have been designed to withstand the effects from extreme events. • Design, install, operate and maintain turbines according to applicable industry standards. • Failsafe devices are capable of shutting down the turbine blades in the event of excessive wind conditions, imbalance or malfunction of other turbine components.	• Regular maintenance and monitoring activities. • Emergency procedures and protocols to be established.
Contaminated Lands – Disposal of wastes	Construction, Operation, and Decommissioning	• Nuisance refuse dispersed to adjacent properties. • Potential contamination to soil, groundwater and/ or surface water resources on or off the Project site.	• Proper disposal of waste materials.	The Contractor would implement a site-specific waste collection and disposal management plan which may include site practices such as: • systematic collection of waste and on-site storage in weather protected areas; • all waste materials and recycling will be transported off site by private waste material collection contractors licensed with a Certificate of Approval – Waste Management System; • contractors will be required to remove excess materials from the site (such as extra cable, scrap metals, pallets, etc.); • appropriate handling and disposal of all wastes classes according to current provincial standards and guidelines; • disposal of contaminated material (if encountered) to a registered waste facility according to current regulatory standards; • labelling and proper storage of liquid wastes (e.g., used oil, drained hydraulic fluid, and used solvents) in a secure area that will ensure containment of the material in	• Monitoring by the Environmental Inspector to ensure compliance during construction and decommissioning phases. • Routine staff waste management procedures and inspection during operational phases.

Affected Environmental Feature(s)	Project Phase	Potential Effects	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures
				the event of a spill; • any spill that does occur, which could potentially cause an adverse environmental effect, should be reported to the MOE's Spills Action Centre (SAC); • prohibition of dumping or burying wastes within the Project areas; • should contaminated soil be encountered during the course of excavations the contaminated material will be disposed of in accordance with the current appropriate provincial legislation, specifically Ontario Regulation 153/04; • disposal of non-hazardous waste at a registered facility; • disposal of sanitary wastes will be the responsibility of the contracted third party and they will ensure disposal in accordance with appropriate legislation, standards and policies; and, • implementation of an on-going waste management program consisting of reduction, reuse and recycling of material.	

6.0 Emergency Response and Communications Plans

The Emergency Response and Communications Plans define the avenue for ongoing communication throughout Project construction, operation and decommissioning phases. This will ensure members of the community, Aboriginal communities, local municipalities and government ministries are kept appraised of pertinent Project activities, in addition to any emergencies in the unlikely event that one should occur.

The Emergency Response and Communications Plans will be reviewed and updated as appropriate by the parties responsible for Project activity according to each phase. These parties would include the construction Contractor, operations and maintenance staff, decommissioning Contractor, and/or Northland as applicable. Any updates to the plans will be communicated to all stakeholders as they are made.

6.1 Communications Plan for Emergencies

Northland and/or the relevant Contractor will finalize a detailed Emergency Response Plan (ERP) in collaboration with the local Emergency Service Departments. A current version of the ERP will be kept at the Parts and Storage building. The ERP will contain current contact information for emergency responders, including local police and fire departments and will outline the chain of communication between on-site personnel, Northland Power, emergency contacts, the local community and other pertinent stakeholders in the event that an emergency situation should occur. The ERP will typically include the following information:

- designation of facility emergency coordinators;
- emergency action communication protocol;
- process description for responding to emergencies;
- objectives for emergency response and communication;
- local emergency response contact phone numbers;
- facility information, including exact location;
- site evacuation procedures and routes;
- fire response plan;
- personal injury response plan;
- procedures for responding to and documenting chemical/oil spills and release, including Ministry of the Environment Spills Action Centre contact information;
- material Safety Data Sheets (MSDS) for all chemicals used during construction, operation, and decommissioning;
- weather-related emergency procedures;
- process for documenting personnel injuries/serous health conditions;

- regulatory references; and,
- required health and safety training for employees.

All access roads related to the Project will have entrance permits and 911 addresses in accordance with the County of Huron Emergency Management 911 Policies and Procedures.

Potential emergency situations which could occur generally include fire, personal injury, and spills. All incidents will be properly documented and kept on file. Documentation will include date of incident, date of reporting, name of reporter, description of the incident, cause of the incident, actions taken, communications with internal and external personnel, and follow-up required. The following sections detail the emergency response procedures for the above noted emergency events.

6.1.1 Fire

In the event that the facility's automatic fire prevention measures cannot prevent a fire event, the fire response plan will be implemented. Appropriate fire extinguishers will be located in Project vehicles, the substation's electrical building, and in compliance with the applicable guidelines and regulations in Ontario. Should a fire occur, Project personnel will attempt to extinguish it, only if it is safe to do so. If there is a risk of personal injury, extinguishing the fire will not be attempted, the Project area will be evacuated and Project personnel will immediately call 911 to summon the local emergency response crews. If applicable, Project personnel will notify all adjacent residents if the fire appears able to move off of the Project site. All staff on site during the life of the Project will be trained in the procedure to deal with a fire and the use of an extinguisher.

6.1.2 Personal Injury

The Proponent will retain contractors to conduct all works related to each Project phase, and it will be the responsibility of the contractors to establish their own Health and Safety program in accordance with the Ontario Occupational Health and Safety Act.

Personal Protective Equipment will be worn by all personnel within the Project area. Any Project equipment requiring access by personnel will have appropriate handrails, toe-boards, non-slip surfaces, and anchor points for harnesses as applicable. Any electrical equipment will be insulated and grounded in accordance with the Ontario Electrical Safety Code. All personnel will receive the appropriate training for Project activities, health and safety, emergency response, and communications plans.

Should a personal injury occur on site that requires an ambulance, Project personnel will immediately call 911 and assist the injured worker, as required, until emergency services arrive.

Should a non-critical personal injury occur on site not requiring an ambulance, the injured worker will be treated on scene or taken to the local hospital. First aid supplies and maps to the local hospitals will be kept in the Parts and Storage building, and Project vehicles. A listing of all Project personnel trained in first aid/CPR will also be posted on site.

In all cases of personal injury, the Project Manager responsible for the phase of the Project will be notified immediately. All incidents will be documented and kept on file. Documentation will include date of incident, date of reporting, name of reporter, name of injured, description of the incident, cause of the incident, actions taken, communications with internal and external personnel, and follow-up required, as required by the Ontario Occupational Health and Safety Act.

6.1.3 Spills

The Ontario Ministry of the Environment clearly outlines spill procedures in the "Spills Reporting – A Guide to Reporting Spills and Discharges", dated May 2007. Definitions for the types of spills that require reporting are defined in O.Reg. 675/98 (Classification and Exemption of Spills and Reporting of Discharges). Due to the extended timeline of the Project, personnel will be responsible for utilising the latest update of the provincial procedures.

Spills that are most probable during the Project phases include discharge into the natural environment from a structure, vehicle or other container, such as sewage and hazardous materials (e.g., lubricating grease and oil).

Should a spill occur, the following will be implemented:

- evaluation of the scene for potential risks to human health and safety;
- stop the spill, if it is safe to do so;
- if there is immediate danger to human health, contact 911 for assistance, and notify the Public who may be directly impacted or in harm's way;
- notify the Project Manager of any incident;
- contain and clean-up the spill, using the on-site spill kit;
- if required, contact outside certified spill response contractors for assistance;
- gather relevant information for documentation and reporting; and,
- report the spill to government agencies as required (i.e., Ministry of the Environment Spills Action Centre, Municipality, etc.).

A spill kit will be available on-site during all Project phases and will contain equipment necessary for emergency spills response. This will include absorbent pads, absorbent boom, disposal bags, neoprene gloves, protective goggles, multi-purpose granular sorbents, and a plastic bin or metal drum to store items.

The Ministry of the Environment Spills Action Centre phone number (1-800-268-6060) will be posted at the Parts and Storage building, as well as on the spill kit.

Documentation for all spills will be kept on file and sent to the Ministry of the Environment as required. The documentation will include all information outlined by the Ministry of the Environment in the aforementioned guide.

6.2 Communications Plan for Project Updates and Activities (Non-Emergency)

All non-emergency communications will be disseminated through a variety of media avenues to keep stakeholders apprised of Project updates and activity. Where applicable, these avenues will include:

- project website;
- newspaper notices;
- construction signage; and,
- email and/or letters.

Project updates will include any legally required notices as well as any information that Northland and/or the Contractor considers relevant to inform the public of and ensure their safety.

6.3 Stakeholder Communication, Complaints, and Response

Northland will create a Communications Plan that clearly outlines a process for two-way communication with all stakeholders. At all times, the Communications Plan will be available on the Project website and at the Parts and Storage building. Each local municipality will also be supplied with contact information to direct stakeholder communications and complaints to the appropriate personnel who can implement the proper procedures.

The Communications Plan will outline the procedure for stakeholder communications to ensure proper documentation and to facilitate an efficient response. Northland and/or the Contractor will promptly respond to stakeholder communications, within 48 hours whenever possible.

Complaints received by Northland and/or the Contractor will be documented and responded to according to the procedure outlined in the Communications Plan. All complaints will be properly documented for record keeping including name, mailing address and telephone number of the complainant, time and date of the complaint, details of the complaint, actions taken to rectify the complaint, and actions that will be taken to prevent a reoccurrence of the complaint. All of this correspondence will be provided to the complainant to keep them informed on the response approach. The Communications Plan will also outline the required communications with government agencies that will take place as appropriate. As requested through the Project's Municipal Consultation Form, notification of complaints will be provided to the Municipality of South Huron.

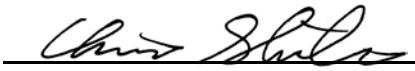
7.0 Conclusion

Safe and reliable operation of the Grand Bend Wind Farm can be implemented without causing significant adverse environmental effects. This will be achieved through proper implementation of the mitigation, monitoring, and contingency measures outlined in this report.

Burnside has prepared the Grand Bend Wind Farm Design and Operations Report for Northland in accordance with O.Reg. 359/09. This report has been prepared by Burnside for the sole benefit of Northland, and may not be re-produced by any third party without the express written consent of Northland.

Respectfully submitted,

Neegan Burnside Ltd.

Signature  Date July 2013
Chris Shilton, P.Eng, LEED®AP
Project Engineer

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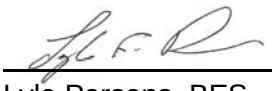
Signature  Date July 2013
Lyle Parsons, BES
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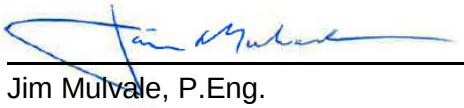
Signature  Date July 2013
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