BORNISH WIND ENERGY CENTRE

RENEWABLE ENERGY APPROVAL APPLICATION

DESIGN AND OPERATIONS REPORT

APRIL 2012

GL Garrad Hassan

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BORNISH WIND ENERGY CENTRE, ONTARIO

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REVISION HISTORY

Issue	Issue Date	Summary
A	2 January 2012	Initial issue for review
B	17 January 2012	Client revisions; new GL Garrad Hassan Canada, Inc. template
C	9 February 2012	Update of Environmental Effects Monitoring Plan
D	25 February 2012	Final client revisions
E	5 April 2012	Update Natural Heritage and Cultural Heritage summaries, update Environmental Effects Monitoring Plan.

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1 PREAMBLE

Bornish Wind LP, is proposing to develop the Bornish Wind Energy Centre (the "Project") which is subject to Ontario Regulation 359/09 (Renewable Energy Approvals (REA) [1] under Part V.0.1 of the Ontario Environmental Protection Act (EPA)) and Regulation 521/10 [2]. Bornish Wind LP was awarded a FIT Contract for this Project in July 2011 and is seeking a Renewable Energy Approval from the Ontario Ministry of the Environment (MOE). Bornish Wind LP is a wholly-owned subsidiary of NextEra Energy Canada ULC. The parent company of NextEra Energy Canada ULC is NextEra Energy Resources, LLC, with a current portfolio of nearly 8,500 operating wind turbines across North America.

This Project is considered to be a Class 4 Wind Facility. The Project is located in the Municipality of North Middlesex and will consist of 45, 1.62 MW turbines with a total nameplate capacity of up to 72.9 MW, though 48 turbine locations will be permitted.

This Design and Operations Report has been prepared in accordance with section 54.1 of O. Reg. 359/09 and the MOE's "Technical Guide to Renewable Energy Approvals"(2011) [3].

1.1 General Project Description

As explained in the Project Description Report, the proposed Project Study Area comprises two main parts, the Wind Energy Centre Study Area, which contains the wind farm itself and its associated infrastructure, and the Transmission Line Study Area, consisting of a proposed 115 kV transmission line to run from the Project's substation to a switchyard directly adjacent to the substation, and then to a Point of Common Coupling (PCC) on Hydro One's 500 kV transmission line at the east end of the Transmission Line Study Area. It is important to note that the 115 kV line running from the switchyard to Hydro One's existing 500 kV line is common to three of NextEra's Projects, i.e. Adelaide, Bornish and Jericho Wind Energy Centres.

The wind farm Project area is located in south-western Ontario, in the Municipality of North Middlesex, Middlesex County, Ontario. More specifically, the Project is located south of Elginfield Road, east of Pete Sebe Road, north of Elmtree Drive and west of Fort Rose Road. The total Project area is approximately 5,177 ha. Project components will be installed on privately-owned agricultural lots within this area; however, it is anticipated that the Project's collection system may be partially located on public rights-of-way. General geographic coordinates of the Project area are presented in Table 1-1.

Table 1-1: Geographic coordinates of the Wind Energy Centre Study Area

Location	Easting	Northing
Northwest corner	435927	4777569
Northeast corner	434798	4770596
Southwest corner	449163	4775470
Southeast corner	448036	4768497

The Project also comprises a proposed transmission route which is to run from the Project's substation to a switchyard directly adjacent to the substation, and then to a Point of Common Coupling (PCC) on Hydro One's 500 kV transmission line at the east end of the Transmission Line Study Area. The proposed transmission route is to travel from the switchyard east along Elginfield and Nairn Roads within municipal rights-of-way to an existing Hydro One 500 kV transmission line. As the proposed route is using existing rights-of-way, limited environmental studies were undertaken for this section; however general natural heritage information in the vicinity of the transmission line route is provided in the Natural Heritage Assessment reports.

The location of the Wind Energy Centre Study Area was defined early in the planning process for the proposed wind energy facility, based on the availability of wind resources, approximate area required for the proposed Project, and availability of existing infrastructure for connection to the electrical grid. The Project Study Area was used to facilitate information collection and Records Review.

1.2 Contact Information

1.2.1 Project Proponent

The Project proponent is Bornish Wind LP, a developer of wind energy. The primary contact for Bornish Wind LP for this Project is:

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1.2.2 Project Consultant

GL Garrad Hassan inc., a member of the GL Group and part of the GL Garrad Hassan brand, (hereafter referred to as "GL GH") has been retained to lead the REA Process for the Bornish Wind Energy Centre.

The Environmental and Permitting Services team of GL GH has completed mandates throughout Canada, the United States and in many other parts of the world. These mandates include permitting management, permit applications, environmental impact assessment, and various environmental studies for more than 15,000 MW of wind and solar-PV projects.

GL GH's environmental team is composed of over 20 environmental professionals, including environmental impact specialists, planners, GIS, technicians and engineers.

GL GH has no equity stake in any device or project. This rule of operation is central to its philosophy, distinguishing it from many other players and underscoring its independence.

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2 SITE PLAN

2.1 Project Optimisation Strategy

The Site Plan presented in this section and found in Appendix A, details the location of facility components, natural features, noise receptors, required setbacks and lands within 300 m of the Project Location.

The Project Location, situated within the broader Project Study Area, is defined as per O. Reg. 359/09 as "*...a part of land and all or part of any building or structure in, on or over which a person is engaging in or proposes to engage in the project and any air space in which a person is engaging in or proposes to engage in the project*". As described therein, the Project Location boundary is the outer limit of where site preparation and construction activities will occur (i.e. Disturbance Areas described below) and where permanent infrastructure is located, including the air space occupied by turbine blades.

Disturbance Areas have been identified surrounding various Project components, which are depicted on the Project Location figure by the item "Project Location" in the legend. These denote areas where temporary disturbance during the construction phase may occur as a result of: temporary Project component laydown and storage areas, crane pad construction and turbine turnaround areas. With the exception of the Project components described above, no permanent infrastructure is proposed within these areas. Following construction activities, the land will be returned to pre-construction conditions.

The exercise of siting a wind farm is an iterative process that involves balancing several design factors, such as the wind resource, prescribed setbacks, environmental and cultural heritage constraints, engineering constraints, and landowner preferences.

The proposed Project design takes into consideration all these factors, namely the setback distances prescribed in O.Reg 359/09, as outlined in the following table, to minimise impact as much as possible. As per REA, "consultation zone" buffers are also set to indicate within which distance an EIS or a property line setback assessment may be required. Wherever possible, the Project was sited to avoid these consultation zone buffers.

Table 2-1: Ontario Regulation 359/05 Setback Distances

	Setback	Note
Built Environment Setbacks		
Point of Reception (dwelling, campground, school, church, picnic site, cemetery, Vacant Lot Receptor, etc.)*	550 m and max PSL of 40 dBA as per MOE noise guidelines	To be measured form the center of the turbine base to the noise receptor.
Lot lines	Hub Height (80 m)	Blade + 10 m (requires Property Setback Assessment)[1]
Roads and railways	Blade + 10 m (60 m)	Blade length + 10 m, measured form the center of the turbine base to the boundary of the right-of-way.
Natural Features and Water Bodies Setbacks		
Significant Natural Features	120 m	Measured from the project location boundary to the nearest point of the natural feature. Project components may be sited closer than the prescribed setback if an Environmental Impact Study is Completed.
Water Bodies	120 m	Measured from the average annual high water mark of a lake, or permanent/intermittent stream. Components may be sited closer than the prescribed setback if a Water Body Report is prepared, note that turbines or transformers may not be sited closer than 30 m to these features).
Petroleum Resources	75 m	Setback distances may be reduced with the submission of a Petroleum Engineer's report submission to the MNR.

[1]Can be reduced if lot abutting parcel of land is owned by the Proponent, or if landowner of abutting parcel has a written agreement with the Proponent to place a turbine closer than blade + 10 m.

The resulting Project design is presented in the detailed site plans found in Appendix A. A description of the significant features found on the site plans, including Project components, cultural heritage features, natural features and noise receptors is found in the next sub-sections.

The Project will include the following components, all of which have been clearly depicted in the site plans in Appendix A. It should be noted that the components are describe in more detail in the following Facility Design Plan Section below.

- Wind turbines – Forty-five GE 1.6-100 (1.62 MW) turbines mounted on a steel reinforced concrete foundation and equipped with a transformer, located outside the base of the tower are proposed to be installed for the Project. The Wind Turbine Technical Specifications Report is found in Appendix B.
- Meteorological towers (temporary and permanent) – Two 80-100 m meteorological towers, lattice type or monopole mounted on small concrete pad and supported by a number of guy wires.

- Access roads and crane pads. Access roads to each wind turbine will lead to crane pad constructed of the same material as the access roads.
- Electrical collector system, substation, switchyard and transmission line – Energy generated by the Project will be collected via 34.5-kV underground cabling directed to substation that will step-up the voltage from 34.5 kV to 115 kV. A project-owned 115-kV transmission line will then link to an adjacent, proponent-owned switchyard and from there will connect to a Hydro One 500 kV transmission line via a proponent-owned substation that will step-up the voltage to 500 kV.
- Operations and maintenance building – A maintenance building of approximately 30 m by 15 m will be located within the fenced area of the substation. Potable water will be supplied by a well or through the municipal water system and if required, a septic bed will be constructed for the disposal of sewage.
- Water crossings – Water crossings be required for some access roads and electrical cables. Water crossings are described in detail in the Water Assessment and Water Body Report.

Laydown and storage areas (including temporary staging areas) – A temporary laydown and storage area of approximately 4 ha will be constructed on privately owned land for the purpose of staging and storing equipment during the construction phase. In addition, a 122 m square area around each wind turbine will be established for the laydown and assembly of the wind turbine components

2.2 Features of the Project Area

Desktop and field studies were undertaken to identify and describe the features in the area that may be affected by the construction and/or operation of the wind energy facility. The following sections summarize the results of these studies.

2.2.1 Cultural Heritage (Archaeological and Heritage Resources)

Detailed heritage and archaeological assessments have been prepared and submitted to the Ministry of Tourism, Culture and Sport (MTCS) for acceptance and recommendation. Copies of the complete reports have been included in the complete REA Application package for this Project.

Archaeological Features

Background studies and property inspection for archaeological resources (the Stage 1 archaeological assessment) were completed by Archaeological Services Inc. and identified potentially significant archaeological resources within the Project Location. Field site investigations were undertaken under a Stage 2 archaeological assessment. The Stage 2 assessment resulted in the documentation of 67 archaeological locations. Forty-five of these locations are pre-contact Aboriginal sites, 21 are historic Euro-Canadian sites, and one multi-component site. Fourteen of the 45 pre-contact Aboriginal sites, 19 of the 21 historic Euro-Canadian sites and the one multi-component site recorded were recommended for a Stage 3 archaeological assessment. All 2011 and 2012 archaeological work is being conducted according to the Ministry of Tourism, Culture and Sport's 2011 *Standards and Guidelines for Consultant Archaeologists* [4]. It should be noted that First Nations monitoring has been part of the archaeological field work program during Stage 2 field assessments and will be a part of any Stage 3 field assessments for Aboriginal archaeological sites.

A copy of the Stage 1 Archaeological Assessment submitted in May 2009 and the Stage 2 Archaeological Assessments submitted on February 14, 2012 to the MTCS for acceptance into the Ontario Public Register of Archaeological Reports are part of the complete REA Application package for this Project.

Heritage Features

A *Self-Assessment* of Heritage Resources for the Project was completed by Scarlett Janusas in December 2011 for review. The report indicates that project infrastructure and areas of direct and indirect impact are not located on any protected properties. Further, a property inspection was conducted to ensure that there were no properties, protected or of potential heritage significance or interest, on the areas of proposed infrastructure or areas of indirect impact. No areas of protected, or of potential heritage significance or interest, were identified during the site visit.

A copy of the *Self-Assessment* is included as part of the complete REA Application package for this Project.

2.2.2 Natural Heritage

A Natural Heritage Assessment (NHA) as per the requirements in the Natural Heritage Assessment Guide for Renewable Energy Projects [7] was prepared in 4 separate reports (Records Review, Site Investigation, Evaluation of Significance and Environmental Impact Study) and submitted to the Ministry of Natural Resources for review and comment on January 12, 2012, February 27, 2012, February 27, 2012 and February 28, 2012 respectively. These NHA reports are part of the complete REA Application package for this Project.

The Bornish Wind Energy Centre Study Area and the Transmission Line Study Area lie within the boundaries of the St. Clair Region and the Ausable Bayfield Conservation Authority. The NHA suggests that the Project's effects on natural heritage features will be limited and will generally be avoided, provided that proper mitigation measures are applied. The majority of the habitat in the study area is generally composed of agricultural fields and associated farms punctuated with numerous hedgerows, isolated woodlands, and the occasional watercourse.

The NHA indicates that there is no known Provincially Significant Wetlands (PSW), Provincially Significant Valleylands, Provincially Significant ANSIs, Important Bird Areas, Bird Sanctuaries or National Wildlife Refuges within the Project Study Area.

A detailed evaluation of significance of all potentially significant natural features and wildlife habitats within 120 m of the Bornish Wind Energy Centre Project area was completed. Of those evaluated as significant, 30 woodlands, 10 wetlands, 2 valleylands, 1 raptor wintering areas, 7 bat maternity colonies, and 3 amphibian breeding habitats (woodland) required detailed consideration as part of the Environmental Impact Study.

In addition to wildlife habitats that have been confirmed to be significant through the completion of the evaluation of significance, several other wildlife habitats that could be considered to be significant have been identified. For the purpose of the NHA submission these habitats will be treated as significant with a commitment for additional pre-construction surveys to be undertaken during the appropriate season, prior

to any construction activities. Wildlife habitats that have been treated as significant for the purpose of this EIS include, 1 raptor wintering area, 7 bat maternity colonies and 3 amphibian breeding habitats – woodlands.

2.2.3 Water Bodies

The Water Body and Water Assessment Reports, characterizing the aquatic natural features and habitats in the Project Study Area can be found as part of the complete REA Application package.

Comprehensive site investigations for the Bornish Wind Farm project were undertaken by NRSI biologists on September 21, 22, 23, 2011, November 2, 3 and 4, 2011 as well as on February 21, 2012. These site investigations included site-specific habitat assessments of water bodies throughout the project area.

Through the completion of these studies, NRSI has confirmed the presence of 22 water bodies within the project area, all of which have been identified as intermittent/permanent watercourses. A total of 40 individual locations have been identified where these water bodies are present within 120 m of the project location. No lakes, Lake Trout lakes or seepage areas were identified within the Bornish Wind Energy Centre area.

Water takings, if required, will be conducted as outlined in the Water Body and Water Assessment Reports.

No significant impacts are anticipated on the identified water body features as a result of the development of the Bornish Wind Energy Centre Project following the implementation of proposed mitigation measures.

2.2.4 Noise Receptors

The Project Study Area is considered to be Class 3 (rural), defined as a rural area with an ambient noise dominated by natural sounds, with little or no road traffic. Class 3 areas are often the following:

- A small community with a population of less than 1,000.
- An agricultural area; and
- A rural recreational area such as a cottage or a resort area, or a wilderness area.

As such, ambient sound levels within the Study Area and on adjacent lands are typical of rural agricultural Ontario, with sounds originating from nature, residential activities, agricultural activities (tractors and other machinery), vehicle traffic, and ambient noise induced by wind.

Buildings within 2 km of the Project Location are identified in the site plans, and for the purposes of preparing the Noise Impact Assessment (NIA), Points of Reception (PoRs) within 1,5 km of the Project Location were identified by way of mapping, aerial imagery and a site validation. A total of 183 PoRs were identified for this Project, including dwellings, Vacant Lot Receptors and other buildings considered PoRs under the MOE's noise guidelines.

Wind energy projects have the potential to generate noise which under certain circumstances may be perceived in the general vicinity of the Study Area, and at specific receptor locations (i.e., residents, hospitals, schools, daycares, places of worship, etc.). As required for all wind energy projects undertaken in Ontario, a Noise Impact Assessment (NIA) was conducted to evaluate these effects. The results from the NIA show that the Project complies with the applicable MOE noise guidelines.

The point of interconnect (Parkhill Interconnect) for this Project has been evaluated separately from the Project as it is located more than 5 km from the Project location. The Parkhill Interconnect consists of a switching station and a substation. The substation includes a 189/315 MVA -121/525 kV LTC transformer with ONAN/ONAF/ONAF cooling rating. The switching station and substation have been strategically sited on lands that the Client holds under lease or purchase options. This study includes Points of Reception found within 2,000 m of the proposed switching station location in order to present modeling results up to 40 dBA; a total of 40 PoRs were considered.

The Noise Impact Assessment is included as Appendix F.

3 FACILITY DESIGN PLAN

The present section provides a summary of the Project components. For conceptual plans and schematic diagrams, please refer to Appendix G.

3.1 Name Plate Capacity and Classification

The wind turbine generators of the Project will convert the wind's energy into electricity to feed into the Hydro One transmission system. This Project is considered to be a Class 4 Wind Facility. The Project is proposed to consist of 45, 1.62 MW turbines with a total nameplate capacity of up to 72.9 MW, though 48 turbine locations will be permitted.

3.2 Turbine Specifications

The wind turbine proposed for this Project is the 1.62 MW GE model wind turbine with a total Project nameplate capacity of up to 72.9 MW. The final number of turbines to be built for this Project will depend on a number of factors. These include the wind resource, siting restrictions, such as setback distances, socio-economic or natural environment constraints, the capacity of the electrical grid, and interest shown by local landowners. In addition, the type of turbine technology selected can also affect the number of turbines as some turbines generate a greater amount of electricity, and therefore, reduce the number of turbines required. The selection of turbine technology is based on its sound and power curve profiles as well as the manufacturer's ability to meet Domestic Content requirements within the Ontario Power Authority's Feed-In Tariff contracts.

The turbines will be located on leased farmlands. The turbines are 3-bladed, upwind, horizontal-axis wind turbines that are state of the art technology. The turbines have a 100 m rotor diameter with a swept area of 7,854 m^2; each blade is connected to the main shaft via the hub. The turbine is mounted on an 80 m tubular steel tower which contains an internal ladder provided for maintenance access. The turbine will be constructed on a foundation that is approximately 200 m^2. The foundation consists of a wooden frame, poured concrete and steel rebar to provide added strength.

The nacelle at the top of the tower may house the generator, gearbox, bearings, couplings, rotor, and auxiliary equipment. The nacelle typically consists of a bedplate on which all of the electro-mechanical components are mounted, surrounded by an enclosure. The nacelle is typically constructed of fibreglass, lined with sound-insulating foam, is ventilated and the interior is illuminated with electric lights. An internal ladder is provided for maintenance access. Some of the wind turbines will have external lighting in accordance with the requirements of Transport Canada (TC). Please refer to the Wind Turbine Specifications Report for more detailed information on the wind turbines proposed for the Project.

Table 3-1: Summary of turbine technical specifications

Make	General Electric
Model	1.6-100
Name plate capacity	1.62 MW
Hub height	80 m
Rotor diameter	100 m
Minimum rotational speed	9.75 rpm
Maximum rotational speed	16.2 rpm

Additional detail on the turbine is found in Appendix B.

3.3 Collector System

The 34.5 kV collector lines from each turbine to the substation will be buried on private property adjacent to the turbine access roads, where feasible. The locations of the underground cables and access roads were determined in consultation with the landowners and in accordance with the setback requirements defined in O. Reg. 359/09.

3.4 Transmission Line

A 115 kV transmission line will link the Project's substation to the adjacent switchyard which will collect power from this Project as well as NextEra's Adelaide and Jericho Wind Energy Centres. The transmission line will travel east along Elginfield and Nairn Roads within the municipal rights-of-way to an existing Hydro One 500 kV transmission line. It is anticipated that the transmission line will be mounted on existing hydro poles or on new hydro poles. The local utility company may require NextEra to erect additional poles, or replace undersized poles, in order to accommodate the transmission line. The poles are proposed to be constructed of wood, concrete or steel and will be between 18 and 30 m tall.

The interconnection plan for any wind farm is subject to study, design and engineering by the Integrated Electricity System Operator which manages the province's electricity grid, Hydro One which owns the transmission lines, the local distribution company and the Ontario Energy Board, which regulates the industry through the Transmission System Code and the Distribution System Code. Details regarding the transmission lines, their routes, and the electrical substation will be developed during the Pre-Construction Design Phase of the Project.

3.5 Access Roads

On-site access roads to each turbine will be constructed to provide an access point to the properties for equipment during the construction phase and for maintenance activities during operation. Typically the access roads will be 11 m wide during the construction phase to accommodate the large cranes (with an additional 2 m clearance on each side for travel), and afterwards reduced to 6 m wide during the operating phase.

3.6 Substation

With a total footprint of approximately 2-3 ha, the electrical substation for the Project will be located on privately-held lands through a lease or purchase arrangement. The electricity collected via the 34.5 kV underground collection lines will converge at the transformer substation where the electricity will be "stepped-up" to 115 kV for transmission to the adjacent switchyard. The substation equipment will include an isolation switch, a circuit breaker, a step-up transformer, transmission switch gear, instrument transformers, grounding and metering equipment. All substation grounding equipment will meet the Ontario Electrical Safety Code.

A secondary containment system will be installed to capture any leaks from the transformer. Water in the containment system will be visually inspected for any evidence of oil (as oil would float to the top). If oil is present, a tank truck will be brought to site to pump the water/oil mix into it. The water/oil mix will then be disposed of off-site at a licensed facility. If no oil is detected in the water, the water will be pumped out to an adjacent swale and then allowed to infiltrate into the ground. For a diagram of the transformer substation, please refer to Appendix D.

The switchyard will be located beside the Bornish Wind Energy Centre substation and will be approximately 2-3 ha in size. The switchyard will also be located on privately held lands through a lease arrangement. The switchyard will include switches, breakers, electrical bus work, instrument transformers, grounding, metering equipment, control house and steel structures supporting incoming and outgoing transmission line circuits. Switchyard grounding will meet the Ontario Electrical Safety Code.

From the substation, the 115 kV transmission line will run east to the point of interconnection with the Hydro One grid. The substation at the point of interconnection will be approximately 2-3 ha in size and will be located on a privately-owned land adjacent to the 500 kV line.

3.7 Operations and Maintenance Building

An operations building, approximately 30 m by 15 m in size, will be constructed on privately held lands or an existing suitable structure will be purchased for the purpose of monitoring the day-to-day operations of the wind energy centre and supporting maintenance efforts. A small parking lot will be constructed to accommodate staff vehicles. Prior to the construction phase, a Stormwater Pollution Prevention Study will be conducted to address any potential effects associated with stormwater runoff.

Potable water will be supplied by a well or through the municipal water system and a septic bed will be constructed for the disposal of sewage. The septic bed will be constructed to the minimum size required for the size of the operation and maintenance building. It is the Project owner's responsibility to ensure proper maintenance of the septic system. The operations and maintenance building, septic system and water supply will be constructed in accordance with applicable municipal and provincial standards.

4 FACILITY OPERATIONS PLAN

4.1 General

The Project will require full time technical and administrative staff to maintain and operate the facility. The primary workers will be wind technicians (i.e. technicians who carry out maintenance on the turbines) along with a site supervisor.

The wind turbines will be operating (i.e. in "Run" mode and generating electricity) when the wind speed is within the operating range for the turbine and there are no component malfunctions.

Each turbine has a comprehensive control system that monitors the subsystems within the turbine and the local wind conditions to determine whether the conditions are suitable for operation. If an event occurs which is considered to be outside the normal operating range of the turbine (such as low hydraulic pressures, unusual vibrations or high generator temperatures), the wind turbine will immediately take itself out of service and report the condition to the Operations Centre. A communication line connects each turbine to the Operations Centre, which closely monitors and, as required, controls the operation of each turbine. The wind turbine system will be integrated with the electric interconnection Supervisory Control and Data Acquisition (SCADA) to ensure that the Project critical controls, alarms and functions are properly co-ordinated for safe, secure and reliable operation.

4.2 Use of Meteorological Data

The use of meteorological data is key to the safe and efficient operation of a wind energy centre. Some operational decisions made using meteorological data include:

- Cut-in wind speed;
- Cut-out wind speed;
- Turbine shut down during icing conditions; and
- Turbine shut down during extreme weather events.

4.3 Routine Turbine Maintenance

Routine preventative maintenance activities are scheduled at six month intervals with specific maintenance tasks scheduled for each interval. Maintenance is done by removing the turbine from service and having two to three wind technicians climb the tower to spend a full day carrying out maintenance activities.

Consumables such as the various greases used to keep the mechanical components operating and oil filters for gearboxes and hydraulic systems are used for routine maintenance tasks. Following all maintenance work on the turbine, the area is cleaned up. All surplus lubricants and grease-soaked rags are removed and disposed of as required by applicable regulations. All maintenance activities will adhere to the same spill prevention industry best practices undertaken during the construction phase.

4.4 Unplanned Turbine Maintenance

Modern wind turbines are very reliable and the major components are designed to operate for approximately 30 years. However, wind turbines are large and complex electromechanical devices with rotating equipment and many components therefore component failures may occur despite the high reliability of the turbines fleet-wide. Most commonly, the failure of small components such as switches, fans, or sensors will take the turbine out of service until the faulty component is replaced. These repairs can usually be carried out by a single technician visiting the turbine for several hours.

Events involving the replacement of a major component such as a gearbox or rotor are rare. If they do occur, the use of large equipment, sometimes as large as that used to install the turbines, may be required.

It is possible that an access road, built for construction and returned to farmland when the construction phase is completed, would need to be rebuilt to carry out repairs to a damaged turbine. Typically only a small percentage of turbines would need to be accessed with large equipment during their operating life.

4.5 Electrical System Maintenance

The collector lines and substation will require periodic preventative maintenance activities. Routine maintenance will include condition assessment for above-ground infrastructure and protective relay maintenance of the substation in addition to monitoring of the secondary containment system for traces of oil. Finally, vegetation control will be required around the transmission line to prevent any damage to the line and ensure safe operation

4.6 Waste Management

Waste generated during the operations phase will be removed from the operations and maintenance building by a licensed operator and disposed of at an approved facility. Any lubricants or oils resulting from turbine maintenance will be drummed on site and disposed of in accordance with applicable Provincial regulations. All reasonable efforts will be made to minimise waste generated and to recycle materials including returning packaging material to suppliers for reuse/recycling. The spill prevention protocols followed during construction will continue to be observed throughout the facility's operations and maintenance activities.

5 ENVIRONMENTAL EFFECTS MONITORING PLAN

This section presents a summary of potential effects, mitigation measures and residual effects associated with project-environment interactions during the construction phase and operations phase of the Project. For the sake of completeness, construction phase effects are also discussed and presented here, but are also found in the Construction Plan Report.

More detailed discussions relating to natural heritage impacts, archaeological and heritage impacts, noise impacts, land use impacts and water body impacts are found in the Natural Heritage Assessment reports, Archaeological Assessment Reports, Heritage Report, Noise Impact Assessment, Property Setback Assessment and Water Body Report, part of the complete REA Application package.

5.1 Methodological Approach

As requested under REA, potential effects from the construction, installation and operation and of the wind farm have to be assessed while considering applicable mitigation and compensation measures. In order to assess *residual* effects from a Project (i.e. after considering mitigation/compensation measures), GL GH uses residual effect definitions from the Canadian Environmental Assessment Agency. A residual effect "level" and "significance" is then applied, as per Table 5-1 below.

Table 5-1: Levels of residual effects and significance of effect

Residual Effect	Level of Concern	Residual Effect Significance
Potential impact could threaten sustainability of the resource and should be considered a management concern. Research, monitoring and/or recovery initiatives should be considered.	High	Significant
Potential impact could result in a decline in resource to lower-than-baseline but stable levels in the study area after Project closure and into the foreseeable future. Regional management actions such as research, monitoring and/or recovery initiatives may be required.	Medium	Significant
Potential impact may result in a slight decline in resource in study area during the life of the Project. Research, monitoring and/or recovery initiatives would not normally be required.	Low	Not Significant
Potential impact may result in a slight decline in resource in study area during construction phase, but the resource should return to baseline levels.	Minimal	Not Significant

Depending on the outcome of the effects assessment, follow-up and/or monitoring programs could be proposed in order to further investigate the potential effects, or verify the significance of the effect following commissioning.

5.1.1 Construction

Table 5-2: Potential negative effects and mitigation measures – Construction

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Cultural Heritage (Protected Properties, Archaeological and Heritage Resources				
Disturbance or displacement of archaeological resources by any ground disturbance activity.	Avoid disturbance/loss of archaeological sites.	Conduct Archaeological Assessment and apply recommended avoidance measures and other measures from licensed archaeologist or MTCS to project design. Details of the Archaeological Assessment can be found in the reports on this subject as part of the complete REA application package.	The Archaeological Assessment was undertaken as per MTCS guidelines and this Project is expected to receive confirmation from the MTCS. The likelihood and magnitude of this residual effect is considered non significant.	Immediate notification of the Archaeologist and the Ministry of Tourism, Culture and Sport (MTCS) In the event archaeological resources are found. Apply monitoring measures as recommended by the MTCS.
Natural Heritage				
Direct vegetation removal – significant woodlands, wetlands and valleylands.	Minimize direct impacts on significant vegetation communities.	Clearly delineate work area within 30 m of significant natural features or wildlife habitats using erosion fencing, or similar barrier, to avoid accidental damage to species to be retained. Directional drilling will occur at a depth of 4-5' below surface to avoid impacts on critical root zones. Any vegetation removal required along roadside collector lines or transmission lines should be minimized and occur completely within the road right of way. Any tree limbs or roots that are accidentally damaged by construction activities within significant woodlands or valleylands will be pruned using proper arboricultural techniques. No vegetation removal will occur in rare plant communities, sensitive landforms or	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	Monitor the success of any re-vegetated areas three (3) times during the first year, and once in each of the next 2 years. Any unsuccessful plantings noted on (or before) assessment within the 2nd year will be re-planted.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		significant wetlands. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.		
Disturbance of local wildlife- significant woodlands, wetlands and valleylands.	Minimize disturbance of local wildlife.	Horizontal directional drill entry/exit pits should be located at least 30m from any significant natural feature. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Sedimentation and erosion - significant woodlands, wetlands and valleylands.	Maintain or restore vegetated buffers, including riparian zones.	Implement a sediment and erosion control plan within 30 m of a significant natural feature or wildlife habitat. Install, monitor, and maintain erosion and sediment control measures (i.e. silt fences) around the construction areas within 30 m of a significant natural feature or wildlife habitat. Collect drill cutting as they are generated and place in a soil bin or bag for off-site disposal. Minimize vehicle traffic on exposed soils, and limit heavy machinery traffic on sensitive slopes. Re-vegetate temporary access roads, crane paths and drill entry/exit pits, that are in non-agricultural habitat, to pre-construction conditions as soon as possible Details of the Natural Heritage Assessment can be found in the reports on this subject as	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		part of the complete REA application package.		
Spills (i.e. oil, gasoline, grease, etc.) - significant woodlands, wetlands and valleylands.	Avoid contamination of significant natural features.	All maintenance activities, vehicle refueling or washing, and chemical storage will be located more than 30 m from any significant natural feature or wildlife habitat. Develop a spill response plan and train staff on appropriate procedures. Keep emergency spill kits on site. Dispose of waste material by authorized and approved offsite vendors. Any stockpiled material will be stored more than 30m of a wetland, woodland, or water body. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures. Develop a spill response plan and train staff on appropriate procedures. Keep emergency spill kits on site.
Changes in soil moisture and compaction - significant woodlands, wetlands and valleylands.	Minimise impact to soil moisture regime and vegetation species composition.	Implement infiltration techniques to the maximum extent possible. Minimize paved surfaces and design roads to promote infiltration. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Disturbance and/or mortality to local wildlife.	Minimize impact to local wildlife.	Avoid construction or decommissioning activities that are within non-agricultural habitats, during sensitive time periods (i.e. breeding bird season) wherever possible. Conduct nest searches if vegetation removal will occur during the breeding bird season	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR.	Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		(May1-July 31) Clearly post construction speed limits Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The likelihood and magnitude of this residual effect is considered non significant.	
Changes to surface water hydrology - significant woodlands, wetlands and valleylands.	Maintain existing surface water flow patterns.	Keep changes in land contours to a minimum. Maintain streams and timing and quantity of flow. Minimize grading activities to maintain existing drainage patterns where possible. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Direct vegetation removal – bat habitats.	Protection of bat roosting habitat.	Clearly delineate work area using erosion fencing, or similar barrier within 30 m of significant bat habitat, to avoid accidental damage to potentially significant bat roosting trees. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Disturbance of local wildlife-significant bat habitats.	Avoid disturbance of locally roosting bat species. Determine if local bat populations are adversely	Impacts are expected to be minimal and temporary in nature, no specific mitigation measures have been determined necessary. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual	Conduct post-construction acoustic monitoring of this feature for 3 years after construction, following pre-construction methods.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
	impacted by the presence of operational turbines.		effect is considered non significant.	
Direct vegetation removal – significant amphibian breeding habitats,	Minimise impacts on significant amphibian breeding habitats.	If evaluated to be significant, clearly delineate work areas within 30 m of significant amphibian habitat using erosion fencing, or similar barrier, to avoid accidental vegetation damage to woodland edges. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application.	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Disturbance of local wildlife- significant amphibian breeding habitats.	Minimise disturbance of local wildlife habitat. Determine if amphibian populations or species abundance are being impacted by Project components.	Impacts are expected to be minimal and temporary in nature, no specific mitigation measures have been determined necessary. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application.	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	If evaluated to be significant, conduct post-construction amphibian call surveys to assess any potential changes in amphibian breeding populations or species distribution.
Direct mortality of dispersing amphibians along access roads	Determine if amphibian populations are being impacted by increased traffic associated with permanent access roads	If evaluated to be significant post speed limits along construction access roads, and maintain signage during the operational phase of the Project. Where a significant amphibian movement corridor is identified during pre-construction surveys an appropriately sized culvert will be installed to enable continued movement of amphibians. Details of the Natural Heritage Assessment	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	If evaluated to be significant, conduct post-construction visual assessments of access roads to look for amphibian mortalities.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		can be found in the reports on this subject as part of the complete REA application.		
Water Bodies				
Alteration of local drainage patterns	Minimise impacts on local drainage patterns	Design to maintain existing surface water drainage patterns and functions (including project layout, grading, storm water management facilities and structure designs) Utilize existing roads and road crossing structures where possible Crossing structures should be sized appropriately according to municipal engineering standards as to not result in alterations in stream hydrology, scouring or flooding crossing structures. Newly impervious surfaces should consider use of permeable material. Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.	The Water Body Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Fish habitat alteration/loss	Limit fish habitat alteration/loss	Consideration of design layout to minimize number of crossings. Consider layout distances to water body features and sensitivity of those features. Crossing locations should be selected as to avoid key habitat features (i.e. refuge pool) and cross the feature within a straight reach of the channel as to avoid meanders etc. and cross perpendicular where possible. Crossing structures should be designed to reduce loss and alterations of habitat where possible (i.e. reduces affected area by cutting back from grading limit to road and install headwall, open bottom culvert etc.). Crossing structure should be properly sized	The Water Body Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		and positioned appropriately (angle and embedded) as to avoid erosion issues and creation of potential fish barriers. Crossing structures should be sized appropriately according to municipal engineering standards as to not result in alterations in stream hydrology, scouring or flooding crossing structures. Crossing structure type should be determined in consultation with agency and municipality staff and should consider sensitivity of the water body and location of crossing. Implement trenchless (i.e. directional drilling) technology at crossings where possible. Any loss to the productive capacity of a watercourse must be compensated for under the *Fisheries Act.* Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.		
Erosion and sedimentation	Minimize impacts of erosion and sedimentation on water bodies	Implement trenchless (i.e. drilling) technology at crossings where possible. Minimize potential for soil compaction (see Soil Compaction). Controlled vehicle and machinery access routes, keep away from water bodies where possible. Schedule clearing, grubbing and grading activities to avoid times of very high runoff volumes, wherever possible. Implement Flood Response Plan if on-site flooding occurs. Implement Erosion and Sediment Control	The Water Body Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		Plan. Stabilize banks as soon as possible after construction disturbance (i.e. plantings, rock etc.), if insufficient time is available in the growing season to establish vegetative cover, an overwintering treatment such as erosion control blankets, fiber matting etc. should be applied to contain the site over the winter period. Minimize disturbance by keeping construction equipment outside and away from water bodies wherever possible. Work in dry conditions (i.e. low flow period) or isolate in-water work area using good engineering practices and dewatering techniques. Install silt fencing in-water downstream of dewatering activities. Dewatering discharge rates should be evaluated as to not result in erosion and sedimentation to receiving water body. Dewatering discharge should be dissipated (i.e. sand bags, hay bales etc.) and may require to be split to more than one location Implement Stormwater Management Plan Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application		
Water Quality Impairment	Minimize any negative impacts to water quality	Implement Erosion and Sediment Control Plan. Implement Spill Response Plan. Keep machinery clean and refuel well away from any water body (>30 m).	The Water Body Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and	Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		Fuel and other construction related chemical stored securely away from water bodies (>30 m). Any discharges to a water body must meet MOE Policy 2 standards (at or better water quality that than of the receiving water body). Adequately treat any discharge water prior to discharge as to meet MOE policy 2 standards (i.e. filer bags). Implement Stormwater Management Plan. Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.	magnitude of this residual effect is considered non significant.	
Temporary disruption of fish habitat (in-water work)	Limit disruption of fish habitat	Restrict construction to coldwater timing windows, as indicated by local OMNR. Work in the dry (i.e. low flow) or isolate work area using good engineering practices or by working in dry conditions using accepted methods to bypass flows. Machinery should be operated in a manner That minimizes disturbance to the banks and bed of the watercourse. Stabilize banks as soon as possible after construction disturbance (i.e. plantings, rock etc). Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.	The Water Body Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures.
Water Level Alteration	Minimize alteration of water level	Dewatering ZOI and rates should be determined prior to dewatering and assessed for impact on affected water bodies. Implement Water Level Response Plan, trigger criteria to be determined in	The Water Body Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from	Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		consultation with OMNR. Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.	the MNR. The likelihood and magnitude of this residual effect is considered non significant.	
Soil Compaction	Minimise the amount of soil compaction.	Controlled vehicle access routes. Staging areas should be located away from water bodies (i.e. 30 m). Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.	The Water Body Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Debris entering a water body	Limit the amount of debris entering water bodies	Construction debris should be stabilized (i.e. tarps) away from water bodies (i.e. 30 m). Refuse and other material should be appropriately disposed of off-site. Staging areas should be located away from water bodies (i.e. 30 m). Drilling shafts should be located away from water bodies (i.e. 30 m). Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.	The Water Body Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures.
Drilling Frac-out	Reduce the potential for drilling frac-out.	Conduct appropriate geotechnical studies as to ensure directional drilling is appropriate at that location and will not result in a 'frac-out'. Develop emergency contingency plan in the unlikely event of a 'frac-out' when drilling below a water body, this plan will deal with	The Water Body Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		issues associated with water level alteration, water quality and erosion & sedimentation. Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.	magnitude of this residual effect is considered non significant.	
Emissions to Air, including Odour and Dust				
Reduction in air quality due to CAC emissions and dust.	Minimise deterioration of air quality.	Ensure proper operation and maintenance of vehicles and machinery to limit noise, CAC emissions and leaks. Use water or water-based dust suppressant to control dust on unpaved roads. Implement speed limits on unpaved roads. Minimize vehicular traffic on exposed soils and stabilize high traffic areas with clean gravel surface layer or other suitable cover material. Minimize mud tracking by construction vehicles along access routes and areas outside of the immediate work site, and ensuring timely cleanup of any tracked mud, dirt and debris. Cover or otherwise containing loose construction materials that have potential to release airborne particulates during transport, installation or removal.	The likelihood and magnitude of this residual effect is considered non significant.	Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in emergency Response and Communications Plan)
Noise				
Increase in noise levels in Project Study Area	Minimise noise increases for inhabited areas	Ensure proper operation and maintenance of vehicles and machinery to limit noise, CAC emissions and leaks. Implement speed limits on unpaved roads. Construction equipment will be kept in good condition and will not exceed the noise emissions as specified in MOE	The likelihood and magnitude of this residual effect is considered non significant.	Faulty equipment resulting in increased noise levels are to be repaired in a timely fashion. Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in emergency Response and Communications Plan)

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		publication NPC-115.		
Local and Provincial Interests, Land, Use and Infrastructure				
Increased traffic and noise in Project Study Area.	Minimise disturbance to local community and achieve zero human safety incident. Receive limited complaints	Ensure proper operation and maintenance of vehicles and machinery to limit noise, CAC emissions and leaks. Implement Communications Plan namely by informing local communities of construction schedule, use of signs and communicating truck routes.	The likelihood and magnitude of this residual effect is considered non significant.	Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan).
Reduction in usable agricultural land.	Minimise reduction in useable agricultural land.	Minimize length of access roads (most agricultural use only affected during construction) where possible.	The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures are applied.
Increased congestion due to increase in truck traffic and short-term lane closures on local roads during delivery of Project components.	Minimise disturbance to local community and achieve zero human safety incident.	Notify the community in advance of construction delivery schedules and installing signage to notify road users of construction activity. If required by municipal authorities develop a traffic management plan for the construction phase and submit to the Municipalities prior to construction and communicate truck routes.	The likelihood and magnitude of this residual effect is considered non significant.	Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan).
Damage to local infrastructure.	Minimise damage to local infrastructure.	Adhere to the best practices regarding the operation of construction equipment and delivery of construction materials. If required by municipal authorities, undertake roads condition survey prior to construction and post-construction.	The likelihood and magnitude of this residual effect is considered non significant.	Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan). If required by local authorities, return damaged infrastructure to original condition (or better) where appropriate.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Areas Protected under Provincial Plans and Policies				
N/A				
Public Health and Safety				
Effects on public health and safety during construction have been described above under Emissions to air, including Odour and Dust, Noise and Local and Provincial Interests Land Use and Infrastructure.				
Other Resources				
The presence of petroleum wells have been identified through consultation with the OGSR database to be within 75 m of project infrastructure	No negative effects on petroleum resources or the renewable energy project	An Engineer's report will be prepared to identify and address potential negative effects and risks to the renewable energy project along with proposed mitigation measures. This report will be submitted to the local district Ministry of Natural Resources as part of the Approval and Permitting Requirements Document (APRD) to be reviewed under the authority of the *Ministry of Natural Resources Act*, and will not be submitted as part of this completed REA application.	N/A	N/A

5.1.2 Operations

Table 5-3: Potential negative effects and mitigation measures – Operations

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Cultural Heritage				
Alteration of the visual character of a cultural heritage sites.	Minimise visual impact of recognized heritage sites.	Conduct a Heritage Assessment and apply measures recommended by the heritage specialist or by MTCS. Details of the Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Heritage Assessment was undertaken as per MTCS guidelines and this Project is expected to receive confirmation from the MTCS. The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures are applied.
Natural Heritage				
Application of herbicides.	Protection of native vegetation species. Minimize impacts to local wildlife and their habitats.	No herbicides will be used within significant features or wildlife habitats. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures are applied.
Direct mortality due to operational wind turbines –significant bat habitats.	Limit direct mortalities to bats.	Avoid placing turbines within blade length of significant habitat. Propose obstruction lighting scheme that minimises risk to bat collisions while fulfills Transport Canada requirements. If impacts to bats are observed to be above provincial thresholds, operational	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR.	Conduct post construction mortality monitoring according to the document *Bat and Bat Habitats: Guidelines for Wind Power Projects*, dated July 2011. The first year results and overall program will be discussed with MNR/CWS at the end of the first year. Mitigation measures in the event of

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		mitigation will be implemented. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The likelihood and magnitude of this residual effect is considered non significant.	demonstrated significant impact to bird populations will be proposed. Details of the bat post-construction monitoring program are found in the Natural Heritage Assessment documents.
Direct mortality of birds with operational wind turbines	Limit direct mortalities to birds	No mitigation proposed as impacts are anticipated to be minimal. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	Bird mortality monitoring will be carried out according to the document *Bird and Bird Habitats: Guidelines for Wind Power Projects*, The first year results and overall program will be discussed with MNR/CWS at the end of the first year. Mitigation measures in the event of demonstrated significant impact to bird populations will be proposed. Details of the bird post-construction monitoring program are found in the Natural Heritage Assessment documents.
Disturbance of local wildlife-significant amphibian breeding habitats.	Minimise disturbance of local wildlife habitat. Determine if amphibian populations or species abundance are being impacted by Project components.	No mitigation proposed as impacts are anticipated to be minimal. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	If evaluated to be significant, conduct post-construction amphibian call surveys to assess any potential changes in amphibian breeding populations or species distribution.
Direct mortality of dispersing amphibians along access roads.	Limit direct mortalities to amphibians	Post speed limits along construction access roads within 30 m of significant amphibian habitats, and maintain signage during the operational phase of the Project Where significant amphibian movement corridor is identified during pre-construction surveys an appropriately	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual	If evaluated to be significant, monitor habitat to determine if amphibian populations are being impacted by increased traffic associated with permanent access roads If evaluated to be significant, conduct post-construction visual assessments of access roads to look for amphibian mortalities.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		sized culvert will be installed to enable continual movement of amphibians. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	effect is considered non significant.	
Soil or water contamination.	Avoid contamination of significant natural features.	Develop a spill response plan and train staff on appropriate procedures. Keep emergency spill kits on site. Vehicle washing, refueling stations, and chemical storage will be located more than 30 m from natural features or water bodies. Dispose of waste material by authorized and approved offsite vendors. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures are applied.
Water Bodies				
Water quality impairment	No impairment of water quality	Implement Spill Response Plan Implement road salt, sand management Plan. Avoid or limit use of pesticides, where possible. Address any impacts resulting from design or construction phases Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application package.	The Water Body Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures are applied.
Emissions to Air, including Odour and Dust				
Emissions of	Limit impact of	Ensure proper maintenance and	The likelihood and	Track all complaints and conduct follow-up

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
contaminants from maintenance vehicles.	maintenance vehicles on local air quality.	operations of vehicles and machinery to limit noise, CAC emissions and leaks.	magnitude of this residual effect is considered non significant.	monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan).
Noise				
Increase in noise levels	Minimise noise level increases in the Project area. Comply with MOE's permissible sound limits at all identified Points of Reception. Receive limited complaints	Apply the minimum REA setback distance of 550 m for all turbines Calculate noise levels at PoRs and design project to comply with MOE noise guidelies. Details of the Noise Impact Assessment can be found in the reports on this subject as part of the complete REA application package.	The likelihood and magnitude of this residual effect is considered non significant.	Implement the communications plan and address noise complaints during operations (see Complaints Resolution Process in Emergency Response and Communications Plan). Faulty equipment resulting in increased noise levels are to be repaired in a timely fashion.
Local and Provincial Interest, Land Use and Infrastructure				
Reduction of farmland	Minimise reduction of farmland	Design project to minimise loss of farmland, namely by placing turbines at lot boundaries where possible. Implement Site Reclamation Plan at the end of construction, namely to re-instate initial conditions on temporary areas used during construction. Limit road width during operations to 6 m. Compensate landowners on Project Location as per land lease agreement.	The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures are applied.
Impacts to abutting parcels of land	Avoid impacts to abutting parcels of land	Design Project with setback distance of hub height to lot lines. For turbines under hub height distance to lot lines, prepare a Property Setback Assessment (PSA) and provide measures	The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures are applied.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		to minimise impact, if required. Details of the Property Setback Assessment can be found in the reports on this subject as part of the competed REA application package.		
Stray voltage	No stray voltage events affecting livestock	Project will be built and maintained as prescribed by the Distribution System Code and the Electrical Safety Authority to minimise the risk of stray voltage.	The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures are applied.
Areas Protected under Provincials Plans and Policies				
N/A				
Public Health and Safety				
Incidents resulting from ice shed	No public health and safety incidents.	Design turbine layout to respect a 20 m setback from any building. Implement Communications Plan namely to inform local community of icing events and place signs in areas with safety concern, when applicable.	The likelihood and magnitude of this residual effect is considered non significant.	Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan). In most cases, turbines automatically shut-down during icing events. Operation of turbine is resumed only after appropriate confirmation of safety.
Radio communication and Radar Systems				
Interference to systems from turbines	Avoid interference to all identified and registered systems	Design turbine layout to avoid radio communication systems (towers and microwave links) as per best practice setbacks indicated in Table 2-1 Notify and receive clearance from NavCan, RCMP, GMCO and DND.	The likelihood and magnitude of this residual effect is considered non significant.	The magnitude of the residual effect is considered non significant therefore no monitoring or contingency is required provided the recommended mitigation/compensation measures are applied.

6 EMERGENCY RESPONSE AND COMMUNICATIONS PLANS

This Emergency Response and Communication Plan (the Plan) for the Project has been prepared in accordance with Table 1 of O.Reg. 359/09. The purpose of the Plan is to define an avenue for ongoing communication throughout the construction, operation and decommissioning phases of the Project. This will ensure that members of the community, Aboriginal communities, local municipalities and government Ministries are kept apprised of pertinent Project activities, in addition to any emergencies in the unlikely event that one should occur. The Emergency Response and Communication Plan will also be filed with the Ministry of the Environment, the Township of North Middlesex and Middlesex County.

The following sections outline NextEra's communication commitments in relation to emergency responses, ongoing communication and complaint management.

6.1 Emergency Response

NextEra Energy Resources, the parent company of NextEra, maintains standard Emergency Action Plans for all of its operating facilities. Throughout the construction, operation and decommissioning phases of the Project, an up-to-date Emergency Action Plan will be maintained in the Project office at the Operations and Maintenance building. The Emergency Action Plan will contain current contact information for emergency responders, including local police and fire departments, and will outline the chain of communication between on-site employees, NextEra, emergency contacts, the local community and other pertinent stakeholders in the event that an emergency situation should arise. NextEra's Emergency Action Plans typically include the following information:

- Designation of facility emergency co-ordinators;
- Process description for responding to emergencies;
- Objectives for emergency response and communication;
- Local emergency response contact phone numbers;
- Regulatory references;
- Required health and safety training for employees;
- Facility information, including exact location;
- Facility emergency procedures;
- Immediate site evacuation procedures and routes;
- Delayed site evacuation procedures;
- Process for documenting personnel injuries/serious health conditions;
- Fire response plan;
- Process for documenting chemical/oil spills and releases;
- Material Safety Data Sheets (MSDS) for all chemicals used in construction and maintenance; and
- Weather-related emergency procedures.

The Emergency Action Plan's communication protocol will be finalized in consultation with the local municipalities and will include the following steps:

- The person observing the emergency will contact first responders immediately via a 911 operator, as required by the site Emergency Action Plan.
- A NextEra representative will then contact the Ministry of the Environment, including the Spills Action Centre, if required, in accordance with Section 92 of the Environmental Protection Act and the local municipalities.

Depending on the level of risk associated with the incident, local community members will be notified at the discretion of NextEra. Employees will be trained on the Emergency Action Plan's procedures and the Plan will be maintained on-site and updated when required to ensure it contains current information throughout the construction, operation and decommissioning phases of the Project.

6.2 Ongoing (Non-Emergency) Communication

NextEra will maintain communication with the local municipalities, members of the community and Aboriginal communities, where appropriate, throughout the construction, operation and decommissioning phases of the Project.

Broad community relations activities are seen as essential to the implementation of a successful project. To this end, the following activities will be undertaken:

- On-site tours with community leaders, local media and other interested parties during construction and periodically during operations; and,
- Installation of construction signage notifying community members of construction activity.

In addition, letters will be mailed to pertinent stakeholders to inform them of:

- Commencement of construction activities;
- Commencement of decommissioning activities; and
- Any other activities that NextEra would like to share with the local community.

A Project email address and phone number will be maintained and monitored by the operations manager and will be used to respond to stakeholder questions and/or complaints. Contact information for the operations manager will be provided on all notifications.

6.3 Complaints Resolution Process

NextEra acknowledges that some members of the community may have concerns regarding construction activities and long-term wind farm operations. To resolve disputes in a collaborative manner NextEra will follow the complaints resolution process described below.

- Should any complaints arise throughout the course of the construction, operation and decommissioning phases, a NextEra representative will contact the complainant within 24 hours of receiving the complaint to understand and seek a resolution. NextEra will notify the local MOE

district office of the complaint and prepare / file an initial Complaint Record and include the following:

- Name, address and phone number of the complainant;
- Date and time of the complaint;
- Details of the complaint;
- Follow-up action to be taken;
- Steps taken to prevent the situation from occurring in the future, where applicable.

- If the complaint cannot be resolved through a phone call, a face-to-face meeting will be scheduled with the complainant.
- An updated Complaint Record will be maintained to describe the proposed resolution of the complaint.
- Complaint Records will be maintained at the Project office in the Operations and Maintenance Building and will be made available to MOE field inspection staff should a request be made.

The Construction Manager will be responsible for the implementation of the complaints resolution process during the construction phase and the Operations Manager will take on this responsibility during the operations phase.

7 REFERENCES

[1] Ontario Regulation 359/09, made under the *Environmental Protection Act*, Renewable Energy Approvals under Part 1.0 of the Act.

[2] Ontario Regulation 521/10, made under the *Environmental Protection Act*, Renewable Energy Approvals under Part 1.0 of the Act.

[3] Technical Guide to Renewable Energy Approvals, Ontario Ministry of the Environment, July 2011.

[4] Standards and Guidelines for Consultant Archaeologists, Ontario Ministry of Tourism, Culture and Sport's, January 2011

[5] *Bird and Bird Habitats*: Guidelines for Wind Power Projects, Ministry of Natural Resources, October 2010.

[6] *Bat and Bat Habitats*: Guidelines for Wind Power Projects, Ministry of Natural Resources, July 2011.

[7] Natural Heritage Assessment Guide for Renewable Energy Projects, Ministry of Natural resources, December 2010