NIAGARA REGION WIND FARM
DESIGN AND OPERATIONS REPORT

File No. 160950269
April 2013

Prepared for:

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1.0 Introduction

The purpose of the Design and Operations Report is to describe the generation components of the Project, including the design of the facility and equipment to be used, how it will be operated, how emergencies will be managed, potential environmental effects and proposed mitigation and monitoring measures to be implemented for the Niagara Region Wind Farm. This report is being released in conjunction with the issuance of several other Technical Reports which provide further detail of Project design and operation, construction and decommissioning.

1.1 PROJECT OVERVIEW

Niagara Region Wind Corporation (NRWC) is proposing to develop, construct, and operate the 230 Megawatt (MW) Niagara Region Wind Farm (the Project) within the Townships of West Lincoln and Wainfleet and the Town of Lincoln within the Niagara Region and within Haldimand County in Southern Ontario, in response to the Government of Ontario's initiative to promote the development of renewable electricity in the province. Project infrastructure such as collector lines and transmission lines will be sited along the boundaries of the Township of Pelham and Town of Grimsby, but will be sited outside of these municipalities on the opposite side of the road. The Project Study Area is shown in **Appendix A, Figure 1**.

The basic components of the Project include 77 wind turbine generators (80 potential locations identified) each with a rated capacity ranging from approximately 2.3 MW to 3.0 MW for a maximum installed nameplate capacity of 230 MW. An overhead and/or underground collection system connects each turbine to one of two transformer substations along a series of 34.5 kilovolt (kV) lines. Turbines are grouped into nine collector circuits that bring power (and data via fibre optic lines) to one of the transformer substations. Voltage is stepped up from 34.5kV to 115kV at each transformer substation by means of a 100 MVA base rated transformer with two stages of cooling (via fans). An 115kV transmission line transports power from each of the two transformer substations north to the tap-in location where the Project is connected to the Hydro One Networks Inc. (HONI) owned transmission line, south of the Queen Elizabeth Way (QEW) in the Town of Lincoln. Power generated from this Project will be conveyed along the existing HONI transmission line to the Beach Transformer Station in Hamilton.

Alternate transmission and collector lines routes have been identified and assessed to provide options during detailed design, the final selection of which route to follow will be confirmed following the consultation process with local distribution companies, agency review and detailed design.

Other Project components include a tap-in location, access roads, junction boxes (or pad-mounted disconnect switches) and associated culverts at swales and waterbody crossings. Temporary components during construction may include temporary laydown areas (for storage and staging areas at each turbine location), crane pads or mats, staging areas along access

roads, delivery truck turnaround areas, central construction laydown areas and crane paths. All project components are illustrated in **Appendix A, Figure 2**.

1.2 REPORT REQUIREMENTS

The Design and Operations Report has been prepared in accordance with Item 4, Table 1 of O.Reg.359/09 and the Ministry of the Environment's (MOE's) draft guidance document "*Technical Guide to Renewable Energy Approvals*" (MOE, March 2012). O.Reg. 359/09 sets out specific content requirements for the Design and Operations Report as provided in **Table 1.1**.

Table 1.1: Design and Operations Report Requirements: O.Reg. 359/09

Requirements	Completed	Section Reference
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,	✓	Appendix A
B. any ground water and surface water supplies used at the facility,	✓	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,	N/A	N/A
E. any areas where waste, biomass, source separated 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, and	✓	Appendix A
G. any noise receptors or odour receptors that may be negatively affected by the use or operation of the facility,	✓	Appendix A & C
ii. a description of each item diagrammed under subparagraph i,	✓	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 the Table to section 19, heritage resources, archaeological resources, water bodies, significant or provincially significant natural features and any other natural features identified in the Protected Countryside or in the portion of the Oak Ridges Moraine Conservation Plan Area that is subject to the Oak Ridges Moraine Plan,	✓	Appendix A
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 metres,	✓	Appendix D
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, and	✓	Appendix D

Table 1.1: Design and Operations Report Requirements: O.Reg. 359/09

Requirements	Completed	Section Reference
vi. a description, map or diagram of the distance between the base of each wind turbine and the nearest noise receptor.	✓	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,	N/A	N/A
ii. any things from which contaminants are discharged into the air, and	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, and	N/A	N/A
iv. if the facility includes a transformer substation, the works, facilities and equipment for secondary spill containment.	✓	3.1 & 4.6
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,	N/A	N/A
A. a description of the time period and duration of water takings expected to be associated with the operation of the facility,	N/A	N/A
B. a description of the expected water takings, including rates, amounts and an assessment of the availability of water to meet the expected demand, and	N/A	N/A
C. an assessment of and documentation showing the potential for the facility to interfere with existing uses of the water expected to be taken,	N/A	N/A
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,	N/A	N/A
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, and	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, A. the expected types of waste to be generated,	✓	4.4
B. the estimated annual average quantity that will be accepted,	✓	4.4
C. the estimated average time that it will remain at the facility, and	✓	4.4
D. the estimated average rate at which it will be used,	✓	4.4
vi. if the facility includes a transformer substation, A. a description of the processes in place to prevent spills,	✓	3.1 & 4.6

Table 1.1: Design and Operations Report Requirements: O.Reg. 359/09

Requirements	Completed	Section Reference
B. a description of the processes to prevent, eliminate or ameliorate any adverse effects in the event of a spill, and	✓	4.6
C. a description of the processes to restore the natural environment in the event of a spill.	✓	4.6
4. Include an environmental effects monitoring plan in respect of any negative environmental effects that may result from engaging in the renewable energy project, setting out,		
i. performance objectives in respect of the negative environmental effects,	✓	5.0
ii. mitigation measures to assist in achieving the performance objectives mentioned in subparagraph i, and	✓	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.	✓	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 Services Boards with respect to the project, including,		
i. measures to provide information regarding the activities occurring at the project location, including emergencies,	✓	6.0
ii. means by which persons responsible for engaging in the project may be contacted, and	✓	6.0
iii. means by which correspondence directed to the persons responsible for engaging in the project will be recorded and addressed.	✓	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 the ecological functions of the shoreline, and	N/A	N/A
ii. how the project will be engaged in to,	N/A	N/A
A. maintain the natural contour of the shoreline through the implementation of natural shoreline treatments, such as planting of natural vegetation and bioengineering, and	N/A	N/A
B. use a vegetative riparian area, 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.	✓	2.0 & 5.0
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 matter addressed in making the determination.	✓	2.0
9. If subsection 21 (3) or 23 (2) applies, provide a summary of the matters addressed in making the determination,	✓	2.0
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, and	✓	2.0
ii. under clause 23 (3) (b), if applicable.	✓	2.0

2.0 Site Plan

The Site Plan which depicts the Project Location during operation is provided in **Appendix A** (**Figure 1**). Detailed site plans, which include the location of the following information, are also provided in **Appendix A** (**Figures 2.1** to **2.58**):

- Permanent facility components, including: turbine locations, underground and overhead collector lines, fibre optic lines, junction boxes/pad-mounted disconnect switches, transmission lines, turbine access roads, two transformer substations, and tap-in location;
- Temporary facility components, including: Turbine laydown/staging areas, crane pads, central construction laydown areas, access road staging areas and truck-turnaround access roads;
- Project Location: the outer limit of all components of the Project, including temporary work areas during construction, used for defining setback and site investigation distances;
- Zone of Investigation, which includes the area in and within 120 metres (m) of the Project Location;
- Existing roads, utility corridors, road allowances, property lines, and easements within 300 m of the Project Location;
- Heritage resources in and within 120m of the Project Location;
- Significant natural features and water bodies in and within 120m of the Project Location;
- Known groundwater wells and gas wells in and within 120m of the Project Location;
- Known pipelines within 120m of the Project Location;
- Noise receptors (participating, non-participating and vacant lots) within 300 metres (m) of any turbine;
- Existing buildings and structures within 300 m of the Project Location; and,
- The areas of the Niagara Escarpment Plan Area and Greenbelt Plan Area (including the Natural Heritage System) which are within the Zone of Investigation.

Together, **Figure 1** and **Figures 2.1** to **2.58** constitute the Site Plan for this Project for the purposes of O. Reg. 359/09.

The locations of archaeological study areas and heritage resources are shown and discussed within the Stage 1 Archaeology Assessment, Stage 2 Archaeology Assessment, Protected Properties Assessment and Heritage Impact Assessment, which are included as part of the Project's REA application documents. This includes a discussion of archaeological and heritage resources described in sections 19 through 23 of O.Reg. 359/09 and an assessment of the potential effects and mitigation measures.

2.1 SETBACK DISTANCES

O. Reg. 359/09 provides setback distances between the Project Location and:

- Significant and provincially significant natural features;
- Sand barrens, savannahs, tallgrass prairies, alvars, non-provincially significant wetlands, and non-provincially significant Life Science ANSIs within the Greenbelt;
- Provincial parks and conservation reserves; and
- Water bodies.

O.Reg.359/09 also provides setback distances between the wind turbine base and:

- Property lines;
- Public road right-of-ways;
- Railway right-of-ways; and
- Noise receptors.

Visual representation of the setback distances are illustrated on the Site Plan (**Appendix A**) and Property Line Setback Assessment Report (**Appendix D**).

All of the proposed turbine sites meet the minimum setback requirement of at least 550m from any non-participating noise receptor in accordance with sections 35(1) and 54(1) of O. Reg. 359/09. All of the proposed turbines meet the minimum setback of at least blade length plus 10 m (48.6 m blade length + 10m = 58.6 m) from any public road or railway in accordance with section 53(1)(a) of O. Reg. 359/09. For the purpose of establishing setbacks, the dimensions of the E101 turbine have been used to account for the worst case scenario (blade length, tip of blade measurements). While E82 turbines may be used at specific sites, due to the shorter blade length of the E82 turbine, the resulting setback distance would be greater at the same location.

Property boundary setbacks are the equivalent of the turbine hub height in accordance with section 53(1)(b) of O. Reg. 359/09, which can be reduced to blade length plus 10 m with the

submission of a Property Line Setback Assessment Report (**Appendix D**) per section 53(3) of O. Reg. 359/09. This report is intended to address a reduction of the property line setback by identifying and evaluating land uses on neighbouring properties and by demonstrating that siting the turbine in such a location will not result in any adverse impacts on neighbouring businesses, infrastructure or land use activities through the implementation of appropriate preventative measures.

Fifty-four (54) turbines are located less than hub height (135 m) to a non-participating property line. Eighty-two (82) non-participating property lines are within 135m of the proposed turbines. One of the proposed turbines is located less than blade length plus 10 m (58.6 m) from a non-participating property line (Turbine T3 is located 56m from an adjacent property line). In order to comply with section 53(2)(b) of O. Reg. 359/09, which permits this further reduction of the property line setback where agreed to by the adjacent landowner, NRWC will execute a written agreement with the landowner of this property to permit the location of the turbine at this distance from the shared property line. A copy of the redacted agreement has been provided with the REA application.

Mapping of each turbine location demonstrating the hub height setbacks (both 124 m and 135 m) are presented in **Appendix D**.

With the exception of where the transmission line may be constructed over the Welland River PSW and where a collector line may be constructed over the Welland Feeder Canal PSW (as permitted by O. Reg. 359/09), and where Project Components will be constructed within agricultural fields used by wintering raptors, no Project Components are located in, on or over significant natural features. Impacts associated with these cases, including options for overhead and underground construction of the power lines, were assessed as part of the Natural Heritage Assessment and Environmental Impact Study (under separate cover).

Where the Project Location is within setback distances to significant natural features, additional evaluation and assessment is provided within the Natural Heritage Assessment/Environmental Impact Study (NHA/EIS) and Water Body and Water Assessment Report, which are included with the Project's REA application documents. Where wind turbines encroach within the setback of hub height from a non-participating property line, additional evaluation and assessment is provided within the Property Line Setback Assessment Report (**Appendix D**).

3.0 Facility Design Plan

3.1 KEY FACILITY COMPONENTS

The Site Plan (**Appendix A**) demonstrates the location of key facility design components including those described in **Table 3.1** below. A detailed description of these components, and their function/purpose in the Project, are provided in the Project Description Report (under separate cover). A detailed description of the installation methods for these components is provided in the Construction Plan Report (under separate cover).

Table 3.1: Key Facility Components

Component	Description
Wind Turbine Generators	77 ENERCON wind turbines with 80 potential locations identified. The selected wind turbine models are the ENERCON E101 and either the ENERCON E82 or a de-rated ENERCON E101 to achieve contract capacity of 230 MW. See Wind Turbine Specifications Report. Turbine foundations will be composed of concrete up to 25 m in diameter and up to 5 m deep with steel reinforcement and steel piles at a further depth as required.
Temporary Laydown Areas and Crane Pads	At each turbine is a built up area laydown area 120 m x 100 m used during construction for the crane pad and to store components. This area will be graded and laid with granular material. The area will be returned to its original land use at its current state or better after construction.
Collector Lines	Underground 34.5 kV collector lines buried at a depth of approximately 1 m and / or overhead 34.5 kV collector lines mounted on new monopoles approximately 25 m high and up to 60 m spacing (subject to detailed design). See **Appendix B** for typical collector line pole structures.
Fibre Optic Cables	Underground fibre optic cables buried with collector lines and /or overhead fibre optic cables mounted on same poles as collector lines.
Junction Box / Pad-Mounted Disconnect Switch	Where two or more collector lines connect and continue as one collector line, a junction box or pad-mounted disconnect switch will be installed. The unit is an enclosed metal box approximately 2m high, 3m long and 2m wide installed within the road right of way. See **Appendix B** for a drawing of a typical junction box.
Transformer Substations	Two transformer substations, each 100m x 100m, will include a fenced-in area with access road entrance and: - One 34.5kV/115kV step-up transformer each; - Switchgear, capacitor, banks, 8 feeder bays and a bus bar; - Protection and Control Equipment; - Noise retention wall / structure; and, - Foundations will have a secondary liquid containment storage area designed to capture the insulating fluid in the unlikely event of a leak. The liquid containment system is conservatively designed to hold all of the liquid from the transformers as well as any precipitation that may accumulate.
Transmission Line	Includes approximately 44 km of 115 kV transmission line. When overhead, the line will be mounted on new monopoles approximately 23 m high and spacing varying from 60m up to 100m (subject to detailed design). Through the approval of a Niagara Escarpment Commission Development Permit the line will be installed underground through the Niagara Escarpment Plan Area (along Mountainview Road at north end of Interconnector Study Area). The option

Table 3.1: Key Facility Components

Component	Description
	also exists to install the transmission beneath the Welland River. Preferred and alternate routes have been identified and assessed. See **Appendix B** for typical transmission line pole structures.
Tap-in Location	The point at which the Project 115 kV transmission line interconnects with the existing Hydro One Networks Inc transmission line. Also known as the Interconnect Station and the Point of Common Coupling. Includes an access road, pad-mounted electrical equipment to facilitate connection to the grid within a fenced area approximately 40m by 50m.
Access Roads	During construction, gravel access roads will be approximately 15m wide. During operation, the gravel access roads will be reduced to approximately 6m wide, depending on landowner preference. See **Appendix B** for a typical access road entrance of a public road.
Operations and Maintenance Building	The operations and maintenance building will be hosted in an existing facility in a nearby town. This component is not shown on the Site Plan as the facility will be an existing facility that will be selected prior to the start of construction.
Water Crossings	Several water crossings varying in length will be installed where access roads cross waterbodies or swales so as to maintain existing drainage. The culverts will be field fit during construction to maintain original site drainage. See **Appendix B** for typical water course crossing (CAPP, 2005).
Meteorological Towers (Met Towers)	The existing met towers on-site will be used for long term monitoring of wind conditions. These existing towers are not a part of the REA approval but have been included in the Site Plan for transparency.
Temporary Central Construction Laydown Areas	Two temporary construction laydown areas will be graded and laid with granular material for the temporary storage of project components and trailers during construction. The first area is located adjacent to the north transformer substation (**Figure 2.39**). The second area is located adjacent to T31 (**Figure 2.28**). After construction these sites will be returned to their original land use to conditions that are the same or better than original conditions.
Temporary Access Road Features	Truck turn-around areas are located at various access roads for safe driving practices for large trucks. Some turbine sites have more than one turnaround area. The frequency and location of these turnaround areas have been designed by engineers to ensure safe driving practices. These turn-around areas are temporary and after construction they will be removed and returned to their original land use to conditions that are the same or better than original conditions. A 5m wide access road staging area will be adjacent to the 15m wide for-construction access road. The staging areas will be removed and returned to their original land use to conditions that are the same or better than original conditions after construction.

3.2 GENERAL DESIGN AND SITING CONSIDERATIONS

A key mitigation strategy used to address potential environmental effects from construction and operation of the facility was avoidance of significant natural and socioeconomic features to the extent possible during siting of the Project. As a result, the location of Project components was designed iteratively to mitigate impacts. The design iterations considered desktop research,

site investigation results, technical feasibility and public, municipal, agency, Aboriginal and landowner consultation. The goal of the design iterations was to:

- Maximize setback distances between wind turbines and non-participating noise receptors (i.e. residences, schools), while maintaining the minimum required 550 m setback and ensuring noise levels do not exceed 40 decibels (dBA) at any non-participating receptor.
- Avoid and maximize setback distances from significant natural features (i.e. wetlands, woodlands).
- Avoid and minimize impacts on archaeological and cultural heritage features.
- Satisfy landowner preferences with respect to infrastructure location on their properties, including attempts to follow existing access roads where possible.
- Utilize existing disturbed municipal road allowances for collector lines and transmission lines.
- Maximize constructability and minimize the cost of construction.
- Minimize impacts to existing land uses.

The transmission line design and routing was selected through an evaluation of possible transmission line corridors and routes based on balancing the following criteria:

- Minimize overall length of route to minimize cost, energy losses and potential environmental (social, natural) impacts.
- Ensure constructability.
- Maximize use of existing road right of ways.
- Avoid impacts on significant natural features (i.e. Provincially Significant Wetlands).
- Avoid urban and/or built up areas.
- Minimize the removal of vegetation, where feasible.
- Minimize adverse effects of construction and operation on existing infrastructure.

As noted in Section 1.1, alternate transmission and collector lines routes have been identified and assessed to provide options during detailed design, all of which have been included in the REA reports. Final selection of which route to follow will be confirmed following consultation with municipalities and local distribution companies, agency review and detailed design.

Potential effects and mitigation measures associated with the Project are discussed in Section 5 of this report.

3.3 GENERAL DESIGN AND SITING PROCESS

The goals described in the preceding section guided the evolution of wind turbine siting. The most influential constraints were the requirements for wind turbines to be sited on participating properties while maintaining a minimum of 550m from non-participating receptors and noise emissions no greater than 40.0 dBA at these receptors.

The iterative process included the following steps:

- Identify Project Study Area based on results of wind resource assessment.
- Identify participating properties for the siting of Project Components and corresponding property line setbacks.
- Through a review of existing background information, complete a records review to identified features where the location of a turbine is prohibited by O. Reg. 359/09, including Provincially Significant Wetlands, Provincial Parks, lakes, waterbodies and seepage areas.
- Identify regulatory setbacks from natural features where Project Components are prohibited, or where additional studies are warranted, including:
    - 550m setback to any non-participating receptors within the Project Study Area.
    - 30m setback to waterbodies identified during records review.
    - 120m setback to natural heritage features identified during records review.
- Site wind turbine locations outside of the 550m setback from non-participating receptors, outside of the 30m setback (measured from blade tip) from waterbodies and, where practical, outside of the 120m setback (measured from blade tip) from natural heritage features that would trigger an Environmental Impact Study (EIS). The location of turbines, transformers and other Project Components targeted existing disturbed areas (i.e. agricultural fields) as a means of minimizing potential environmental impacts on the natural, cultural and social environment.
- Conduct Noise Assessment to identify noise compliance at all non-participating receptors and where exceeding, identify which turbines cause noise emissions greater than 40 dBA at any non-participating receptor.

- Through multiple iterations of the turbine layout and noise impact assessment, adjust, refine and/or remove non-compliant wind turbines by increasing their distance from affected receptors.

- Repeat several iterations of this process to develop a noise-compliant layout that maximizes setbacks from non-participating receptors and provides the nameplate capacity (230MW) for this Project.

- Conduct site specific field investigations in and within 120 m of the proposed turbine sites, including Stage 2 archaeology assessments, cultural heritage assessments, natural heritage assessments and waterbody assessments to verify the presence and boundaries of any significant features.

- Based on the results of the site investigations, adjust the siting and location of turbines to avoid natural and cultural heritage features and maintain regulatory setbacks.

- Repeat the Noise Assessment to confirm noise compliance of the revised layout. Where necessary, adjust turbine siting to develop a noise-compliant layout and maximize setbacks from natural and cultural heritage features identified during field investigations.

- Repeat several iterations to develop a noise compliant layout which maximizes setbacks from non-participating receptors and natural and cultural heritage features identified during field investigations.

- Identify potential impacts and corresponding mitigation measures to minimize or avoid adverse environmental impacts.

- Finalize the draft site plan layout with 80 turbines (where only 77 will be constructed to provide the 230MW nameplate capacity for this Project).

- During detailed design, consider wind resource assessment, project efficiencies, energy losses, power production to determine which three turbines will not be constructed such that power output is optimized.

The goals identified in the preceding section guided the general design and siting process for access roads and collector lines by following these steps upon the finalization of the wind turbine layout:

- Conduct site walk of hosting property to identify existing access roads or disturbed areas that could be used to host access roads or collector line components.

- Propose a route for access roads and collector lines outside of setbacks from natural and cultural heritage features identified during field investigations for wind turbines.

- Conduct further field work where necessary to identify location of any significant natural and cultural heritage features within 120m of proposed access road and collector lines routes.

- Adjust access road and collector line routes to avoid new significant natural and cultural heritage features, where necessary.

- Adjust access road and collector line routes based on feedback from hosting landowner.

In total, hundreds of iterations of the turbine locations and adjustments to the location of Project Components were completed for this Project, consistent with the general design and siting considerations (identified above) and the regulatory requirements of O. Reg. 359/09, to develop the project layout depicted on the Site Plan (**Appendix A**).

3.4 USE OF UNOPENED ROAD ALLOWANCES

In some cases, the Site Plan includes the design and construction of access roads, collector lines and fibre optic cables within unopened road allowances. Several factors influenced the decision to use the unopened road allowances, including but not limited to:

- Obtaining access land locked properties or properties where access would require traversing significant natural heritage features, including Provincially Significant Wetlands;

- Avoiding the need for project components on non-participating properties;

- Minimizing the length of the access roads, collector lines and fibre optic cables to improve overall efficiency of the Project; and

- Minimizing disturbance to existing communities during construction (i.e. cottage development along North Shore Drive).

The unopened road allowances that will be affected by the project include:

- Baldwin Road, Township of West Lincoln, which provides access to T36 and T74 (**Figure 2.26** and **2.38**). This unopened road allowance includes bridges and culverts which the Township of West Lincoln states are not built to municipal standards and are not likely to be able to safely handle the truck traffic. As a result, NRWC would be responsible for assessing the structural integrity of the bridges and culverts and upgrading where necessary, at the cost of NRWC;

- Silverdale Road, Township of West Lincoln hosts collector line and fibre optics (**Figures 2.15**). This unopened road allowance provides the most direct route for a small section of collector line and fibre optic cables;

- Minor Road, Township of West Lincoln provides access to T85, T66 and T94 (**Figure 2.10**). A portion of Minor Road is an unopened road allowance and will require upgrades to access the property.. Use of this road avoids locating Project infrastructure in a large woodland amphibian breeding habitat to the south;

- Comfort Road, Township of West Lincoln, provides access to T28 and T27 (**Figure 2.13**). A portion of Comfort Road is an unopened road allowance and will require upgrades to access the property. Use of this road allowance avoids running Project infrastructure cross-country through several agricultural fields;

- Concession 3, Township of Wainfleet, provides access to T24 (**Figure 2.58**). Use of this unopened road allowance avoids running Project infrastructure across agricultural fields and significant woodland feature;

- Unnamed Road Allowance, Township of Wainfleet – access to T24, T23 and T49 (**Figures 2.57** and **2.58**). Use of this unopened road allowance avoids running Project infrastructure cross-country through several agricultural fields and hedgerows, and avoids disturbance impacts during construction along North Shore Road; and,

- Shafley Road, Township of Wainfleet – collector and transmission line. (**Figure 2.41** and **2.42**). This unopened road allowance will host collector and transmission lines. It provides the most direct route for the transmission line and provides service to T10 and T37.

The unopened road allowances will be upgraded and maintained to the same or similar design as the access roads, or, to the design specifications identified by the affected municipality. Further description of the construction of access roads is included in the Construction Plan Report. In some cases the unopened road allowances are proposed to be used during construction only, whereas in other cases the unopened road allowances are proposed to be used for the lifetime of the project as they host access roads. Upgrades and maintenance of the access roads within these unopened road allowances will be the responsibility of NRWC during construction (where unopened road allowances are used for construction only) and during operation (where unopened road allowances are used for operation/maintenance), unless otherwise determined in the executed Road Use Agreements between NRWC and the affected municipalities.

Upgrades to additional substandard roads will be required to provide access during construction and operation of the Project (ex. Fifteen Rd, Woods Rd.). These upgrades would be subject to the same requirements as described above for the unopened road allowances. NRWC will include commitments in the Road Use Agreement for the upgrade, maintenance and long term use of the unopened or substandard road allowances with the affected municipalities. The exact terms of these commitments will be defined through consultation with these municipalities prior to construction.

4.0 Facility Operations Plan

Operation activities include daily monitoring of the wind turbines and maintenance activities which are described in more detail in this section.

4.1 SITE SUPERVISION AND STAFF TRAINING

NRWC may hire a specialized Operation and Maintenance Contractor for specific maintenance tasks. It is expected that up to 12 full-time operation and maintenance staff from NRWC and the Operation and Maintenance Contractor would be employed by the wind project during the operation phase to carry out the various on-going maintenance activities. Additional staff would be brought in on an as needed basis to support the maintenance activities required for the project.

During pre-operational mobilization, NRWC and/or the Operation and Maintenance Contractor would develop an Operation and Maintenance Program. The program would be designed to ensure compliance with any applicable municipal, provincial, and/or federal requirements. As appropriate, the program would cover staff training, predictive/ preventive maintenance, routine maintenance, unscheduled maintenance (including appropriate environmental mitigation measures), annual overhauling, inspection of equipment and components, procurement of spare parts, and maintenance of optimum inventory levels in order to reduce inventory carrying costs and working capital costs. No significant inventory would be kept on-site. The program would also include a schedule for regular inspections of the turbines.

4.2 PLANNED MAINTENANCE

The maintenance of the turbines would also be the responsibility of NRWC and/or the Operation and Maintenance Contractor. Maintenance and inspection related to the electrical collector system would remain the responsibility of NRWC but may be sub-contracted.

Through use of a SCADA system that is connected to fibre optic cables, the maintenance staff would be able to monitor the performance of all turbines on-line in real time. Constant monitoring of the turbines will occur from an off-site location. The SCADA system would identify any potential problems so that pro-active inspection and maintenance can be undertaken. Potentially damaged turbines would be shut down until maintenance staff can perform a site inspection and confirm the nature of the damage to avoid (i) potential further damage to the turbine or (ii) unplanned operation of the turbine outside of the permitted tolerances and approvals. Regular maintenance of the equipment would be a key method of mitigating these potential effects.

Scheduled maintenance that would occur depending on operation hours would cover the following:

- Visual inspection;
- Inspection of mechanical components;
- Inspection of electrical components; and
- Greasing and general maintenance.

Initial visits for planned maintenance are more frequent, slowing to once every six months or more as the Project matures. Maintenance of each wind turbine usually takes five days to complete. Traffic for regular maintenance will include approximately two regular sized trucks on site per day. No Transportation and Traffic Management Plan for operations is anticipated due to the low number of trucks for maintenance.

In the case of large equipment replacement maintenance, which requires the use of large trucks for component delivery, the Operations and Maintenance Contractor will apply the same Transportation and Traffic Management Plan (TTMP) developed during construction, or propose a new revised plan based on existing regulations of the time. Consultation will be conducted with affected municipalities if the TTMP is revised and for notification of large equipment transportation.

Greasing would occur on a semiannual basis and require approximately 12 L of grease per turbine each year. No oil (including hydraulic oil) is required for maintenance as the direct-drive generator system does not have a gear-box contained in oil.

There would also be planned maintenance with respect to the transmission line route whereby tree-trimming and vegetation removal adjacent to the route would be required to protect the line from falling branches and preserve the safety of maintenance workers. Tree trimming would likely be required on a bi-annual or less frequent basis depending on the species of vegetation adjacent to the line.

4.3 UNSCHEDULED MAINTENANCE

NRWC and/or the Operation and Maintenance Contractor would also provide unscheduled maintenance for the turbine units when required. Unscheduled maintenance activities could include replacement of major components such as blades or generators.

Temporary crane pads that may be required for unscheduled maintenance activities would be constructed adjacent to individual turbine sites to facilitate turbine maintenance. The cranes pads would be located in the same location as the crane pads used during construction of the Project. Operation-phase crane pad construction would follow the same design and process

used for crane pads during the construction phase, as described in the Construction Plan Report including the same transportation route. Any potential effects from construction of the crane pads would be the same as those identified during the construction phase. Disturbed areas would be restored immediately following completion of the maintenance activities in the same manner as described in the Construction Plan Report.

4.4 WASTE MATERIAL DISPOSAL

During operation, there will be no domestic waste produced on site as the O&M building is at an existing facility in an industrial area.

Waste lubricating fluids, approximately 12L of grease per turbine per year, will be generated during standard operation and maintenance activities. The used grease would be removed from site on the same day that it is removed from the equipment. There will be no on-site disposal or storage of waste during the operation of the facility. Used grease and all wastes would not be stored on-site but rather handled and recycled or disposed of in accordance with regulatory requirements. No oil is used in the operation of the wind turbines due to the direct-drive generator which does not include a gearbox.

4.5 SEWAGE

No sewage will be produced during operation of the facility.

4.6 ACCIDENTAL SPILLS

Appropriate containment facilities will be used at the existing Operations and Maintenance building for fuel storage and emergency response material (e.g., spill kits). Refueling, equipment maintenance, and other potentially contaminating activities will occur only in designated areas at the existing Operations and Maintenance building.

In the event of an accidental discharge of fluids associated with Project operation, the Operation and Maintenance personnel will immediately stop work at the source of the discharge and rectify the accidental spill. Once the spill is contained, any contaminated soil will be removed and disposed of in accordance with the current appropriate provincial legislation, such as Ontario Regulation 347. Areas affected by accidental spills will be restored to a safe and clean condition using native materials and vegetation in accordance with MNR requirements.

In the event of a spill reaching a waterbody, containment booms will be deployed and the contained fluid will be removed from the water surface by vacuum truck or other appropriate method. Any contaminated shoreline soils or sediments will be removed and disposed of in accordance with applicable provincial legislation and as determined in consultation with the MNR and DFO as required.

The transformers at both transformer substations will each be mounted on foundations equipped with secondary liquid containment storage areas which will be designed to capture the fluid in the unlikely event of a leak. The liquid containment system will be designed to hold all of the liquid from the transformer as well as any precipitation that may accumulate.

The Emergency Response Plan (see Section 6) will contain procedures for spill contingency and response plans, spill response training, notification procedures, and necessary clean-up materials and equipment. As per s.13 of the *Environmental Protection Act*, all spills that could potentially have an adverse environmental effect, or are in excess of prescribed regulatory levels will be reported to the MOE's Spills Action Centre.

4.7 MONITORING METEOROLOGICAL DATA

Each turbine would have sensors to measure wind speed and direction. This data would be used to control the pitch of the blades and the orientation of the nacelle.

Monitoring of meteorological data would be completed using the meteorological sensors within the nacelle as well as met towers. The wind farm's SCADA system will use this data to:

- Provide additional parameters such as wind direction, air temperature, air pressure and wind shear to better manage the operational performance of the equipment; and
- Provide a backup source of wind speed data should a wind turbine's own sensors prove unreliable.

The Ontario Independent Electrical System Operator (IESO) is expected to require NRWC to provide real-time weather data from the meteorological sensors, along with real-time generation data to provide input to their central generation forecasting model. The existing meteorological towers currently within the Project Study Area will be used for this purpose.

4.8 WATER-TAKING ACTIVITIES

The operation of the Project does not require any water-taking activities for regular or unplanned maintenance.

4.9 ACCIDENTS AND MALFUNCTIONS

Although highly unlikely, the potential exists for full or partial blade failure from a wind turbine, resulting in potential damage to the area where the detached blade material lands. In order to determine the potential for effects associated with general blade failure of wind turbines, Garrad Hassan Canada undertook a review of publicly-available literature on wind turbine rotor failures resulting in full or partial blade failure (Garrad Hassan Canada, 2007). Such events were found to be very rare; therefore data describing these events are scarce.

The review confirmed that root causes of blade failure have been continuously addressed through developments in best practice in design, testing, manufacture, and operation; much of these developments have been captured in the International Electrotechnical Commission ("IEC") standards, to which all current large wind turbines comply (Garrad Hassan Canada, 2007), including those of the Project.

Wind turbine control systems are subjected to rigorous specification in the design standards for wind turbines (IEC 61400-1) and exhaustive analysis in the certification process. Wind turbines with industry certification must have a safety system completely independent of the control system. In the event of a failure of one system, the other is designed to control the rotor speed.

Lightning protection systems for wind turbines have developed significantly over the past decade and best practices have been incorporated into the industry standards to which all modern turbines must comply. This has led to a significant reduction in events where lightning causes structural damage.

Even in the rare event of a blade failure in modern wind turbines, it is much more likely that the damaged structure would remain attached to the turbine rather than separating (Garrad Hassan Canada, 2007). Reviews of available information did not find any recorded evidence of injury to the public as a result of turbine blade or structural failure (Garrad Hassan Canada, 2007; Chatham-Kent Public Health Unit, 2008).

Also highly unlikely, there is potential for turbine collapse and potential for damage to the area where the collapsed turbine lands. To ensure survivability and prevent turbine collapse, ENERCON incorporates cast iron components, concrete towers and gravity foundations in the design of its wind turbines. The cast iron components are used in key load bearing sections of the turbine, such as the main carrier, thus adding strength. The concrete tower provides a more rigid tower which considerably reduces lateral movement of the turbine at high wind speeds. The gravity foundation is essentially a large mass heavy enough to weigh down the turbine even in extreme wind conditions approaching 60 metres per second (m/s) (216 kilometres per hour).

ENERCON has been manufacturing commercial wind turbines since the early 1980's. As of mid-2012, ENERCON has installed over 19,600 wind turbines worldwide for an installed capacity of over 28,200 MW. Due to ENERCON's conservative design methodology, there have been no collapse of megawatt scale wind turbines currently being operated and maintained by ENERCON and the likelihood of turbine collapse due to design is negligible.

Given that accidents or malfunctions of wind turbines are considered to be infrequent events, that current design standards greatly assist in minimizing such potential, and that the event of structural failure would not fall beyond the setback distance, there is no affect to public health and safety.

The remote possibility also exists for accidents related to third party damage of the wind turbines. However, given the location of the wind turbines (e.g. on private agricultural land), coupled with the structural integrity of the wind turbines, impacts affecting the structural integrity of the wind turbines are highly unlikely.

5.0 Potential Environmental Effects and Monitoring Plans

O. Reg. 359/09 requires that any adverse environmental effects that may result from operation activities be described within a 120 m radius of the Project Location. This section describes the potential effects, mitigation measures, monitoring plans and net effects that may result from operation activities within 120 m of the Project Location.

Descriptions of the existing natural heritage, water, archaeological and heritage environments in the Project Study Area and/or Project Location and a description of potential effects, mitigation measures and monitoring plans can be found within the Natural Heritage Assessment & Environmental Impact Study (NHA/EIS), Water Assessment & Water Body Report (WA/WBR), Stage I and II Archaeological Assessments, Protected Properties Assessment, and Heritage Impact Assessment. These reports form part of the REA application and are provided under separate cover.

5.1 METHODOLOGY FOR IDENTIFICATION OF POTENTIAL ENVIRONMENTAL EFFECTS

The need, assessment, and selection of protection and mitigation measures discussed in the following sections have been predicated on the hierarchical principles of:

- avoidance – the elimination of adverse environmental effects by siting, scheduling, and design considerations
- minimization – reduction or control of adverse environmental effects through Project modifications or implementation of protection and mitigation measures
- restoration and compensation – enhancement or rehabilitation of affected areas

The application of these principles has greatly reduced the potential for adverse environmental effects from the Project as demonstrated in the following subsections.

The key mitigation strategy used to address potential environmental effects from operation of the facility was to design the facility in a manner that primarily avoided significant features to the extent possible during siting of the Project, as discussed in Sections 3.2 and 3.3.

Where net effects remain, they are characterized as either positive or adverse. Positive net effects were not assessed. Adverse net effects were assessed in consideration of the following nine descriptors, as applicable:

- **Direction**: the degree to which an effect may be positive or adverse;
- **Duration**: the period of time until the element returns to baseline conditions;
- **Ecological/Social Context**: the nature of the area in which the effect may occur;
- **Frequency**: the number of times that an effect may occur;
- **Magnitude**: the degree to which an effect may occur;
- **Permanence**: the degree to which an effect will not return to baseline conditions;
- **Probability**: the likelihood that an effect may occur;
- **Reversibility**: the likelihood that an element will recover from an effect; and
- **Spatial Extent**: the area within which an effect may occur.

5.2 OBJECTIVES AND GUIDING PRINCIPLES FOR ENVIRONMENTAL MONITORING

The environmental effects monitoring plans for the Project have been designed to monitor implementation of the proposed protection and mitigation measures and to verify compliance of the Project with O.Reg.359/09. NRWC will be the primary party responsible for the implementation of operational effects monitoring. Implementation of these measures would be undertaken in compliance with applicable municipal, provincial and federal standards and guidelines.

The goals of the monitoring plan are:

- Minimize environmental effects from the Project during the design and operation phase;
- Minimize conflicts in the communities affected by the execution of the works according to legal terms and to the proponent's policies;
- Avoid accidents and malfunctions;
- Minimize environmental effects on natural habitats, flora and fauna;
- Avoid levies or sanctions from the relevant government agencies for negligent environmental performance;

- Comply with environmental quality standards set by law; and
- Establish measures that enhance occupational health and safety.

The following guiding principles were considered in preparation of the monitoring plan:

- Focus upon environmental, health, and safety risk prevention;
- Conform to relevant standards, codes, and practices considered in the application of safe technologies;
- Perform all activities in a safe and effective manner, by trained personnel;
- Maintain all equipment in good operating condition for protection of worker health and safety, conservation of the environment, and protection of property;
- Implement all necessary precautions to control, remove, or otherwise correct any health and safety hazards; and
- Meet all relevant municipal, provincial, and federal standards that collectively ensure sufficient technical levels of safety during operation of the facility.

Building upon the above methodology, goals and objectives, and guiding principles, the monitoring plan is composed of the following components: environmental management systems; programs, plans, and procedures; monitoring and contingency requirements.

Table 5.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Net Effects
Heritage and Archaeological Resources					
Protected Properties	• Although 12 protected properties were identified in the Protected Properties Assessment no direct or indirect operation-related impacts were identified.	• N/A	• N/A	• N/A.	No net effects.
Heritage Resources	• Although 119 cultural heritage resources were identified in the Project Study Area in the Heritage Impact Assessment, no direct operation-related impacts were identified. • The assessment identified four heritage resources, the Elcho United Church Cemetery, Mount Carmel Cemetery, Mount Carmel United Brethren Church and West Lincoln McCaffrey Cemetery, which have potential for operation-related indirect effects from visual impacts.	• Minimize visual impacts	• Work directly with Elcho Cemetery Board to design and install an appropriate visual barrier around the cemetery to protect views. • Install transmission line poles on east side of Port Davidson Road (opposite side of road from the West Lincoln McCaffrey Cemetery). • Work directly with the municipality and cemetery board to design and erect appropriate visual barrier (i.e., tree plantings, fencing) on the northern, western and southern boundaries of the Mount Carmel cemetery. • Junction box at the intersection of Hutchinson Road and Highway 3 should be located at the northwest corner of the intersection away from Mount Carmel United Brethren Church.	• N/A	Minimal indirect visual impacts anticipated.
Archaeological Resources	• There are no areas that would be excavated during the operation phase that would not have been previously assessed prior to construction; therefore no effects are anticipated to archaeological resources during operation.	• None required.	• In the event that archaeological resources are encountered during operations, o all work within the vicinity of an archaeological find will be suspended; o the Ministry of Tourism, Culture and Sport archaeologist would be contacted; and o Aboriginal communities would be contacted.	• In the event that human remains are encountered or suspected of being encountered before or during construction, all work would stop immediately. Notification would then be made to the Ontario Provincial Police or local police.	• No net effects to archaeological resources during operations are anticipated.
Natural Heritage Resources					
Wetlands	• Contamination through accidental spills.	• No spills.	• See ‘Spills‘. • All maintenance activities, vehicle refueling or washing and chemical storage will be conducted at the operations and maintenance facility (off site) or, if necessary, located more than 30m from wetlands.	• Hydrological conditions will be monitored once in the spring and once in the summer during the first year of post-construction.	None.
Areas of Natural and Scientific Interest (ANSI’s)	• No potential effects to Life Science ANSI (St. Ann’s Slough Forest) as no components are located in the feature. • No operation-related potential effects to the Winger Earth Science ANSI which hosts project components. • Contamination through accidental spills.	• No spills.	• See ‘Spills‘. • See ‘Woodlands’.	• N/A	None.
Valleylands and Hazard Lands	• The Project Location encounters one valleyland, the Welland River. Collector lines and transmission lines are proposed to cross the Welland River. The option of overhead lines or underground lines will be confirmed during detailed design but both options have been assessed for potential impacts. Potential impacts to woodlands, wetlands, watercourses and	• See “Wetlands”, “Woodlands” and “Surface Water, Fish and Fish Habitat”	• See “Wetlands”, “Woodlands” and “Surface Water, Fish and Fish Habitat”	• See “Wetlands”, “Woodlands” and “Surface Water, Fish and Fish Habitat”	See “Wetlands”, “Woodlands” and “Surface Water, Fish and Fish Habitat”

Table 5.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Net Effects
	fish habitat within the valleyland during regular maintenance.				
Woodlands	• Contamination through accidental spills.	• No spills.	• See 'Spills'.	• See "spills".	None.
Provincial Parks and Conservation Reserves	• As no Provincial Parks and Conservation Reserves were identified within the Project Location, there are no anticipated impacts.	• N/A	• N/A	• N/A	N/A
Significant Wildlife and Wildlife Habitat	• Shifts in species abundance, avoidance and behavior during operation. • Direct mortality of birds and bats from collisions. • Turbine lighting has potential to impact migratory birds and cause collisions. • Disturbance to species during maintenance activities from traffic, noise and dust. • Direct mortality of turtles, amphibians and snakes due to collision with maintenance vehicles.	• Minimize mortality of significant wildlife. • Minimize disturbances to significant wildlife.	• Turbine lights with the shortest allowable flash durations and longest allowable pause between flashes are preferred. To the extent possible, no steady burning lights/floodlights will be used at the facility. • Principles of avoidance and minimization, as discussed in section 5.1, were applied during layout design to mitigate potential effects during operation. • Setbacks between project components and significant wildlife habitat were considered during layout design to mitigate potential effects during operation. • Maintenance vehicle speeds will be limited to 30 km/h or less on access roads and traffic will be limited primarily to daytime hours. Signs will be erected to communicate the speed limit. • No herbicide will be used within significant features or wildlife habitats.	• Mortality monitoring for birds will be conducted twice weekly (3-4 day intervals) at ten turbines from May 1 - October 31 for 3 years post construction (see **NHA/EIS** and EEMP in **Appendix E**). • Raptor monitoring will be conducted monthly from May 1 – October 31 and weekly from November 1 – April 30 for 3 years post construction (see **NHA/EIS** and EEMP in **Appendix E**). • Disturbance monitoring for wintering Short-eared Owls will occur for 3 years post-construction (see **NHA/EIS** and EEMP in **Appendix E**). • Disturbance monitoring for migratory birds at significant migratory bird stopover areas will occur for 3 years post-construction (see **NHA/EIS** and EEMP in **Appendix E**). • Disturbance monitoring will be conducted at all significant raptor wintering areas for 3 years post-construction (see **NHA/EIS** and EEMP in **Appendix E**). • Post-construction mitigation, including operational controls, will be considered if annual mortality of birds exceeds the MNR thresholds (14 birds/turbine/year at individual turbine or turbine groups, 0.2 raptors/turbine/year, 0.1 raptors of provincial conservation concern/turbine/year OR 10 or more birds at any one turbine or 33 or more birds at multiple turbines). Mitigation includes: o Consultation with MNR. o Increased monitoring and analyses of monitoring. o Periodic shut-down of selected turbines at specific times of year o Blade feathering at specific times of year. (See EEMP in **Appendix E**)	No significant net effects are anticipated given the required implementation of contingency measures and adaptive management plan associated with the EEMP (**Appendix E**).

Table 5.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Net Effects
				• In the case of a mass bird mortality event (more than 10 bird fatalities at any one turbine or more than 33 bird fatalities at multiple turbines on a single survey) the following steps will be implemented: o Notify MNR o Emergency carcass search of all turbines in the project. o Analysis of the results of the emergency carcass search. o Based on the risk factors identified, additional mitigation and scoped monitoring recommendations will be developed in conjunction with MNR with goal of avoiding future mortality events. (See EEMP in **Appendix E**) • Mortality Monitoring for bats will be conducted twice weekly (3 – 4 day intervals) at 30% of the wind turbines from May 1 to October 3 for 3 years. • Disturbance monitoring will be conducted at identified at significant bat maternity colonies within 120m of any turbine for 3 years including Exit Surveys in June. • In the event of significant bat mortality (more than 10 bats/turbine/year) increasing cut-in speed to 5.5 m/s or feathering wind turbine blades when wind speeds are below 5.5 m/s between sunset and sunrise from July 15 to September 30. (See EEMP in **Appendix E**) • In the event of continued significant bat mortality, MNR will be notified and consulted to determine additional mitigation and scoped monitoring requirements. (See EEMP in **Appendix E**) • Disturbance monitoring will be conducted for 1 year within significant turtle nesting features within 30m or proposed access roads (June and July). • Disturbance monitoring will be conducted for 1 year within significant amphibian breeding habitat within 30m of proposed access roads (April to June). • NRWC and the MNR will review the post-construction monitoring results to	

Table 5.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Net Effects
				determine if an ecologically significant effect on migratory birds, winter raptors, turtle nesting habitat, bat maternity colonies or breeding amphibians is occurring. Contingency measures identified in the EEMP in **Appendix E** may be implemented if performance objectives are not met. • A Vegetation Monitoring Plan will be developed to monitor the success of the Replanting and Restoration Plan.	
Other Wildlife and Wildlife Habitat	• Increased noise and disruption from operations and maintenance activities. • Limited mortality due to potential bird and bat collisions with turbines. • Potential impacts to deer and mammal movements.	• Minimize disturbance to wildlife and wildlife habitat.	• See 'Local Traffic' • See 'Environmental Noise' •	• See 'Local Traffic'. • See 'Environmental Noise'. • See 'Significant Wildlife and Wildlife Habitat' • NRWC committed to work with the Six Nations to develop and participate in a winter mammal movement study to track deer proximity to turbines post-construction.	No significant net effects are anticipated given the required implementation of contingency measures associated with the EEMP (**Appendix E**). Adverse impacts are not expected on deer's land use in proximity to turbines.
Significant Flora and Vegetation Communities	• Indirect effects to flora and vegetation from dust emissions. • Contamination through accidental spills.	• Minimize disturbance to flora and vegetation communities.	• All maintenance activities, vehicle refueling or washing or chemical storage will be located at the operations and maintenance facility of site, or where necessary, more than 30m from features. • See 'Dust and Odour Emissions'. • Minimize required tree trimming and coordinate maintenance work with different infrastructure services. • Where practical, locate pole line away from mature trees.	• See 'Dust and Odour Emissions'	None.
Other Flora and Vegetation Communities	• Indirect effects to other flora and vegetation from dust emissions. • Long term tree trimming along aboveground collector lines and transmission lines.	• Minimize disturbance to other flora and vegetation communities.	• All maintenance activities, vehicle refueling or washing or chemical storage will be located at the operations and maintenance facility of site, or where necessary, more than 30m from features. • See 'Dust and Odour Emissions'. • Minimize required tree trimming and coordinate maintenance work with different infrastructure services. • Where practical, locate pole line away from mature trees.	• See 'Dust and Odour Emissions'.	None.

Table 5.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Net Effects
Water Bodies and Aquatic Resources					
Groundwater	• Potential contamination from accidental spills.	• No spills.	• See 'Spills'.	• See 'Spills'.	See 'Spills'.
Surface Water, Fish, and Fish Habitat	No potential impacts are anticipated with the proper installation of Project components and appropriate use of maintenance equipment. There is potential for some impacts where improper installation of Project components or inappropriate use of maintenance equipment results in: • Impediment of fish movement or water passage due to inappropriate sizing or installation of culverts. • Potential contamination from accidental spills. • Erosion, sedimentation, and surface water turbidity during maintenance activities.	• No impediment. • No spills. • No erosion, sediment transport or surface water turbidity.	• No additional mitigation measures are required for correctly installed culverts. Culvert will be appropriately sized and field fit on site. • See 'Spills'. • Vegetation removal on the slopes of watercourses will be minimized to the extent possible • Stream banks will not be disturbed until necessary for maintenance activities. • Materials removed or stockpiled deposited and contained in a manner to ensure sediment does not enter a watercourse. • Seeding completed where possible. • If siltation to a watercourse occurs, activities will cease immediately until the situation is rectified.	• See 'Spills'. • NRWC will ensure monitoring during the following spring run-off one year after construction to review effectiveness of the bank and slope re-vegetation, to check bank and bank stability and to ensure surface drainage has been maintained.	None.
Air Quality and Environmental Noise					
Air Quality	• Emissions from maintenance equipment and vehicles.	• Minimize duration and magnitude of emissions.	• Operation staff would operate vehicles in a manner that reduces air emissions to the extent practical, including: o Using multi-passenger vehicles to the extent practical o Avoid idling vehicles o Equipment and vehicles would be maintained in a manner that reduces air emissions, including: o Using mufflers and emission control systems as available; o Using catalytic converters as required; and, o Monitor vehicles and ensure compliance with the emissions requirements of the MOE and/or MTO; • As appropriate, records of vehicle maintenance will be retained and made available for periodic review by NRWC and/or the Operation and Maintenance Contractor.	• Adherence to Complaint Response Protocol • All vehicles identified through the monitoring program that fail to meet the minimum emission standards will be repaired immediately or replaced as soon as practicable.	• Any net effects are expected to be short-term in duration and highly localized.
Dust & Odour Emissions	• Dust emissions from operation and maintenance vehicles. • No potential for odour emissions.	• Minimize duration and magnitude of dust emissions. • Minimize disturbance to existing land uses.	• Maintaining equipment in good running condition and in compliance with regulatory requirements. • Dust suppression (e.g. water and/or calcium chloride) of source areas as necessary. • Covering loads of friable materials during transport.	• Adherence to Complaint Response Protocol.	• Any net effects are expected to be short-term in duration and highly localized.
Environmental Noise	• There are 2667 receptors within 1.5km of any turbine including 2032 non-participating occupied receptors, 539 non-participating vacant lot receptors and 96 participating receptors. • All non-participating receptors are greater than 550m from the centre point of any	• Ensure noise at all non-participating receptors meets MOE Guidelines. • Minimize duration and magnitude of noise emitted from maintenance	• Adherence to all noise setback requirements for both 124m hub height and 135m hub height tower. • Transformer substations are equipped with a noise attenuating barriers (4-sided noise wall at north transformer substation and 2-sided noise wall at south transformer substation, as per **Noise Assessment Report.**)	• Noise monitoring or acoustic auditing (if required) of all noise emissions, would be conducted in accordance with the REA for the Project including auditing of noise emissions at various times of year, wind speeds and locations in the Project Study Area.	• Net effects will be some noise emissions from the turbines and transformer but in compliance with the required MOE limits.

Table 5.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Net Effects
	turbine and show noise emissions less than 40 dBA in the **Noise Assessment** (**Appendix C**). • Noise emitted from a turbine and/or transformer substation during operation. • Noise emitted from maintenance equipment during operations and maintenance.	equipment.	• All engines associated with maintenance equipment would be equipped with mufflers and/or silencers in accordance with MOE and/or MTO guidelines and regulations. • Noise levels arising from maintenance equipment would also be compliant with sound levels established by the MOE. • Routine Project maintenance to ensure infrastructure is operating properly and efficiently. • To the greatest extent possible, operation activities that could create excessive noise would be restricted to regular business hours, when residents are less sensitive to noise, and adhere to any local noise by-laws and any requirements of the Occupational Health and Safety Act. • If maintenance activities that cause excessive noise must be completed outside of normal time frames, adjacent residents will be notified in advance and by-law conformity will occur, as required.	• Turbine shutdown in the event of a malfunctioning turbine or extreme weather event. • Turbine maintenance to ensure turbines are running properly and efficiently. • Adherence to Complaint Response Protocol. • In the event of a malfunctioning turbine which is resulting in noise emissions that are above MOE requirements, the problematic turbine(s) would be shut down until corrective measures are taken.	
Land Use and Socio-Economic Resources					
Areas Protected Under Provincial Plans and Policies	• No project components within the Oak Ridges Moraine Conservation Plan or the Lake Simcoe watershed.	• N/A	• N/A	• N/A	• N/A
	• A portion of the transmission line is located within existing road rights-of-way in the Protected Countryside of the Greenbelt Area Plan • Long term tree trimming and vegetation removal adjacent to the transmission line for lifetime of the project.	• Avoid and/or minimize negative impacts to key natural heritage features and key hydrologic features. • Optimize coordination with different infrastructure services.	• Design the transmission line with monopole structures, minimize pole structure height and maximize pole structure spacing. • Design the transmission line to minimize vegetation removal. • Follow existing municipal road right of way to avoid cross-country routes and minimize disturbance to natural features. • Route alignment through Greenbelt Area minimizes length traversed by the transmission line.	• See ‘Significant Flora and Vegetation Communities’ • See ‘Other Flora and Vegetation Communities •	• No anticipated significant net effects.
	• A portion of the transmission line is located within the Niagara Escarpment Plan Area within existing road rights-of-way. The line will be installed underground through the NEP Area. • No potential impacts during operation.	• N/A	• Obtain a Development Permit from the NEC prior to receipt of REA.	• N/A	• No anticipated significant net effects.
Existing Land Uses	• Temporary / minor increase in noise and dust levels during maintenance activities. • Minor increase in traffic.	• Minimize disturbance to existing land uses, including local businesses.	• See ‘Environmental Noise’. • See ‘Dust and Odour Emissions’.	• See ‘Environmental Noise’. • See ‘Dust and Odour Emissions’.	• No anticipated significant net effects.
Recreation Areas and Features	• Much of the land within 120 m of the Project Location is used for recreation purposes such as hunting, fishing, hiking and off-roading. • Recreational areas include the Mountainview Conservation Area, Bruce Trail and Wainfleet Rail Trail (Gord Harry	• Minimize disturbances to public’s use of recreation areas (i.e., hikers, bicyclists).	• Enforce maintenance vehicle speed limits of 30 km/hr when along the Wainfleet Rail Trail or any access roads which connect to the trail. • Notify NPCA in advance of any maintenance in the area. • Continue consultation with NPCA. • See “Dust & Odour Emissions” and “Environmental	• Consult with NPCA to confirm whether additional mitigation measures are required based on hiker comments or feedback. • Adherence to Complaint Response Protocol.	• No anticipated significant net effects.

Table 5.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Net Effects
	Trail). • The Lake Erie waterfront is approximately 600 m from the nearest project components. • There are no operation-related effects to the Bruce Trail and Mountainview Conservation Area recreation sites and the shores of Lake Erie. • There will be occasional maintenance vehicle access of the Wainfleet Rail Trail along the approximately 500m stretch between Elgin Road and Townline Road. Access would not require trail closure but has potential to cause disturbance to hikers through the generation of noise and dust. Consultation with the NPCA confirmed that the potentially affected portion of the Wainfleet Rail Trail is not currently open or maintained for public use. However, NPCA is considering opening this portion of the trail in the near future. • Temporary trail closure may be required in extreme cases where large equipment replacement is necessary.		Noise"		
Agricultural Lands and Operations	• Change in land use from agriculture to renewable energy development. • Noise and visual impacts to livestock. • Dust emissions associated with vehicular traffic during regular maintenance.	• Minimize disturbance to agricultural lands and operations.	• Landowners are financially compensated for the lease of private lands. • Change in land use in not permanent and will be returned to original land use at the end of the project life cycle. The condition of the land at the end of the project life cycle will be the same or better than original conditions. • Consultation was conducted with landowners to help minimize land disturbance when siting wind turbines and associated infrastructure. • Consultation with landowners will be continued during construction and post-construction to ensure that rehabilitation of temporary construction areas are adequately returned to their original land use to conditions that are the same or better than original conditions. • Communication with livestock owners. • Dust emissions are expected to be short-term in duration and highly localized; no mitigation measures required.	• Adherence to Complaint Response Protocol.	• No anticipated significant net effects.
Mineral, Aggregate, and Petroleum Resources	• No potential operation-related effects to mineral, aggregate and petroleum resources. • The nearest turbine to a pipeline is 654m.	• N/A	• Landowners are financially compensated for the land that would be taken out of production during the lifetime of the Project. • Additional studies to verify the location of known petroleum resources in proximity to Project components will be undertaken as part of the MNR's Approval, Permitting and Requirements Document	• None required.	• Primary and secondary aggregate deposits would be removed from future use where Project infrastructure overlays these deposits until the Project is

Table 5.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Net Effects
			(APRD) process. • Companies operating oil and gas pipelines in the area have been consulted regarding the Project regarding location of infrastructure and will be continue to be consulted through the REA process and detailed design , as appropriate. • Underground locates in the road allowance will be completed as needed prior to construction.		decommissioned. However, wind turbines are not considered permanent structures on the landscape.
Game And Fishery Resources	• Sensory disturbance to game species from noise. • Impediment of fish movement or water passage due to improperly installed culverts.	• Minimize disturbance to game and fishery resources.	• See 'Environmental Noise'. • Culverts installed such that there is no restriction of flows.	• See 'Environmental Noise'. • None required.	• Temporary and intermittent net effects are anticipated.
Local Traffic	• Short-term, localized disturbance to traffic patterns, increases in traffic volume, and/or creation of potential traffic safety hazards during regular maintenance. • Traffic on previously unopened road allowances.	• Minimize disturbance to local traffic.	• There may be infrequent instances where excess loads (e.g. turbine and transformer components) would require special traffic planning, widening turning radiuses and road widths and the creation of new ingress/egress nodes. • NRWC may provide notification of non-conventional load movements that may interfere with local traffic. • NRWC to execute Road Use Agreement with affected municipalities including a definition of upgrades, maintenance and use of unopened road allowances and general liability.	• Adherence to Complaint Response Protocol.	• A limited short-term effect on traffic during regular maintenance.
Viewscape	• Viewscape from areas surrounding the Project Location will be altered due to the presence of wind turbines, transformer substations, tap-in location and aboveground collector and transmission pole lines.	• Minimize potential for visual disturbance.	• Minimal mitigation measures are available to address concerns related to visual changes in the area due to the physical size of the turbines and poles. • Turbines will be painted light grey and distributed over the Project Study Area. • Turbine lights with the shortest allowable flash durations and longest allowable pause between flashes are preferred. • To the extent possible, no steady burning lights/floodlights will be used at the facility, including at the transformer substations. • Where feasible, full cutoff fixtures (those that reduce up-lighting) will be used for outdoor lighting at the transformer substations to mitigate light trespass on neighbouring properties and potential impacts on the nighttime environment. • NRWC will consult with Transport Canada and Nav Canada to minimize the number of turbines which are lit, based on the relevant regulations at the time of construction. • Collector line poles and transmission line poles will be monopole structures and designed with maximum spacing and minimum height practical to minimize visual impacts • A Landscaping Plan developed by the Construction Contractor will include recommendations for natural	• None.	• Net effect, either positive or negative based on perceptions, due to the change in viewscape of the surrounding area.

Table 5.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Net Effects
			• landscaping around chainlink fences. • See 'Heritage Resources'.		
Local Economy	• Increase in employment over the operation period. • Local economic benefits from land lease payments, municipal taxes, etc.	• Create positive effects on local economy.	• To the extent possible local hiring will be maximized. • NRWC will be contributing over $20 million to local communities through community vibrancy funds.	• None required.	• A positive net effect is anticipated on the local economy during the operation of the Project through the creation of jobs and use of local labour and suppliers. Approximately 12 full-time operation and maintenance staff would be employed during the operation phase. • Community vibrancy fund will support local projects and will be managed by local citizens. • A Niagara Community employment and contractors seminar is being planned for Spring 2013. • NRWC has engaged several Aboriginal communities to identify employment opportunities.
Existing Infrastructure					
Provincial, municipal, and other major infrastructure	• Excess loads during maintenance of large components would require special traffic planning. • Maintenance of transmission lines and collector lines could disrupt existing infrastructure at crossings of HONI transmission lines and railways.	• Minimize disturbance to Provincial, municipal, and other major infrastructure.	• Necessary permits would be obtained. • As appropriate, "pilot" vehicles will accompany non-conventional loads. • Public notification of unconventional load movements may occur. • Consultation with HONI and railway owners as appropriate.	• See 'Local Traffic'	• Net effect will be short-term and spatially limited.
Telecommunications Networks	• Potential to interfere with radio, TV, or internet signals (static ghosting, signal blockage, dynamic interference/pulsing) (RABC, 2010). • Potential to interfere with cellular telephone networks.	• Minimize interference with radio, TV, or internet signals. • Minimize interference with cellular telephone networks.	• NRWC has consulted with relevant agencies and licensed providers to identify any likely effects to telecommunication and radar systems.	• Adherence to Complaint Response Protocol. • NRWC would review potential incidents of telecommunications interference on a case by case basis. • In the unlikely event that signal disruption is experienced, contingency measures (at the cost of NRWC) may include: o Replacing the receiving antenna with one that has a better discrimination to the unwanted signals o Relocating either the transmitter or receiver o Switching to an alternate means of receiving the information.	• No anticipated significant effects.

Table 5.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Net Effects
				o Cellular coverage could be restored by installation of an additional cell tower or of one or more additional antennae on the existing cell tower.	
Aeronautical Systems	• Aeronautical obstruction. • Consultation with Nav Canada confirmed that the turbines will be visible to Hamilton and Toronto RADAR's at the Hamilton and Toronto with potential for the following impacts: - A large number of nuisance (false) primary radar targets; - A significant reduction in ability to identify and track primary surveillance targets; - Inability to provide full traffic information to aviation customers; - An increase in the controller's workload. - A decrease in flight safety for aircraft operation; and, - Increase to the Obstacle Clearance Circle (OCC) altitude at the Dunnville Airport.	• Minimize potential hazard to low flying aircraft. • Minimize impacts to Nav Canada RADAR's.	• Turbine lighting will conform to Transport Canada standards. In order to reduce rural light pollution, lights would be selected with the minimal allowable flash duration, narrow beam, and would be synchronized. • Consultation with Nav Canada and Transport Canada will confirm which turbines will require lighting – NRWC will aim to minimize the number of lit turbines. • Nav Canada confirmed that the potential effects on the RADAR systems can be mitigated with specific technical adjustments on a cost-recovery basis. NRWC and Nav Canada will enter into an agreement to ensure that all necessary technical adjustments are made to mitigate impacts. • Nav Canada would be responsible for updating all aeronautical charts with the turbine locations. • Low-level aircraft such as ultra-lights and crop dusters are to be familiar with the area they are flying over and are prohibited from night-time flights.	• Routine maintenance of the turbines and replacement of safety lighting in the event of malfunction. • Continued consultation with Nav Canada throughout the lifetime of the Project.	• No anticipated significant effects to aeronautical systems. • Low-level aircrafts such as crop dusters may need to re-route their paths or consult with NRWC when spraying is to occur.
Waste Management and Contaminated Lands					
Waste Generation	• Improper disposal of waste material may result in contamination to soil, groundwater, and/or surface water resources on and off the Project sites. • Litter may become a nuisance to nearby residences if not appropriately contained and allowed to blow off the site.	• Ensure proper disposal of waste.	• Implementation of a site-specific waste collection and disposal management plan, which may include good site practices such as: o Contractors will be required to remove all waste materials from the Project sites during maintenance activities; o All waste materials and recycling would be transported off-site by private waste material collection contractors licensed with a Certificate of Approval – Waste Management System; and, o Labeling and proper storage of liquid waste. • As appropriate, spill kits will be provided on-site. • Dumping or burying wastes within the Project sites will be prohibited. • Disposal of non-hazardous waste at a registered waste disposal site(s). • If waste is classified as waste other than solid non-hazardous, a Generator Registration Number is required from the MOE and the generator will have obligations regarding manifesting of waste. • Implementation of an on-going waste management program consisting of reduction, reuse, and recycling of materials. • See 'Spills'	• See 'Spills'.	No anticipated significant effects.

Table 5.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Net Effects
Spills	• Potential contamination from accidental spills.	• No spills.	• Refueling, equipment maintenance, and other potentially contaminating activities would occur in designated areas. • Spills will be reported immediately to the MOE Spills Action Centre, as applicable. • The two transformers will be mounted on foundations that have a secondary liquid containment storage area designed to capture the insulating fluid in the unlikely event of a leak. The liquid containment system is designed to hold all of the liquid from the transformers as well as any precipitation that may accumulate. • The TS will be operated in accordance with all applicable codes and standards including the Canadian Electrical Code and the Ontario Electrical Safety Code. • Development of Emergency Response Plan.	• Monitoring would be required following the unlikely event of contamination from an accidental spill or leak (method for monitoring may be developed in consultation with the Spills Action Centre of the MOE). • Contaminated soils would be removed and replaced as appropriate. • Emergency Response Plan will address procedures for response to spills including containment and clean-up materials and their storage locations. • Internal audits will be completed to confirm compliance with Monitoring and Emergency Response Plans.	No anticipated significant effects.
Public Health and Safety					
Turbine Blade and Structural Failure	• Potential risk to public health and safety from collision with failed components.	• No structural failure of the turbines or ancillary equipment.	• Adherence to required setbacks of turbines from homes, property lines and right of ways. • Design, install, operate, and maintain turbines according to applicable industry standards/certifications. • Use of lightning protection systems. • Training and education of staff operating the control system. • Familiarizing local municipal emergency response staff with Project facilities. • ENERCON Storm Control system recognizes high winds and controls wind turbine appropriately to reduce risk of damage.	• Inspections of turbines would occur after extreme events and contingency measures such as turbine shutdown would be implemented in the event of structural damage. • Turbine maintenance to ensure turbines are running properly and efficiently. • NRWC and/or the Operation and Maintenance Contractor would maintain a master Incident Report. Incident reporting would follow the requirements of the Occupational Health and Safety Act. • Emergency Response Plan will address procedures for response to incidents. • Internal audits will be completed to confirm compliance with Monitoring and Emergency Response Plans.	With adherence to safety policies and procedures, there is minimal increased or new risk to public health and safety.
Ice fall and shed	• Public Health and Safety from collision with ice.	• Limit potential for ice throw/shed to impact pedestrians.	• Adherence to required setbacks of turbines from homes, property lines and right of ways. • Design of turbine tower reduces ice accumulation (solid conical tower rather than latticed tower). • ENERCON blade de-icing system reduces chance of ice accumulation via an electric fan heater which maintains the surface of the blade to above 4°C. • If weather conditions cause ice formation on blades and de-icing system is not effective at removing the ice, the turbine controls detect ice formation and shut down the turbine until ice has gone.	• Inspections of turbines would occur after extreme events and contingency measures such as turbine shutdown would be implemented in the event of structural damage and/or icing to a turbine(s). • Turbine maintenance to ensure turbines are running properly and efficiently. • NRWC and/or the Operation and Maintenance Contractor would maintain a master Incident Report. Incident reporting would follow the requirements of the Occupational Health and Safety Act. • Emergency Response Plan will address	With adherence to safety policies and procedures, there is minimal increased or new risk to public health and safety.

Table 5.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Net Effects
				procedures for response to incidents. • Internal audits will be completed to confirm compliance with Monitoring and Emergency Response Plans.	
Extreme Weather Events	• Potential damage to project infrastructure from extreme weather events.	• No structural failure of the turbines or Project equipment.	• Project components have been designed to withstand the effects from extreme events (turbine is designed for gusts up to 59.5 m/s or 214 km/h). • Use of lightning protection systems. • Design, install, operate, and maintain turbines according to applicable industry standards/certifications. • Failsafe devices are capable of shutting down the turbine blades in the event of excessive wind conditions, imbalance, or malfunction of other turbine components. • ENERCON Storm Control system recognizes high winds and controls wind turbine appropriately to reduce risk of damage.	• See 'Turbine Blade and Structural Failure'.	With adherence to safety policies and procedures, there is minimal increased or new risk to public health and safety.
Third Party Damage	• Potential damage to towers from accidental collision from off-road and maintenance vehicles.	• No structural failure of the turbines or Project equipment.	• Access to the towers will be restricted to avoid potential accidents to unqualified persons.	• See 'Turbine Blade and Structural Failure'.	With adherence to safety policies and procedures, there is minimal increased or new risk to public health and safety.

6.0 Emergency Response and Communications Plan

The following sets out a description of the actions to be taken during all Project phases to inform public, municipal and government stakeholders of activities occurring at the Project site (including emergencies) and means by which stakeholders can contact NRWC and/or the Contractor. The following also identifies the means by which correspondence sent to NRWC and/or the Contractor would be recorded and addressed.

As appropriate, NRWC and/or the Contractor would review the Emergency Response and Communications Plan prior to and during each phase of the Project. Notification of any changes to the Emergency Response and Communications Plan would be provided to stakeholders as outlined in Section 6.0.

6.1 COMMUNICATION PLAN FOR EMERGENCIES

In the event of an emergency, NRWC and/or the Contractor would initiate the Emergency Response Plan (Section 6.0).

The plan would include key contact information for emergency service providers, a description of the chain of communications and how information would be disseminated between NRWC and/or the Contractor and the relevant responders. The plan would also indicate how NRWC and/or the Contractor would directly contact (via phone or in-person) Project stakeholders who may be directly impacted by an emergency so that the appropriate actions can be taken to protect stakeholders health and safety.

The communication plan for emergencies would be developed in collaboration with local emergency responders, and would be prepared following consultations with the relevant upper and lower tier municipalities including Township of West Lincoln, Town of Lincoln, Niagara Region, Haldimand County and Town of Pelham. Although there is no Project infrastructure proposed within the Town of Pelham, the Town's Fire Services would be consulted as they provide cross-border emergency services to the southeast corner of the Township of West Lincoln (which includes turbines T29, T78, T18 an). NRWC also intends to participate with these entities in familiarization sessions specific to the Project prior to Project construction.

6.2 EMERGENCY RESPONSE PLAN

The Emergency Response Plan would include plans for various emergencies. For instance, the Plan would include processes, roles and responsibilities for the proper handling of material spills and associated procedures to be undertaken during a spill event and specify containment and clean-up materials and their storage locations.

The Emergency Response Plan would include general procedures for personnel training. As appropriate, the Emergency Response Plan may cover response actions to high winds, fire

preparedness, evacuation procedures, and medical emergencies. Through initial discussions with local municipalities, while training opportunities for high angle rescue may be offered to municipal emergency staff, the responsibility for emergencies during construction and operation of the wind turbines will be the responsibility of NRCW and/or the Construction Contractor. Developing this plan with local emergency services personnel would allow the Proponent to determine the extent of emergency response resources and response actions of those involved.

6.3 COMMUNICATION PLAN FOR PROJECT UPDATES AND ACTIVITIES

NRWC and/or the Operations and Maintenance Contractor would engage with Project stakeholders during all phases of the Project including providing updates on the Project website (http://www.nrwc.ca/Projects.html). As a long-term presence in the area, NRWC would continue to develop contacts and to develop local relationships and channels of communication. Additional updates may be provided to stakeholders via letters/newsletters, newspaper notices, on municipal websites or direct contact.

6.4 COMMUNICATIONS AND COMPLAINT RESPONSE PROTOCOL

The following protocol will be developed for all Project phases to address any reasonable concern from the public and would be implemented by NRWC and/or the Contractor.

A telephone number for contacting NRWC and/or the Operations and Maintenance Contractor along with the mailing/e-mail address would be posted on the Project website (http://www.nrwc.ca/Projects.html) and provided directly to the upper and lower tier municipalities and the MOE. These would be the direct contact points for NRWC and/or the Operations and Maintenance Contractor during all phases of the Project.

The telephone number provided for the reporting of concerns and/or complaints would be equipped with a voice message system used to record the name, address, telephone number of the complainant, time and date of the complaint along with details of the complaint. All messages would be recorded in a Complaint Response Document to maintain a record of all complaints. NRWC and/or the Contractor would endeavor to respond to messages within 48 hours. All reasonable commercial efforts would be made to take appropriate action as a result of concerns as soon as practicable. The actions taken to remediate the cause of the complaint and the proposed actions to be taken to prevent reoccurrences of the same complaint in the future would also be recorded within the Complaint Response Document. If appropriate, the MOE Spills Action Centre would be contacted to notify them of the complaint.

Correspondence and reporting of complaints would be shared with other stakeholders, such as the MOE, as required and/or as deemed appropriate.

Ongoing stakeholder communication would allow NRWC and/or the Operations and Maintenance Contractor to receive and respond to community issues on an ongoing basis. The

next section discusses the Community Liaison Committee which is proposed to help facilitate this communication.

6.5 COMMUNITY LIAISON COMMITTEE

NRWC has proposed the draft terms of reference for a Community Liaison Committee (CLC) as a forum to communicate Project information and share concerns between interested residents, members of the public and the NRWC. The draft terms of reference are included in **Appendix F**. The CLC would be composed of up to 20 members including but not limited to residents and landowners within 2 km of any turbine and staff from NRWC and/or the Operations and Maintenance Contractor.

One of the key purposes of the CLC is to discuss issues or concerns relating to the operation and maintenance of the Project. The CLC will provide a forum for the public to share their concerns or complaints in an open and transparent process. NRWC and/or the Operations and Maintenance Contractor will also publicly share a summary of the Complaints Response Document at the CLC while maintaining anonymity for those members of the public who have issued complaints. This approach will ensure that NRWC and/or the Operations and Maintenance Contractor are accountable for responses to complaints and any required action. The CLC members will review and monitor the response times and actions taken for public complaints. The CLC members will also have an opportunity to evaluate and provide recommendations for improvement of the Complaints Response Protocol, if necessary.

The final terms of reference of the CLC will be determined through further consultation with the affected municipalities. The kick-off for the CLC is expected to be in the Spring of 2013.

6.6 PUBLIC SAFETY PLAN

In addition to the Public Safety Plan that would be developed by the Construction Contractor for the protection of public safety during the construction and decommissioning phases, NRWC and/or the Operation and Maintenance Contractor would prepare and implement a Public Safety Plan for operation of the Project. As previously noted and as appropriate, NRWC and/or the Operation and Maintenance Contractor would develop or have an existing operation training program to ensure personnel receive appropriate training in relation to operation and maintenance programs, environmental, health and safety procedures, and an Emergency Response and Communications Plan. Proper training would ensure operational safety for Project personnel. Operational safety to minimize potential risks to the public would include:

- Site access restrictions (with the exception of maintenance and emergency personnel);
- Development of an Emergency Response and Communications Plan; and
- Turbine design and adherence to construction standards.

Signage may include, but would not be limited to signs associated with potential risks at the Project. Signs may be posted in the vicinity of buried cables, high voltage equipment, and warning of the presence of maintenance vehicles along the access roads.

Access restrictions would include “No Trespassing” signs on the turbine access roads and turbine tower site. Access roads would not have restricted access (e.g. gates), thus allowing emergency vehicles to access the substation properties and all turbine locations in the event of an emergency.

As previously noted, during pre-operational mobilization NRWC and/or the Operation and Maintenance Contractor would finalize an Emergency Response and Communications Plan for the operational activities in collaboration with Niagara Region’s and Haldimand County’s Emergency Medical Services and municipal fire departments. The development of and proper execution of the Emergency Response and Communications Plan would help ensure public safety is maintained throughout the operation of the facility.

Potential risk to public safety as a result of extreme events such as fire, lightning, and tornadoes is low. The turbines have been designed with various protective measures to address extreme events to reduce the potential risk to public safety (See ‘Public Health and Safety’ in **Table 5.1**) . The turbines would adhere to marking and lighting requirements of the Aerodrome Safety Branch of Transport Canada. In addition, construction of the turbines would be completed according to stringent national and international codes.

7.0 Closure

The Niagara Region Wind Farm 'Design and Operations Report' has been prepared by Stantec for NRWC in accordance with Item 4, Table 1 of Ontario Regulation 359/09, and the draft guidance document "*Technical Guide to Renewable Energy Approvals"*. Information compiled in this report has been provided in association with Hatch Ltd., PCL Construction Ltd., ENERCON and the Niagara Region Wind Corporation.

This report has been prepared by Stantec for the sole benefit of NRWC, and may not be used by any third party without the express written consent of NRWC. The data presented in this report are in accordance with Stantec's understanding of the Project as it was presented at the time of reporting.

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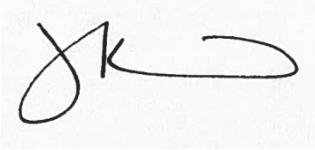

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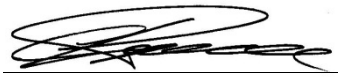

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