NIAGARA REGION WIND FARM
PROJECT DESCRIPTION REPORT

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Table of Contents

1.0 INTRODUCTION 1.1
1.1 PROJECT OVERVIEW 1.1
1.2 PROJECT LOCATION 1.2
1.3 REPORT REQUIREMENTS 1.3

2.0 GENERAL INFORMATION 2.1
2.1 KEY FACTS 2.1
2.2 AUTHORIZATIONS, PERMITS AND APPROVALS REQUIRED 2.2
2.2.1 Federal 2.2
2.2.2 Provincial 2.2
2.2.3 Municipal 2.3

3.0 PROJECT COMPONENTS 3.1
3.1 WIND TURBINE GENERATORS 3.1
3.2 ELECTRICAL INTERCONNECTION COMPONENTS 3.5
3.2.1 Collector Lines 3.5
3.2.2 Junction Boxes / Pad-Mounted Disconnect Switches 3.5
3.2.3 Fibre Optic Cables 3.6
3.2.4 Transformer Substations 3.6
3.2.5 Transmission Line and Tap-in Location 3.6
3.3 ACCESS ROADS 3.7
3.4 OPERATIONS AND MAINTENANCE BUILDING 3.8
3.5 METEOROLOGICAL TOWERS 3.9
3.6 WATER CROSSINGS 3.9
3.7 TEMPORARY WORK AREAS 3.10
3.7.1 Turbine Laydown/Staging Area and Crane Pad 3.10
3.7.2 Temporary Central Construction Laydown Areas 3.10
3.7.3 Temporary Access Road Features 3.10

4.0 KEY PROCESS FEATURES 4.1
4.1 WASTE GENERATION 4.1
4.1.1 Construction and Decommissioning 4.1
4.1.2 Operation 4.1
4.2 AIR EMISSIONS AND DUST GENERATION 4.1
4.2.1 Construction and Decommissioning 4.1
4.2.2 Operation 4.2
4.3 NOISE EMISSIONS 4.2
4.3.1 Construction and Decommissioning 4.2
4.3.2 Operation 4.2
4.4 HAZARDOUS MATERIALS 4.2
4.4.1 Construction and Decommissioning 4.2
4.4.2 Operation 4.2
4.5 SEWAGE 4.3
4.5.1 Construction and Decommissioning 4.3
4.5.2 Operation 4.3

Table of Contents

4.6 STORMWATER MANAGEMENT 4.3
4.6.1 Construction and Decommissioning 4.3
4.6.2 Operation 4.3
4.7 WATER-TAKING ACTIVITIES 4.4
4.7.1 Construction and Decommissioning 4.4
4.7.2 Operation 4.4
4.8 ACCIDENTAL SPILLS 4.4

5.0 PROJECT ACTIVITIES AND SCHEDULE 5.1
5.1 PROJECT ACTIVIES 5.1
5.2 PROJECT SCHEDULE 5.2

6.0 DESCRIPTION OF POTENTIAL ENVIRONMENTAL EFFECTS 6.1
6.1 METHODOLOGY 6.1
6.2 PROJECT RELATED SETBACKS 6.2

7.0 CLOSURE 7.1

8.0 REFERENCES 8.1

List of Tables

Table 1.1: Project Description Report Requirements (as per O. Reg. 359/09 – Table 1) 1.3
Table 2.1: Key Project Facts 2.1
Table 2.2: Key Federal Permits and Authorizations 2.2
Table 2.3: Key Provincial Permits and Authorizations 2.3
Table 2.4: Key Municipal Permits and Authorizations 2.4
Table 3.1: Basic Wind Turbine Specifications 3.2
Table 3.2: Wind Turbine Coordinates and Specifications 3.2
Table 5.1: Key Project Activities 5.1
Table 5.2: Project Schedule Overview 5.2
Table 6.1: Project Related Setbacks 6.2

List of Appendices

Appendix A Figures
Appendix B Legal Parcel Descriptions
Appendix C Turbine Specifications
Appendix D Summary of Potential Environmental Effects, Mitigation Strategies and Monitoring Plans

1.0 Introduction

The purpose of the Project Description Report is to describe the Project components, operation and construction activities, potential environmental effects and mitigation measures 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 as part of the requirements under Ontario Regulation 359/09 as amended by O. Reg. 333/12 (O. Reg. 359/09).

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. The Project Study Area is shown in **Appendix A**.

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). A 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 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, Figures 2.1 to 2.58**.

In total, during construction the Project components will cover approximately 335 hectares of land. Of this land, approximately 270 hectares will be temporarily disturbed during construction only and returned to original land use to the same condition or better after construction. The project components associated with the long term operations of the Project will cover approximately 65 hectares.

1.2 PROJECT LOCATION

In accordance with O. Reg. 359/09, the "Project Location" includes all land and buildings/structures associated with the Project and any air space in which the Project will occupy. This includes structures such as turbines, substations, access roads and power lines as well as any temporary work areas (the 'constructible area' for the Project within which all disturbed areas are contained) which are required to be utilized during the construction of the Project.

The Project site plan which depicts the Project Location during operation is provided in **Appendix A** (**Figure 1**). Detailed site plans, including natural and cultural heritage features, are also provided in **Appendix A** (**Figures 2.1** to **2.58**).

The "Project Study Area" was established to scope the siting of the proposed wind turbines, collector lines, access roads and temporary work areas. Similarly, the "Interconnector Study Area" was established to scope the location of the proposed 115kV transmission line, transformer substations and tap-in location. These two terms are intended to assist with background data collection and consultation, however have no formal definition or application under O. Reg. 359/09. **Appendix A** identifies both Study Areas, which include portions of the Townships of West Lincoln and Wainfleet and the Towns of Grimsby and Lincoln within the Niagara Region and within Haldimand County in Southern Ontario. 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.

For the purposes of the REA reports, the "Zone of Investigation" includes all land, air and water within 120 metres of the "Project Location" where site investigations are required and were completed in accordance with O. Reg. 359/09.

1.3 REPORT REQUIREMENTS

The Project Description Report has been prepared in accordance with Item 10, Table 1 of O. Reg. 359/09 which includes the requirements outlined in the table below.

Table 1.1: Project Description Report Requirements (as per O. Reg. 359/09 – Table 1)

Requirements	Completed	Section Reference
1. Any energy sources to be used to generate electricity at the renewable energy generation facility.	✓	2.1
2. The facilities, equipment or technology that will be used to convert the renewable energy source or any other energy source to electricity.	✓	3.0
3. If applicable, the class of the renewable energy generation facility.	✓	2.1
4. The activities that will be engaged in as part of the renewable energy project.	✓	4.0 and 5.1
5. The name plate capacity of the renewable energy generation facility.	✓	2.1
6. The ownership of the land on which the project location is to be situated.	✓	2.1
7. If the person proposing to engage in the project does not own the land on which the project location is to be situated, a description of the permissions that are required to access the land and whether they have been obtained.	✓	2.1
8. Any negative environmental effects that may result from engaging in the project.	✓	6.0 and Appendix D
9. If the project is in respect of a Class 2 wind facility and it is determined that the project location is not on a property described in Column 1 of the Table to section 19, a summary of the matters addressed in making the determination.	N/A	N/A
10. If the project is in respect of a Class 2 wind facility in respect of which section 20 applies 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), a summary of the matters addressed in making the determination.	N/A	N/A
11. An unbound, well marked, legible and reproducible map that is an appropriate size to fit on a 215 millimetre by 280 millimetre page, showing the project location and the land within 300 metres of the project location.	✓	Appendix A

2.0 General Information

2.1 KEY FACTS

Key facts providing an overview of the Project are provided in **Table 2.1** below.

Table 2.1: Key Project Facts

Fact	Project Info	
Name of the Project	Niagara Region Wind Farm	
Proponent / Applicant	Niagara Region Wind Corporation	
Project Location	Project is located within the Townships of West Lincoln and Wainfleet and the Town of Lincoln within the Niagara Region and within Haldimand County in Southern Ontario. See **Appendix A**.	
Land Ownership	Project components will be primarily on privately owned lands and within municipal right of ways through agreements with local landowners and municipalities. A section of access road and collector line is also on land owned by the Niagara Peninsula Conservation Authority. Lease agreements are in place for all lands hosting wind turbines, construction laydown areas and the transformer substations. Negotiations are still ongoing between NRWC and some municipalities and the NPCA for lease agreements to secure the location of some ancillary uses including access roads and collector line. All lease and road-use agreements will be in place prior to the start of construction.	
Legal Description of the Land	See Appendix B.	
Energy Sources	Wind energy – no supplementary fuel sources will be used	
Class of Facility	Class 4 Wind Facility	
Nameplate Capacity	230 MW	
Contact Information	Contact information for the proponent / applicant and consultant is as follows:	
	Darren Croghan Niagara Region Wind Corporation Vice President, Project Development 277 Lakeshore Road East, Suite 211 Oakville, ON L6J 6J3	J.A. (Al) Leggett, BA, MCIP, RPP Stantec Consulting Ltd. Project Manager 300-675 Cochrane Drive Markham, ON L3R 0B8
	Project Website: www.nrwc.ca Project Email: info@nrwc.ca Project Telephone: 905-390-3306 or 1-855-720-2892 (toll free)	

2.2 AUTHORIZATIONS, PERMITS AND APPROVALS REQUIRED

At the federal, provincial and municipal level, a number of permits, licenses, approvals and authorizations will be required to facilitate the development of the Project, in addition to the REA. The ultimate applicability of all permits, licenses and authorizations will be determined and based on the Project's detailed design.

2.2.1 Federal

A screening was undertaken to determine the applicability of the *Canadian Environmental Assessment Act* (CEAA) and federal environmental assessment process to the Project. The screening concluded that no 'triggers' have been identified under the CEAA.

Despite no requirement to conduct a CEAA screening, the agency consultation program for the Project will include all federal departments and agencies typically interested in wind power projects (e.g., Department of National Defense, Environmental Canada, Transport Canada, etc.). All required federal permits and approvals required for the Project will be determined during the REA process, but may include those listed in **Table 2.2**.

Table 2.2: Key Federal Permits and Authorizations

Permit / Authorization	Administering Agency	Rationale
Aeronautical Obstruction Clearance	Transport Canada – Aviation Division	Turbine lighting and marking
Land Use Clearance	NavCanada	Aeronautical safety mapping and designations
Navigational Clearance	Transport Canada – Marine Division	Crossing a navigable watercourse
Harmful Alteration, Disruption or Destruction (HADD) of fish habitat	Department of Fisheries and Oceans	Watercourse crossings that result in unmitigable loss or impact to fish habitat (to be screened by Conservation Authorities).

2.2.2 Provincial

At the provincial level there are a number of permits and approvals that may be required to facilitate the development of the Project, in addition to the REA. Their ultimate applicability will be determined during the REA process and based upon the Project's detailed design. **Table 2.3** lists the key permits and approvals that are required.

Table 2.3: Key Provincial Permits and Authorizations

Key Permit / Authorization	Administering Agency	Rationale
Approval of Connection	Independent Electricity System Operator (IESO)	Electrical interconnect with IESO regulated network
Connection Assessment	IESO	Integration of project with IESO-controlled transmission system
Customer Impact Assessment	Hydro One Networks Inc. (HONI)	Integration of project with Hydro One and effects to customers
Connection Cost Recovery Agreement (CCRA)	HONI	Recovery of costs to grid operator of changes to allow connection
System Impact Assessment	IESO	Integration of project with IESO-controlled transmission system
Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses Permit	Niagara Peninsula Conservation Authority (NPCA) and/or Grand River Conservation Authority (GRCA)	Work within floodplains, water crossings, river or stream valleys, hazardous lands and within or adjacent to wetlands. Projects will be screened on behalf of the Department of Fisheries and Oceans (DFO) by the Conservation Authorities.
Development Permit	Niagara Escarpment Commission (NEC)	Proposed transmission line crosses through the Niagara Escarpment Plan Area.
Certificate of Inspection	Electrical Safety Authority (ESA)	A record that electrical work complies with the requirements of the Ontario Electrical Safety Code.
Generator's License	Ontario Energy Board (OEB)	Generation of electrical power for sale to grid
Leave to Construct	OEB	Authorization to construct power transmission lines
Notice of Project	Ministry of Labour	Notify the Ministry of Labour before construction begins.
Special vehicle configuration permit	Ministry of Transportation (MTO)	Use of non-standard vehicles to transport large components
Transportation Plan	MTO	Adherence to road safety and suitability
Highway Entrance Permit	MTO	Entrance permit for new or upgraded road entrances onto a provincial highway Interference or obstruction of the highway
Change of Access and Heavy/Oversize Load Transportation Permit	MTO	Compliance with provincial highway traffic and road safety regulations
Wide or excess load permit	MTO	Transportation of large or heavy items on provincial highways
Public Lands Act	Ministry of Natural Resources (MNR)	Crossing the Welland River or other navigable waterways deemed to be public lands
Endangered Species Act	MNR	Disturbance or disruption of protected species or their habitats (temporary or permanent)
Building and Land Use Permit	MTO	For any building structure within proximity to a provincial highway (Highway 3)

2.2.3 Municipal

Several permits and authorizations may also be required from the Townships of West Lincoln and Wainfleet and the Town of Lincoln within the Niagara Region and within Haldimand County, as listed in **Table 2.4**.

Table 2.4: Key Municipal Permits and Authorizations

Key Permit / Authorization	Rationale
Municipal Consent, Work within the R.O.W (Road Use Agreements)	Required for works in municipal road allowances
Consent/Severance Application	Required if easements over private lands required
Road Cut Permit	May be required for access roads off of county roads or works to county roads
Pre-Condition Survey	Assessment of pre-construction conditions for engineering staff
Building Permit	Compliance with building codes
Entrance Permit	Entrance from county roads
Transportation Plan	Adherence to road safety and suitability
Additional Plans related to general engineering (e.g. siltation control, lot grading, plan of services, etc.), water, wastewater, storm water, transportation, emergency services, construction and geotechnical	Supporting information/plans required by the Townships of West Lincoln and Wainfleet and the Town of Lincoln within the Niagara Region and within Haldimand County

3.0 Project Components

This section provides a description of the major equipment and infrastructure associated with operation and construction of the Project including:

- Wind turbine generators;
- Electrical interconnection components, including:
  - Collector Lines;
  - Junction Boxes / Pad-mounted Disconnect Switches;
  - Fibre-optic cables;
  - Transformer Substations; and
  - Transmission Line and Tap-in Location;
- Access roads;
- Meteorological Towers;
- Water Crossings; and
- Temporary Work Areas.

The locations of these components are shown in **Figures 2.1** to **2.58** in **Appendix A**.

3.1 WIND TURBINE GENERATORS

The Project will include 77 ENERCON wind turbine generators (80 potential locations identified) each with a rated capacity ranging from approximately 2.3 MW to 3.0 MW with a maximum installed nameplate capacity of 230 MW.

The selected wind turbine models for the Project are the ENERCON E101 and either the ENERCON E82 or a de-rated ENERCON E101 to achieve the contract capacity of 230 MW. Specifications of the E101 and E82 turbines are summarized below in **Table 3.1** and provided in **Appendix C** as well as in detail in the **Wind Turbine Specifications Report** provided under separate cover.

Both wind turbine models have been assessed with two hub height options (124m and 135m) in the REA application to provide operational flexibility. Final selection between the turbine models and hub heights will be determined during detailed design. The E101 turbine has higher sound emissions and a larger blade length than the E82. As a result, for the Technical Studies such as the **Natural Heritage Assessment / Environmental Impact Study**, **Water Body and Water Body Assessment Report**, **Stage 1 and 2 Archaeological Assessments**, **Protected Properties Assessment** and **Heritage Impact Assessment**, all turbines are assumed to be E101 turbines to account for the worst case scenario for feature setbacks and identification of potential negative impacts.

Some specific wind turbine model and hub height constraints have been identified through the **Noise Assessment Report**. Operational flexibility will not be provided for nine turbines which will have a hub height of 135m (T18, T36, T45, T46, T47, T53, T55, T60 and T74). Three of these nine turbines (T36, T46 and T53) will also be either E82 turbines or de-rated E101 turbines, the selection of which will be determined during detailed design on condition that the final selection meets the noise emission limits highlighted in the **Noise Assessment Report**. Additional information with respect to the sound power level for the ENERCON E101 and E82 turbines is provided in the **Noise Assessment Report** (**Appendix C** of the **Design and Operations Report** provided under separate cover).

Table 3.1: Basic Wind Turbine Specifications

Manufacturer	ENERCON	ENERCON
Model	E101	E82
Name plate capacity (MW)	3.0 MW	2.3 MW
Hub height above grade	124 m or 135 m	135m
Blade length	48.6m	38.8m
Rotor diameter	101 m	82m
Blade sweep area	8,012 m^2	5,281 m^2
Rotational Speed	Variable, 4 – 14.5 rpm	variable, 6 - 18 rpm
Noise Level	104.8 dBA	103.3 dBA
Frequency spectrum	50 Hz or 60 Hz	50 Hz or 60 Hz

Table 3.2 identifies the coordinates of the proposed wind turbines at the locations shown on the Site Plan in **Appendix A**.

Table 3.2: Wind Turbine Coordinates and Specifications

Turbine identifier	Location Coordinates (UTM 17 NAD 83)		Notes*	
	X – Easting [m]	Y-Northing [m]	Hub Height	Turbine Model
T01	622986	4765745		
T02	627380	4765942		
T03	629891	4763588		
T04	627524	4767740		
T05	621171	4747754		
T06	623096	4767244		
T07	618636	4764053		
T08	614545	4764911		
T09	616790	4762576		
T10	623259	4758990		
T11	620836	4756609		
T12	621135	4756407		
T13	621410	4756122		
T14	624137	4748807		
T16	624153	4749243		

Table 3.2: Wind Turbine Coordinates and Specifications

Turbine identifier	Location Coordinates (UTM 17 NAD 83)		Notes*	
	X – Easting [m]	Y-Northing [m]	Hub Height	Turbine Model
T18	630123	4766229	135m tower	
T19	620380	4755516		
T20	620627	4749341		
T21	625004	4748242		
T22	624829	4748510		
T23	627540	4748974		
T24	627752	4750239		
T27	622535	4768708		
T28	622517	4769096		
T29	628498	4763100		
T31	625150	4765821		
T32	624780	4764410		
T33	626969	4765950		
T34	626486	4764591		
T35	627164	4764483		
T36	622379	4763063	135m tower	E82 or de-rated E101
T37	623038	4758881		
T38	620669	4765752		
T39	617349	4764279		
T41	620998	4756851		
T42	619935	4753628		
T43	624815	4748952		
T44	624350	4748471		
T45	623160	4748650	135m tower	
T46	622737	4748968	135m tower	E82 or de-rated E101
T47	622483	4748447	135m tower	
T48	624687	4749283		
T49	626836	4748915		
T51	617020	4762752		
T52	614215	4766531		
T53	614456	4766402	135m tower	E82 or de-rated E101
T54	619944	4765594		
T55	623610	4764393	135m tower	
T56	626599	4768825		
T57	624435	4768696		
T58	628473	4767629		
T59	629964	4767676		
T60	630277	4767682	135m tower	
T61	625177	4747970		

Table 3.2: Wind Turbine Coordinates and Specifications

Turbine identifier	Location Coordinates (UTM 17 NAD 83)		Notes*	
	X – Easting [m]	Y-Northing [m]	Hub Height	Turbine Model
T62	621877	4751311		
T63	621609	4751032		
T65	622984	4754679		
T66	619127	4768529		
T72	620828	4757122		
T74	621656	4763002	135m tower	
T75	621357	4764543		
T76	623640	4765719		
T78	628581	4764783		
T79	630384	4771637		
T80	630186	4771984		
T81	616343	4766967		
T82	618390	4754915		
T83	615821	4770715		
T84	622487	4753393		
T85	619136	4769108		
T88	615816	4771059		
T89	623216	4753160		
T91	620504	4756521		
T93	618324	4767127		
T94	618752	4768764		
T97	617215	4765642		
T98	617982	4753043		
T99	619208	4749224		
T95	622817	4760851		
T96	621423	4750668		

*Note: All turbines are ENERCON E101 models with tower heights at either 124m or 135m unless otherwise specified above, in accordance with the Noise Assessment Report.

The direct-drive generator of the E101 and E82 wind turbines produce direct current (DC) power at varying voltages and frequency, dependent on the hub's rotational speed. From the generator, a rectifier and cables run the 400V DC generated power down the turbine tower to an inverter, contained inside the base of the tower, which converts the DC power to alternating current (AC) power. A step-up transformer contained inside the base of the tower transforms the power from 400V to the standard distribution level voltage of 34.5 kV. From the step-up transformer, the power is brought through 34.5 kV switchgear also contained within the base of the tower, to the collector system.

The turbine foundation will be composed of poured in place reinforced concrete. Foundation design will vary based on site specific geotechnical assessments and could be either a gravity

spread type foundation, or pile-type foundation with or without rock anchors. The foundation will be up to 25 m in diameter and up to 5 m deep. Steel anchor bolts and embedded steel rings will further support the foundation at larger depths. The foundation will also have conduits for electrical power cables and a grounding grid consisting of copper wire and ground rods.

3.2 ELECTRICAL INTERCONNECTION COMPONENTS

3.2.1 Collector Lines

From the turbine switchgear, underground 34.5 kV collector lines carry the power to the municipal road allowances along the turbine access roads or other defined routes. Along the municipal road allowances, underground and/or overhead collector lines on new poles organized into several circuits will transport the power to one of the transformer substations.

Overhead lines will be installed on poles that will be designed to meet the requirements of the local distribution companies, and in some cases, the assets of the local distribution companies may share the poles with the project assets or be buried underground. Wood monopoles will be used where feasible, but some concrete or steel monopoles may be required to avoid guy wires spanning outside of municipal road allowances (to be confirmed during detailed design).

The monopoles carrying the collector lines will vary in height depending on the number of circuits installed. A minimum pole height of approximately 19 m and maximum pole height of approximately 25 m is expected with varied pole spacing up to 60 m (subject to detailed design).

Collector lines are proposed to be installed overhead or underground at two of the wetland crossings, specifically over the Welland River and Welland Feeder Canal (construction method subject to confirmation during detailed design). All other collector lines on private properties will be installed underground, including where they are proposed to cross wetland or woodland features. Both installation options have been considered in the **Natural Heritage Assessment and Environmental Impact Study**. Details on the method of installation are provided in the **Construction Plan Report**.

3.2.2 Junction Boxes / Pad-Mounted Disconnect Switches

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. The unit is safe to touch and locked to prevent unauthorized entry. The units are brought to site by truck and lowered onto cast-in place concrete pads. Collector lines are fed into the box from underground.

All junction boxes / pad-mounted disconnect switches are located within road right-of-ways along the same route as the collector lines, typically where an access road enters a municipal road.

3.2.3 Fibre Optic Cables

Fibre optic cables will be installed along similar routes as the collector and transmission lines to provide a communication connection for each turbine to monitor individual performance and control the turbine as required. These cables will be installed underground and/or overhead along the same alignments as the power collection lines, with the exception of some minor deviations.

3.2.4 Transformer Substations

There are two transformer substations (TS) located on private land each centralized in the north half and south half of the Project Study Area.

At each TS, voltage is stepped up from 34.5 kV to 115 kV via a main step-up transformer. These transformers will be located at the following UTM coordinates (see **Figures 2.39** and **Figure 2.47**):

- North Transformer (621937, 4761727)
- South Transformer (622837, 4754679)

These transformers will each be rated 100 MVA as a base rating, with two stages of cooling (via fan). The TS will each be enclosed with fencing and warning signage to alert the public. An area approximately 100 m x 100 m will be graded and laid with granular material. The electrical equipment within the substations will include the transformer, cooling fans and switchgear, which will be supported by concrete foundations, either cast-in place or pre-cast slabs.

The two power transformers will be mounted on concrete foundations. The north transformer will have a sound barrier on all four sides approximately 5 metres in height. The south transformer will have a sound barrier on the south and west sides approximately 5 metres in height. The 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 designed to hold all of the liquid from the transformers as well as any precipitation that may accumulate.

The transformer substations will be operated in accordance with all applicable codes and standards including the Canadian Electrical Code and the Ontario Electrical Safety Code.

Operation, monitoring and control of the transformer substation will be conducted 24-hours a day via a telecommunication system.

3.2.5 Transmission Line and Tap-in Location

To facilitate the Project's connection to the provincial grid, a new 115 kV transmission line approximately 44 km in length will be constructed as part of the Project. A preferred transmission line route has been identified in the REA, as well as some alternate transmission

line routes where further consultation with municipalities and local distribution companies will help to select the most ideal route. The routes for the preferred and alternate transmission lines have all been assessed and are shown in **Appendix A**.

The poles of the transmission line will be approximately 23 m in height and vary in spacing from approximately 60m to 100m as required (subject to detailed design). Smaller spans or taller poles may be required (subject to detailed design), including in some areas where narrow rights of way, angles or unforeseen problems or unforeseen obstructions necessitate. Wood, steel or concrete monopoles will be used.

The transmission line will be installed overhead along municipal road right of ways, and either overhead or underground where it is proposed to cross the Welland River and associated wetland. Through the approval of a Development Permit from the Niagara Escarpment Commission, the transmission line will be buried within the municipal right of way along Mountainview Road where it crosses the Niagara Escarpment Plan Area. The transmission line will also continue underground to the tap-in location, and may be buried along other sections of the transmission line route as required or determined through detailed design (i.e. clearance beneath existing HONI transmission lines). Both underground and overhead options have been considered in the **Natural Heritage Assessment and Environmental Impact Study.** Details on the methods of installation are provided in the **Construction Plan Report**.

Underground sections of the transmission line would be installed in PVC conduits in a steel-reinforced concrete-encased ductbank with a cross-section approximately 2m x 2m. The ductbank would be installed at least 1m deep but potentially deeper when intersecting existing infrastructure or natural features (i.e., water crossings). Concrete cable chambers approximately 4m x 3m x 3m would be installed approximately every 750m along the underground transmission line route.

The transmission line will connect to the existing Hydro One Networks Inc. 115 kV transmission line (Q5G), which runs parallel to the south side of the QEW and intersects Mountainview Road in Lincoln. This connection occurs at the tap-in location, also known as the Interconnector Station and Point of Common Coupling. At this tap-in location, the Interconnector Station will receive the underground 115 kV transmission line and connect to the overhead HONI 115 kV transmission line. The tap-in location will also include the necessary equipment for power isolation, main circuit protection, communication with HONI and revenue metering. The tap-in location will include pad-mounted equipment on a graded surface surrounded by a chain link fence and accessed via a private access road with warning signage. The size of the station will be approximately 40m by 50m.

3.3 ACCESS ROADS

Existing provincial and municipal roads will be used to transport project-related components, equipment and personnel to the Project Study Area. The Project will be installed on private land and within municipal road right of ways. Access to these lands will be required for installation

and operation of the project components including wind turbines and the transformer substations.

Existing agricultural laneways have been utilized for the routing of new or upgraded access roads, where possible. New access roads will be constructed as required to provide access to the individual turbine sites. During construction, these roads will be up to 15 m wide to be traversable by crawler cranes as crane paths. Along the roads will also be another temporary 5 m used for access road staging for a total width of 20m during construction. Access roads will be generally reduced after construction to a permanent width of approximately 6m but may vary in size or location based on landowner preference. Access roads will be constructed of gravel, native materials, and/or engineered fill, with the base of the access roads stabilized using cement/soil stabilizing agent. In some instances, a woven geotextile may also be utilized with a reduced granular material depth.

Access roads will require entrances off of municipal, county and provincial roads. Entrances will be approximately 15m wide during construction and reduced to 6m wide for the lifetime of the Project. The entrance additionally requires an obstruction-free area approximately 60m wide to facilitate the turning radius of the large components (i.e., blades). Detailed design will confirm whether the temporary relocation of existing hydro poles, sign posts or other obstructions will be required.

Turbine siting in some locations requires the use of unopened road allowances to access otherwise land-locked properties or properties where access is restricted due to existing natural features. Unopened road allowances are also proposed as a means to avoid disturbance to area residences during construction (i.e. cottage development along North Shore Drive in Wainfleet). 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.

3.4 OPERATIONS AND MAINTENANCE BUILDING

A facility is required to provide warehouse and workshop spaces, administrative offices, telecommunications areas, outdoor and indoor equipment storage and security facilities, as required for operations and maintenance. An existing building in proximity to the Project will be used by ENERCON as the operations and maintenance building. However, no new facilities are required for this purpose.

3.5 METEOROLOGICAL TOWERS

Meteorological (met) towers and Sonic Detection and Ranging devices (SODAR) are used to monitor environmental conditions such as wind speed, air pressure and temperature. These features help in the efficient planning and operation of wind farms.

A met tower is a latticed tower structure up to 135m tall (depending on selected turbine tower height), which hosts measuring devices along the outside of the tower to record environmental conditions (i.e. wind speed, wind direction) at different heights. The existing lattice met towers currently installed on private land across the Project Study Area will be used as permanent met towers to comply with the requirements of the Independent Electricity System Operator (IESO). No new met towers will be installed.

A SODAR device is a mobile trailer approximately 3 m high, 4 m wide and 4 m deep, depending on the model selected. The device emits a short sound pulse to measure the attributes of the wind. The sound pulse is changed by the motion and turbulence of the atmosphere and some sound is reflected back to the device. The changes are interpreted by the device to determine qualities such as wind speed, wind direction, and turbulent character. Approximately four SODAR units will be utilized throughout the Project Study Area on private land and outside of significant natural features. The exact locations of the SODAR units will vary as these mobile devices will be relocated at different times. The SODAR units are likely only to be used in the early years of operation.

The existing met towers and portable SODAR units are not part of the REA application and do not require approval under O. Reg. 359/09. This information has been provided for reference only.

3.6 WATER CROSSINGS

Access roads, including underground collector lines and fibre optic cables, will require crossing of permanent and intermittently flowing watercourses, as well as small surface drainage features (e.g., swales). To avoid flooding and to maintain pre-construction flow patterns, flow conveyance will be accommodated at these crossings through the installation of culverts beneath the proposed access roads, the size and location of which will be confirmed during detailed design. The proposed location of culverts at watercourse crossings are illustrated on **Figures 2.1** to **2.58** (**Appendix A)**, while the exact location of the swale culverts will be determined during detailed design and field fit on site during construction.

All regulatory watercourse crossings associated with access roads will require approval from the Niagara Peninsula Conservation Authority (NPCA) or Grand River Conservation Authority (GRCA) prior to construction. The design of these structures will account for the policies of these agencies, as well as potential impacts on fish and fish habitat. All temporary crossings would comply with the DFO's Ontario Operation Statement '*Temporary Stream Crossings*', where possible.

3.7 TEMPORARY WORK AREAS

All temporary work areas are illustrated on **Figures 2.1** to **2.58** (**Appendix A**) as being within the constructible area for this Project. "Constructible Areas" have been identified surrounding the various Project components, which include temporary work areas, laydown/staging areas or areas within which some disturbance may occur during construction. No permanent structures are proposed within these areas, with the exception of the Project components noted above.

3.7.1 Turbine Laydown/Staging Area and Crane Pad

A temporary turbine laydown/staging area and crane pad will be located at the base of each turbine. The temporary turbine laydown/staging area will be approximately 100m x 120m and will be graded and laid with granular material. The temporary crane pad will be located within the turbine laydown/staging area but will be approximately 25 m x 60m laid with additional granular material to provide sufficient support to the crane during construction. Crane mats may also be used within the turbine laydown/staging area.

After construction both areas will be returned to their original land use at conditions that are either the same or better than original conditions.

3.7.2 Temporary Central Construction Laydown Areas

Two potential construction staging areas have been identified: (a) adjacent to the north transformer substation on Canborough Road (**Figure 2.39**) and (b) east of Turbine 31 on the north side of Vaughn Road (**Figure 2.28**). Both potential areas are centrally located in the Township of West Lincoln. These areas will be graded and laid with granular material for storage of various project components throughout the construction phase. A site trailer will be located on one of these areas as well for the duration of the construction phase. These areas will be returned to their original land use after construction (agricultural) to conditions that are either the same or better than original condition.

3.7.3 Temporary Access Road Features

Temporary access road features include delivery truck turnaround areas, for-construction access roads and access road staging areas. Turnaround areas have been shown as access roads on the Site Plan (**Figures 2.1** to **2.58**) whereas the for-construction access roads and staging areas have been shown together as the "access road 20m construction area" on the Site Plan.

Turnaround areas are provided to allow large delivery trucks enough space to pull in and out of turbine laydown areas so as to avoid the unsafe practice of reversing out onto municipal roads. These turnarounds will be the same width as access roads and may be removed after construction.

Access road staging areas will host equipment, materials and construction vehicles during the construction of the access roads. These staging areas will be 5m wide immediately adjacent to

the 15m wide for-construction access roads for a total disturbed area of 20m along the access roads during construction.

4.0 Key Process Features

The following sections provide a summary of key process features as identified in MOE's guidance document "Technical Guide to Renewable Energy Approvals" (MOE, 2012). These features are discussed in detail under separate cover in the **Design and Operations Report** and **Construction Plan Report**.

4.1 WASTE GENERATION

4.1.1 Construction and Decommissioning

During construction and decommissioning, waste material will be generated at, and transported from, the Project Location. Waste material produced by the Project is expected to consist of construction material (e.g., excess fill, soil, brush, scrap lumber and metal, banding, plastic wrap removed from palletized goods, equipment packaging, grease and oil, steel, etc.) and a minor amount of domestic waste (i.e., garbage, recycling and organics). Similar waste material may be generated during decommissioning. These materials will require shipment offsite for reuse, recycling, and/or disposal at an appropriate regulated off-site facility.

Soil excavated for installation of Project infrastructure will be re-used on site as feasible. Although not anticipated, if soil disposal on-site is not feasible, the soil will be disposed of at a regulated off-site facility to be determined by the Construction Contractor.

4.1.2 Operation

Through operation and maintenance, lubricating and hydraulic oils would be used and waste materials such as oil, grease, batteries, and air filters and a minor amount of domestic waste (i.e., garbage, recycling, and organics), would be generated. The Project will require approximately 12L of grease per turbine per year. No oil is required for maintenance as the direct-drive generator system does not have a gear-box contained in oil. There is no hydraulic fluid used in the Enercon turbines.

Used grease and all wastes would not be stored on-site but rather handled and recycled or disposed of in accordance with regulatory requirements.

4.2 AIR EMISSIONS AND DUST GENERATION

4.2.1 Construction and Decommissioning

During construction, dust and emissions will be generated as a result of operating heavy equipment and due to construction related traffic and various construction activities (e.g., excavation, grading, etc.). Similar emissions may be expected during decommissioning.

4.2.2 Operation

Wind turbines are a clean source of renewable energy and do not emit any harmful air emissions or particulate matter. Operations related traffic from personnel vehicles and waste management haulers during regular business hours will create dust in the immediate vicinity of the Project, however, effects are anticipated to be intermittent, short-term in duration and highly localized.

4.3 NOISE EMISSIONS

4.3.1 Construction and Decommissioning

During construction, acoustic emissions will be generated as a result of operating heavy equipment and due to construction related traffic and various construction activities (e.g., excavation, grading, etc.). Similar emissions may be expected during decommissioning.

4.3.2 Operation

Mechanical and aerodynamic noise will be emitted from the wind turbines in addition to environmental noise from the transformers located at the substations. A **Noise Assessment Report** has been undertaken for the Project in accordance with the MOE *Noise Guidelines for Wind Farms* and O. Reg. 359/09 (provided within the **Design and Operations Report**). The Project has been designed to ensure that any non-participating receptors are greater than 550m from any turbine and that noise emissions do not exceed 40 dBA at these receptors.

4.4 HAZARDOUS MATERIALS

4.4.1 Construction and Decommissioning

Hazardous materials are limited to fuels and lubricants that will be on-site for use in equipment. These materials will be stored in appropriate storage containers (within construction laydown areas) during the construction phase by the construction contractor. Usage and storage of hazardous materials will be in accordance with applicable regulations. Similar methods are expected to be applied during decommissioning.

4.4.2 Operation

Hazardous materials to be used during the course of Project operation are limited to lubricants and fluids for the operation and maintenance of the wind turbines, the transformer substations, and other equipment. These materials will be brought to the Project Location by the facility operator in accordance with applicable regulations. During operation wind turbines do not generate any other hazardous materials or by-products.

4.5 SEWAGE

4.5.1 Construction and Decommissioning

Sanitary waste generated by the construction and decommissioning crews will be collected via portable toilets and wash stations supplied by a contracted third party. Temporary bathroom facilities will be provided during construction via an aboveground 2000 gallon sewage holding tank and 1000 gallon water tank. The unit will be located at the central construction laydown area at the north TS. In addition, small portable toilet and wash station units will be temporarily installed at each turbine site. Weekly disposal of these wastes will be the responsibility of the contracted party and will be done in accordance with regulatory requirements. The units will be removed after construction.

4.5.2 Operation

No sewage will be generated during the operation of the Project.

4.6 STORMWATER MANAGEMENT

4.6.1 Construction and Decommissioning

During construction and decommissioning, proper grading will be conducted and mitigation measures implemented to minimize erosion and sedimentation at the work areas. These mitigation measures may include minimizing the cleared areas, installation of erosion control fencing, check dam structures in ditches/swales, or installation of erosion control matting as appropriate.

4.6.2 Operation

As per the MOE *Stormwater Management Planning and Design Guidelines Manual* (2003) the total drainage area associated with the transformer substations and access road “hard” surfaces is less than 2 ha per site and therefore a “wet” water quality control pond is not required.

Area drainage from the substations will be accomplished through swales/ditches adjacent to the proposed access road that will collect and convey runoff from the substation areas and the associated access road.

The swales will also provide water quality control, which is a suitable stormwater management practice for such an area according to the MOE guidelines. Where required, culverts properly fitted and sized will be installed at water crossings and swales to ensure that original drainage patterns are maintained and to prevent flooding either upstream or downstream of the access roads.

4.7 WATER-TAKING ACTIVITIES

4.7.1 Construction and Decommissioning

There is potential for groundwater to be encountered during the installation of the turbine components. As such, it is possible that some dewatering activities may be required when installing these project components; however withdrawal amounts are anticipated to be below 50,000 l/d (the trigger for the need to obtain a Permit to take Water from the MOE). Similar expectations apply for decommissioning.

4.7.2 Operation

No water-taking will be required during operation of the Project.

4.8 ACCIDENTAL SPILLS

Standard containment facilities and emergency response materials (i.e., spill kits) will be maintained on-site as required. Refueling, equipment maintenance, and other potentially contaminating activities will occur in designated areas such as laydown areas and will not occur within 30 metres of watercourses to minimize and prevent spills.

In the event of an accidental discharge of fluids associated with Project construction or operation, the Construction Contractor or Operator will immediately stop work in the immediate area and rectify the accidental discharge. Once the discharge is contained the Contractor will remove contaminated soil and dispose of it in accordance with the current appropriate provincial legislation.

In the event of a spill reaching a waterbody, containment booms will be deployed and the contained fluids 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 Emergency Response Plan 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, are outside the normal course of events, or are in excess of prescribed regulatory levels, will be reported to the MOE's Spills Action Centre in accordance with MOE requirements.

5.0 Project Activities and Schedule

5.1 PROJECT ACTIVIES

A general overview of the activities during construction, operation, and decommissioning phases of the Project are provided in **Table 5.1**.

Table 5.1: Key Project Activities

Project Phase	Activities
Construction	**Turbine Sites**
	Delineation of temporary work areas, including vegetation protection and erosion control
	Completion of necessary site grading
	Access road construction and culvert installation
	Construction of turbine laydown/staging areas and central laydown areas
	Installation of turbine foundations
	Installation of crane pads or mats
	Turbine erection
	Installation of collector lines, usually parallel to access roads
	Reclamation of temporary work areas
	Site landscaping (final grading, topsoil replacement, etc.)
	Transformer Substations Sites
	Preparation of laydown area, including vegetation protection and erosion control
	Installation of transformer and other substation components and connection with grid
	Reclamation of temporary work areas
	Off-Site Activities
	Installation of collector and transmission lines in municipal road right of way
	Additional Activities
	Component transportation to Project Location
Operation	**Turbine Sites**
	Preventative maintenance
	Unplanned maintenance
	Meter calibrations
	Grounds keeping
	Substation Sites
	Preventative maintenance for substations
	Unplanned maintenance for substations
	Operations and Maintenance Building Site
	Remote wind farm condition monitoring
	Operations and maintenance building maintenance
	Off-Site Activities
	Collector and transmission line maintenance
Decommissioning	**Turbine Sites**
	Removal of turbine and infrastructure
	Site grading (dependent upon new proposed use)
	Possible removal of access roads dependent upon agreement with property owner
	Possible excavation and removal of collector lines depending upon agreement with

Table 5.1: Key Project Activities

Project Phase	Activities
	property owner
	Substation Sites
	Removal of substations
	Disconnect transformer station from provincial grid
	Off-Site Activities
	Removal of collector and transmission lines in municipal right of way (remove wires and poles depending on agreement with municipality.

5.2 PROJECT SCHEDULE

Table 5.2 below provides an overview of the proposed projected dates associated with the Project.

Table 5.2: Project Schedule Overview

Milestone	Approximate Date
Initiate Public REA Process (Project Notice)	July 6, 2011
Community Meeting #1	July 26, 2011
REA technical studies	Ongoing through to Fall 2012
Official Public Meeting #1	September 13 to15, 2011 (6 meetings)
Publication of Draft Site Plan	August 13, 2012
Official Public Meeting #2 (expanded notice)	September 20, 2012
Draft REA Reports to Municipalities, NEC, Aboriginal Groups	November 5, 2012
Draft REA Reports to Public	December 5, 2012
Publication of Updated Draft Site Plan	December 5, 2012
Official Public Meeting #3 (Final)	February 5 to 7, 2013 (6 meetings)
REA Application Submission	April 2013
REA Awarded	Summer 2013
Start of Construction	Fall 2013
Start of Operation	December 2014
Repowering/Decommissioning	2034 (approximately 20 years after COD)

6.0 Description of Potential Environmental Effects

The effects of constructing, operating, and maintaining a wind energy facility are well understood and can be typically mitigated through well-known and accepted techniques and practices. The following potential effects, mitigation measures, monitoring plans and contingency plans have been identified and developed to address potential negative environmental effects that may result from the construction / decommissioning and operation of the Project. These items are summarized in this report but are discussed in detail in the **Design & Operation Report** and **Construction Plan Report**, provided under separate cover.

6.1 METHODOLOGY

O. Reg. 359/09 requires that any adverse environmental effects that may result from engaging in the Project be described. The term “environment” in O. Reg. 359/09 includes the natural, physical, cultural and socio-economic environment.

In order to identify potential negative environmental effects that may result from construction and operation of the Project, the following is a high level summary of the applied methodology:

- Collect information on the existing environment using available background information, consultation with stakeholders and site investigation.
- Review proposed Project activities in order to predict the potential interactions between the Project and environment.
- Identify potential interactions that could cause an adverse effect on the environment.
- Develop measures to avoid, mitigate and monitor potential adverse effects.

Based upon a screening of the existing environment, experience gained during Project planning, and the requirements of the REA process, the following environmental components have been assessed as part of the REA application process:

- Heritage and Archaeological Resources
- Natural Heritage Features
- Water Bodies and Aquatic Resources
- Air Emissions of Odour and Dust
- Environmental Noise
- Land Use and Socio-Economic Resources
- Provincial and Local Infrastructure
- Public Health and Safety
- Areas Protected under Provincial Plans and Policies

The potential effects, mitigation measures and net effects to these environmental features during construction and operation are summarized in **Appendix D**. As noted in Section 3.1, all turbines are conservatively assumed to be E101 turbines at a tower height of 135 m to account for the worst case scenario for defining project related setbacks and identifying potential negative impacts, except where specified for the **Noise Assessment Report**.

Detailed descriptions of the potential effects, mitigation measures and net effects to these environmental features during the construction, operation, and decommissioning phases of the Project are provided in the **Construction Plan Report**, **Design and Operation Plan Report, Decommissioning Plan Report, Natural Heritage Assessment and Environmental Impact Study** and **Water Assessment and Water Body Assessment** as part of the complete REA submission (under separate cover).

6.2 PROJECT RELATED SETBACKS

A key component of the REA process is the establishment of standard setbacks for all renewable energy facilities in the Province. Where Project related infrastructure will be located within the 120 m setback from natural features, additional analysis (i.e., Environmental Impact Study) has been provided. Key setbacks that have been applied throughout the design of the proposed Project are as follows:

Table 6.1: Project Related Setbacks

Feature	Setback Distance	Study Alternative When Within Setback
Non-participating receptor	550 m (from wind turbine base) 500 m (from transformer)	No alternatives permitted for setback from turbine. In addition, a Noise Assessment must be completed for the Project according to MOE Noise Guidelines to verify that noise emissions do not exceed 40dBA at any non-participating receptors. Alternatives permitted for transformer with the submission of a Noise Assessment which verifies that noise emissions do not exceed 40dBA at any non-participating receptor.
Public road and railway	Wind turbine blade length + 10 m (from the centre of the wind turbine base)	No alternatives permitted for setback.
Non-participating property line	Hub height (from centre of the wind turbine base)	Setback can be reduced to wind turbine blade length + 10 m with the completion of the Property Line Setback Assessment report, as included with the REA submission. Setback can be reduced further with a written agreement between NRWC and the affected property owner.
Provincially Significant Wetland	120 m (50 m for collector / transmission lines)	Development generally not permitted within feature. Development and site alteration may be possible within setback area; EIS required. Development of distribution and transmission lines within / beneath feature may be possible; EIS required.

Table 6.1: Project Related Setbacks

Feature	Setback Distance	Study Alternative When Within Setback
Significant Woodland	120 m (50 m for collector / transmission lines)	Development and site alteration may be possible within natural feature and setback area; EIS required.
Provincially Significant Areas of Natural and Scientific Interest (Life Science)	120 m (50 m for collector / transmission lines)	Development and site alteration may be possible within natural feature and setback area; EIS required.
Provincially Significant Areas of Natural and Scientific Interest (Earth Science)	50 m	Development and site alteration may be possible within natural feature and setback area; EIS required.
Significant Wildlife Habitat	120 m (50 m for collector / transmission lines)	Development and site alteration may be possible within natural feature and setback area; EIS required.
Non-provincially significant wetland within the Greenbelt	120 m (50 m for collector / transmission lines)	Development and site alteration may be possible within natural feature and setback area; EIS required.
Sand barren, savannah, tallgrass prairie or alvar within the Greenbelt	120 m (50 m for collector / transmission lines)	Development and site alteration may be possible within natural feature and setback area; EIS required.
Non-Provincially Significant Life Science Areas of Natural and Scientific Interest within the Greenbelt	120 m (50 m for collector / transmission lines)	Development and site alteration may be possible within natural feature and setback area; EIS required.
Lake	120 m from the average annual high water mark (turbines and substations prohibited within 30 m)	Development and site alteration may be possible within setback area; additional Water Body Report required. No wind turbine or transformer permitted within a lake or within 30 m of the average annual high water mark.
Permanent or intermittent stream	120 m from the average annual high water mark (turbines and substations prohibited within 30 m)	Development and site alteration may be possible within setback area; additional Water Body Report required. No wind turbine or transformer permitted within a permanent or intermittent stream or within 30 m of the average annual high water mark.
Seepage area	120 m from the average annual high water mark (turbines and substations prohibited within 30 m)	Development and site alteration may be possible within setback area; additional Water Body Report required. No wind turbine or transformer permitted within 30 m of a seepage area.

*Note: O. Reg. 359/09 was amended November 2, 2012, which included amendments to the setback distances that trigger an EIS for significant natural features next to distribution (collector) and transmission lines, and revoked sections pertaining to valleylands.

7.0 Closure

The Niagara Region Wind Farm Project Description Report has been prepared by Stantec for NRWC in accordance with Item 10, Table 1 of Ontario Regulation 359/09 and the *Technical Guide to Renewable Energy Approvals* (MOE, 2012). 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 Consulting Ltd. for the sole benefit of NRWC, and may not be used by any third party without the express written consent of NRWC and Stantec Consulting Ltd. The data presented in this report are in accordance with Stantec's understanding of the Project as it was presented at the time of the Report.

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8.0 References

Ontario Ministry of the Environment (MOE). 2012. Technical Guide to Renewable Energy Approvals, as amended.

O. Reg. 359/09. 2012. Ontario Regulation 359/09 made under the Environmental Protection Act, Renewable Energy Approvals Under Part V.0.1 of the Act, as amended by O. Reg. 333/12 on November 2, 2012.