Jericho Wind, Inc.

Final Construction Plan Report – Jericho Wind Energy Centre

Prepared by:

AECOM
300 – 300 Town Centre Boulevard 905 477 8400 tel
Markham, ON, Canada L3R 5Z6 905 477 1456 fax
www.aecom.com

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60155032

Date:

February, 2013

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Appendix A. Parkhill Interconnect Renewable Energy Approval Application Construction Plan Report (GLGH, 2013)
Appendix B. Hydrogeological Calculations for Dewatering Activities

Glossary of Terms

ABCA ..... Ausable Bayfield Conservation Authority
ANSI ..... Area of Natural and Scientific Interest
DFO ..... Department of Fisheries and Oceans Canada
EIS ..... Environmental Impact Study
GE ..... General Electric
GIS ..... Geographic Information System
kV ..... Kilovolt
LLC ..... Limited Liability Company
MNR ..... Ontario Ministry of Natural Resources
MOE ..... Ontario Ministry of the Environment
MTCS ..... Ontario Ministry of Tourism, Culture and Sport
MTO ..... Ontario Ministry of Transportation
MW ..... Megawatt
NextEra ..... NextEra Energy Canada
O.Reg. 359/09 ..... Ontario Regulation 359/09
PCC ..... Point of Common Coupling
PDR ..... Project Description Report
PSW ..... Provincially Significant Wetland
REA ..... Renewable Energy Approval
SCRCA ..... St. Clair Region Conservation Authority
SGRA ..... Significant Groundwater Recharge Area
The Project ..... Jericho Wind Energy Centre
ULC ..... Unlimited Liability Corporation

1. Introduction

Jericho Wind, Inc., a wholly owned subsidiary of NextEra Energy Canada, ULC, (NextEra) is proposing to construct a wind energy project in the Municipality of Lambton Shores and the Township of Warwick, in Lambton County, Ontario and in the Municipality of North Middlesex, in Middlesex County, Ontario (**Figure 1-1**). The Project is referred to as the Jericho Wind Energy Centre (the "Project"). All turbines will be located on private lands.

This Construction Plan Report was prepared in accordance with the requirements of the Renewable Energy Approval (REA) process outlined in Ontario Regulation 359/09 (*O. Reg. 359/09*) and the Technical Guide to Renewable Energy Approvals (Ontario Ministry of the Environment (MOE), 2011).

The following sections provide information on the construction and installation activities, potential negative environmental effects of construction and installation activities and mitigation measures for the identified negative effects.

1.1 Summary of Construction Plan Report Requirements

The requirements for the Construction Plan Report defined under *O.Reg. 359/09* are provided in the following table (**Table 1-1**) in addition to the corresponding report section.

Table 1-1 Adherence to Construction Plan Report Requirements

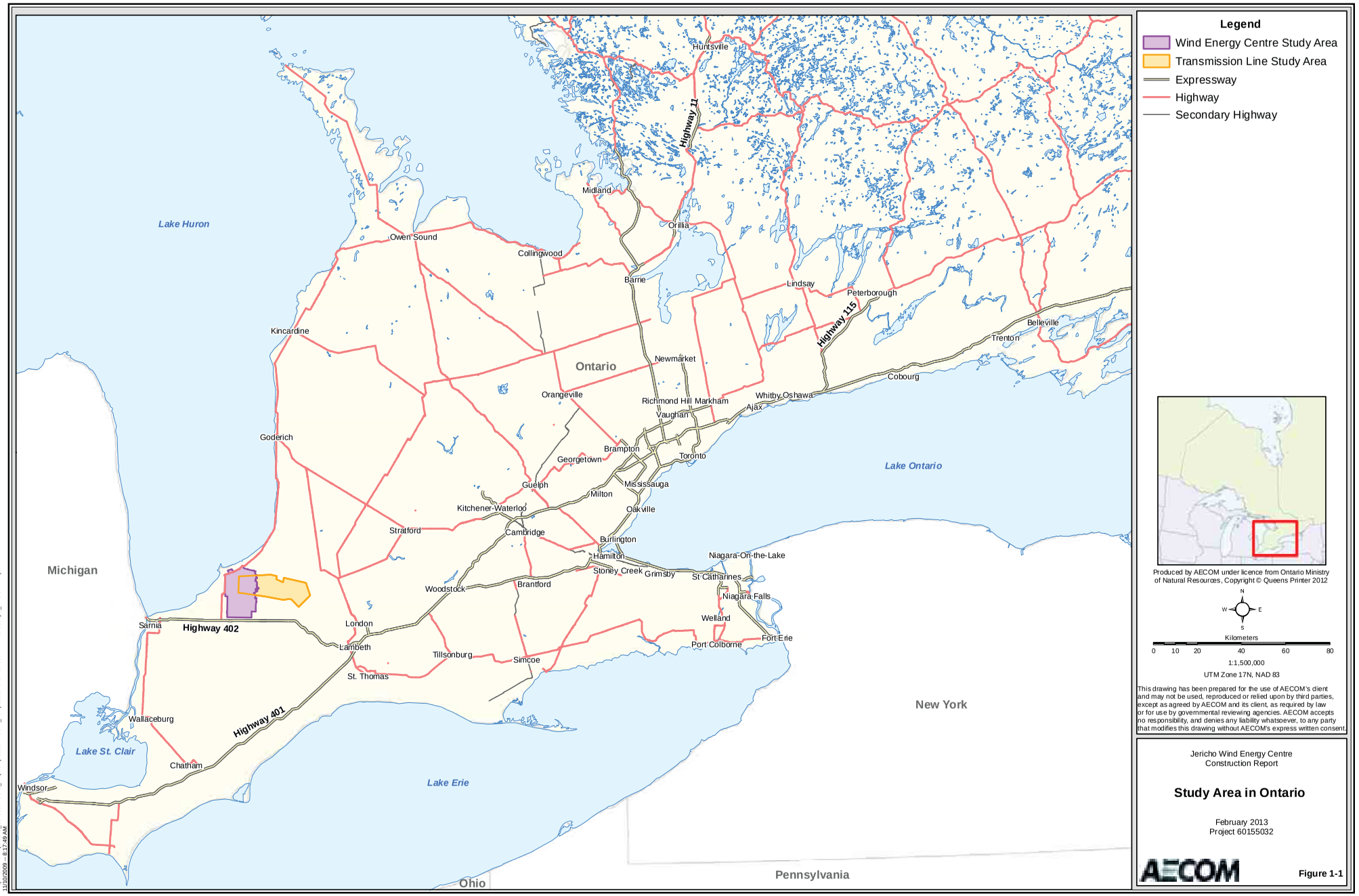
Requirement	Completed	Corresponding Section
Details of construction or installation activities	Yes	Section 2
The location and timing of any construction or installation activities for the duration of the construction or installation	Yes	Section 1.3 and Figure 2-1 Section 2.1
Any negative environmental effects that may result from construction or installation activities	Yes	Section 3
Mitigation measures in respect of any negative environmental effects	Yes	Section 3 and the Environmental Effects Monitoring Plan in the Design and Operation Report

1.2 The Proponent

The Project will be owned and operated by Jericho Wind, Inc., a subsidiary of NextEra. NextEra Energy Canada's indirect parent company is NextEra Energy Resources, LLC, a global leader in wind energy generation with a current operating portfolio of over 100 wind energy projects in North America. Wind farms currently owned and operated by NextEra Energy Canada include: Mount Copper and Mount Miller (both 54 megawatt (MW)), located in Murdochville, Quebec; Pubnico Point, (31 MW) located near Yarmouth, Nova Scotia; Ghost Pine (82 MW), located in Kneehill County, Alberta; and Conestogo (23 MW) located in Wellington County, Ontario.

The primary contacts for the Project are as follows:

Project Proponent	Project Consultant
Ross D. Groffman Project Director NextEra Energy Canada, ULC 390 Bay Street, Suite 1720 Toronto, Ontario, M5H 2Y2 *Phone:*.....416.364.9714 *Email:* .....Jericho.Wind@NextEraEnergy.com *Website:* ..www.NextEraEnergyCanada.com	Marc Rose Senior Environmental Planner AECOM 300-300 Town Centre Blvd. Markham, Ontario, L3R 5Z6 *Phone:* ....905.477.8400 x388 *Email:*.....marc.rose@aecom.com


Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Expressway
Highway
Secondary Highway
Lake Huron
Lake Ontario
Lake Erie
Lake St. Clair
Ontario
Michigan
New York
Pennsylvania
Ohio
Huntsville
Midland
Orillia
Owen Sound
Collingwood
Barrie
Lindsay
Peterborough
Belleville
Trenton
Cobourg
Kincardine
Newmarket
Orangeville
Richmond Hill
Markham
Whitby
Oshawa
Ajax
Vaughan
Goderich
Brampton
Georgetown
Toronto
Guelph
Mississauga
Milton
Kitchener-Waterloo
Oakville
Stratford
Cambridge
Burlington
Hamilton
Niagara-On-the-Lake
Stoney Creek
Grimsby
St Catharines
Woodstock
Brantford
Niagara Falls
Welland
Sarnia
London
Lambeth
Tillsonburg
Simcoe
Port Colborne
Fort Erie
St. Thomas
Wallaceburg
Chatham
Windsor
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Highway 402
Highway 401
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Jericho Wind Energy Centre
Construction Report
Study Area in Ontario
February 2013
Project 60155032
AECOM
Figure 1-1
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1.3 Project Study Area

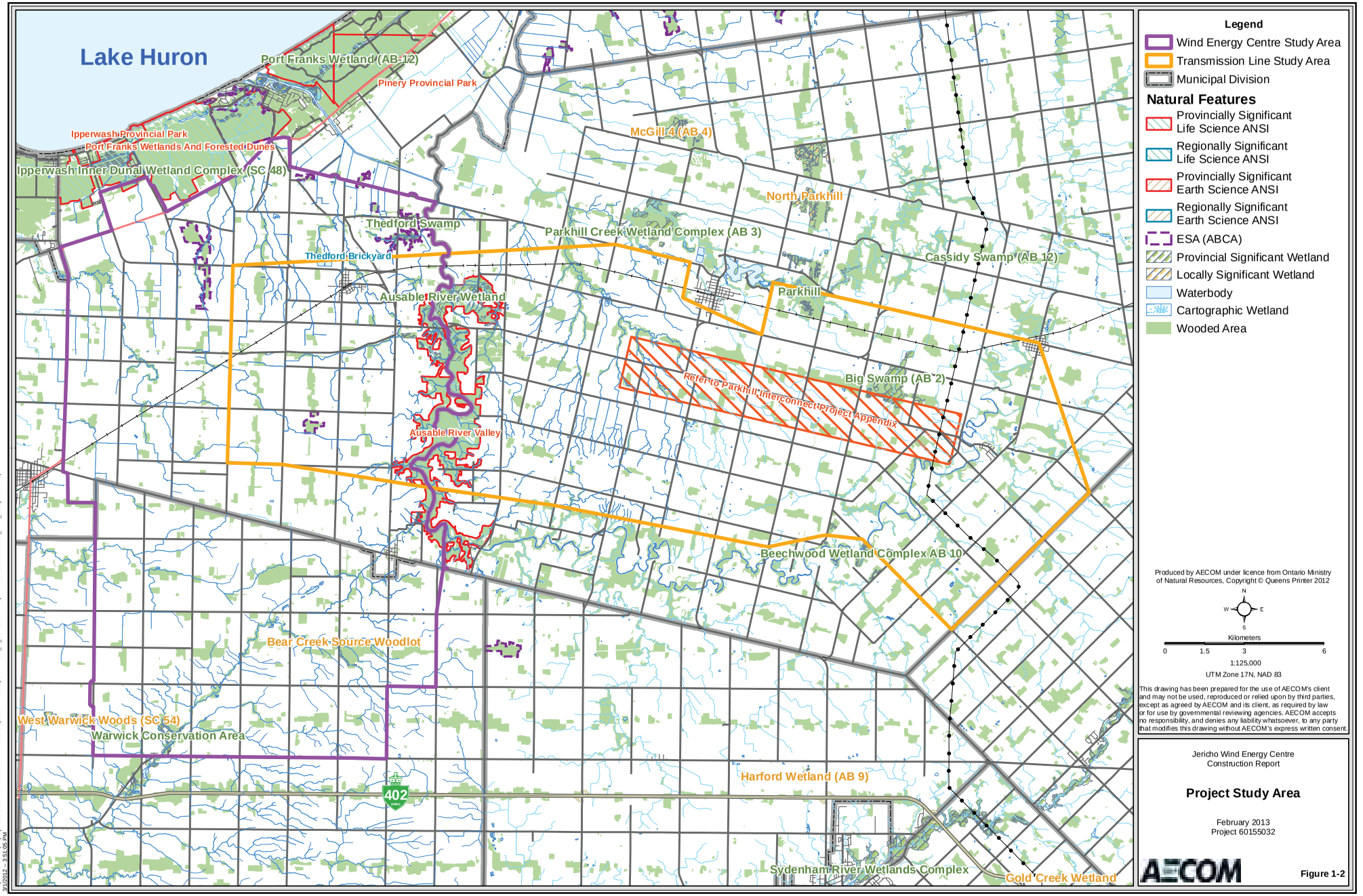
The proposed Project is located in the Municipality of Lambton Shores and the Township of Warwick, in Lambton County, Ontario and in the Municipality of North Middlesex, in Middlesex County, Ontario. The Project Study Area consists of the areas being studied for the wind energy component (Wind Energy Centre Study Area), as well as for the interconnection route (i.e., the area being studied for transmission lines to connect the Project to the electrical grid) (Transmission Line Study Area) (**Figure 1-2**). The Wind Energy Centre Study Area is generally bounded by Lakeshore Road/Bog Line to the north, Egremont Road to the south, the Lambton Shores/North Middlesex municipal boundary to the east and Rawlings Road/Elarton Road to the west, in Lambton County. The Transmission Line Study Area is generally bounded by Kennedy Line, Parkhill Drive and Elginfield Road to the north, Jura Line, Elm Tree Drive and Poplar Hill Road to the south, Fernhill Drive to the east, and the Jericho Road to the west, in Lambton and Middlesex Counties.

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

The following co-ordinates define the external boundaries of the Project Study Area:

UTM Coordinates

Easting	Northing
420938	4761752
419681	4780912
456597	4777307
453312	4766484



Legend

- Wind Energy Centre Study Area
- Transmission Line Study Area
- Municipal Division

Natural Features

- Provincially Significant Life Science ANSI
- Regionally Significant Life Science ANSI
- Provincially Significant Earth Science ANSI
- Regionally Significant Earth Science ANSI
- ESA (ABCA)
- Provincial Significant Wetland
- Locally Significant Wetland
- Waterbody
- Cartographic Wetland
- Wooded Area

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Jericho Wind Energy Centre
Construction Report

Project Study Area

February 2013
Project 60155032

AECOM

Figure 1-2

2. Description of Construction and Installation Activities

The Project Location is defined as per *O. Reg. 359/09* as "*a part of land and all or part of any building or structure in, on or over which a person is engaging in or proposes to engage in the project and any air space in which a person is engaging in or proposes to engage in the project*" (Government of Ontario, 2009). As described therein, the Project Location boundary is the outer limit of where site preparation and construction activities will occur (i.e., Disturbance Areas described below) and where permanent infrastructure will be located, including the air space occupied by turbine blades.

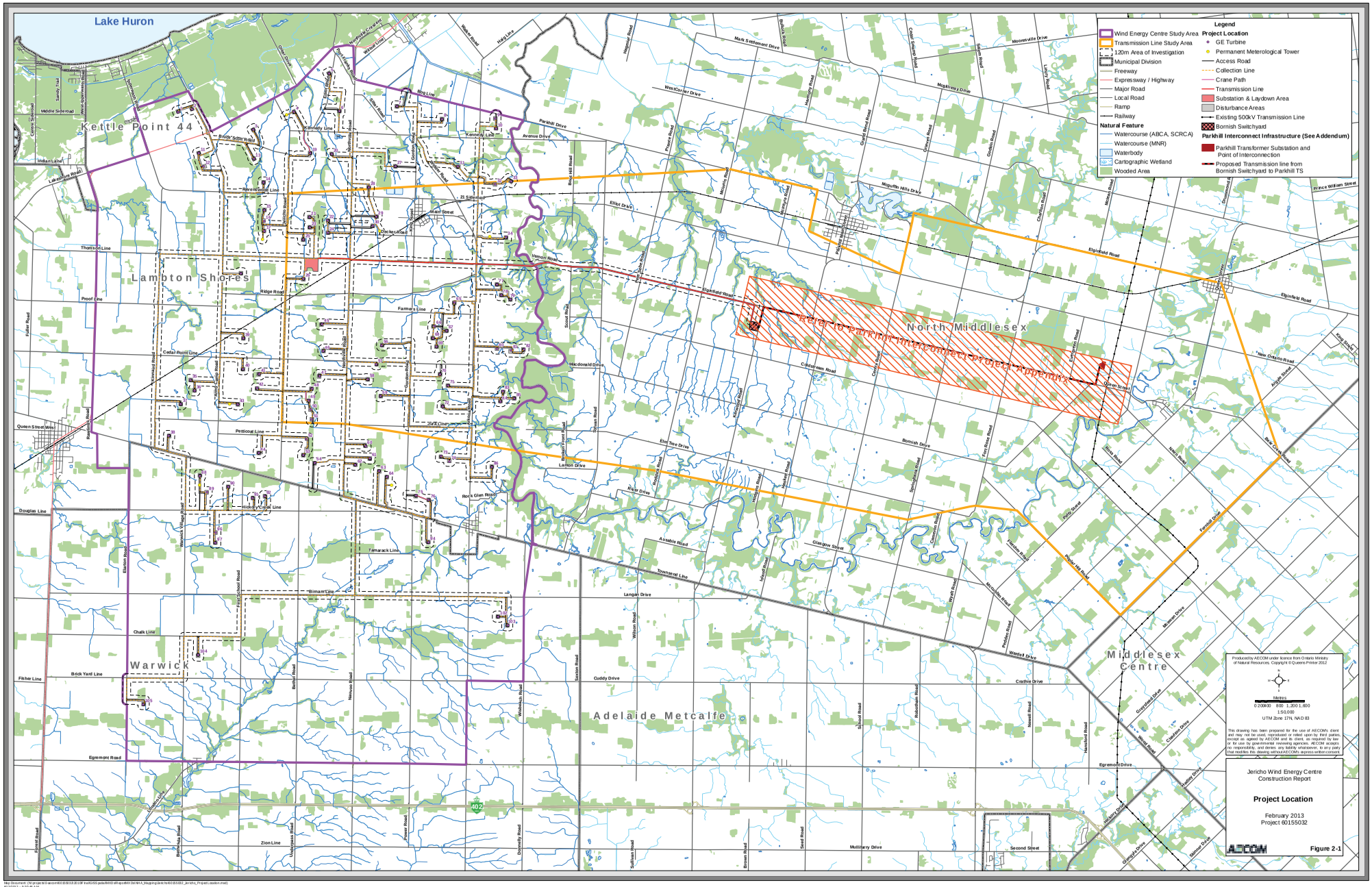
The proposed Project Location is shown on **Figures 2-1, 2-2** and **2-3**, and includes the components of the Project listed below:

- 97 GE 1.6-100 Wind Turbine generator locations and pad mounted step-up transformers (however, only approximately 92 turbines will ultimately be constructed);
- Turbine laydown and storage areas (including temporary staging areas, crane pads and turnaround areas surrounding each wind turbine);
- Construction laydown area for the purposes of providing temporary storage of construction materials and temporary construction offices and ancillary equipment such as electrical service from the local electrical distribution line;
- A transformer substation and ancillary equipment;
- 34.5 kV electrical collection lines to connect the turbines to the proposed transformer substation and other ancillary equipment such as above-ground junction boxes;
- A 115 kV transmission line to run from the proposed Project transformer substation to the proposed Bornish switchyard. A common 115 kV transmission line will carry electricity from the proposed Adelaide, Bornish and Jericho Wind Energy Centres to a Point of Common Coupling (PCC) on Hydro One's 500 kV transmission line;
- Turbine access roads;
- Permanent meteorological towers; and
- An operations and maintenance building and ancillary equipment such as an electrical service line connected to the local distribution service.

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

The above mentioned Project components, with the exception of the common 115 kV transmission line from the Bornish switchyard to the PCC, are depicted in the Project Location figures described below (please refer to Appendix A for the Parkhill Interconnect Renewable Energy Approval Application Construction Plan Report):

- **Figure 2-1**: shows the locations of Project components and associated disturbance areas including: wind turbines, access roads, the electrical collection system, 115 kV transmission line, the transformer substation, and temporary laydown/storage areas. This figure also shows topographical land contours and surface water drainage for all land within 120 m of the Project Location.


Lake Huron
Kettle Point 44
Lambton Shores
Warwick
Adelaide Metcalfe
North Middlesex
Middlesex Centre
Refer to Parkhill Interconnect Project Appendix
Legend
Wind Energy Centre Study Area
Transmission Line Study Area
120m Area of Investigation
Municipal Division
Freeway
Expressway / Highway
Major Road
Local Road
Ramp
Railway
Natural Feature
Watercourse (ABCA, SCRCA)
Watercourse (MNR)
Waterbody
Cartographic Wetland
Wooded Area
Project Location
GE Turbine
Permanent Meterological Tower
Access Road
Collection Line
Crane Path
Transmission Line
Substation & Laydown Area
Disturbance Areas
Existing 500kV Transmission Line
Bornish Switchyard
Parkhill Interconnect Infrastructure (See Addendum)
Parkhill Transformer Substation and Point of Interconnection
Proposed Transmission line from Bornish Switchyard to Parkhill TS
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Construction Report
Project Location
February 2013
Project 60155032
AECOM
Figure 2-1

- **Figure 2-2**: shows the location of Project components and associated disturbance areas in relation to surrounding natural heritage and water body features such as: wetlands, woodlands, streams, and Areas of Natural and Scientific Interest, in addition to water wells identified in MOE's database. This figure also demonstrates compliance with the 120 m setback distance for natural heritage features, measured from the boundary of the Project Location.
- **Figure 2-3**: shows the location of Project components and associated disturbance areas in relation to surrounding socio-economic features such as: property boundaries, roads and railways, petroleum resources, landfills, aggregate resources and noise receptors. This figure also identifies the setback distances between these features and the Project components. Note that noise compliance is addressed in **Appendix B** - Noise Assessment Report, of the Design and Operations Report (AECOM, 2013).

The exercise of siting infrastructure is an iterative process that involves balancing the wind resource with environmental, socio-economic and engineering constraints, including the preferences of individual landowners, while at the same time adhering to the setback distances prescribed by the Province and outlined in *O. Reg. 359/09*.

The following sections outline the activities anticipated for the construction phase of the Project and provide details on the timing of the activities, materials brought on site, construction equipment used, and temporary uses of land.

These project activities are also described in Section 2.2.1 of the Project Description Report (PDR) (AECOM, 2013).

2.1 Project Timing

Subject to the receipt of the necessary permits and approvals, site work for the Jericho Wind Energy Centre is expected to begin in 2013 and last for approximately 6 to 12 months. **Table 2-1** presents the currently anticipated construction schedule and approximate order of construction activities for the proposed Project.

Table 2-1 Construction Schedule

Activity		Probable Timing of Activity	Probable Duration
Surveying		Prior to construction – preference is winter months	< 1 day per turbine location
Geotechnical Sampling		Prior to construction – preference is winter months	One to two hours per turbine location
Land Clearing and Construction of Access Roads		Summer up to spring – preference is to conduct during drier months	One to three days per access road to each turbine
Installation of Culverts		Summer up to spring – preference is to conduct during drier months	One to two days per culvert
Construction Laydown Area		Summer up to spring – preference is to conduct during drier months	One week
Turbine Site and Crane Pad Construction		Summer up to spring – preference is to conduct during drier months	Two to four days per turbine location
Delivery of Equipment		Throughout construction phase as needed, and in compliance with Traffic Management Plan	As needed throughout construction phase
Turbine Foundations		Summer up to spring – preference is to conduct during drier months	Three to four days (excluding curing)
Wind Turbine Assembly and Installation		Following turbine foundations	Four to five days per turbine location
Electrical Collector System	**Pad Mount Transformers**	Summer up to spring – preference is to conduct during drier months	Four to six days
	Collection Lines	Summer up to spring – preference is to conduct during drier months	Dependent upon the required length of the lines; however, between 4 and 8 km of collector lines can be installed in a week.
Transformer Substation		Summer up to spring – preference is to conduct during drier months	15 – 20 weeks
Operations Building		Summer up to spring – preference is to conduct during drier months	Eight weeks
Clean-up and Reclamation		Following turbine construction	Will be conducted as site is constructed
Turbine Commissioning		Following turbine assembly and installation	One to three days per turbine

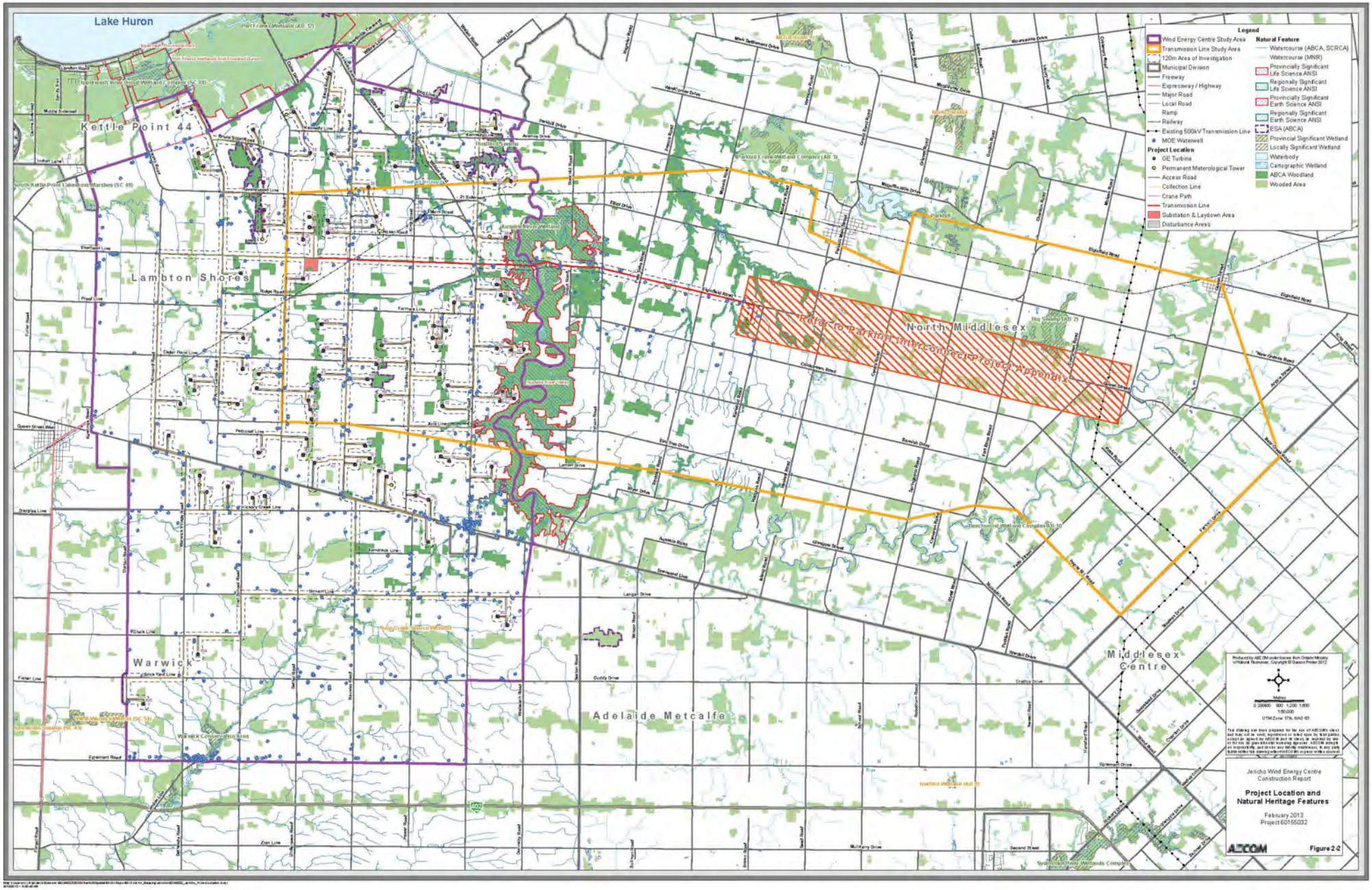
Lake Huron
Kettle Point 44
Lambton Shores
Warwick
Adelaide Metcalfe
North Middlesex
Middlesex Centre
Refer to parking, interconnect, Project Appendix
Legend
Wind Energy Centre Study Area
Transmission Line Study Area
120m Area of Investigation
Municipal Division
Freeway
Expressway / Highway
Major Road
Local Road
Ramp
Railway
Existing 500kV Transmission Line
MOE Waterwell
Project Location
GE Turbine
Permanent Meterological Tower
Access Road
Collection Line
Crane Path
Transmission Line
Substation & Laydown Area
Disturbance Areas
Natural Feature
Watercourse (ABCA, SCRCA)
Watercourse (MNR)
Provincially Significant Life Science ANSI
Regionally Significant Life Science ANSI
Provincially Significant Earth Science ANSI
Regionally Significant Earth Science ANSI
ESA (ABCA)
Provincial Significant Wetland
Locally Significant Wetland
Waterbody
Cartographic Wetland
ABCA Woodland
Wooded Area
Jericho Wind Energy Centre
Construction Report
Project Location and Natural Heritage Features
February 2013
Project 60156032
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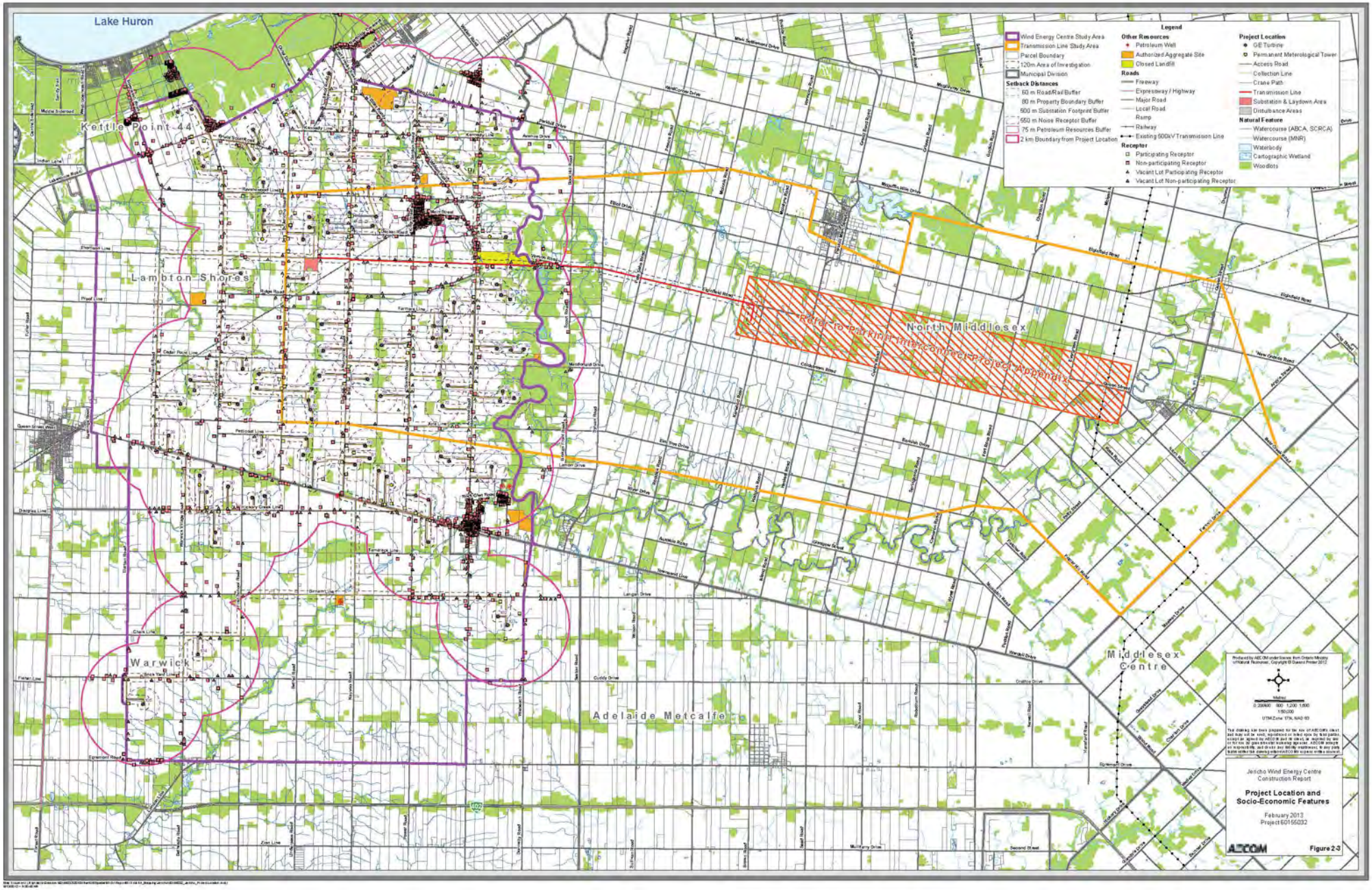
Figure 2-2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Adelaide Metcalfe
Middlesex Centre
Legend
Wind Energy Centre Study Area
Transmission Line Study Area
Parcel Boundary
120m Area of Investigation
Municipal Division
Setback Distances
50 m Road/Rail Buffer
80 m Property Boundary Buffer
500 m Substation Footprint Buffer
550 m Noise Receptor Buffer
75 m Petroleum Resources Buffer
2 km Boundary from Project Location
Other Resources
Petroleum Well
Authorized Aggregate Site
Closed Landfill
Roads
Freeway
Expressway / Highway
Major Road
Local Road
Ramp
Railway
Existing 500kV Transmission Line
Receptor
Participating Receptor
Non-participating Receptor
Vacant Lot Participating Receptor
Vacant Lot Non-participating Receptor
Project Location
GE Turbine
Permanent Meterological Tower
Access Road
Collection Line
Crane Path
Transmission Line
Substation & Laydown Area
Disturbance Areas
Natural Feature
Watercourse (ABCA, SCRCA)
Watercourse (MNR)
Waterbody
Cartographic Wetland
Woodlots
Refer to parking interconnect project Appendix
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Project Location and Socio-Economic Features
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Project 60155032
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Figure 2-3

2.2 Construction Activities

The proposed Project will consist of up to 97 GE 1.6-100 Wind Turbines with a nameplate capacity of up to 150 MW (however, only approximately 92 turbines will be constructed).

A 115 kV transmission line from the Project's transformer substation to the Point of Common Coupling (PCC) on Hydro One's 500 kV transmission line is proposed to be located on private property and within existing road rights-of-way. The proposed transmission line will pass through the Bornish switchyard located in the Transmission Line Study Area where the electricity from the proposed Adelaide and Bornish Wind Energy Centres will converge. From this point, the proposed 115 kV line will carry electricity generated by all three projects to the PCC on the existing Hydro One 500 kV transmission line. A separate report has been prepared to describe the section of the transmission line between the Bornish switchyard and the PCC and is appended to this report (refer to the appendix entitled Parkhill Interconnect Project).

It is anticipated that the transmission line will be overhead and mounted on new transmission line poles. There may be occasional places where the line is placed underground for technical reasons. The poles are proposed to be constructed of wood, concrete or steel and typically will be between 18 m and 30 m tall.

The interconnection plan for a wind energy centre is subject to study, design and engineering by: (a) the Independent Electricity System Operator which manages the province's electricity grid; (b) Hydro One; and (c) the Ontario Energy Board, which regulates the industry through the Transmission System Code and the Distribution System Code.

2.2.1 Surveying and Geotechnical Study Activities

Existing buried infrastructure located on public property will be identified using the Ontario One Call service and buried infrastructure located on private property will be identified by private contractors prior to construction and updated throughout construction, as required.

Geotechnical sampling will be required for turbine foundation locations. Typically, a truck-mounted drill rig visits the sampling locations, drills the borehole and collects geotechnical information. This operation typically uses two operators and requires one to two hours per turbine location.

Equipment will include, at a minimum, trucks, a truck mounted drill rig, and possibly a track-mounted drill rig. The trucks will be driven to the site via existing municipal roads. No materials will be brought on site for these activities and any waste generated would be comprised of drill cuttings which will be scattered in the vicinity of the boreholes. The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment.

Fuel-handling for all construction activities will be conducted in compliance with the mitigation measures outlined in Section 3.

2.2.2 Land Clearing and Construction of Access Roads

Access roads will be constructed to transport equipment to the construction sites and for maintenance activities during operation. There will be an approximately 60 m wide area of potential disturbance associated with the construction of the access roads. The access road will be sited within this area of disturbance in consultation with the landowner and taking into consideration potential environmental effects. Typically the access roads will be between 10 m and 20 m wide during the construction phase to accommodate the large cranes (with an additional clearance on each side for travel).

The construction of the access road will typically require clearing and grubbing of any vegetation, excavation of the topsoil layer and adding a layer of compacted material to a typical thickness of 300 mm to 600 mm, depending upon site specific geotechnical conditions. Clean granular material (typically “A” or “B” gravel) will be brought to the site as needed and will not be stockpiled onsite. The topsoil will be kept and re-used on site. The access road to each turbine will typically require one to three days of construction time. Depending on the length of the access roads, construction may require approximately 25 trucks of gravel.

New culverts may be required to maintain drainage in ditches at junctions with roadways and these will be constructed to support the construction equipment and delivery trucks. The exact details of culverts and their installation in addition to erosion control measures will be determined in conjunction with the Ausable Bayfield Conservation Authority (ABCA) and the St. Clair Region Conservation Authority (SCRCA) as part of their permitting process. The culverts are proposed to be open bottom and left in place following the operation phase.

Equipment will include, at a minimum, trucks, graders, and bulldozers. Municipal and provincial roads will also be used for transporting equipment. Any road damages associated with the Project will be repaired prior to the completion of the construction phase. A Road Use Agreement will be developed in consultation with the municipalities. The trucks and graders will be driven to the site and the bulldozers will be transported via trailers. The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment.

Fuel-handling will be conducted in compliance with the mitigation measures outlined in Section 3.

2.2.3 Construction of Laydown Areas

An approximately 4 hectare (10 acre) site will be constructed for the temporary storage of construction material and as a site for the construction office trailers. Following clearing and grubbing of any vegetation, the topsoil at the temporary laydown area will be removed and approximately 600 mm of clean compacted crushed gravel will be imported as needed. The excavated topsoil will be re-used on site as feasible. A temporary electrical service line will be connected to the existing distribution line for the purpose of providing power to the construction office trailers. Construction activities are expected to last approximately one week and will require approximately 100 loads of gravel, and a crew of six people. Following the construction phase, the gravel will be removed from the site or re-used, to be determined in consultation with the landowner. The temporary electrical service line and poles will be removed. The stockpiled topsoil will then be redistributed throughout the temporary laydown area.

Equipment will include, at a minimum, trucks, graders, and bulldozers. The trucks and graders will be driven to the site and the bulldozers will be transported via trailers. The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment.

Fuel-handling will be conducted in compliance with the mitigation measures outlined in Section 3.

2.2.4 Construction of Turbine Sites and Crane Pads

Prior to construction, the construction area will be cleared and grubbed. In order to provide sufficient area for the laydown of the wind turbine components and its assembly, an approximately 122 m by 122 m square around the wind turbine must be cleared, levelled, and be accessible during the construction phase. The topsoil is typically removed and some soil stabilizing material (i.e. crushed gravel or clean back fill) may need to be added depending upon site specific geotechnical conditions. Where the site laydown areas are close to watercourses, erosion control measures will be implemented.

Crane pads will be constructed at the same time as the road and will be located adjacent to the turbine locations. The crane pads will typically be 15 m by 35 m in area. The topsoil at the crane pad will be removed and

approximately 600 mm of clean compacted crushed gravel will be imported as needed. The excavated topsoil will be re-used on site as feasible. The construction crew is anticipated to require four to six people and construction activities are expected to last for approximately one to two days per turbine site.

Equipment will include, at a minimum, trucks, graders, and bulldozers. The trucks and graders will be driven to the site and the bulldozers will be transported via trailers. The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment.

Fuel-handling will be conducted in compliance with the mitigation measures outlined in Section 3.

2.2.5 Delivery of Equipment

Equipment will be delivered by truck and trailer throughout the construction phase and stored at the temporary lay-down sites surrounding each turbine. A Road Use Agreement and Traffic Management Plan will be developed in consultation with the municipalities. Alternative traffic routes will be prepared to address traffic congestion, as needed. To the extent necessary, modifications to public roads will be addressed in the Road Use Agreement.

2.2.6 Construction of Turbine Foundations

A backhoe will be used to excavate an area approximately 3 m deep x 20 m x 20 m with the material being stockpiled for future backfilling. Stockpiled material will have topsoil and subsoil separated out and surplus excavated material will be removed from the site for disposal in an approved manner. The foundation, with an approximate footprint of 400 m^2, will be constructed of poured concrete and reinforced with steel rebar to provide strength. The construction timeframe for turbine foundations is approximately three to four days, excluding curing time. After construction the foundation will be backfilled and the surface will be landscaped for drainage. The only surface evidence of the foundation will be a small protrusion of concrete to which the tower is attached; as such, land can be cultivated to within a few metres of the turbine. Any wood-waste generated will be removed from the site and recycled unless the landowner otherwise directs. Spent welding roads will be disposed of as hazardous waste by a licensed contractor.

Typical construction equipment, on a per turbine basis, will include:

- Excavator for removing material;
- Flatbed trucks (four to six) for delivery of rebar, turbine mounting assembly and forms;
- Truck mounted crane or rough terrain forklift for unloading and placement of rebar and forms;
- Concrete trucks for delivery of concrete (30-40 loads);
- Construction trucks (three to four vehicles with multiple visits); and,
- Dozer, loader and trucks to backfill and compact foundation and remove surplus excavated materials.

The trucks and graders will be driven to the site and the bulldozers will be transported via trailers. The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment.

Fuel-handling will be conducted in compliance with the mitigation measures outlined in Section 3.

2.2.7 Wind Turbine Assembly and Installation

Turbine components will arrive on-site using flat bed and other trucks and will be temporarily stored on-site in the immediate vicinity of the base prior to assembly. Typically two cranes will be used to install the turbines. The larger crane is usually a crawler type with a capacity of 400 tonnes or larger, and is used for the higher lifts.

Clearing and grubbing will be required for the erection area. The erection cranes and crew will follow the foundation crew and erect the wind turbines once the foundations are completed and the concrete has set. This will typically be in five lifts (three for the towers, one for the nacelle and one for the rotor) over a period of two to three days. The lower tower sections may be installed several days before the upper tower sections and the turbine to optimize installation sequence. The lower tower section will also include electrical and communications equipment. Total turbine assembly and installation will typically require four to five days for each turbine. Fifteen to twenty people may be required at the site during the turbine installation; they will be transported using light duty vehicles.

Packing frames for the turbine components are returned to the turbine vendor. Following commissioning, the surrounding area will be returned to its original use.

Equipment will include, at a minimum, trucks, two cranes, graders, and bulldozers. The trucks and graders will be driven to the site and the bulldozers will be transported via trailers. The larger track mounted crane can move from turbine site to turbine site; however, it will need to be disassembled to move it along roadways and from the Project site. Alternatively, cranes may be moved between turbine sites without disassembly along crane paths. In such instances, no additional infrastructure is required to support the crane movement. The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment.

Fuel-handling will be conducted in compliance with the mitigation measures outlined in Section 3.

2.2.8 Construction of Electrical Collector System

The electrical collector system will consist of pad mounted transformers and underground collection lines. These components are described below.

Pad Mount Transformers: A concrete transformer pad, approximately 2.2 m by 2.5 m in size, will be installed adjacent to each turbine at the same time as the turbine base installation. The construction will consist of excavation, soil storage, installation of the buried electrical grounding grid, installation of the concrete pad, installation of the transformer, and electrical connections. Transformer installation and cabling between the turbine and transformer is expected to take three days per turbine. Equipment will include flatbed trucks to transport the equipment to site, and a truck-mounted crane for the installation. These activities will likely require four to six trucks, a work force of approximately two people per vehicle per day, and is expected to last between four to six days per turbine use.

Collection Lines: Cables and fibre optics lines (for communications) from each turbine to the transformer substation will be buried and will be located on private property or within municipal road right-of-ways. There may be occasional locations where the collection lines are placed above ground on wood, concrete or steel poles. Above ground junction boxes will be installed to connect sections of underground cabling. There will be an approximately 20 m wide area for construction of the collection lines. The collection lines will be sited within this area of disturbance in consultation with the landowner and taking into consideration potential environmental effects. The excavated soil will be stored temporarily and then reused as backfill. Power conductors will be approximately 0.9 m below grade and the location will be marked. Equipment will include trenchers or diggers (depending on soil type) and construction will require a crew of six people. The construction timeframe is dependent upon the required length of the lines.

Horizontal Directional Drilling: Electrical cables may need to be installed using horizontal directional drilling to minimize effects to woodlots or watercourses. Erosion control devices will be installed at the drill location and drill cuttings will be collected and removed from the site for disposal in an approved and appropriate manner. An entrance and exit pit will be excavated on either side of the feature to be bored under. The directional drilling equipment will be set up at the entrance pit and a drill bit attached to rod segments is advanced until it reaches the exit pit. A slurry of bentonite and/or polymer mixed with water will be injected into the hole while drilling to help

stabilize the bore hole and reduce friction. Once the drill bit has reached the exit pit the drill bit will be removed and a "reamer" attached and pulled back through the hole to enlarge the bore. The electrical cable will then be installed through the hole. Equipment will include a directional drilling rig and two to three support trucks to carry drilling rods, drilling supplies and cable.

The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment, and the polymer used for directional drilling.

Fuel-handling will be conducted in compliance with the mitigation measures outlined in Section 3.

2.2.9 Construction of Electrical Transmission Line

Holes for new transmission line poles are typically augured in the ground using a truck mounted auger device. The poles will then be inserted using special cranes to a typical depth of 2 m to 3 m below grade. The poles are typically "dressed" (made ready to accept conductors) on the ground prior to installation. In locations where the transmission line makes a turn, guy wires may be used to anchor the corner pole in place. At times, when guy wires cannot be used at corner poles, the steel poles may be mounted on concrete pier foundations. Typically, one crew will install the poles and one crew will dress them. Approximately six construction vehicles (including trucks and a pole loader) and a crew of approximately 12 to 15 people are anticipated for construction of the transmission lines. Typically, twelve to sixteen poles can be installed and dressed in one day. Once the poles are in place and dressed, cables will be strung in place using boom trucks and special cable reel trucks. Finally, any pre-existing poles that are no longer in use will be removed.

Some packing-material waste may be generated from construction. All recyclable materials will be separated from non-recyclable materials and both streams will be removed from the site and disposed of at an approved and licenced facility.

Equipment will include, at a minimum, a truck mounted crane, a drill rig, flatbed trailers and a truck mounted auger. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. A lubricant is likely to be used when the cables are pulled in through the conduit.

Fuel-handling will be conducted in compliance with the mitigation measures outlined in Section 3.

2.2.10 Construction of Transformer Substation

During construction of the substation, topsoil and subsoils will be stripped and stockpiled separately. Stripped topsoil and subsoil will be placed in the temporary storage facility area and topsoil stripped from the substation area will be distributed on other Project properties. An electrical service line will connect to the existing distribution line adjacent to the substation for the purpose of providing house service power to the substation control building. The construction crew will consist of approximately 25 to 40 people and construction is expected to last for about four months. Some packing-material waste may be generated. All recyclable materials will be separated from non-recyclable materials and both streams will be removed from the site and disposed of at an approved and licensed facility.

Construction equipment will include small trenchers, a small crane, a backhoe, forklifts, concrete trucks, an auger truck and a bulldozer. The trucks and graders will be driven to the site and the bulldozers will be transported via trailers. The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment and transformer oil.

Fuel-handling will be conducted in compliance with the mitigation measures outlined in Section 3.

2.2.11 Construction of Operation and Maintenance Building

Construction of an operations and maintenance building may take up to three months to complete and will require a crew of approximately 10 to 15 people. Equipment will include, at a minimum, forklifts, concrete trucks and smaller crew trucks. The chemicals required for this phase will include oils, gasoline, and grease used to operate construction equipment.

Fuel-handling will be conducted in compliance with the mitigation measures outlined in Section 3.

2.2.12 Construction of Permanent Meteorological Towers

The towers will be erected using winches and secured with guy wires tied off to anchors or a monopole foundation. No significant soil or vegetation disturbance is anticipated. Construction of each meteorological tower will take approximately two days and require a crew of six people.

2.2.13 Clean-up and Reclamation

Site clean-up will occur throughout the construction phase and site reclamation will occur after construction has been completed. Waste and debris generated during the construction activities will be collected by a licensed operator and disposed of at an approved facility. All reasonable efforts will be made to minimize waste generated and to recycle materials including returning packaging material to suppliers for reuse/recycling.

Stripped soil will be replaced and re-contoured in the construction areas and disturbed areas will be re-seeded, as appropriate. Erosion control equipment will be removed once inspections have determined that the threat of erosion has diminished to the original land use level or lower. High voltage warning signs will be installed at the transformer substation and elsewhere, as appropriate. At the conclusion of construction, vehicles and construction equipment will be removed from the site.

2.2.14 Turbine Commissioning

Turbine commissioning will occur once the wind turbines and substation are fully installed and Hydro One is ready to accept grid interconnection. The commissioning activities will consist of testing and inspection of electrical, mechanical and communications systems. Some packing-material waste may be generated. All recyclable materials will be separated from non-recyclable materials and both streams will be removed from the site and disposed of at an approved and licenced facility.

Temporary portable generator sets may be used to electrically commission the turbines prior to connection to the grid. The generators will be required for approximately one day per turbine. Following the commissioning phase, the portable generators will be removed from the site and returned to the owners.

Equipment will include support trucks which will be driven to the construction site. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment and portable generators, gearbox oil, and lubricants.

Fuel-handling will be conducted in compliance with the mitigation measures outlined in Section 3.

3. Description of Environmental Effects and Mitigation Measures

The following section describes potential effects associated with the construction and installation of the Project, in addition to mitigation measures and monitoring commitments that will be implemented to minimize these potential effects. The potential effects described below are also presented in Section 3 of the PDR (AECOM, 2013). Please note that effects, mitigation, and monitoring commitments associated with the section of the transmission line between the Bornish switchyard and the PCC are addressed in Appendix A.

For each potential effect, performance objectives were developed to describe a desired outcome of mitigation. Next, mitigation measures were proposed to achieve the performance objectives. Residual effects, which are those effects that remain following the application of mitigation measures and monitoring commitments, were then assessed based on professional judgment as well as previous Project experience. Where possible, the significance of residual adverse effects has been described based on the following:

Magnitude.....the size or degree of the effect compared against baseline conditions; and
Likelihood.....the probability that the effect will occur.

Finally, where monitoring commitments have been identified, they are intended to verify that the mitigation measures achieve performance objectives. Should the monitoring during construction and operation of the Project reveal that the mitigation measures are not achieving the intended results; the identified contingency measures will then be implemented.

This description of effects was completed for all 97 turbines and associated infrastructure shown on the Project Location figures. However, note that only approximately 92 turbines will be constructed resulting in a conservative assessment of effects.

3.1 Cultural Heritage

Stage 1 and 2 Archaeological Assessments (Golder, 2012 and 2013) were conducted to identify the presence of archaeological resources within the Project Study Area and within the Project Location. The Stage 1 Archaeological Assessment consists of an initial desktop archaeological study and site visit and was carried out in summer 2010 and updated in spring 2012. This assessment determined that there are known archaeological resources within the Project Study Area in addition to properties with the potential to contain archaeological resources.

Between 2010 and 2012, pedestrian surveys were conducted within the Project Location in support of the Stage 2 Archaeological Assessment, according to the 2011 *Standards and Guidelines for Consultant Archaeologists* issued by the Ontario Ministry of Tourism, Culture and Sport (MTCS) (Government of Ontario, 2011). A total of 223 archaeological sites were identified and 74 sites have been recommended for further Stage 3 Archaeological Assessment.

A Heritage Assessment (Golder, 2012a and 2013a) was also completed to identify heritage resources including built heritage and cultural heritage landscapes of cultural heritage value or interest. All work was carried out in accordance with *O.Reg.359/09*. The report identified 118 structures (66 houses, 51 barns, and one institutional structure) greater than 40 years of age located on parcels which contain project components in the Project Location. When applying the criteria set out in *Ontario Regulation 9/06*, 89 of these structures (42 houses, 46 barns, and one institutional structure) were determined to have cultural heritage value or interest.

Following the evaluation of anticipated impacts, both direct and indirect, according to *InfoSheet #5* in *Heritage Resources in the Land Use Planning Process, Cultural Heritage and Archaeology Policies of the Ontario Provincial Policy Statement, 2005* (Government of Ontario, 2006), no anticipated impacts to these 89 structures were identified. Therefore, no further work is recommended.

Table 3-1 provides mitigation measures, residual effects and the monitoring plan for each potential effect relating to cultural heritage.

Table 3-1 Mitigation Measures, Residual Effects and Monitoring Plan: Cultural Heritage

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Disturbance or displacement of 74 archaeological resources identified through Stage 2 Assessment due to construction of project infrastructure.	• Avoid disturbance/ loss of archaeological sites	• Avoid site or conduct Stage 3 archaeological assessment if recommended based on the outcome of the Stage 2 assessment: ▪ To avoid, install a protective fence around all or part of the site if construction activities are close enough to potentially affect the archaeological resource; or ▪ Conduct Stage 3 archaeological assessment, document findings in Stage 3 assessment report, and submit report to MTCS for approval. Any potentially interested Aboriginal communities will be contacted, as appropriate, from at least this point onward. • Avoid site or conduct Stage 4 archaeological assessment if recommended based on the outcome of the Stage 3 assessment: ▪ To avoid, install a protective fence around all or part of the site if construction activities are close enough to potentially affect the archaeological resource; or ▪ Conduct Stage 4 archaeological assessment, document findings in Stage 4 assessment report, and submit report to MTCS for approval. Construction can then proceed without any further documentation or monitoring.	• Disturbance or displacement of archaeological resources avoided or minimized through application of mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• Retain a licensed archaeologist to monitor any construction activities within a 50 m monitoring zone for an archaeological resource surrounded by a 20 m buffer where a Stage 3 archaeological assessment has been recommended. Submit a report to MTCS detailing the results of any monitoring activities. • Retain a licensed archaeologist to monitor any construction activities for Stage 4 avoidance that may affect archaeological resources. **Contingency Measures:** • Cease work immediately should previously unidentified archaeological resources be discovered during the construction phase. The area will be secured and a licensed archaeologist contacted to conduct further archaeological work. Construction will only resume in the location when any archaeological assessment has been completed. Any potentially interested Aboriginal communities will be contacted, as appropriate. • Cease work immediately should human remains be found during construction, and contact the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services. Construction will only resume in the location when any archaeological assessment has been completed. Any potentially interested Aboriginal communities will be contacted, as appropriate.

3.2 Natural Heritage

The potential effects, mitigation measures, residual effects and monitoring commitments regarding Significant Natural Heritage Features (including significant wetlands, woodlands, and wildlife habitat and Life Science Areas of Natural and Scientific Interest) were identified and evaluated in the Natural Heritage Assessment and Environmental Impact Study Report (AECOM, 2013) prepared based on the *Natural Heritage Assessment Guide for Renewable Energy Projects* (Ontario Ministry of Natural Resources, 2012) and submitted to the Ontario Ministry of Natural Resources (MNR) for review and sign-off.

Following the completion of the Records Review and Site Investigation for all natural heritage features located within 120 m of the Project Location, an Evaluation of Significance was conducted to identify any features that required an Environmental Impact Study (EIS).

Table 3-2 documents the significant natural heritage features located within 120 m of the Project Location for which an EIS was conducted.

Table 3-2 Summary of Natural Features Included in the EIS

Feature	Natural Features Carried Forward to the EIS
Wetlands	29 wetland complexes were treated as significant and carried forward to the EIS.
Woodlands	73 woodlands were determined to be significant and therefore carried forward to the EIS.
Significant Wildlife Habitat	The following Significant Wildlife Habitat features were determined to be significant within the 120 m Area of Investigation and within 120 m of qualifying Project infrastructure, and were therefore carried forward to the EIS: • Bat Maternity Colonies; • Rare Vegetation Communities; • Habitat for Plant Species of Conservation Concern (multiple) ; and • Habitat for Bird Species of Conservation Concern (Hooded Warbler). The following features were treated as Significant Wildlife Habitat for the purpose of this submission and carried forward to the EIS (in some cases, a determination as to whether the mitigation measures described in the EIS will be applied will be made based on the outcome of pre-construction surveys): • Waterfowl Stopover and Staging Areas (terrestrial); • Waterfowl Stopover and Staging Areas (aquatic); • Raptor Wintering Area; • Bat Maternity Colonies; • Turtle Wintering Areas; • Reptile Hibernacula; • Deer Winter Congregation Areas; • Bald Eagle and Osprey Nesting, Foraging, and Perching Habitat; • Woodland Raptor Nesting Habitat; • Turtle Nesting Habitat; • Seeps and Springs; • Amphibian Woodland Breeding Habitat; • Amphibian Wetland Breeding Habitat; • Woodland Area-sensitive Bird Breeding Habitat; and • Amphibian Movement Corridors. The following candidate Significant Wildlife Habitats were identified within the 120 m Area of Investigation however not within 120 m of qualifying project infrastructure, and were therefore carried forward to the EIS as Generalized Candidate Significant Wildlife Habitat: • Raptor Wintering Area; • Bat Maternity Colonies (numerous); • Turtle Wintering Areas; • Old Growth or Mature Forest Stands; • Rare Vegetation Communities; • Waterfowl Nesting Areas; • Woodland Raptor Nesting Habitats; • Turtle Nesting Habitat; • Seeps and Springs; • Amphibian Woodland Breeding Habitat; • Amphibian Wetland Breeding Habitat; • Marsh Breeding Bird Habitat; • Woodland Area-Sensitive Bird Breeding Habitat; • Open Country Breeding Bird Habitat; • Terrestrial Crayfish Habitat; • Habitat for Plant Species of Conservation Concern (numerous); • Red-headed Woodpecker Habitat (numerous); • Habitat for Insect Species of Conservation Concern (numerous); and • Amphibian Movement Corridor.
Provincially Significant Life Science Areas of Natural and Scientific Interest (ANSIs)	The following two Provincially Significant Life Science ANSIs were carried forward to the EIS: • Port Franks Wetland and Forested Dunes Life Science ANSI; and • Ausable River Valley Life Science ANSI.

Table 3-3 provides mitigation measures, residual effects and the monitoring plan for potential effects related to *Generalized Candidate Significant Wildlife Habitat*.

Table 3-4 provides Feature/Unit specific mitigation measures, residual effects and the monitoring plan for potential effects related to *Significant Wetlands, Woodlands, and Wildlife Habitat*. Note that at all locations described below, the best management practices and mitigation measures outlined in the Generalized Candidate Significant Wildlife Habitat table (**Table 3-3**) will be applied.

Table 3-3 Mitigation Measures, Residual Effects and Monitoring Plan: Generalized Candidate Significant Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Increased erosion and sedimentation resulting from clearing and grubbing, excavation, backfilling and stockpiling.	• Minimize erosion and sedimentation from clearing, grubbing, excavation, backfilling and stockpiling.	• Develop and implement an erosion and sediment control plan before commencement of construction as per Ontario Provincial Standard Specifications (OPSD 219.130). • Utilize erosion blankets, erosion control fencing, straw bales, siltation bags, etc. For construction activities within 30 m of a wetland, woodland, Generalized Candidate Significant Wildlife Habitat or water body, to mitigate potential excessive erosion and sedimentation. Extra erosion and sediment control materials will be kept on hand, (*i.e.*, heavy duty silt fencing, straw bales). • Check that erosion control tools are in good repair and properly functioning prior to conducting daily work and re-install or repair as required prior to commencing daily construction activities. • Keep sediment and erosion control measures in place until disturbed areas have been stabilized (*i.e.*, re-vegetated). • Schedule grading within 30 m of a watercourse, Generalized Candidate Significant Wildlife Habitat or wetland to avoid times of high runoff volumes, wherever possible. Temporarily suspend work if high runoff volume is noted or excessive flows of sediment discharges occur until mitigation measures are in place. • Re-vegetate temporary roads to pre-construction conditions as soon as possible after construction activities are complete using species native to Ontario in naturally vegetated areas.	• Increased erosion and sedimentation avoided or minimized through application of mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• Monitor on-site conditions (i.e., erosion and sediment control, spills, flooding, etc.) by an Environmental Monitor where construction occurs within 30 m of a feature on the following basis: ▪ Weekly during active construction periods; ▪ Prior to, during and post forecasted large rainfall events (>20 millimetres in 24 hours) or significant snowmelt events (*i.e.*, spring freshet); ▪ Daily during extended rain or snowmelt periods; ▪ Monthly during inactive construction periods, where the site is left alone for 30 days or longer. • **Contingency Measures:** ▪ Suspend work if excessive flows of sediment discharges occur until additional mitigation measures are in place (e.g. install the extra erosion and sediment control materials kept on site, such as heavy duty silt fencing, straw bales, etc.). ▪ Report the details of a flooding event to MOE, including a description of any assessment and remediation undertaken.
Removal/ disturbance of topsoil and increased soil compaction from manoeuvring of heavy machinery, excavation and backfilling.	• Minimize removal/ disturbance of topsoil and increased soil compaction.	• Minimize vehicle traffic on exposed soils, avoid compacting or other hardening of natural ground surface, and avoid the movement of heavy machinery on areas with sensitive slopes.	• Increased erosion and sedimentation avoided or minimized through application of mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• See erosion and sedimentation above.
Increased erosion and sedimentation resulting from directional drilling.	• Minimize erosion and sedimentation.	• Conduct all drilling by licensed drillers in accordance with Regulation 903 under Ontario Water Resources Act, R.S.O. 1990. • Set back drill entry and exit pits at least 30 m from natural features (*i.e.*, woodlands, wetlands, Generalized Candidate Significant Wildlife Habitat) or water bodies. • Monitor natural features for signs of surface disturbance.	• Increased erosion and sedimentation avoided or minimized through application of mitigation measures. • Moderate likelihood; if accidental damage occurred, negative effects may be measurable but would likely represent a small change relative to existing conditions.	• See erosion and sedimentation above. • Monitor directional drilling for the duration of such activities by an Environmental Monitor to ensure that “frac-out” or accidental intrusion does not occur, and if it does, to ensure that there are no effects on surface or groundwater. • **Contingency Measures:** ▪ In the event of a “frac-out”, implement the “Frac-Out” Contingency Plan, which will include but is not limited to the following:

Table 3-3 Mitigation Measures, Residual Effects and Monitoring Plan: Generalized Candidate Significant Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
		• Develop "Frac-Out" Contingency Plan outlining steps to contain any chemicals or to avoid contamination of adjacent features. • Ensure drill depth is at an appropriate depth below feature to reduce the risk of a "frac-out".		- Immediately stop all work, including the recycling of drilling mud / lubricant. - Isolate affected watercourse or area using a temporary dam and install by-pass pump system (if required) to maintain continuous flow downstream of the site; - Insert rigid in-water/soil containment unit or underwater boom into the "frac-out" source area in order to contain any sediments and/or deleterious materials originating from the "frac-out". - No captured material will be left on-site. The captured material should be extracted by vacuum truck, if available, or pumped into a containment unit or area for off-site disposal; - Monitor "frac-out" for four hours to determine if the drilling mud congeals. If drilling mud congeals, take no other action that would potentially suspend sediments in the water column. If drilling mud does not congeal, maintain isolation/containment unit in place and continue pumping captured material to a containment unit or area until drilling mud congeals or stops flowing. - Notify the Ministry of the Environment's (MOE) Spills Action Centre (1-800-268-6060) of the "frac-out" event and the response taken to contain the spill. This step should be completed during the 4 hour "frac-out" monitoring period. - Engage a spill response team to contain and clean up excess drilling mud in the water. - Monitor clean-up procedures to ensure they do not result in greater damage than leaving the mud in-place. - If the spill affects an area that is vegetated, the area will be seeded and/or replanted using the same species to those in the adjacent area, or allowed to re-grow from existing vegetation. Re-vegetated areas will be monitored once per growing season for two years subsequent to "frac-out" to confirm re-vegetation is successful. - Document post-cleanup conditions with photographs and prepare "frac-out" incident report describing time, place, actions taken to remediate "frac-out" and measures implemented to prevent recurrence. Provide incident report to MNR and MOE within 30 days of the incident.

Table 3-3 Mitigation Measures, Residual Effects and Monitoring Plan: Generalized Candidate Significant Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Disturbance and/or mortality to terrestrial wildlife, including barriers to wildlife movement.	• Minimize disturbance and/or mortality to terrestrial wildlife.	• Time vegetation removal to avoid periods of habitat use to the extent possible, particularly to avoid sensitive life stages (e.g., breeding season for migratory birds, May 1 to July 30). Undertake active nest surveys by a qualified Biologist if clearing of vegetation must take place during this period. Avoid intersecting potential wildlife migration routes wherever possible.	• Disturbance and/or mortality to terrestrial wildlife, including barriers to wildlife movement avoided or minimized through application of mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• Undertake monthly site inspections by an Environmental Monitor to ensure that only specified trees are removed, protective fencing is intact and that there is no damage caused to the remaining trees during construction. • **Contingency Measures:** ▪ Prune any damaged trees through implementation of proper arboricultural techniques, under supervision of an Arborist or Forester. ▪ Consult with MNR to determine additional contingency measures if necessary.
Damage to vegetation while operating equipment.	• Minimize disturbance to/loss of wildlife habitat and vegetation.	• Keep vegetation removal to a minimum and limited to non-significant habitats (e.g., hedgerows). • For roadside collection line and transmission line routes, vegetation removal (if any) will be kept to a minimum and will be limited to the road right-of-way. • Where construction is to occur within 10 m of natural features, install and maintain protective fencing to clearly define the construction area and prevent accidental damage to vegetation. • Where excavation for construction of access roads or collection lines is conducted within the rooting zone of trees (e.g., within 5 m of the dripline), implement proper root pruning measures to protect tree roots.	• Disturbance to or loss of wildlife habitat and damage to vegetation while operating equipment avoided or minimized through application of mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• Undertake monthly site inspections by an Environmental Monitor to ensure that only specified trees are removed, protective fencing is intact and that there is no damage caused to the remaining trees during construction. • **Contingency Measures:** ▪ Repair protective fencing if damaged. ▪ Prune any damaged trees through implementation of proper arboricultural techniques, under supervision of an Arborist or Forester. ▪ Consult with MNR to determine additional contingency measures if necessary.
Disturbance to or loss of wildlife habitat, including active bird nests.	• Minimize vegetation removal and destruction of bird nests.	• Schedule vegetation removal outside of breeding season (May 1 to July 30) where possible. Undertake active nest surveys if clearing of vegetation must take place during this period.	• Vegetation removal minimized and destruction of active bird nests avoided through application of mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• Undertake monthly site inspections by an Environmental Monitor to ensure that only specified trees are removed, protective fencing is intact and that there is no damage caused to the remaining trees during construction. • **Contingency Measures:** ▪ Prune any damaged trees through implementation of proper arboricultural techniques, under supervision of an Arborist or Forester. ▪ Consult with MNR to determine additional contingency measures if necessary.
Soil / water contamination by oils, gasoline, grease and other materials from construction equipment, materials storage and handling.	• Minimize soil/water contamination.	• Ensure machinery is maintained free of fluid leaks. • Site maintenance, vehicle washing and refuelling stations where contaminants are handled at least 30 m away from natural features or water bodies. • Store any stockpiled materials at least 30 m away from a wetland, woodland, Generalized Candidate Significant Wildlife Habitat or water body. • Develop a spill response plan and train staff on associated procedures. • Control soil / water contamination through best management practices. • Dispose of any waste material from construction activities by authorized and approved off-site vendors.	• Soil and water contamination avoided or minimized through application of mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• Contractor to conduct routine inspections of construction equipment for leaks / spills • Develop an emergency spills plan. • **Contingency Measures:** ▪ Immediately stop all work until the spill is cleaned up. ▪ Notify MOE's Spills Action Centre of any leaks or spills. ▪ If a spill enters a water body, collect and analyze water samples for appropriate parameters. ▪ Monitor daily until cleanup is completed.

Table 3-3 Mitigation Measures, Residual Effects and Monitoring Plan: Generalized Candidate Significant Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Soil / water contamination by release of pressurized drilling fluids into natural features from fractures in substrate (also known as a 'frac-out').	• Minimize soil or water contamination.	• Conduct all drilling by licensed drillers in accordance with Regulation 903 under Ontario Water Resources Act, R.S.O. 1990. • Develop "Frac-Out" Contingency Plan outlining steps to contain any chemicals or to avoid contamination of adjacent features. • Collect drill cuttings as they are generated and place in a soil bin or bag for off-site disposal. • Ensure drill depth is at an appropriate depth below feature to reduce the risk of a "frac-out". Drilling depth will be determined based on site-specific geotechnical conditions and would take into account soil type, soil variances, porosity, etc. as derived from exploratory borehole information. • Install protective fencing around vegetation to prevent accidental damage. • Monitor natural features for signs of surface disturbance (e.g., escape of drilling mud, evidence of tunnel collapse).	• Risk of soil or water contamination avoided or minimized through application of mitigation measures. • Moderate likelihood; if accidental damage occurred, negative effects may be measurable but would likely represent a small change relative to existing conditions.	• Monitor directional drilling for the duration of such activities by an Environmental Monitor to ensure that "frac-out" or accidental intrusion does not occur, and if it does, to ensure that there are no effects on surface or groundwater. • **Contingency Measures:** ▪ Implement a "Frac-Out" Contingency Plan in the event of a "frac-out", which will include but is not limited to the following: - Immediately stop all work, including the recycling of drilling mud / lubricant. - Isolate affected watercourse or area using a temporary dam and install by-pass pump system (if required) to maintain continuous flow downstream of the site; - Insert rigid in-water/soil containment unit or underwater boom into the "frac-out" source area in order to contain any sediments and/or deleterious materials originating from the "frac-out". - No captured material will be left on-site. The captured material should be extracted by vacuum truck, if available, or pumped into a containment unit or area for off-site disposal; - Monitor "frac-out" for four hours to determine if the drilling mud congeals. If drilling mud congeals, take no other action that would potentially suspend sediments in the water column. If drilling mud does not congeal, maintain isolation/containment unit in place and continue pumping captured material to a containment unit or area until drilling mud congeals or stops flowing. - Notify the Ministry of the Environment's (MOE) Spills Action Centre (1-800-268- 6060) of the "frac-out" event and the response taken to contain the spill. This step should be completed during the 4 hour "frac-out" monitoring period. - Engage a spill response team to contain and clean up excess drilling mud in the water. - Monitor clean-up procedures to ensure they do not result in greater damage than leaving the mud in-place. - If the spill affects an area that is vegetated, the area will be seeded and/or replanted using the same species to those in the adjacent area, or

Table 3-3 Mitigation Measures, Residual Effects and Monitoring Plan: Generalized Candidate Significant Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
				allowed to re-grow from existing vegetation. Re-vegetated areas will be monitored once per growing season for two years subsequent to "frac-out" to confirm re-vegetation is successful. - Document post-cleanup conditions with photographs and prepare "frac-out" incident report describing time, place, actions taken to remediate "frac-out" and measures implemented to prevent recurrence. Provide incident report to MNR and MOE within 30 days of the incident.
Changes in surface water drainage patterns. Obstruction of lateral flows in surface water to wetlands.	• Minimize changes in surface water drainage patterns and obstruction of lateral flows in surface water to wetlands.	• Ensure Best Management Practices are used to maintain current drainage patterns, including: ▪ Implement infiltration techniques to the maximum extent possible. ▪ Minimize paved surfaces and design roads to promote infiltration. ▪ Limit changes in land contours.	• Changes in surface water drainage patterns and obstruction of lateral flows avoided through mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• Inspect locations within 30 m of wetlands following completion of access roads by an Environmental Monitor to ensure no changes in drainage patterns. • **Contingency Measures:** ▪ If surface water drainage alterations are detected, undertake corrective measures to restore drainage pattern.
Changes in water levels resulting from short-term construction dewatering.	• Minimize effects on significant wildlife habitat due to dewatering activities.	• Confirm the zone of influence of required dewatering activities prior to construction. • For turbines within the sand and/or gravel deposits, schedule dewatering activities to avoid the sensitive timing window for the Significant Wildlife Habitat(s) present (if determined to be significant) and Generalized Candidate Significant Wildlife Habitat. If this is not possible, MNR will be consulted regarding mitigation measures that may be required. ▪ Amphibian woodland breeding habitat: no dewatering from April 1 to July 31; ▪ Turtle wintering habitat: no dewatering from October 1 to April 30; ▪ Seeps and springs: avoid dewatering from December 1 to March 31, where possible; ▪ Amphibian wetland breeding habitat: no dewatering from April 1 to July 31; ▪ Habitat for insect Species of Conservation Concern: no dewatering from April 1 to July 31; ▪ Marsh bird breeding habitat: no dewatering from April 1 to July 31; and ▪ Rare vegetation community (SWD1-2): no dewatering from April 1 to June 30. • Limit duration of dewatering to as short a time frame as possible. • Implement groundwater cut-offs as required to limit water taking quantities.	• Dewatering effects minimized through the application of mitigation measures. • Negligible residual effects.	• For significant natural features within the zone of influence and potentially affected by dewatering activities, the following Monitoring Plan will be implemented: ▪ Prior to construction, undertake monthly monitoring for a minimum of six months of surface water levels (staff gauge), stream flow (if applicable), vertical hydraulic gradients (mini-piezometers), surface water temperature and vegetation health of the feature within the identified dewatering zone of influence. ▪ During construction dewatering activities, undertake daily monitoring of surface water levels (staff gauge), stream flow (if applicable), vertical hydraulic gradients (mini-piezometers), surface water temperature and vegetation health of the feature within the identified dewatering zone of influence. ▪ Following construction, undertake monthly monitoring for up to one year of surface water levels (staff gauge), stream flow (if applicable), vertical hydraulic gradients (mini-piezometers), surface water temperature, and vegetation health of the feature within the identified dewatering zone of influence. Monitoring may be terminated prior to one year post-construction if there is no evidence of residual effects and levels have returned to norms established through pre-construction monitoring.

Table 3-3 Mitigation Measures, Residual Effects and Monitoring Plan: Generalized Candidate Significant Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
		• Limit dewatering where turbines are constructed within the sand and/or gravel deposits to less than 400,000 L/day. • Set back groundwater discharge locations at least 30 m from Generalized Candidate Significant Wildlife Habitat. All groundwater discharge will undergo appropriate water quality and temperature controls, as required, and will be directed through a sediment filter (i.e., filter bag), sediment basin or other appropriate device capable of handling the anticipated volumes of water, before being discharged to the environment. The specific locations for directing treated groundwater discharge will be selected in the field at the time of construction, but will generally be limited to grassed areas, existing drainage ditching or agricultural fields.		• **Contingency Measures:** ▪ In the event of a decrease in surface water levels which can be attributed to the dewatering activities, stop dewatering until appropriate site-specific mitigation has been implemented. Implement contingency measures (to be determined in consultation with MNR), if required, including but not limited to rescue of stranded wildlife.

Table 3-4 Mitigation Measures, Residual Effects and Monitoring Plan: Significant Wetlands, Woodlands and Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Accidental intrusion into Significant Wetlands and Significant Woodlands resulting in damage to vegetation or habitat form or function.	• Avoid accidental intrusion into significan2 • t natural features.	• Align project components such that vegetation removal is kept to a minimum and limited to non-significant habitats (e.g., hedgerows), where possible. • For roadside collection line and transmission line routes, vegetation removal will be kept to a minimum and will be limited to the road right-of-way, where possible. • Prune any trees damaged during construction through the implementation of proper arboricultural techniques. • Where excavation for construction of collection lines is conducted adjacent to the dripline of woodlands (or within the dripline for collection line installation within road right-of-ways), implement proper root pruning measures to protect tree roots. • Where construction occurs within 30 m, install and maintain protective fencing to clearly define the construction area and prevent accidental damage to vegetation.	• Accidental intrusion will be avoided through clear delineation of boundaries and protective fencing. • Negligible residual effects.	• Undertake monthly site inspection by an Environmental Monitor to ensure that protective fencing is intact and that there is no damage caused during construction. • **Contingency Measures:** ▪ Repair protective fencing if damaged. ▪ Any damaged trees will be pruned through the implementation of proper arboricultural techniques, under supervision of an Arborist or Forester. ▪ If accidental damage to vegetation or habitat occurs, habitat restoration will occur within the disturbed area utilizing suitable native species.
Accidental intrusion resulting in habitat damage in Raptor Wintering Area, and Bat Maternity Colonies.	• Avoid accidental intrusion into habitat.	• Clearly delineate habitat boundaries where construction will occur within 10 m using protective fencing to ensure that construction activities occur outside the habitat boundaries (defined by the drip-line of trees or the edge of the cultural meadow as defined by ELC, where applicable). • Construction activities will be limited to the disturbance areas as detailed on Figure 2-1.	• Habitat damage will be avoided through clear delineation of boundaries and protective fencing. • Negligible residual effects.	• Undertake on-site inspections by an Environmental Monitor to ensure that protective fencing is intact and that there is no damage caused during construction on the following basis: ▪ Weekly during active construction periods; ▪ Inspection not required during inactive construction periods, where the site is left alone for 30 days or longer. • **Contingency Measures:** ▪ Repair protective fencing if damaged. ▪ Any damaged trees will be pruned through implementation of proper arboricultural techniques, under supervision of an Arborist or Forester. ▪ If accidental damage to habitat occurs, habitat restoration will occur within the disturbed area using suitable native species. ▪ Consultation with MNR to determine additional contingency measures if necessary.

Table 3-4 Mitigation Measures, Residual Effects and Monitoring Plan: Significant Wetlands, Woodlands and Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Accidental intrusion resulting in habitat damage in Rare Vegetation Communities, Amphibian Woodland Breeding Habitats, Amphibian Wetland Breeding Habitats.	• Avoid accidental intrusion into significant wildlife habitat.	• Clearly delineate habitat boundaries where construction will occur within 30 m using protective fencing to ensure that construction activities occur outside the habitat boundaries. • Construction activities will be limited to the disturbance areas as detailed on Figure 2-1.	• Habitat damage will be avoided through clear delineation of boundaries and protective fencing. • Negligible residual effects.	• Undertake on-site inspections by an Environmental Monitor to ensure that protective fencing is intact and that there is no damage caused during construction on the following basis: ▪ Weekly during active construction periods; ▪ Inspection not required during inactive construction periods, where the site is left alone for 30 days or longer. • **Contingency Measures:** ▪ Repair protective fencing if damaged. ▪ Any damaged trees will be pruned through implementation of proper arboricultural techniques, under supervision of an Arborist or Forester. ▪ If accidental damage to habitat occurs, habitat restoration will occur within the disturbed area using suitable native species. ▪ Consultation with MNR to determine additional contingency measures if necessary.
Accidental intrusion resulting in habitat damage in Turtle Wintering Areas.	• Avoid accidental intrusion into significant wildlife habitat.	• Clearly delineate habitat boundaries where construction will occur within 30 m using protective fencing (sediment and erosion control fence) to ensure that construction activities occur outside the habitat boundaries. • Construction activities will be limited to the disturbance areas as detailed on Figure 2-1.	• Disruption to turtle wintering habitats avoided through habitat delineation and fencing. • Negligible residual effects.	• Undertake on-site inspections by an Environmental Monitor to ensure that protective fencing is intact and that there is no damage caused during construction on the following basis: ▪ Weekly during active construction periods; ▪ Prior to, during and post forecasted large rainfall events (>20 millimetres in 24 hours) or significant snowmelt events (*i.e.*, spring freshet); and ▪ Daily during extended rain or snowmelt periods. ▪ Inspection not required during inactive construction periods, where the site is left alone for 30 days or longer. • **Contingency Measures:** ▪ Repair protective fencing if damaged. ▪ Consultation with MNR to determine additional contingency measures if necessary.
Accidental intrusion resulting in habitat damage in Reptile Hibernacula and Turtle Nesting Habitats.	• Avoid accidental intrusion into significant wildlife habitat.	• Clearly delineate habitat boundaries where construction will occur within 30 m using protective fencing to ensure that construction activities occur outside the natural feature / habitat boundaries. • Construction activities will be limited to the disturbance areas as detailed on Figure 2-1.	• Habitat damage will be avoided and mortality minimized through clear habitat delineation. • Negligible residual effects.	• Undertake on-site inspections by an Environmental Monitor to ensure that protective fencing is intact and that there is no damage caused during construction on the following basis: ▪ Weekly during active construction periods; ▪ Inspection not required during inactive construction periods, where the site is left alone for 30 days or longer. • **Contingency Measures:** ▪ Repair protective fencing if damaged. ▪ Consultation with MNR to determine additional contingency measures if necessary.

Table 3-4 Mitigation Measures, Residual Effects and Monitoring Plan: Significant Wetlands, Woodlands and Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Accidental intrusion resulting in habitat damage in Habitat for Plant Species of Conservation Concern.	• Avoid accidental intrusion into significant wildlife habitat.	• Clearly delineate habitat boundaries where construction will occur within 30 m using protective fencing to ensure that construction activities occur outside the natural feature / habitat boundaries. • Construction activities will be limited to the disturbance areas as detailed on Figure 2-1.	• Habitat damage will be avoided and mortality minimized through clear habitat delineation. • Negligible residual effects.	• Undertake monthly site inspections by an Environmental Monitor to ensure that protective fencing is intact and that there is no damage caused during construction. • **Contingency Measures:** ▪ Repair protective fencing if damaged. ▪ Any damaged trees will be pruned through implementation of proper arboricultural techniques, under supervision of an Arborist or Forester. ▪ If accidental damage to habitat occurs, habitat restoration will occur within the disturbed area using suitable native species.
Potential introduction of invasive species into Significant Wetland.	• Minimize species invasion into wetland communities.	• Set back permanent access road 5 m from the wetland boundary (WET-027). Develop and implement a restoration plan to re-vegetate the 5 m buffer between the access road and the wetland (WET-027). This will include the 1 year application of an approved herbicide (as per Ausable Bayfield Conservation Authority or St. Clair Region Conservation Authority) to eradicate invasive species followed by seeding with a native seed mix and the planting of native shrubs along the edge consistent with existing vegetation composition.	• Introduction of invasive species avoided or minimized through the application of mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• Monitor re-vegetated areas once per growing season for two years to confirm survival of plantings and/or seed mix. • **Contingency Measures:** ▪ Should seed mix and/or plantings not survive, additional seeding and/or plantings will be undertaken.
Risk of soil or water contamination resulting from accidental spills near Significant Wetlands and Significant Woodlands.	• Minimize soil or water contamination.	• Develop and implement emergency spills plan outlining steps to contain any chemicals or to avoid contamination of adjacent significant natural features. • Control soil or water contamination through best management practices, including: ▪ Store any stockpiled materials at least 30 m away from a wetland, woodland or water body. ▪ Develop a spill response plan and train staff on associated procedures. ▪ Maintain emergency spill kits on site. ▪ Dispose of any waste material from construction activities by authorized and approved off-site vendors.	• Soil and water contamination avoided or minimized through the application of mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• Contractor to conduct routine inspections of construction equipment for leaks / spills. • Develop an emergency spills plan. • **Contingency Measures:** • In the event of a spill: ▪ Immediately stop all work until the spill is cleaned up. ▪ Notify MOE's Spills Action Centre of any leaks or spills. ▪ If a spill enters a wetland, collect and analyze water samples for appropriate parameters. ▪ Monitor daily until cleanup is completed.
Increased dust accumulation on peripheral vegetation, causing damage to plants in Significant Wetlands.	• Minimize dust accumulation on peripheral vegetation.	• Use of water as a dust suppressant along areas where construction is located within 5 m of a significant wetland or woodland.	• Accumulation of dust on peripheral vegetation avoided or minimized. • Some residual effects of limited magnitude likely.	• Daily monitoring of areas where active construction is occurring within 5 m of a significant wetland by an Environmental Monitor. • **Contingency Measures:** ▪ If dust accumulation on wetland plants occurs, spray down plants with water.

Table 3-4 Mitigation Measures, Residual Effects and Monitoring Plan: Significant Wetlands, Woodlands and Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Changes in surface water drainage patterns resulting in effects to soil moisture and species composition of vegetation in Significant Wetlands and Significant Woodlands.	• Minimize effects to soil moisture and species composition of vegetation.	• Ensure Best Management Practices are used to maintain current drainage patterns, including: ▪ Implement infiltration techniques to the maximum extent possible. ▪ Minimize paved surfaces and design roads to promote infiltration. ▪ Limit changes in land contours.	• Effects to soil moisture and species composition of vegetation minimized. • Low likelihood and limited magnitude of effect as a result.	• Site inspection by Environmental Monitor following grading activities within 30 m of significant wetlands and significant woodlands. • **Contingency Measures:** ▪ If surface water drainage alterations are detected, undertake corrective measures to restore drainage patterns.
Increased erosion and sedimentation resulting from clearing and grubbing, excavation, backfilling and stockpiling where construction occurs within 5 m of Significant Wetlands.	• Minimize erosion and sedimentation from clearing, grubbing, excavation, backfilling and stockpiling.	• Install sediment and erosion control fencing along edge of construction area if within 30 m of a significant wetland as per Ontario Provincial Standards Specifications (OPSD 219.130). • Develop and implement an erosion and sediment control plan before commencement of construction. • Extra erosion and sediment control materials will be kept on hand, (i.e., heavy duty silt fencing, straw bales). • Check that erosion control tools are in good repair and properly functioning prior to conducting daily work and re-install or repair as required prior to commencing daily construction activities. • Keep sediment and erosion control measures in place until disturbed areas have been stabilized (i.e., re-vegetated). • To avoid sedimentation in significant wetlands, schedule grading within 30 m of a significant wetland to avoid times of high runoff volumes wherever possible. Temporarily suspend work if high runoff volume is noted or excessive flows of sediment discharges occur until contingency measures are in place. • Re-vegetate temporary roads to pre-construction conditions as soon as possible after construction activities are complete using species native to the area in naturally vegetated areas.	• Increased sedimentation and erosion avoided or minimized through the application of mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• Monitor on-site conditions (i.e., erosion and sediment control, flooding, etc.) where construction occurs within 5 m of a significant wetland feature by an Environmental Monitor on the following basis: ▪ Daily during active construction periods; ▪ Prior to, during and post forecasted large rainfall events (>20 millimetres in 24 hours) or significant snowmelt events (i.e., spring freshet); ▪ Daily during extended rain or snowmelt periods; ▪ Monthly during inactive construction periods, where the site is left alone for 30 days or longer. • **Contingency Measures:** ▪ Suspend work if excessive flows of sediment discharges occur until additional mitigation measures are in place (e.g. installation of extra erosion and sediment control materials kept on site such as silt fencing, straw bales, etc.).
Increased erosion and sedimentation resulting from clearing and grubbing, excavation, backfilling and stockpiling where construction occurs within 30 m of Significant Wetlands and Significant Woodlands.	• Minimize erosion and sedimentation from clearing, grubbing, excavation, backfilling and stockpiling.	• Install sediment and erosion control fencing along edge of construction area if within 30 m of a significant wetland or woodland as per Ontario Provincial Standards Specifications (OPSD 219.130). • Develop and implement an erosion and sediment control plan before commencement of construction. • Extra erosion and sediment control materials will be kept on hand, (i.e., heavy duty silt fencing, straw bales).	• Increased sedimentation and erosion avoided or minimized through the application of mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• Monitor on-site conditions (i.e., erosion and sediment control, flooding, etc.) by an Environmental Monitor where construction occurs within 5 m to 30 m of a significant feature on the following basis: ▪ Weekly during active construction periods; ▪ Prior to, during and post forecasted large rainfall events (>20 millimetres in 24 hours) or significant snowmelt events (i.e., spring freshet);

Table 3-4 Mitigation Measures, Residual Effects and Monitoring Plan: Significant Wetlands, Woodlands and Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
		• Check that erosion control tools are in good repair and properly functioning prior to conducting daily work and re-install or repair as required prior to commencing daily construction activities. • Keep sediment and erosion control measures in place until disturbed areas have been stabilized (i.e., re-vegetated). • To avoid sedimentation in significant wetlands, schedule grading within 30 m of a significant wetland to avoid times of high runoff volumes wherever possible. Temporarily suspend work if high runoff volume is noted or excessive flows of sediment discharges occur until contingency measures are in place. • Re-vegetate temporary roads to pre-construction conditions as soon as possible after construction activities are complete using species native to the area in naturally vegetated areas.		▪ Daily during extended rain or snowmelt periods; ▪ Monthly during inactive construction periods, where the site is left alone for 30 days or longer. • **Contingency Measures:** ▪ Suspend work if excessive flows of sediment discharges occur until additional mitigation measures are in place (e.g. installation of extra erosion and sediment control materials kept on site such as silt fencing, straw bales, etc.).
Increased erosion and sedimentation resulting from clearing and grubbing, excavation, backfilling and stockpiling where vegetation removal is proposed in a Significant Woodland.	• Minimize erosion and sedimentation from clearing, grubbing, excavation, backfilling and stockpiling.	• Install sediment and erosion control fencing along edge of construction area as per Ontario Provincial Standards Specifications (OPSD 219.130). • Install heavy duty sediment and erosion control fencing along construction disturbance area for access road to Turbines 78 and 79 where within 30 m of natural area 90. • Develop and implement an erosion and sediment control plan before commencement of construction. • Extra erosion and sediment control materials will be kept on hand, (i.e., heavy duty silt fencing, straw bales). • Check that erosion control tools are in good repair and properly functioning prior to conducting daily work and re-install or repair as required prior to commencing daily construction activities. • Keep sediment and erosion control measures in place until disturbed areas have been stabilized (i.e., re-vegetated). • Re-vegetate temporary roads to pre-construction conditions as soon as possible after construction activities are complete using species native to the area in naturally vegetated areas.	• Sedimentation avoided or minimized through the application of mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• Monitor on-site conditions (i.e., erosion and sediment control, flooding, etc.) by an Environmental Monitor where construction occurs within 5 m to 30 m of a significant feature on the following basis: ▪ Weekly during active construction periods; ▪ Prior to, during and post forecasted large rainfall events (>20 millimetres in 24 hours) or significant snowmelt events (i.e., spring freshet); ▪ Daily during extended rain or snowmelt periods; ▪ Monthly during inactive construction periods, where the site is left alone for 30 days or longer. • **Contingency Measures:** ▪ Suspend work if excessive flows of sediment discharges occur until additional mitigation measures are in place (e.g. installation of extra erosion and sediment control materials kept on site such as silt fencing, straw bales, etc.).

Table 3-4 Mitigation Measures, Residual Effects and Monitoring Plan: Significant Wetlands, Woodlands and Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Increased erosion and sedimentation resulting from clearing and grubbing, excavation, backfilling and stockpiling near Turtle Wintering Areas, Rare Vegetation Communities, Turtle Nesting Habitats, Amphibian Woodland Breeding Habitat, Amphibian Wetland Breeding Habitats, and Amphibian Movement Corridors.	• Minimize erosion and sedimentation in significant wildlife habitat feature.	• Install sediment and erosion control fencing along edge of construction area if within 30 m of habitat feature as per Ontario Provincial Standards Specifications (OPSD 219.130).	• Erosion and sedimentation mitigated through sediment and erosion control fencing. • Moderate likelihood; if erosion and sedimentation occur, negative effects may be measurable but would likely represent a small change relative to existing conditions.	• Monitor on-site conditions (*i.e.*, erosion and sediment control, spills, flooding, etc.) by an Environmental Monitor where construction occurs within 30 m of a feature on the following basis: ▪ Weekly during active construction periods; ▪ Prior to, during and post forecasted large rainfall events (>20 millimetres in 24 hours) or significant snowmelt events (*i.e.*, spring freshet); ▪ Daily during extended rain or snowmelt periods; ▪ Monthly during inactive construction periods, if the site is left alone for 30 days or longer. • **Contingency Measures:** ▪ Suspend work if excessive flows of sediment discharges occur until additional mitigation measures are in place (e.g. install the extra erosion and sediment control materials kept on site, such as heavy duty silt fencing, straw bales, etc.).
Potential for unplanned intrusion into Significant Wetland in event of equipment malfunction during directional drilling. **Risk of soil or water contamination from spills during directional drilling.** **Risk of sedimentation or erosion into Significant Wetland during directional drilling.**	• Minimize potential for accidental intrusion into significant wetland. • Minimize soil or water contamination. • Minimize erosion, sedimentation and turbidity during directional drilling.	• Conduct drilling by licensed drillers in accordance with Regulation 903 under Ontario Water Resources Act, R.S.O. 1990. • Locate entrance and exit pits at least 30 m from wetland edge. • Collect drill cuttings as they are generated and place in a soil bin or bag for off-site disposal. • Installation of sediment fencing as per Ontario Provincial Standard Specifications (OPSD 219.130). • Ensure drill depth is at an appropriate depth below wetland to reduce the risk of a “frac-out”. Drilling depth will be determined based on site-specific geotechnical conditions and would take into account soil type, soil variances, porosity, etc. as derived from exploratory borehole information. • Monitor natural features for signs of surface disturbance (e.g., escape of drilling mud, evidence of tunnel collapse). • Restore drilling sites to pre-construction conditions once construction is complete. • Develop a “Frac-Out” Contingency Plan outlining steps to contain any chemicals and avoid contamination of wetland feature.	• Risk of unplanned intrusion into wetland due to directional drilling, resulting in soil or water contamination and/or sedimentation and erosion, minimized through the application of mitigation measures. • Moderate likelihood; if unplanned intrusion occurred negative effects may be measurable but would likely represent a small change relative to existing conditions.	• Monitor directional drilling for the duration of such activities by an Environmental Monitor to ensure that “frac-out” or accidental intrusion does not occur, and if it does, to ensure that there are no effects on surface or groundwater. • **Contingency Measures:** ▪ Implement a “Frac-Out” Contingency Plan in the event of a “frac-out”, which will include but is not limited to the following: - Immediately stop all work, including the recycling of drilling mud / lubricant. - Isolate affected watercourse or area using a temporary dam and install by-pass pump system (if required) to maintain continuous flow downstream of the site; - Insert rigid in-water/soil containment unit or underwater boom into the “frac-out” source area in order to contain any sediments and/or deleterious materials originating from the “frac-out”. - No captured material will be left on-site. The captured material should be extracted by vacuum truck, if available, or pumped into a containment unit or area for off-site disposal; - Monitor “frac-out” for four hours to determine if the drilling mud congeals. If drilling mud congeals, take no other action that would

Table 3-4 Mitigation Measures, Residual Effects and Monitoring Plan: Significant Wetlands, Woodlands and Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
				potentially suspend sediments in the water column. If drilling mud does not congeal, maintain isolation/containment unit in place and continue pumping captured material to a containment unit or area until drilling mud congeals or stops flowing. - Notify the Ministry of the Environment's (MOE) Spills Action Centre (1-800-268- 6060) of the "frac-out" event and the response taken to contain the spill. This step should be completed during the 4 hour "frac-out" monitoring period. - Engage a spill response team to contain and clean up excess drilling mud in the water. - Monitor clean-up procedures to ensure they do not result in greater damage than leaving the mud in-place. - If the spill affects an area that is vegetated, the area will be seeded and/or replanted using the same species to those in the adjacent area, or allowed to re-grow from existing vegetation. Re-vegetated areas will be monitored once per growing season for two years subsequent to "frac-out" to confirm re-vegetation is successful. - Document post-cleanup conditions with photographs and prepare "frac-out" incident report describing time, place, actions taken to remediate "frac-out" and measures implemented to prevent recurrence. Provide incident report to MNR and MOE within 30 days of the incident.
Changes in water levels resulting from short term construction dewatering[1] near Significant Wetlands, Turtle Wintering Area, Seeps and Springs, Amphibian Woodland Breeding Habitats, and Amphibian Movement Corridors.	• Minimize effects on significant natural features due to dewatering activities.	• Determine the zone of influence of required dewatering activities prior to construction. • For significant wetlands potentially affected by dewatering, avoid dewatering activities during April 1 to July 31. If this is not possible, MNR will be consulted regarding mitigation measures that may be required. • For turtle wintering areas potentially affected by dewatering, avoid dewatering activities during October 1 to April 30. If this is not possible, MNR	• Dewatering effects minimized through the application of mitigation measures. • Negligible residual effects.	• For significant natural features within the zone of influence and potentially affected by dewatering activities, the following Monitoring Plan will be implemented: ▪ Prior to construction, undertake monthly monitoring for a minimum of six months of surface water levels (staff gauge), stream flow (if applicable), vertical hydraulic gradients (mini-piezometers), surface water temperature and vegetation health of the feature within the

1. *In the event that construction dewatering is not required, or if a significant feature is confirmed not to be within the zone of influence based on Project-specific geotechnical investigation, no dewatering-related monitoring or dewatering restrictions will be required for that feature.*

Table 3-4 Mitigation Measures, Residual Effects and Monitoring Plan: Significant Wetlands, Woodlands and Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
		will be consulted regarding mitigation measures that may be required. • For seeps and springs, avoid dewatering activities during December 1 to March 31, where possible. • For amphibian woodland breeding habitats and amphibian movement corridors potentially affected by dewatering, avoid dewatering activities during April 1 to July 31. If this is not possible, MNR will be consulted regarding mitigation measures that may be required. • Limit duration of dewatering to as short a time frame as possible. • Implement groundwater cut-offs as required to limit water taking quantities. • Limit dewatering where turbines are constructed within the sand and/or gravel deposits to less than 400,000 L/day. • Set back groundwater discharge locations at least 30 m from significant features. All groundwater discharge will undergo appropriate water quality and temperature controls, as required, and will be directed through a sediment filter (i.e., filter bag), sediment basin or other appropriate device capable of handling the anticipated volumes of water, before being discharged to the environment. The specific locations for directing treated groundwater discharge will be selected in the field at the time of construction, but will generally be limited to grassed areas, existing drainage ditching or agricultural fields.		identified dewatering zone of influence. ▪ During construction dewatering activities, undertake daily monitoring of surface water levels (staff gauge), stream flow (if applicable), vertical hydraulic gradients (mini-piezometers), surface water temperature and vegetation health of the feature within the identified dewatering zone of influence. ▪ Following construction, undertake monthly monitoring for up to one year of surface water levels (staff gauge), stream flow (if applicable), vertical hydraulic gradients (mini-piezometers), surface water temperature, and vegetation health of the feature within the identified dewatering zone of influence. Monitoring may be terminated prior to one year post-construction if there is no evidence of residual effects and levels have returned to norms established through pre-construction monitoring. • **Contingency Measures:** ▪ In the event of a decrease in surface water levels which can be attributed to the dewatering activities, stop dewatering until appropriate site-specific mitigation has been implemented. Implement contingency measures (to be determined in consultation with MNR), if required, including but not limited to rescue of stranded wildlife.
Clearing of vegetation for access roads in Significant Woodlands resulting in loss of up to 0.16 ha of forest cover (representing 0.008% of woodland area).	• Minimize loss of forest cover over time.	• Establish an area of forest equal in area to the cleared area (0.16 ha) through tree planting and management (e.g., in partnership with a local Conservation Authority). Details of the afforestation plan will be provided to MNR in a Compensation Plan. • Perform vegetation clearing outside of the breeding bird season (May 1 to July 31). If this is not possible, MNR will be consulted regarding mitigation measures that may be required. • Clearly stake area to be cleared. • Fell trees with a chainsaw toward the construction area to reduce damage to adjacent vegetation being retained.	• Some clearing of vegetation will occur for the access roads; this would represent a small change relative to existing conditions. • Loss of forest cover minimized through afforestation; however there will be a time delay for the planted area to reach the same function as the cleared forest.	• Daily monitoring of areas where active vegetation removal is occurring by Environmental Monitor. • Monitor establishment of planted area and replant/fill plant if required (may be undertaken by partner organization). • **Contingency Measures:** ▪ Any damaged trees will be pruned through implementation of proper arboricultural techniques, under supervision of an Arborist or Forester.

Table 3-4 Mitigation Measures, Residual Effects and Monitoring Plan: Significant Wetlands, Woodlands and Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
		• Limit size of machines entering significant woodlands to minimize soil compaction. • Carry out removal of tree limbs on adjacent trees being retained under supervision of an Arborist or Forester. • Cut damaged tree roots clean as soon as possible and cover exposed roots in an approved topsoil under supervision of an Arborist or Forester.		
Disruption of Tundra Swans in Waterfowl Stopover and Staging Areas due to construction activities.	• Avoid disruption of Tundra Swans during migration.	• Schedule construction activities within 300 m[†] of the stopover and staging habitat to occur outside the important period of staging Tundra Swan (March 1 to April 15)[2]. If this is not possible MNR will be consulted regarding mitigation measures that may be required. • Construction activities within 300 m[†] will be limited to the disturbance areas as detailed on Figure 2-1. • Restore temporary construction areas to pre-construction conditions as soon as possible (e.g. re-vegetate formerly naturally vegetated areas with native plants).	• Disruption to Tundra Swan will be avoided by timing of construction activities. • Negligible residual effects.	• No monitoring or contingency measures required provided construction occurs outside migration period.
Disruption of migrating waterfowl in Waterfowl Stopover and Staging Areas (Terrestrial and Aquatic) due to construction activities.	• Avoid disruption of waterfowl during migration.	• Schedule construction activities within 100 m of the stopover and staging habitat to occur outside the important period of staging for migrating waterfowl (March 1 to April 15). If this is not possible, MNR will be consulted regarding mitigation measures that may be required.	• Disruption to migrating waterfowl will be avoided by timing of construction activities. • Negligible residual effects.	• No monitoring or contingency measures required provided construction occurs outside migration period.
Avoidance behaviour of winter raptors during construction near Raptor Wintering Area.	• Minimize avoidance by raptors.	• No construction within 120 m of this habitat during winter period (November to March) when raptors present. If this is not possible MNR will be consulted regarding mitigation measures that may be required.	• Effects on raptors will be minimized through construction timing. • Negligible residual effects.	• No monitoring or contingency measures required.
Noise disturbance to bats during construction near Bat Maternity Colonies.	• Minimize disturbance to bat roosting habitat.	• Schedule construction activities within 30 m of significant bat habitats to daylight hours during the bat maternal period of May 1st to July 31st, wherever possible.	• Disturbance will be avoided or minimized though timing of construction. • Construction effects temporary and minor.	• No monitoring or contingency measures required.

[†] *The area of the flooded field habitat plus a 100 m to 300 m radius buffer, dependant on local site conditions and adjacent land use, is the Significant Wildlife Habitat as per the Draft Ecoregion 7E Criterion Schedule Addendum to the Significant Wildlife Habitat Technical Guide (MNR, 2012). Therefore, the buffer area may be reduced to 100 m following the completion of pre-construction surveys described in the Natural Heritage Assessment and Environmental Impact Study (AECOM, 2013).*

[2] *Timing window may be modified based on the results of Tundra Swan migration monitoring (e.g. as conducted by the Lambton Heritage Museum); to be determined in consultation with MNR.*

Table 3-4 Mitigation Measures, Residual Effects and Monitoring Plan: Significant Wetlands, Woodlands and Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Displacement and/or mortality of nursing female and juvenile bats resulting from vegetation clearing for access road construction within Bat Maternity Colony. **Removal of confirmed significant cavity trees or other suitable, but not studied, cavity trees resulting from vegetation clearing for access road construction within Bat Maternity Colony.**	• No displacement and/or mortality of nursing female and juvenile bats. • Protection of suitable cavity trees for bat maternity colonies.	• Clearly delineate construction boundaries within 10 m of the habitat using protective fencing to avoid accidental damage to the habitat. • Prepare a tree preservation plan which identifies specific trees to be removed and whether each tree contains a cavity suitable for potential use as a bat maternity colony. • Given the small size of BMA-090A and limited amount of tree removal proposed, no tree greater than or equal to 25 cm DBH, that is within decay class 1-3 (Watt and Caceres, 1999) and has one or more cavities is to be removed. If this is not possible, MNR will be consulted regarding any additional mitigation measures that may be required. • Schedule tree removal to occur outside of the bat maternal period of May 1st to July 31st. If this is not possible, MNR will be consulted regarding mitigation measures that may be required.	• Significance of residual effects will be determined based on the results of post-construction monitoring.	• Supervision of tree removal by a qualified Environmental Monitor. • Undertake on-site inspections by an Environmental Monitor to ensure that protective fencing is intact and that there is no damage caused during construction on the following basis: ▪ Weekly during active construction periods; ▪ Inspection not required during inactive construction periods, where the site is left alone for 30 days or longer. **Contingency Measures:** ▪ Repair protective fencing if damaged. ▪ Any damaged trees will be pruned through implementation of proper arboricultural techniques, under supervision of an Arborist or Forester. ▪ If accidental damage to habitat occurs, habitat restoration will occur using suitable native species.
Noise disturbance to and/or avoidance behaviour of bats during construction within Bat Maternity Colony.	• Minimize noise disturbance and/or avoidance behaviour during construction.	• Schedule tree removal to occur outside of the bat maternal period of May 1st to July 31st, wherever possible. If this is not possible, MNR will be consulted regarding mitigation measures that may be required.	• Disturbance avoided through timing of construction activities. • No residual effects anticipated.	• No monitoring or contingency measures required.
Disruption or possible mortality of turtles moving between wintering ponds and other areas resulting from construction near Turtle Wintering Areas.	• Minimize disruption to turtle movement.	• Post speed limits and turtle crossing signage along relevant construction access roads (30 km/hr). • Do not clear vegetation within 30 m of ponds in April, May, September or October. No vegetation within the defined habitat is to be removed. If this is not possible, MNR will be consulted regarding any additional mitigation measures that may be required. • To avoid collisions with turtles, schedule construction activities within 30 m to occur during daylight hours and not during the period of emergence (March 15 to May 31). • If construction must occur during this timing window, conduct area searches for turtles daily prior to construction activities.	• Disruption and/or mortality minimized through construction timing and speed limits. • Low likelihood of occurring and limited magnitude.	• If construction occurs within 30 m of a turtle wintering area (if determined to be significant) between March 15 and May 31, conduct area searches for turtles by a qualified Biologist prior to soil stripping or grubbing, as well as daily prior to construction activities by the Contractor within the construction footprint. • **Contingency Measures:** ▪ Turtles encountered within the construction area will be moved to a safe location (nearby pond) under the direction of the Environmental Monitor or a qualified Biologist.

Table 3-4 Mitigation Measures, Residual Effects and Monitoring Plan: Significant Wetlands, Woodlands and Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Possible indirect effects on habitat condition resulting from changes to surface water drainage patterns near Turtle Wintering Areas, Turtle Nesting Habitats, Amphibian Woodland Breeding Habitats, and Amphibian Wetland Breeding Habitats.	• Minimize indirect effects on significant wildlife habitat through changes in surface water drainage patterns.	• Ensure Best Management Practices are used to maintain current drainage patterns, including: ▪ Implement infiltration techniques to the maximum extent possible. ▪ Minimize paved surfaces and design roads to promote infiltration. ▪ Limit changes in land contours.	• Indirect effects to habitat minimized by maintaining grade. • Low likelihood of occurring and limited magnitude.	• Inspect locations following completion of access roads by an Environmental Monitor to ensure no changes in drainage patterns. • Examine condition of significant wildlife habitat features within 30 m of access roads following completion of construction. • **Contingency Measures:** ▪ If surface water drainage alterations are detected, undertake corrective measures to restore drainage pattern.
Possible mortality to snakes from construction equipment during construction near Reptile Hibernacula.	• Avoid mortality from equipment.	• No construction activities will occur within 30 m of the hibernaculum feature (*i.e.,* within the 30 m habitat buffer) between September 1 and May 15, to avoid overwintering snakes. • If construction must take place within 30 m of hibernacula during this timing window, no sub-surface (excavation) work is to occur. If above-ground activities are to occur: ▪ Erect temporary drift fence where within 30 m; and ▪ Conduct area searches for snake species within the construction area daily prior to construction activities. • If this is not possible, MNR will be consulted regarding additional mitigation measures that may be required.	• Mortality minimized through construction timing or drift fencing. • Low likelihood of occurring and limited magnitude (i.e., no or limited mortality expected).	• If construction occurs within 30 m of a reptile hibernaculum (if determined to be significant) between September 1 and May 15, conduct area searches for snakes by a qualified Biologist prior to soil stripping or grubbing, as well as daily prior to construction activities by the Contractor within the construction footprint. • **Contingency Measures:** ▪ Snakes encountered within the construction area will be moved to a safe location under the direction of the Environmental Monitor or a qualified Biologist.
Noise disturbance to and/or avoidance behaviour of deer during construction near Deer Winter Congregation Areas.	• Minimize disturbance to wintering deer.	• Schedule construction activities within 120 m of deer wintering areas to occur before December 1 or after April 15 when the snow depth is greater than 20 cm or there is evidence of yarding. If this is not possible, MNR will be consulted regarding mitigation measures that may be required. • In years where environmental conditions are not favourable for yarding, contact MNR to determine if construction activities may proceed between December 1 and March 31.	• Disturbance to wintering deer will be minimized through construction timing. • Negligible residual effects.	• No monitoring or contingency measures required if construction does not occur between December 1 and April 15. • If construction is scheduled to occur between December 1 and April 15, undertake survey to determine snow depth and evidence of yarding (e.g. concentrations of tracks) by a qualified Biologist. Contact MNR to determine if construction activities may proceed.

Table 3-4 Mitigation Measures, Residual Effects and Monitoring Plan: Significant Wetlands, Woodlands and Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Disruption of Bald Eagle in breeding habitat due to noise from construction activities near Bald Eagle and Osprey Nesting, Foraging and Perching Habitat.	• Avoid disruption of Bald Eagle breeding habitat.	• If the nest is active, no construction activities will occur within 200 m of the nest in feature BEN-01 (*i.e.* construction activities will remain outside the primary and secondary habitat zones, as defined by MNR). • If the nest is active, no construction activities will occur within 800 m[§] of the nest in feature BEN-01 during the most critical period for Bald Eagle nesting areas, which extends from March 1 until May 15. • Construction activities will be limited to the disturbance areas as detailed on Figure 2-1.	• Disruption to Bald Eagle avoided through construction timing. • Negligible residual effects.	• In any given year, if the nest is determined to be active and construction is to occur within 800 m[§] of the nest between February 15 and March 1 or between May 15 and August 15, monitoring for disturbance effects will be undertaken during construction by a qualified Biologist, using the Bald Eagle Activity Assessment protocol or, if completed, the Bald Eagle Behavioural Study, both described in the NHA. • The Bald Eagle Activity Assessment includes: ▪ Surveys conducted at approximately two week intervals starting on February 15 and extending to May 15. ▪ Surveys conducted during daylight hours from a suitable vantage point for a minimum of 30 minutes. ▪ All observed Bald Eagle individuals and nests will be recorded along with GPS coordinates of their location, individual life stage, and behavioural observations. ▪ If active breeding is confirmed, surveys will continue at the same frequency until fledglings have left the nest (approximately August 15). • **Contingency Measures:** ▪ If a significant change to Bald Eagle habitat use is noted through disturbance monitoring, such as changes to flight paths and/or abandonment of the nest, MNR will be contacted immediately to determine additional contingency measures if necessary.
Removal of vegetation within Woodland Raptor Nesting Habitat and Woodland Area-sensitive Bird Breeding Habitat (up to 0.16 ha). This tree removal is proposed within thin sections of forest that presently consist of edge habitat and contain no interior forest habitat.	• Avoid effects to interior forest habitat quantity or quality.	• Clearly delineate limits of easement using protective fencing to ensure that construction activities occur only within prescribed areas. • Minimize the area of tree removal within the natural area to the extent possible. • Construction activities will be limited to the disturbance areas as detailed on Figure 2-1.	• No effects to interior forest habitat quantity or quality.	• Supervision of vegetation removal by a qualified Environmental Monitor to limit removal of habitat to the extent possible. • **Contingency Measures** ▪ Prune any damaged trees through implementation of proper arboricultural techniques, under supervision of an Arborist or Forester.

[§] *This distance may be reduced through the completion of a pre-construction Behavioural Study according to the protocol described in the Natural Heritage Assessment and Environmental Impact Study (AECOM, 2013).*

Table 3-4 Mitigation Measures, Residual Effects and Monitoring Plan: Significant Wetlands, Woodlands and Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Breeding woodland raptors and/or woodland area-sensitive birds may be disturbed by noise from construction within Woodland Raptor Nesting Habitat and Woodland Area-sensitive Bird Breeding Habitat.	• Avoid disturbance to breeding raptors and/or area-sensitive birds.	• Schedule vegetation clearing within habitat to occur outside the breeding season of May 1 to July 31. If this is not possible, MNR will be consulted regarding mitigation measures that may be required.	• Disturbance to woodland raptors avoided through timing of construction activities.	• No monitoring or contingency measures required.
Possible mortality to turtles from construction equipment during construction near Turtle Nesting Habitats.	• Avoid mortality from equipment.	• Post speed limits and turtle crossing signage along relevant construction access road (30 km/hr). • Schedule construction activities within 30 m to avoid nesting period (May 15 to June 30). If this is not possible, MNR will be consulted regarding mitigation measures that may be required.	• Disruption minimized through speed limits and fencing. • Low likelihood of occurring and limited magnitude (i.e., no or limited mortality expected).	• If construction occurs within 30 m of turtle nesting habitat (if determined to be significant) between May 15 and June 30, conduct area searches for turtles by a qualified Biologist prior to soil stripping or grubbing, as well as daily prior to construction activities by the Contractor within the construction footprint. • **Contingency Measures:** ▪ Turtles encountered within the construction area will be moved to a safe location under the direction of the Environmental Monitor or qualified Biologist.
Removal of vegetation for construction of access roads within Seeps and Springs resulting in habitat damage (up to 0.01 ha).	• Minimize habitat damage within feature.	• Minimize the area of tree removal in feature to the extent possible. • Construction activities will be limited to the disturbance areas as detailed on Figure 2-1.	• Habitat damage minimized through application of mitigation measures. • Negligible residual effects.	• Supervision of vegetation removal by an Environmental Monitor to ensure no tree removal within 30 m of seeps.
Disruption or possible mortality of amphibians moving to breeding pools and home range near Amphibian Woodland Breeding Habitats, Amphibian Wetland Breeding Habitats, and Amphibian Movement Corridors.	• Minimize disruption to amphibians. • Minimize amphibian mortality along access roads.	• Limit construction of roads within 30 m of significant amphibian habitats to daylight hours between April 1 and June 30 (for significant frog breeding habitats) or between March 15 and April 30 (for significant salamander breeding habitat), to avoid excessive noise and vehicle caused mortality, wherever possible. If this is not possible, MNR will be consulted regarding mitigation measures that may be required. • Post speed limits along construction access roads (30 km/hr).	• Disruption mitigated through construction timing and speed limits. • Low likelihood of occurring and limited magnitude (*i.e.*, no or limited mortality expected).	• No monitoring required if timing windows are applied. • If construction must occur within 30 m during the noted time periods due to a critical phase of construction, work may be permitted if conditions for amphibian breeding are not ideal. Specifically, work may occur if any one of following conditions is met: temperatures are below 6°C, there has been no rain in the previous 24 hours or wind speeds are higher than 3 on the Beaufort Scale. The Environmental Monitor will track weather conditions and determine if suitable amphibian breeding conditions are or are not present.

Table 3-4 Mitigation Measures, Residual Effects and Monitoring Plan: Significant Wetlands, Woodlands and Wildlife Habitat

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Removal of vegetation for construction of access road within Hooded Warbler Habitat resulting in habitat damage (up to 0.15 ha). **Noise disturbance to breeding Hooded Warbler during construction of access road within Hooded Warbler Habitat.**	• Minimize disturbance to breeding habitat. • Avoid disturbance to breeding birds.	• Schedule vegetation clearing within habitat to occur outside the breeding season of May 1 to July 31. If this is not possible, MNR will be consulted regarding any additional mitigation measures that may be required. • Clearly delineate limits of easement using protective fencing to ensure that construction activities occur only within prescribed areas. • Construction activities will be limited to the disturbance areas as detailed on Figure 2-1. • Minimize the area of tree and shrub removal within the natural area to the extent possible. • Include plantings of native shrub species suitable to Hooded Warbler in the area of disturbance during restoration of disturbance areas for the access road.	• Some (up to 0.15 ha) permanent vegetation removal within the natural feature containing habitat for Hooded Warbler will occur. The amount of habitat loss is minor and restricted to two narrow sections of the woodlot; this would represent a small change relative to existing conditions. • Disturbance to Hooded Warbler avoided through timing of construction activities.	• Supervision of vegetation removal by a qualified Environmental Monitor to limit removal of habitat to the extent possible. **Contingency Measures:** ▪ Prune any damaged trees through implementation of proper arboricultural techniques, under supervision of an Arborist or Forester.

3.3 Surface Water and Groundwater

Potential effects to surface water and groundwater, resulting from locating a Project component within the prescribed setbacks to water bodies, are evaluated in the Water Assessment and Water Body Report (AECOM, 2013) and are described below.

3.3.1 Surface Water

Following the Records Review and Site Investigation, 116 water bodies were identified. According to *O. Reg. 359/09*, a water body includes a lake, permanent stream, intermittent stream and a seepage area, defined as:

- Permanent stream – a stream that continually flows in an average year;
- Intermittent stream – a natural or artificial channel, other than a dam, that carries water intermittently and does not have established vegetation within the bed of the channel, except vegetation dominated by plant communities that require or prefer the continuous presence of water or continuously saturated soil for their survival;
- Lake Trout Lake – a lake that has been designated by the Ministry of Natural Resources for Lake Trout management, as set out in records maintained by and available from that Ministry, and;
- Seepage Area – a site of emergence of groundwater where the water table is present at the ground surface, including a spring.

All identified water bodies are within 120 m of Project infrastructure. To aid in the assessment of water bodies and to focus mitigation measures, information was collected during site investigations that incorporated water quality, flow, aquatic habitat and riparian features in order to provide some understanding of the system's resiliency. Based on a sensitivity ranking conducted by AECOM, 9 water bodies were classified as high sensitivity (i.e., not very resilient to environmental change); 71 water bodies were classified as moderate sensitivity; and 36 water bodies were classified as low sensitivity. The assessment concluded that the majority of the watersheds are fairly resilient to environmental perturbations. In general, water quality throughout the Project Study Area is heavily influenced by agriculture, as evidenced by tile drain runoffs, high suspended solids and turbidity of the water, as well as algae growth in some of the channels.

Table 3-5 provides mitigation measures, residual effects and the monitoring plan for each potential effect relating to surface water.

Table 3-5 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Increase to surface water temperature from reduced groundwater contribution if dewatering activities are required for excavation of turbine foundations.	• Minimize reduction of stream baseflows and groundwater upwelling areas, and increase in water temperatures.	**Water Management** • Control rate and timing of water pumping; pump from deep wells to infiltration galleries adjacent to water bodies or wetlands. • Restrict taking groundwater and surface water during drought conditions. • Regulate the discharge of water-taking (if required) to ensure that there is no flooding in the downstream area and no soil erosion, or stream channel scouring at the point of discharge. Use a discharge diffuser or other energy dissipation device will be used, if necessary, to mitigate flows which physically alter the stream channel or banks. • Install siltation control measures that are sufficient for the volumes pumped at both the taking location upstream of the construction site and (if necessary) the discharge site. All measures will be taken to properly maintain these control devices throughout the construction period. **Dewatering Activities** • Confirm the zone of influence of required dewatering activities prior to construction. • Schedule dewatering activities to take place during a seasonally dry time of year where possible. • Limit duration of dewatering to as short a time frame as possible. • Implement groundwater cut-offs as required to limit water taking quantities. • Limit dewatering where turbines are constructed within the sand and/or gravel deposits to less than 400,000 L/day. **Timing Windows** • Schedule construction activities that occur within 30 m of watercourses to avoid periods of critical habitat use (i.e., spawning) to the extent possible. There are generic restricted in-water work timing windows established by the Department of Fisheries and Oceans Canada (DFO). • Specific timing windows for this Project will be developed in consultation with the Ausable Bayfield Conservation Authority (ABCA) and St. Clair Region Conservation Authority (SCRCA).	• Reduced stream baseflows, groundwater upwelling areas and increase in water temperatures minimized through application of mitigation measures. • Low likelihood and limited magnitude of effects as there will only be small scale dewatering (if required).	• Where known groundwater dewatering is required, install staff gauges to monitor stream levels • Monitor water level at these locations to monitor watercourse depth and estimated flow before, during and after dewatering activities. **Contingency Measures:** • Control rate and timing of water pumping. ▪ In the event of a decrease in surface water levels, of which it can be attributed to the dewatering activities, stop dewatering until appropriate site specific mitigation plan has been developed.

Table 3-5 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Increase to streamflows in watercourses that receive temporary groundwater dewatering discharge (if required). Groundwater discharge has potential to cause streambed and/or bank erosion and downstream sedimentation if not managed properly.	• Minimize increase in flows to watercourses and erosion and/or sedimentation.	**Erosion and Sediment Control** • Develop and implement an erosion and sediment control plan before commencement of construction. • Utilize erosion blankets, erosion control fencing, straw bales, etc., where necessary to mitigate potential excessive erosion and sedimentation. Ensure any materials placed in floodline are free from silt and other such particles. Keep extra erosion and sediment control materials on site (*e.g.*, heavy duty silt fencing, strawbales). • Check that erosion control tools are in good repair and properly functioning prior to conducting daily work and re-install or repair as required prior to commencing daily construction activities. • Keep sediment and erosion control measures in place until disturbed areas have been stabilized (i.e., re-vegetated). **Water Management – See above** **Timing Windows – See above**	• Increased flows to watercourses and associated streambed and/or bank erosion minimized through application of mitigation measures. • Low likelihood and limited magnitude of effects as there will only be short term dewatering (if required).	• Monitor erosion and sedimentation of receiving watercourse before and during dewatering events • Monitor water level and stream flow at these locations to test watercourse depth and flow before and during construction. • Collect surface water samples from discharge locations before, during and after construction. Analyze for general chemistry (e.g., temperature, pH, dissolved oxygen, and conductivity), suspended solids, total phosphorus and total metals (e.g., copper, iron, zinc and aluminum). These data will be used to determine background watercourse water quality at discharge locations. The findings of the monitoring program will be reported back to MOE following the completion of dewatering activities. **Contingency Measures:** • Install a temporary storage basin adjacent to foundation area to allow water to infiltrate.
Increased erosion, sedimentation and turbidity from clearing and grubbing on adjacent lands for construction of turbines, pads/turnaround areas, and access roads and from directional drilling activities.	• Minimize erosion, sedimentation and turbidity.	**Erosion and Sediment Control – See above** **Grading and Excavation** • Minimize changes in land contours and natural drainage; maintain timing and quantity of flows. Any grading of lands adjacent to water body features should match existing grades at the identified set-back, or buffer from the features. **Equipment Use** • Minimize vehicle traffic on exposed soils, avoid compacting or other hardening of natural ground surface, and avoid the movement of heavy machinery on areas with sensitive slopes. • Limit speed of vehicles near watercourse crossings.	• Increased erosion, sedimentation and turbidity from clearing and grubbing minimized through application of mitigation measures • Low likelihood and limited magnitude of effects as a result.	• Monitor on-site conditions (i.e., erosion and sediment control, spills, flooding, etc.) where construction occurs within 30 m of a water course on the following basis: ▪ Weekly during active construction periods. ▪ Prior to, during and post forecasted large rainfall events (>20 mm in 24 hours) or significant snowmelt events (i.e., spring freshet). ▪ Daily during extended rain or snowmelt periods. ▪ Monthly during inactive construction periods, where the site is left alone for 30 days or longer. • In the event that a spill / flooding occurs, report the details of the event to MOE, including a description of any assessment and remediation undertaken. **Contingency Measures:** • Suspend work if excessive flows of sediment discharges occur until mitigation measures are in place (e.g. installation of extra erosion and sediment control materials kept on site, such as silt fencing, straw bales, etc.).

Table 3-5 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Soil compaction, which may result in hardening of surfaces and increased runoff into watercourses	• Minimize soil compaction and increased runoff into watercourses.	**Erosion and sediment control – See above** **Grading and Excavation – See above** **Water Quality – See above**	• Soil compaction and associated increase in runoff into watercourses minimized through application of mitigation measures • Low likelihood and limited magnitude of effects as a result.	• Monitor on-site conditions (i.e., erosion and sediment control, spills, flooding, etc.) where construction occurs within 30 m of a water course on the following basis: ▪ Weekly during active construction periods. ▪ Prior to, during and post forecasted large rainfall events (>20 mm in 24 hours) or significant snowmelt events (i.e., spring freshet). ▪ Daily during extended rain or snowmelt periods. ▪ Monthly during inactive construction periods, where the site is left alone for 30 days or longer. **Contingency Measures:** • Suspend work if excessive flows of sediment discharges occur until mitigation measures are in place.
Release / discharge of runoff from the construction area, which has the potential to transport sediment and nutrients into the watercourse.	• Minimize release or discharge of sediment-laden surface water into adjacent watercourse or drainage features.	**Water Quality – See above** **Erosion and Sediment Control – See above** **Timing Windows – See above**	• Release or discharge of sediment laden surface water into the adjacent watercourse or drainage features minimized through application of mitigation measures • Low likelihood and limited magnitude of effects as a result.	• Monitor on-site conditions (i.e., erosion and sediment control, spills, flooding, etc.) where construction occurs within 30 m of a water course on the following basis: ▪ Weekly during active construction periods. ▪ Prior to, during and post forecasted large rainfall events (>20 mm in 24 hours) or significant snowmelt events (i.e., spring freshet). ▪ Daily during extended rain or snowmelt periods. ▪ Monthly during inactive construction periods, where the site is left alone for 30 days or longer. • In the event that a spill / discharge of sediment occurs, report the details of the event to MOE, including a description of any assessment and remediation undertaken. **Contingency Measures:** • Suspend work if excessive flows of sediment discharges occur until mitigation measures are in place.

Table 3-5 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Obstruction of lateral flows in watercourses from water crossings.	• Minimize obstruction of lateral flows in watercourses.	**Culvert Design** • Design and install culverts to prevent creation of barriers to fish movement and maintain bankfull channel functions. • Install open bottom crossing structures where possible. • Design culverts to accommodate high flows of the watercourse by undertaking hydraulic engineering studies. • Embed the culvert below the streambed to maintain lateral flow. • Install adequate gravel base to maintain flow of shallow groundwater. • Locate crossings within straight sections of the stream, perpendicular to the bank, where possible. Avoid crossings on meander bends, braided streams and any other unstable areas. • Use only clean material (i.e., rock or coarse gravel) for approaches to culverts. • Regularly maintain culverts to ensure no debris build-up is impeding stream flow. **Isolated Crossing** • Install in-water works for permanent water bodies in the dry via dam and pump method or creation of a diversion channel to maintain flow around the work site. For intermittent water bodies, work is preferred to be completed in the dry and carried out during seasonally dry or when the water body is frozen to the bottom. • Develop and implement a fish rescue plan for dewatering areas. This will include appropriate sized end-of-pipe fish screen to prevent potential losses of fish due to entrainment or impingement as outlined in the DFO Freshwater Intake End-of-Pipe Fish Screen Guideline. • Retain an adequate portion of channel with sufficient width and depth to allow for fish passage if construction requires that an instream work area be isolated from the primary channel. In the event that an area must be blocked from bank to bank, construct a temporary by-pass to allow fish passage around the construction area.	• Obstruction of lateral flows in watercourses avoided through application of mitigation measures. • No likelihood of effect occurring.	• Monitor on-site conditions at all water body crossings (i.e., culverts are installed properly and embedded below the streambed.): prior to, during and after the installation of the culvert to ensure lateral flows have been maintained. **Contingency Measures:** • In the event the culvert creates issues relating to lateral flow and fish barriers, steps will be required to fix issues which may involve re-installing the culvert and ensuring it is properly installed and embedded within the streambed.

Table 3-5 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Temporary disruption of substrates/habitat associated with in-water works.	• Minimise temporary disruption of substrates/habitats.	**Timing Windows – See above** **Isolated Crossing – See above** **Erosion and Sediment Control – See above** **Rehabilitation** • Re-vegetate and restore the turbine staging area following turbine installation with tiling (if desired by the owner). • Restore and maintain vegetative buffers around water bodies including within the foundation footprint where possible. • Restore and maintain vegetative buffers around water bodies including within the temporary construction areas. • Keep vegetation removal to a minimum. • Add suitable stream substrates (e.g., gravel or rip rap) to stabilize sediment and provide cover.	• Temporary disruption of substrates/habitat associated with in-water works minimized through application of mitigation measures. • Moderate likelihood and magnitude of effect occurring due to number of watercourse crossings.	• Monitor fish habitat once per week or throughout duration of in-water construction to identify any minor or major disturbances caused by construction activities by undertaking the following: ▪ Turbidity monitoring for sediment loading; ▪ Monitoring bank stability; ▪ Monitoring substrate composition; ▪ Monitoring stream flow and ensure fish passage is maintained at all times. • Document changes to aquatic habitat as a result of construction activities and obtain photographic documentation. • Report the findings of the monitoring program to MOE following the completion of in-water construction activities. **Contingency Measures:** • Mitigate or compensate for any disturbance to fish habitat according to Department of Fisheries and Oceans Canada (DFO) authorization and in consultation with ABCA and SCRCA.
Degradation of fish habitat from culvert installation.	• Minimize degradation of fish habitat.	**Culvert Design – See above** **Timing Window – See above**	• Degradation of fish habitat minimized through application of mitigation measures. • Moderate likelihood of effect occurring due to number of watercourse crossings; however, magnitude of effect limited due to marginal habitat and common species; as such fish passage will be maintained and will continue to provide habitat.	• Monitor fish habitat throughout duration of in-water construction to identify any minor or major disturbances caused by construction activities. • Document changes to aquatic habitat as a result of construction activities and obtain photographic documentation. **Contingency Measures:** • Mitigate or compensate for any disturbance to fish habitat according to Department of Fisheries and Oceans Canada (DFO) authorization and in consultation with ABCA and UTRCA.
Soil/water contamination by oils, grease and other materials from accidental spills and release of contaminants from construction equipment.	• Minimize soil/water contamination.	**Equipment Use – See above plus:** • Use a spill collection pad for refuelling and maintenance. **Material Stockpiling and Handling** • Store any stockpiled materials at least 30 m away from water body to prevent deleterious substances from inadvertently discharging to the environment. • Develop a spill response plan and train staff on associated procedures. • Dispose of any waste material from construction activities by authorized and approved off-site vendors. **Water Quality – See above** **Timing Windows – See above**	• Soil / water contamination minimized through application of mitigation measures. • Low likelihood and limited magnitude of effects on surface water and groundwater as a result.	• Contractor to conduct routine inspections of construction equipment for leaks / spills **Contingency Measures:** • In the event of a spill: ▪ Immediately stop all work until the spill is cleaned up. ▪ Notify MOE's Spills Action Centre of any leaks or spills. ▪ If a spill enters a water body, collect and analyze water samples for appropriate parameters. ▪ Monitor daily until cleanup is completed.

Table 3-5 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Release of pressurized drilling fluids into watercourses from fractures in substrate (also known as a 'frac-out').	• Minimize fractures in substrates and release of pressurized drilling fluids into watercourse.	**Directional Drilling** • Conduct all drilling by licensed drillers in accordance with Regulation 903 under Ontario Water Resources Act, R.S.O. 1990. • Locate drill entry and exit pits at least 30 m from water bodies. • Collect drill cuttings as they are generated and place in a soil bin or bag for off-site disposal. • Ensure drill depth is at an appropriate depth below the water body to reduce the risk of a 'frac-out'. • Develop 'Frac-out' plan (see Section 5.3 of Water Assessment and Water Body Report, AECOM, 2013) **Water Quality – See above**	• Fractures in substrate releasing pressurized drilling fluids into watercourse and causing potential change to groundwater flow patterns minimized through application of mitigation measures. • Low likelihood of effects as a result of mitigation measures; however magnitude of effects could be high as release of pressurized drilling fluids into a water body could affect both water quality and aquatic habitat.	• Monitor directional drilling for the duration of such activities to ensure that "frac-out" does not occur, and if it does, to ensure that effects are minimized on surface or groundwater. **Contingency Measures:** • In the event of a "frac-out", immediately stop all work, including the recycling of drilling mud / lubricant and implement 'frac-out' contingency plan. • Implement 'Frac-out' plan.
Reduction of streamflow due to the withdrawal of surface water for construction activities such as dust suppression, equipment washing and land reclamation (e.g., hydroseeding).	• Minimize effects to surface water and fish habitat.	**Erosion and Sediment Control – see above** **Water Management** • Restrict taking groundwater and surface water during drought conditions • Control rate and timing of water pumping from surface water features • Regulate the discharge of water-taking to ensure there is no soil erosion, or stream channel scouring is caused by the point of discharge.	• Low likelihood and limited magnitude of effects on surface water as a result.	• Monitor all surface water-taking activities to ensure no damage to watercourse and fish habitat occurs, including drops in water levels and damage to stream banks and bed from discharge. **Contingency Measures:** • In the event of decreased water levels and damage to stream banks and bed, suspend work until mitigation measures are in place.
Loss of riparian habitat adjacent to watercourses for installation of culverts and transmission line poles.	• Minimize loss of riparian habitat adjacent to watercourses	**Rehabilitation** • Keep vegetation removal to a minimum • Restore and maintain vegetative buffers around water bodies including within the temporary construction areas **Erosion and Sediment Control – see above**	• Loss of riparian habitat adjacent to watercourses minimized through application of mitigation measures. • Low likelihood and limited magnitude of effects riparian cover and adjacent watercourse.	• Monitor site during riparian vegetation removal. • Monitor on-site conditions (i.e., erosion and sediment control, etc.) where construction occurs within 30 m of a water course on the following basis: ▪ Weekly during active construction periods. ▪ Prior to, during and post forecasted large rainfall events (>20 mm in 24 hours) or significant snowmelt events (i.e., spring freshet). ▪ Daily during extended rain or snowmelt periods. ▪ Monthly during inactive construction periods, where the site is left alone for 30 days or longer. **Contingency Measures:** • Suspend work if excessive flows of sediment discharges occur until mitigation measures are in place. • Restabilize banks with plantings as works are complete to ensure no further damage to stream banks.

Table 3-5 Mitigation Measures, Residual Effects and Monitoring Plan: Surface Water

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Changes in surface water drainage patterns to water bodies.	• Minimize changes in surface water drainage patterns and obstruction of lateral flows in surface water to water bodies.	• Minimize changes in land contours and natural drainage; maintain timing and quantity of flows. • Match any grading of lands adjacent to natural features to existing grades at the identified set-back, or buffer from the features.	• Changes in surface water drainage patterns and obstruction of lateral flows avoided through mitigation measures. • Low likelihood and limited magnitude of effect as a result.	• Inspect locations within 30 m of wetlands following completion of access roads by an Environmental Monitor to ensure no grade changes. • **Contingency Measures:** ▪ If surface water drainage alterations are detected, undertake corrective measures to restore drainage pattern.
Damage to stream banks from the use of heavy machinery.	• Minimize damage to stream banks.	**Work Area** • Stabilize banks where necessary, minimizing area and duration of soil exposure. • Operate machinery on land and in a manner that minimizes disturbance to stream banks • Erect sediment fencing around water bodies and areas to be avoided • Locate staging areas away from watercourses and if possible out of the regulated floodplain to limit risk of impacts to aquatic habitat and surface water quality from accidental spills. **Erosion and Sediment Control – see above** **Rehabilitation** • Restore and maintain vegetative buffers around water bodies including within the temporary construction areas	• Damage to stream banks minimized through application of mitigation measures. • Low likelihood and limited magnitude of effects on surface water and groundwater as a result.	• Monitor on-site conditions (i.e., erosion and sediment control, etc.) where construction occurs within 30 m of a water course on the following basis: ▪ Weekly during active construction periods. ▪ Prior to, during and post forecasted large rainfall events (>20 mm in 24 hours) or significant snowmelt events (i.e., spring freshet). ▪ Daily during extended rain or snowmelt periods. ▪ Monthly during inactive construction periods, where the site is left alone for 30 days or longer. **Contingency Measures:** • Suspend work if excessive flows of sediment discharges occur until mitigation measures are in place. • Restabilize banks with appropriate measures as soon as works are complete to ensure no further damage to stream banks.

3.3.2 Geology and Groundwater

A desktop study was conducted to identify potential effects to groundwater from the construction and installation of the Project. Materials used in this desktop study included MOE Water Well Records, geological descriptions from the Ontario Geological Survey (OGS), Geographic Information System (GIS), technical publications from the Ausable Bayfield Conservation Authority, St. Clair Region Conservation Authority and Lambton County, as well as the turbine and supporting infrastructure layout for the Project and turbine construction details.

Bedrock geology of the Project Study Area consists of Devonian age limestones of the Dundee Formation, and shales of the Hamilton Group and the Kettle Point Formation. In general, the bedrock underlying the Project Study Area is overlain by up to 60 m of overburden material. The Dundee Formation, exposed in the northeast portion of the Project Study Area, is overlain by approximately 60 m of overburden material (Cooper, 1979). The Hamilton Group underlies the central portion of the Project Study Area and forms a prominent bedrock ridge, known as the Ipperwash Escarpment, separating the Hamilton Group from the underlying Dundee Formation. This feature is exposed at surface northeast of the town of Thedford and trends northwest to southeast. The Kettle Point Formation becomes the overlying bedrock in the southwest portion of the Project Study Area. West of the Ipperwash Escarpment, bedrock topography slopes gently north and west into the Lake Huron basin.

The predominant overburden material throughout the Project Study Area is the St. Joseph Till, which is widely characterized as a clayey silt to silty clay till (Cooper, 1979). The St. Joseph Till is not uniform in its lithology across the Project Study Area. Incorporation and interbedding of course grained sediments ranging from laminated silts and clays to sands and gravels are encountered. It is important to note these heterogeneities such as sand and gravel lenses, within the St. Joseph Till have the potential to contain significant quantities of groundwater. Predominantly, the St. Joseph Till has a high clay content, which likely restricts infiltration of precipitation and surface water as well as groundwater movement. The St. Joseph Till is considered a local aquitard based on these hydrogeological properties.

Course grained glaciolacustrine deposits transect the Project Study Area and are present as long bands of glacial lake beach-foreshore deposits of sand and gravel, typically trending in a southwest to northeast direction. Within the Project Study Area, these deposits are associated with glacial Lake Grassmere to the north, glacial Lake Warren transecting through the centre of the Project Study Area, and glacial Lake Arkona in the south. These deposits are highly permeable and are responsible for the majority of groundwater recharge within the Project Study Area. These deposits have been designated as a Significant Groundwater Recharge Area (SGRA) by the MOE (ABCA & MVCA, 2011). Typically, these deposits are underlain by fine grained sediments, creating perched aquifer conditions where the groundwater table is close to surface. Similar characteristics are found associated with the glacialfluvial outwash deposits, which are largely confined to the northeastern portion of the Project Study Area, within the Ausable River valley.

Found between glacial lake foreshore deposits and the current Lake Huron shore line are fine grained glaciolacustrine deposits of silt and clay. These deposits are considered to be relatively impermeable and likely restrict groundwater infiltration and groundwater movement.

Available MOE water well records within the Project Study Area indicate that the majority of the water supply wells are screened within bedrock aquifers. Overburden aquifers are used by water wells in the northern portion of the Project Study Area and are completed in the unconfined shallow sand aquifers, largely confined to the course grained glaciolacustrine deposits (beach-foreshore deposits). These unconfined aquifers create perched groundwater conditions, where groundwater is found less than 2 m below ground surface. Shallow water table conditions may be encountered during construction of the turbine foundation and during the installation of the collection lines, especially when in close proximity to the beach-foreshore sand and gravel deposits. In these instances dewatering of the overburden aquifer may be required.

Any water taking conducted during the construction phase is subject to the Renewable Energy Approval application and as such does not require a separate Permit to Take Water (MOE, 2011). The extraction of groundwater for construction dewatering purposes is expected to be of low volume due to the short duration of dewatering activities, and the shallow depth of the turbine bases (up to 4 mbgs). However, there is the potential that water taking could be greater than 50,000 L/day, depending on the surficial material being excavated, the depth to groundwater, the amount of precipitation received during excavation activities, and other geological characteristics that may be determined during the geotechnical analysis. The following turbines have been determined, through the analysis of available geological mapping and MOE water well record borehole logs, to have the potential to require construction dewatering of greater than 50,000 L/day during the excavation and installation of turbine foundations: 1-8, 10, 13, 20, 28, 31-34, 44, 59, 75-76, 83-85, 88-92, 94, 99, 105.

As such the water taking may be classified as Groundwater – Category 2 (short-term, non-recurring taking less than 30 consecutive days and less than 400,000 L/day). Appendix B contains detailed calculations on the dewatering estimates and radii of influence for the construction dewatering. Based on the calculations in Appendix B, the conservative water taking per turbine base excavation range from 2,300 L/day to 163,000 L/day with calculated radii of influence for the construction dewatering of 15 m and 213 m for the silty/clayey till unit and the sand and gravel unit respectively. A conservative estimate of 250 m for the zone of influence has been assumed.

As these calculations are based on estimations from the available data, at least one geotechnical borehole will be drilled for each turbine base location and these calculations will be revisited using the new soil data and depth to groundwater found from the geotechnical investigations.

Table 3-6 provides mitigation measures, residual effects and the monitoring plan for each potential effect relating to groundwater.

Table 3-6 Mitigation Measures, Residual Effects and Monitoring Plan: Geology and Groundwater

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Reduction in groundwater quality and quantity due to dewatering when excavating and constructing the turbine foundations.	• Minimize reduction in groundwater quality and quantity.	• Direct the discharge from dewatering back into the nearest watercourse (following sediment control practices) to negate the potential that drawdown will decrease baseflow into streams and groundwater discharge into wetlands. • Limit duration of dewatering to as short a time frame as possible • Implement groundwater cut-offs as required to limit water taking quantities • Limit dewatering where turbines are constructed within the sand and/or gravel deposits or where shallow water table conditions are expected to less than 400,000 L/day (Turbines: 1-8, 10, 13, 20, 28, 31-34, 44, 59, 75-76, 83-85, 88-92, 94, 99, and 105).	• Reduction in groundwater quality and quantity minimized through application of mitigation measures. • Low likelihood and negligible magnitude of effects based on the amount of dewatering required and the duration of expected dewatering activities.	• Undertake environmental monitoring of significant natural features and water wells within the calculated radius of influence for construction dewatering prior to, during and post construction dewatering. **Contingency Measures:** • If surface water levels are temporarily affected from construction dewatering activities, divert water from dewatering activities following appropriate water quality and water temperature controls (i.e. filter bags and/or envirotanks, discharge locations, etc.) to the surface water feature to supplement flow and or surface water levels. • Restrict dewatering activities to a seasonally dry time of year to minimize dewatering requirements when the dewatering may affect a significant natural heritage feature (i.e. a wetland).

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Increase in impervious area created by the turbine base and access roads resulting in reduced infiltration near to the noted ground-water recharge areas (beach foreshore deposits and glacial outwash deposits).	• Minimize increase in impervious areas.	• Direct runoff from the constructed impervious surfaces to ground surface to prevent any decrease in infiltration and recharge.	• Reduced infiltration near groundwater recharge areas minimized through application of mitigation measures. • Low likelihood and limited magnitude of effects based on amount of dewatering required.	• No monitoring or contingency measures required.
Formation of sinkholes during foundation construction.	• Minimize formation of sinkholes.	• Conduct geotechnical investigations at all turbine locations prior to construction.	• Formation of sinkholes avoided through application of mitigation measures. • No likelihood of occurrence.	• No monitoring or contingency measures required.

3.4 Emissions to Air

Construction and installation activities require the operation of equipment, including trucks, cranes, and portable generator sets, which represent a source of air emissions from the engines in addition to the generation of dust.

Table 3-7 provides mitigation measures, residual effects and the monitoring plan for each potential effect relating to emissions to air.

Table 3-7 Mitigation Measures, Residual Effects and Monitoring Plan: Emissions to Air

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Increased dust and air emissions due to construction activity.	• Minimize deterioration of air quality.	• Use spray water and environmentally friendly dust suppressants applied at an environmentally acceptable rate to minimize the release of dust from gravel, paved areas and exposed soils only where necessary on problem areas; • Implement a speed limit that will lead to reduced disturbance of dust on paved and unpaved roads; and, • Ensure proper maintenance of vehicles and machinery to limit noise, Criteria Air Contaminant (CAC) emissions and leaks.	• Increased dust and air emissions minimized through application of mitigation measures. • High likelihood of effects occurring; however, any dust and air emissions are short-term and magnitude of such effects will be limited.	• Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan). • **Contingency Measures:** ▪ Suspend construction in high winds.

3.5 Noise

Construction activities require the operation of equipment, including trucks, cranes and bulldozers that generate noise.

Table 3-8 provides mitigation measures, residual effects and the monitoring plan for each potential effect relating to noise.

Table 3-8 Mitigation Measures, Residual Effects and Monitoring Plan: Noise

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Increased noise due to construction activity.	• Minimize noise increases for inhabited areas.	• Ensure that construction equipment is kept in good condition and does not exceed noise emissions as specified in MOE publication NPC-115. • Operate construction vehicles in accordance with municipal by-laws. • Implement speed limit on unpaved roads.	• Increased noise minimized through application of mitigation measures. • High likelihood of effect occurring; however, increase in noise levels associated with construction is short-term and magnitude of such effects will be limited.	• Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan). • **Contingency Measures:** ▪ Repair faulty equipment resulting in increased noise levels in a timely fashion.

3.6 Local Interests, Land Use and Infrastructure

Land uses within 300 m of the Project Study Area were identified through the REA planning process. The following section describes the results of the effects assessment for the construction phase of the Project.

3.6.1 Existing Land Uses and Infrastructure

Common agricultural land uses in Lambton and Middlesex Counties are cash crops (e.g., soybeans, corn and wheat) and livestock farming. Other land uses include the urban settlements of Thedford and Arkona, and natural heritage corridors, which are scattered throughout the Project Study Area along water courses (Lambton County, 2011; Middlesex County, 2006).

In the Municipality of Lambton Shores there are three Conservation Areas, only one of which is in the Project Study Area. Rock Glen Conservation Area, which is owned by ABCA, is located 2 km northeast of Arkona and includes trails, picnic area, play area, shelter, camping and a museum (Ausable Bayfield Conservation Authority, 2012).

There are no conservation areas in Middlesex County within the Project Study Area.

Table 3-9 provides mitigation measures, residual effects and the monitoring plan for each potential effect relating to local interests, land use and infrastructure.

Table 3-9 Mitigation Measures, Residual Effects and Monitoring Plan: Local Interests, Land Use and Infrastructure

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Minor reduction in usable agricultural land.	• Minimize reduction in usable agricultural land.	• Orientation of access roads determined in consultation with landowners to minimize impacts to agricultural use where possible.	• Minor reduction in usable agricultural land minimized through application of mitigation measures. • High likelihood of effect occurring; however, limited magnitude due to size of overall footprint within the entire Project Study Area.	• No monitoring or contingency measures required.

Table 3-9 Mitigation Measures, Residual Effects and Monitoring Plan: Local Interests, Land Use and Infrastructure

Potential Effect	Performance Objectives	Mitigation Strategy	Residual Effects	Monitoring Plan and Contingency Measures
Increased congestion due to increase in truck traffic and short-term lane closures on local roads during delivery of project components.	• Minimize disturbances to local traffic patterns.	• Develop a traffic management plan for the construction phase and submit to the Municipalities prior to construction; and, • Notify the community in advance of construction delivery schedules and install signage to notify road users of construction activity.	• Increased congestion due to increase in truck traffic and short-term lane closures minimized through application of mitigation measures. • High likelihood of effect occurring; however, limited magnitude due to spread-out nature of the project and duration of lane closures.	• Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan, Design & Operations Report (AECOM, 2013)). • Contingency Measures: ▪ Establish alternate delivery routes.
Damage to local infrastructure	• Minimize damage to local infrastructure.	• Adhere to best practices regarding the operation of construction equipment and delivery of construction materials; and, • Undertake roads condition survey prior to construction and post-construction.	• Damage to local infrastructure minimized through application of mitigation measures. • Moderate likelihood and magnitude of effects occurring due to presence oversize loads during delivery of turbine components.	• Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan). • Contingency Measures: ▪ Return damaged infrastructure to original condition (or better) where appropriate.

3.7 Areas Protected Under Provincial Plans and Policies

The REA requires a determination as to whether the Project is being proposed in any of the following protected or plan areas:

- Protected Countryside or Natural Heritage Systems in the Greenbelt Plan;
- Oak Ridges Moraine Conservation Plan Areas;
- Niagara Escarpment Plan Area; or
- Lake Simcoe Watershed Plan Area.

The Jericho Wind Energy Centre is not proposed in any of these protected or plan areas. As such, there will be no effects on these areas as a result of the Project.

3.8 Public Health and Safety

Effects on public health and safety during construction have been described in Section 3.4 (Emissions to Air, including Odour and Dust), Section 3.5 (Noise), and 3.6 (Local Interests, Land Use and Infrastructure).

3.9 Other Resources

A search for landfills, aggregate resources, forest resources and petroleum resources was undertaken based upon data from the municipalities and from the MNR's Oil, Gas & Salt Resources (OGSR) library (Ontario Oil, Gas & Salt Resource Library, 2011).

3.9.1 Landfills

MOE Landfill Inventory Management Ontario records (Ontario Ministry of the Environment, 2010) identify one closed landfill within the Project Study Area (as shown on **Figure 2-3**). The closed landfill is owned by the Municipality of Lambton Shores (Jeff Wolfe, personal communication, October 12, 2012) and is located to the east of Arkona Road and to the north of Vernon Road, adjacent to the proposed collection line along Arkona Road. As the closed landfill is situated to the east of the road allowance (Arkona Road), and the collection line is proposed to be constructed within the road allowance, no effects on the landfill as a result of construction activities are anticipated. There will also be no effects on the landfill as a result of transmission line construction adjacent to the south of the landfill, as there is limited disturbance of soil associated with the excavation of transmission line poles.

There are no landfills, either active or closed, in the Township of Warwick (Fran Woods, personal communication, October 3, 2012) or in the Municipality of North Middlesex (Ontario Ministry of the Environment, 2010) within the Project Study Area.

3.9.2 Aggregate Resources

Eight authorized aggregate resources are located within the Project Study Area, as shown on **Figure 2-3** and **Table 3-10** below, only one of which is located adjacent to Project infrastructure. This is an active authorized aggregate resource with a Class A licence and is located adjacent to the proposed collection line to Turbine 104 along Birnam Line. As the resource is situated to the south of the road allowance (Birnam Line), and the collection line is proposed to be constructed within the road allowance, no effects as a result of construction activities are anticipated. The remaining authorized aggregate resources are not located within the disturbance area of Project infrastructure and therefore no effects as a result of construction activities are anticipated (Ontario Ministry of Natural Resources, 2012).

Table 3-10 Aggregate Resources

Area (ha)	Licence Class	Status	Distance to Project Infrastructure Disturbance Area
4.33	Class B Licence <= 20000 Tonnes	Revoked	301 m
58.96	Class A Licence > 20000 Tonnes	Active	44 m
7.21	Class B Licence <= 20000 Tonnes	Active	279 m
20.92	Class B Licence <= 20000 Tonnes	Active	510 m
8.45	Class A Licence > 20000 Tonnes	Active	Adjacent
0.25	Class B Licence <= 20000 Tonnes	Surrendered	301 m
15.80	Class B Licence <= 20000 Tonnes	Active	21 m
3.68	Class B Licence <= 20000 Tonnes	Active	383 m

Source: Ontario Ministry of Natural Resources, 2012

3.9.3 Forest Resources

Based on the MNR's Sustainable Forest Licences (SFL) database (Ontario Ministry of Natural Resources, 2012), there are no SFLs within the Project Study Area. Therefore, no effects on forest resources are anticipated.

3.9.4 Petroleum Resources

Based on MNR's Oil, Gas & Salt Resources (OGSR) library, there are no active petroleum wells within 75 m of the project infrastructure. According to CanACRE's Petroleum Facility Location Report (2012), however, seven abandoned wells are located within 75 m of Project infrastructure, as shown in **Table 3-11** below.

Table 3-11 Abandoned Petroleum Wells

Well ID	Project Infrastructure within 75 m	Distance to Project Infrastructure
W1	T7 access road	58 m
W2	Collection line between T31 and T8	52 m
W7	Transmission line	47 m
W10	T47 and associated access road and collection line	18 m
W11	T71 and associated access road and collection line	37 m
W14	T76 access road and collection line to T75 and T76	1 m
W15	T94 access road and collection line	43 m

Source: CanACRE, 2012

As these wells are abandoned, no effects on petroleum resources are anticipated.

4. Summary and Conclusions

Field work and data collection were undertaken to determine the potential effects to the various environmental and social features during the construction and installation phase of the Project. Mitigation measures to manage these potential effects have been identified and monitoring and contingency plans proposed to ensure effects are minimized as outlined above.

The overall conclusion of this Construction Plan Report is that this project can be constructed and installed without any significant adverse residual effects.

5. References

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Appendix A

Parkhill Interconnect Renewable Energy Approval Application Construction Plan Report (GLGH, 2013)

PARKHILL INTERCONNECT

RENEWABLE ENERGY APPROVAL APPLICATION

CONSTRUCTION PLAN REPORT

February 2013

GL Garrad Hassan

GL Garrad Hassan

RENEWABLE ENERGY APPROVAL APPLICATION – CONSTRUCTION PLAN REPORT

PARKHILL INTERCONNECT, ONTARIO

Client	Jericho Wind, Inc.
Contact	Ross Groffman
Document No	800253-CAMO-R-01
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Date	07 February 2013

Author

G. Constantin

Checked by

-

Approved by

N. O'Blenes

GL Garrad Hassan Canada, Inc.

151 Slater Street, Suite 806, Ottawa, Ontario CANADA
Phone: (613) 230-3787 | Fax: (613) 230-1742
www.gl-garradhassan.com

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REVISION HISTORY

Issue	Issue Date	Summary
A	05 October 2012	Initial version
B	07 February 2013	Reference to the Operation and Maintenance Building. Update Site Plan and update Environmental Effects Monitoring Plan

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1 PREAMBLE

Jericho Wind, Inc. is proposing to develop the Jericho Wind Energy Centre and the Parkhill Interconnect Project (''Parkhill Interconnect"), which are subject to Ontario Regulation 359/09 (Renewable Energy Approvals (REA) under Part V.0.1 of the Ontario Environmental Protection Act (EPA)) [1]. Jericho Wind, Inc. is seeking a Renewable Energy Approval from the Ontario Ministry of the Environment (MOE) for the Jericho Wind Energy Centre and its related Parkhill Interconnect Project.

The Parkhill Interconnect will consist of a switchyard, approximately 11.5 km of 115 kV transmission line and a substation. The substation will consist of two (2) 135/225 MVA transformers. The 115 kV line will run from the Parkhill Interconnect's switchyard, known as the Bornish Switchyard, to the Parkhill Interconnect's substation, known as the Parkhill Substation. The Parkhill Substation will then be interconnected to a Hydro One-owned switchyard, known as the Evergreen Switchyard, and to an existing Hydro One 500 kV transmission line that is common to the Jericho Wind Energy Centre, the Adelaide Wind Energy Centre (owned by Kerwood Wind, Inc.), and the Bornish Wind Energy Centre (owned by Bornish Wind, LP). The Point of Common Coupling will be the interface between the Parkhill Substation and Hydro One's Evergreen Switchyard. The Parkhill Interconnect will be owned by Bornish Wind LP, Kerwood Wind, Inc., and Jericho Wind, Inc. These three companies are wholly-owned subsidiaries of NextEra Energy Canada, ULC ("NextEra").

This Construction Plan Report has been prepared in accordance with section 54.1 of O. Reg. 359/09 and the MOE's "Draft Technical Guide to Renewable Energy Approvals"(2012) [3].

1.1 General Project Description

The proposed Parkhill Interconnect is located in the Municipality of North Middlesex, Middlesex County, Ontario (please refer to Figure 1-1). The Study Area comprises a 115 kV transmission line from the Bornish Switchyard to the Point of Common Coupling (PCC) on Hydro One's 500 kV transmission line. The electricity generated from the Adelaide, Bornish and Jericho Wind Energy Centres will converge at the Bornish Switchyard. From this point, the proposed 115 kV line will carry electricity generated by all three projects to the Parkhill Substation then to a second Hydro One-owned Switchyard on to an existing Hydro One 500 kV transmission line. Approximately 11.5 km in length, the transmission line is proposed to be mounted on new hydro poles within the road rights-of-way along Kerwood, Elginfield and Nairn Roads. There may be occasional locations where the transmission is below ground for technical reasons.

Table 1-1: Geographic coordinates of the Transmission Line Study Area

Site	Easting	Northing
Northwest corner	441 165	4 780 749
Northeast corner	458 588	4 777 297
Southwest corner	438 585	4 771 264
Southeast corner	458 588	4 766 303

The location of the Transmission Line Study Area was defined early in the planning process for the proposed wind energy facility, based on the availability of existing infrastructure for connection to the electrical grid. The Transmission Line Study Area was used to facilitate information collection and Records Review.

Figure 1-1: Transmission Line Study Area

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1.2 Contact Information

1.2.1 Project Proponent

Jericho Wind, Inc., a wholly-owned subsidiary of NextEra Energy Canada, ULC, is the proponent for the Parkhill Interconnect. The primary contact for Jericho Wind, Inc. is:

Derek Dudek
Community Relations Consultant
NextEra Energy Canada, ULC
390 Bay Street, Suite 1720
Toronto, ON M5H 2Y2
Canada
Phone: 1-877-257-7330
Email: Jericho.Wind@NextEraEnergy.com
Website: www.NextEraEnergyCanada.com

1.2.2 Project Consultant

GL Garrad Hassan Canada, Inc., a member of the GL Group and part of the GL Garrad Hassan brand, (hereafter referred to as "GL GH"), has been retained to lead the REA Process for the Parkhill Interconnect Project.

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

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

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

GL GH's contact information is as follows:

Nancy O'Blenes
GL Garrad Hassan Canada, Inc.
Uxbridge, ON L9P 1A5
Tel.: (416) 801-6822
nancy.o'blenes@gl-garradhassan.com

Further information about GL GH can be found at: www.gl-garradhassan.com.

1.3 Overview of Project Components

The Parkhill Interconnect will be made up of the following main components:

- Transmission line;
- Access roads;
- Substation;
- Switchyard; and
- Operations and maintenance building.

2 DESCRIPTION OF CONSTRUCTION AND INSTALLATION ACTIVITIES

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

Disturbance Areas have been identified surrounding various Parkhill Interconnect components; such areas correspond to the "Project Location" boundaries in the map in Appendix A. These areas denote zones where temporary disturbance during the construction phase may occur as a result of temporary Parkhill Interconnect component laydown and storage areas. With the exception of the Parkhill Interconnect components described above, no permanent infrastructure is proposed within these areas. Following construction activities, the land will be returned to pre-construction conditions.

Construction of the Parkhill Interconnect will meet or exceed all local regulations and standards (i.e. Ontario Electric Safety Code, Ontario Building Code, etc.). The proposed infrastructure is presented in Appendix A.

2.1 Surveying and Geotechnical Study Activities

Surveys will be required for the micrositing of the switchyard, access roads, electrical lines, and the substation. Crews will drive light trucks to reach sites primarily using existing roads. They will then survey the site on foot and mark the locations using stakes.

Existing buried infrastructure located on public property will be identified using the Ontario One Call service and buried infrastructure located on private property will be identified by private contractors prior to construction or geotechnical sampling and updated throughout construction, as required.

Geotechnical sampling typically involves a truck-mounted drill rig visiting the sampling locations, drilling the borehole, and collecting geotechnical information. This operation typically uses two operators and requires one to two hours per location.

Any archaeological sites, as identified during the Archaeological Assessment, will be clearly marked in the field. All personnel working on or entering the construction area will be instructed to avoid these areas.

This activity can be summarized as follows:

- Equipment required: At a minimum, trucks, a truck-mounted drill rig, and possibly a track-mounted drill rig.
- Materials brought on site: None. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Fuel handling will be conducted in compliance with the mitigation measures outlined in Section 3.

- Timing: These activities will take place prior to construction and are not season-dependent. Preference is to complete this activity in the winter to minimize crop disruption. This operation typically uses two operators and requires one to two hours per site.
- Material generated: Some drill cuttings (composed of soil) will be generated and will be disposed of on site by scattering in the vicinity of the borehole.

2.2 Construction of Access Roads

Typically the access roads will be approximately 11 m wide during the construction phase to accommodate large construction equipment.

The construction of the access roads will typically require clearing and grubbing of any vegetation, excavation of the topsoil layer, and adding a layer of compacted material to a typical depth of 300 to 600 mm, depending upon site-specific geotechnical conditions. Clean granular material (typically "A" or "B" gravel) will be brought to the site as needed and will not be stockpiled on site. The topsoil will be kept and re-used on site. New culverts may be required to maintain drainage in ditches at junctions with roadways and will be constructed to support the construction equipment and delivery trucks. The location of proposed water crossings will be summarized in the water assessment. The exact culvert details, installation details, and erosion control measures will be determined in conjunction with the Ausable Bayfield Conservation Authority as part of their permitting process; however, the culverts are proposed to be open bottom and are proposed to be left in place following the operations phase, in consultation with the landowner.

The access roads will typically require one to three days for construction. Depending on the length of the access roads, construction may require approximately 10-25 truckloads of gravel.

Municipal and provincial roads will also be used for transporting equipment, and minor modifications may be required to some of the existing roads (e.g. widening the turning radius) to accommodate oversized loads. Any road damages will be repaired.

This activity can be summarized as follows:

- Equipment required: At a minimum, trucks, graders, and bulldozers. The trucks and graders will be driven to the site and the bulldozers will be transported via trailers.
- Materials brought on site: Granular material for road construction and steel culverts. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Fuel handling will be conducted in compliance with the mitigation measures outlined in Section 3.
- Timing: This activity will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall, depending on the amount of rainfall. The access road to each turbine will typically require one to three days of construction.
- Material generated: Once the construction activities have been completed, the granular base will be removed and distributed to the landowners, if desired, or removed from the site and disposed of in an approved and appropriate manner. The disturbed area will have its topsoil replaced from stockpiled material and will be reseeded in consultation with the landowner.

2.3 Delivery of Project Components

The Parkhill Interconnect components will be delivered by truck and trailer throughout the construction phase at the Project Location. A traffic management plan will be developed using MTO Book 7 standards and will be provided to Middlesex County. Alternative traffic routes will be prepared to address traffic congestion, as needed.

2.4 115 kV Transmission Line

The 115 kV transmission line, from the Bornish Switchyard, will collect power from Adelaide, Bornish, and Jericho Wind Energy Centres. The transmission line will travel along Kerwood, Elginfield and Nairn Roads within the municipal rights-of-way to the Parkhill Substation then to a second Hydro One-owned Switchyard on to an existing Hydro One 500 kV transmission line.

It is anticipated that the transmission line will be mounted onnew hydro poles. The local utility company may require Jericho Wind, Inc. to erect additional poles, or replace undersized poles, in order to accommodate the transmission line. The poles are proposed to be constructed of wood, concrete or steel and will be between 18 and 30 m tall.

Holes are typically augured in the ground using a truck-mounted auger device. The poles are then inserted using special cranes to a typical depth of 1 to 2 m below grade. The poles are then “dressed” (made ready to accept conductors) using a boom truck. Typically, one crew will install the poles and one crew will dress them. Approximately six construction vehicles (including trucks and a pole loader) and a crew of 12-15 persons are anticipated for construction of the transmission lines. Twelve to sixteen poles can be installed and dressed in one day. Once the poles are in place and dressed, cables are strung in place using boom trucks and special cable reel trucks. Lastly, any pre-existing poles that are no longer in use are removed. Some packing-material waste may be generated. All recyclable materials will be separated from non-recyclable materials and both streams will be removed from the site and disposed of at an approved and licensed facility.

The interconnection plan for any wind project is subject to study, design and engineering by the Independent Electricity System Operator (which manages the province’s electricity grid), Hydro One and the Ontario Energy Board (which regulates the industry through the Transmission System Code and the Distribution System Code).

Equipment will include, at a minimum, a truck-mounted crane, flatbed trailers and a truck-mounted auger. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Fuel handling will be conducted in compliance with the mitigation measures outlined in Section 3.

2.5 Substation and Switchyard

As explained above, a 115 kV transmission line will be built to connect the Parkhill Interconnect Project to a Hydro One 500 kV line, which will run from the Bornish Switchyard to the Parkhill Substation. The substation at the point of interconnection will be approximately 2-3 ha in size and will be located adjacent

to the 500 kV line. The substation equipment will include an isolation switch, a circuit breaker, a step-up power transformer, transmission switch gear, instrument transformers, and grounding and metering equipment. Substation grounding will meet the Ontario Electrical Safety Code.

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

The substation and switchyard areas will be gravelled with clean material imported to the site on an as-needed basis and sloped to facilitate drainage. A secondary containment system will be installed around the transformer in the event of an oil leak to prevent any soil contamination.

Construction is expected to last approximately four months. During construction of the substation, topsoil and subsoils will be stripped and stockpiled separately. Stripped topsoil and subsoil will be replaced in the temporary storage facility area and topsoil stripped from the substation area will be distributed on other Parkhill Interconnect Project properties. The construction crew will consist of approximately 25-40 persons.

Both streams of waste will be removed by a licensed sub-contractor.

This activity can be summarized as follows:

- Equipment Required: Small trenchers, a small crane, forklifts, concrete trucks and a bulldozer. The trucks and graders will be driven to the site and the bulldozers will be transported by trailers.
- Materials brought on site: gravel, an isolation switch, a circuit breaker, instrument transformers, grounding and metering equipment, insulators, transformer oil, and electrical cabling. The trucks and graders will be driven to the site and the bulldozers will be transported by trailer. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment and transformer oil. Fuel handling will be conducted in compliance with the mitigation measures outlined in Section 3.
- Timing: This will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall, depending on weather conditions.
- Material generated: Some packing material waste will be generated. The recyclable material will be separated from the non-recyclable material on site. Both streams of waste will be removed by a licensed sub-contractor.

2.6 Operations and Maintenance Building

An operations building measuring approximately 30 m by 15 m will be assembled on the Bornish substation property. The facility will be used to monitor the day-to-day operations of the Bornish, Jericho and Adelaide Wind Energy Centers, and to support maintenance efforts. A small parking lot will be constructed to accommodate staff vehicles. Prior to the construction phase, a Stormwater Pollution Prevention Study will be conducted to address any potential effects associated with stormwater runoff.

Potable water will be supplied by a well or through the municipal water system and if required, a septic bed will be constructed for the disposal of sewage. The septic bed will be constructed to the minimum size required for the size of the operation and maintenance building. Both will be constructed in accordance with applicable municipal and provincial standards. Construction of the operations building may take up to three months to complete. It is anticipated that construction activities will require approximately 10-15 persons.

This activity can be summarized as follows:

- Equipment Required: At a minimum, forklifts, concrete trucks and smaller crew trucks.
- Materials brought on site: a pre-fabricated building structure. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Fuel handling will be conducted in compliance with the mitigation measures outlined in Section 3.
- Timing: This will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall, depending on weather conditions.
- Material generated: Some packing material waste will be generated. The recyclable material will be separated from the non-recyclable material on site. Both streams of waste will be removed by a licensed sub-contractor.

2.7 Clean-up and Reclamation Strategy

Site clean-up will occur throughout the construction phase and site reclamation will occur after construction has been completed. Waste and debris generated during the construction activities and not reusable on site as part of the reclamation strategy will be collected and disposed of at an approved facility. All reasonable efforts will be made to minimize waste generated and to recycle materials including returning packaging material to suppliers for reuse/recycling. During construction, industry best practices for spill prevention will be utilized. In the unlikely event of a minor spill, the latter will be cleaned up immediately and any impacted soils will be removed from site and disposed of at an approved and appropriate facility; details on emergency response is provide in the Emergency Response Plan as part of the Design and Operations Report for the Parkhill Interconnect Project. At the conclusion of construction vehicles and construction equipment will be removed from the site.

Stripped soil will be replaced and re-contoured in the construction areas and disturbed areas will be re-seeded, as appropriate. Erosion control equipment will be removed once inspections have determined that the threat of erosion has diminished to the original land use level or lower. High-voltage warning signs will be installed at the transformer substation and elsewhere, as appropriate.

2.8 Timing and Operational Plans of Proposed Construction and Installation Activities

Commencement of the construction phase is anticipated to occur in approximately summer 2013 up to spring 2014. In any scenario, construction is expected to be completed within 6 to 7 months and will lead to the commissioning of the Parkhill Interconnect.

Construction activities will commence once all necessary permits have been obtained and weather conditions are conducive to construction. Table 2-1 outlines the duration of each activity and approximate order of construction activities for the proposed Parkhill Interconnect.

Table 2-1: Duration of construction activities

Activity	Timing of Activity	Duration
Surveying	Prior to construction – preferably in winter	< 1 day per component location
Geotechnical Sampling	Prior to construction – preferably in winter	1-2 hours per component location
Land Clearing and Construction of Access Roads	Late spring or summer – preferably during drier months	1-3 days per access road to each component
Installation of Culverts	Late spring or summer – preferably during drier months	1-2 days per culvert
Delivery of Equipment	Throughout construction phase as needed, and in compliance with Traffic Management Plan	As needed throughout construction phase
Transformer Substation	Late spring or summer – preferably during drier months	15 – 20 weeks
Transmission Line	Late spring or summer – preferably during drier months	24 -30 weeks
Clean-up and Reclamation	Following construction	Will be conducted as site is constructed.

2.9 Temporary Water Takings

Water takings, if required, will be conducted as proposed by the Water Body and Water Assessment reports included as part of the completed REA Application.

3 ENVIRONMENTAL EFFECTS MONITORING PLAN

This section presents a summary of potential effects, mitigation measures and residual effects associated with environmental interactions during the construction and operations phases of the Parkhill Interconnect.

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

3.1 Methodological Approach

As requested under the REA, potential effects from the construction, installation, and operation of the Parkhill Interconnect must be assessed while considering applicable mitigation and compensation measures. In order to assess *residual* effects from a project (i.e. after considering mitigation/compensation measures), GL GH uses the residual effect definitions elaborated by the Canadian Environmental Assessment Agency. A residual effect "level" and "significance" is then applied, as presented in Table 3-1 below.

Table 3-1: Levels of residual effects and significance of effect

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

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

Table 3-2 outlines the potential impacts and mitigation measures of the Construction and Operations Phases, respectively.

3.1.1 Construction

Table 3-2: Potential negative effects and mitigation measures – Construction

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Cultural Heritage (Protected Properties, Archaeological and Heritage Resources				
Disturbance or displacement of archaeological resources by any ground disturbance activity.	Avoid disturbance/loss of archaeological sites.	Conduct Archaeological Assessment and apply recommended avoidance measures and other measures from licensed archaeologist or Ministry of Tourism, Culture and Sport (MTCS) to Project design. Details of the Archaeological Assessment can be found in the reports on this subject as part of the complete REA application package.	The Archaeological Assessment was undertaken as per MTCS guidelines and has received confirmation from the MTCS. The likelihood and magnitude of this residual effect is considered non-significant.	Immediate notification of the Archaeologist and the MTCS in the event archaeological resources are found. Apply monitoring measures as recommended by the MTCS.
Natural Heritage				
Noise disturbance and/or avoidance behaviour during construction – Bald Eagle Nesting, Foraging and Perching Habitat	To protect any potentially nesting bald eagles from disturbance, displacement, or mortality as a result of the development of the Parkhill Interconnect.	Project layout will be constructed so that all construction activities will occur at least 200m from the nest location, and outside of the both the primary and secondary habitat zones, Project layout will be designed so that all infrastructure, except for the transmission line, will be set back from the nest a minimum of 400m, Overhead lines (and poles) that are located greater than 400m but within 800m of the nest will be less than 30m in height, Construction within the tertiary zone (as determined by site-specific surveys) will not occur from March 1st to May 15th, During construction, monitoring of the eagle nest will follow the methods for the	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. If a permanent disturbance has been noted within this wildlife habitat, the MNR will be contacted.	During construction, monitoring of the eagle nest will follow the methods for the Behavioural Study and occur for the duration that construction activities occur within the tertiary zone of the nest within the period of February 15th to August 15th, exclusive of March 1st to May 15th when no construction will be permitted within the tertiary zone of the active nest. If a permanent disturbance has been noted within this wildlife habitat, the MNR will be contacted to determine whether additional mitigation measures will be needed.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		Behavioural Study and occur for the duration that construction activities occur within the tertiary zone of the nest within the period of February 15th to August 15th, exclusive of March 1st to May 15th when no construction will be permitted within the tertiary zone of the active nest. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.		
Accidental vegetation removal – significant woodlands.	Minimize direct impacts on significant vegetation communities.	Clearly delineate work area within 30 m of significant natural features or wildlife habitats using erosion fencing, or similar barrier, to avoid accidental damage to species. Any vegetation removal required along roadside transmission lines should be minimized and occur completely within the road right-of-way. Any tree limbs or roots that are accidentally damaged by construction activities within significant woodlands will be pruned using proper arboricultural techniques. No herbicides will be used within significant features or wildlife habitats. No vegetation removal will occur in rare plant communities or sensitive landforms. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non-significant.	The magnitude of the residual effect is considered non-significant; therefore, no monitoring or contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Sedimentation and erosion - significant	Maintain or restore vegetated buffers, including riparian	Implement a sediment and erosion control plan within 30 m of a significant natural	The Natural Heritage Assessment was undertaken as per MNR	Environmental supervision during construction as part of a routine inspection program will be implemented to ensure

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
woodlands.	zones.	feature or wildlife habitat. Install, monitor, and maintain erosion and sediment control measures (i.e. silt fences) around the construction areas within 30 m of a significant natural feature or wildlife habitat. Minimize vehicle traffic on exposed soils, and limit heavy machinery traffic on sensitive slopes. Re-vegetate temporary access roads that are in non-agricultural habitat, to pre-construction conditions as soon as possible. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non-significant.	adherence to the prescribed mitigation measures.
Spills (i.e. oil, gasoline, grease, etc.) - significant woodlands,.	Avoid contamination of significant natural features.	All maintenance activities, vehicle refueling or washing, and chemical storage will be located more than 30 m from any significant natural feature or wildlife habitat. Develop a spill response plan and train staff on appropriate procedures. Keep emergency spill kits on site. Dispose of waste material by authorized and approved off-site vendors. Any stockpiled material will be stored more than 30 m from a woodland or water body. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non-significant.	Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures. Develop a spill response plan and train staff on appropriate procedures. Keep emergency spill kits on site.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Changes in soil moisture and compaction - significant woodlands.	Minimize impact to soil moisture regime and vegetation species composition.	Implement infiltration techniques to the maximum extent possible. Minimize paved surfaces and design roads to promote infiltration. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non-significant.	The magnitude of the residual effect is considered non-significant; therefore, no monitoring or contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Disturbance and/or mortality to local wildlife.	Minimize impact to local wildlife.	Avoid construction or decommissioning activities that are within non-agricultural habitats, during sensitive time periods (i.e. breeding bird season) wherever possible. Conduct nest searches if vegetation removal will occur during the breeding bird season (May1st-July 31st) Clearly post construction speed limits Construction activities within 30 m of significant woodlands should occur during daylight hours to avoid excessive noise and/or light disturbances to wildlife. Details of the Natural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR. The likelihood and magnitude of this residual effect is considered non-significant.	Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures.
Changes to surface water hydrology – significant woodlands.	Maintain existing surface water flow patterns.	Keep changes in land contours to a minimum. Maintain streams and timing and quantity of flow. Minimize grading activities to maintain	The Natural Heritage Assessment was undertaken as per MNR guidelines and this Project is expected to receive confirmation from the MNR.	The magnitude of the residual effect is considered non-significant; therefore, no monitoring or contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.

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

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		reduce loss and alterations of habitat where possible (i.e. reduces affected area by cutting back from grading limit to road and install headwall, open bottom culvert etc.). Crossing structure should be properly sized and positioned appropriately (angle and embedded) so as to avoid erosion issues and creation of potential fish barriers. Crossing structures should be sized appropriately so as to not result in alterations in stream hydrology, scouring or flooding crossing structures. Crossing structure type should consider sensitivity of the water body and location of crossing. Any loss to the productive capacity of a watercourse must be compensated for under the Fisheries Act. Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.		
Erosion and sedimentation	Minimize impacts of erosion and sedimentation on water bodies	Minimize potential for soil compaction (see Soil Compaction). Controlled vehicle and machinery access routes, avoid water bodies where possible. Schedule clearing, grubbing and grading activities to avoid times of very high runoff volumes, wherever possible. Implement Flood Response Plan if on-site flooding occurs. Implement Erosion and Sediment Control Plan. Stabilize banks as soon as possible after	The Water Body Assessment was undertaken as per MOE guidelines. The likelihood and magnitude of this residual effect is considered non-significant.	Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures.

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

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

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		trigger criteria to be determined in consultation with OMNR. Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.	magnitude of this residual effect is considered non-significant.	
Soil Compaction	Minimize the amount of soil compaction.	Controlled vehicle access routes. Staging areas should be located away from water bodies (i.e. 30 m). Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.	The Water Body Assessment was undertaken as per MOE guidelines. The likelihood and magnitude of this residual effect is considered non-significant.	The magnitude of the residual effect is considered non-significant; therefore, no monitoring or contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Debris entering a water body	Limit the amount of debris entering water bodies	Construction debris should be stabilized (i.e. tarps) away from water bodies (i.e. 30 m). Refuse and other material should be appropriately disposed of off-site. Staging areas should be located away from water bodies (i.e. 30 m). Drilling shafts should be located away from water bodies (i.e. 30 m). Details of the Water Body Assessment can be found in the reports on this subject as part of the complete REA application.	The Water Body Assessment was undertaken as per MOE guidelines. The likelihood and magnitude of this residual effect is considered non-significant.	Environmental supervision during construction as part of a routine inspection program will be implemented to ensure adherence to the prescribed mitigation measures.
Emissions to Air, including Odour and Dust				
Reduction in air quality due to CAC emissions and dust.	Minimize deterioration of air quality.	Ensure proper operation and maintenance of vehicles and machinery to limit noise, CAC emissions and leaks. Use water or water-based dust suppressant to control dust on unpaved roads. Implement speed limits on unpaved roads.	The likelihood and magnitude of this residual effect is considered non-significant.	Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in emergency Response and Communications Plan).

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		Minimize vehicular traffic on exposed soils and stabilize high traffic areas with clean gravel surface layer or other suitable cover material. Minimize mud tracking by construction vehicles along access routes and areas outside of the immediate work site, and ensuring timely cleanup of any tracked mud, dirt and debris. Cover or otherwise containing loose construction materials that have potential to release airborne particulates during transport, installation or removal.		
Noise				
Increase in noise levels in Project Study Area	Minimize noise increases for inhabited areas	Ensure proper operation and maintenance of vehicles and machinery to limit noise, CAC emissions and leaks. Implement speed limits on unpaved roads. Construction equipment will be kept in good condition and will not exceed the noise emissions as specified in MOE publication NPC-115.	The likelihood and magnitude of this residual effect is considered non-significant.	Faulty equipment resulting in increased noise levels are to be repaired in a timely fashion. Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in emergency Response and Communications Plan).
Local and Provincial Interests, Land Use and Infrastructure				
Increased traffic and noise in Project Study Area.	Minimize disturbance to local community and achieve zero human safety incident. Receive limited complaints	Ensure proper operation and maintenance of vehicles and machinery to limit noise, CAC emissions and leaks. Implement Communications Plan namely by informing local communities of construction schedule, use of signs, and communicating truck routes.	The likelihood and magnitude of this residual effect is considered non-significant.	Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan).
Reduction in usable agricultural land.	Minimize reduction in useable agricultural	Minimize length of access roads (most agricultural use only affected during	The likelihood and magnitude of this residual effect is considered non-	The magnitude of the residual effect is considered non-significant; therefore, no monitoring or contingency is required

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
	land.	construction) where possible.	significant.	provided the recommended mitigation/compensation measures are applied.
Increased congestion due to increase in truck traffic and short-term lane closures on local roads during delivery of Project components.	Minimize disturbance to local community and achieve zero human safety incident.	Notify the community in advance of construction delivery schedules and installing signage to notify road users of construction activity. If required by municipal authorities, develop a traffic management plan for the construction phase and submit to the municipalities prior to construction and communicate truck routes.	The likelihood and magnitude of this residual effect is considered non-significant.	Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan).
Damage to local infrastructure.	Minimize damage to local infrastructure.	Adhere to the best practices regarding the operation of construction equipment and delivery of construction materials. If required by municipal authorities, undertake road condition survey prior to construction and post-construction.	The likelihood and magnitude of this residual effect is considered non-significant.	Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan). If required by local authorities, return damaged infrastructure to original condition (or better) where appropriate.
Areas Protected under Provincial Plans and Policies				
N/A	N/A	N/A	N/A	N/A
Public Health and Safety				
Effects on public health and safety during construction have been described above under (i) Emissions to Air, including Odour and Dust; (ii) Noise; and (iii) Local and Provincial Interests, Land Use and	N/A	N/A	N/A	N/A

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Infrastructure.				
Other Resources				
The presence of petroleum wells have been identified through consultation with the OGSR database to be within 75 m of project infrastructure	No negative effects on petroleum resources or the renewable energy project	As part of the Approval and Permitting Requirements Document and as per the Ontario Ministry of Natural Resources (MNR) "Template for Renewable Energy Projects: Setbacks from Petroleum Operations" a site validation of all petroleum wells and facilities identified by the OGSR Library to be within 75 m of the Project location was conducted and confirmed that there are NO petroleum wells or facilities existing within 75 m of the Project location. Notice of the findings has been reported to the Aylmer District MNR.	N/A	N/A

4 REFERENCES

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

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

[3] DRAFT Technical Guide to Renewable Energy Approvals, Ontario Ministry of the Environment, April 2012.

[4] Ministry of Tourism, Culture and Sport, Standards and Guidelines for Consultant Archaeologists, 2011.

APPENDIX A SITE PLAN

Legend

Project Components

- Proposed Transmission Line - 115 kV
- Parkhill Substation
- O&M Building Area
- Substation and Switchyard
- Project Location
- 120m Boundary
- 300m Boundary

Significant Natural Features

- Woodland
- Wetland
- Valleyland
- Generalized Habitat

Other Components

- 1 Storey Receptor
- 2 Storey Receptor
- 3 Storey Receptor
- Vacant Lot Receptor
- Other Building
- Existing 500 kV Line
- Existing Transmission Line
- Railway
- Arterial Road
- Local Road / Street
- Pipeline
- Permanent Watercourse
- Intermittent Watercourse
- Contour (5m)
- Park / Sports Field
- Residential Area
- Cemetery
- Pit or Quarry
- Waterbody
- Wetland

0 0.5 1 2 3 km

Parkhill Interconnect

SITE PLAN

1009-001-121011--001-RG

November 27, 2012

Projection: UTM Zone 17, NAD83
Sources: Ontario Base Mapping, Ontario Road Network, Land Information Ontario, Geobase, CanVec.

APPENDIX B TECHNICAL SPECIFICATIONS AND CONCEPTUAL PLANS OF PROJECT COMPONENTS

NEXTera ENERGY	TRANSFORMER SPECIFICATION PARKHILL T.S. DETAIL REQUIREMENTS	Spec. No. Exhibit 1 Rev. No. 0 Date 7/24/12 Page 1 of 3

TRANSFORMER RATINGS												
Application (Wind Farm / Solar) AutoTransformer												
Phase	3	Cooling Class	HV Volts		XV Volts		YV Volts		ZV(TV) Volts		Sumal Level BIL	
Frequency	60		525 kV		121 kV		27.6					
Cooling medium	Oil	Connection	Wye		Wye		delta					
Phase Diagram	YNa0d1	ONAN	135	MVA	135	MVA	42	MVA		MVA	750	
Oil preservation	Conservator /diaphragm	ONAF	180	MVA	180	MVA	56	MVA		MVA	Top	
		ONAF	225	MVA	225	MVA	70	MVA		MVA	ONAF	

ADDITIONAL TAP VOLTAGES			
Terminal	Style	Taps at kV	Capacity
HV	MR	+ 10 % (33 Taps ULTC)	Full Capacity ULTC
XV	N/A	N/A	

PERCENT IMPEDANCE VOLTS		
%	Windings	At MVA
10.0	H - X	135 MVA
	H - Y	
	X - Y	

TEMPERATURE RISES	°C	MVA
Winding	≤65	Top ONAF
Metallic Part	≤100	Top ONAF
Metallic Part in contact with paper	≤80	Top ONAF
Top Oil	≤65	Top ONAF

PD = <300 pC
RIV = < 100 uV

Winding and Bushing Ratings										
	Winding				Bushing					
Terminal	MVA	Voltage (kV)	BIL (kV)	Ampere (A)	Class (kV)	BIL (kV)	Ampere (A)	Min Strike Dist		Ext. Creep
								Ph to Ph	Ph to Gnd	
HV Line	225	525	1550		525	1675				
HGXO Neutral			200		36	200				
XV Line	225	121	550		145	650				
XV Neutral										
YV Line	70	27.6	200		36	200				
YV Neutral										

UNUSUAL SERVICE CONDITIONS Yes x No (Check one) – Conform to CSA-C88-M90		FOUNDATION Specific Details and Measurements	
Ambient Temp in °C (Max, Avg, Min)	38, 20, -30	Foundation Type:	
Elevation/Wind Speed	See Exhibit 2	Distance from Center of Foundation:	
Seismic Zone Designation (see Appendix H)	See Exhibit 2	To Segment 1	
Snow/Ice Accumulation (under energized, but no load)	See Exhibit 2	To Segment 2	
Short-time emergency Overloading (except GSU)	See IEEE C57.91-1995 Table 8	To Segment 3	
Long-time emergency Overloading (except GSU)		To Segment 4	LOSS EVALUATION
Abnormal harmonic currents solid-state short circuits	no	No Load losses per kW will be evaluated at	See Appendix F
Geomagnetically Induced Current (GIC) location	yes	Load losses per kW will be evaluated at	See Appendix F
High-current isolated-phase bus duct connection	no	Auxiliary losses per kW will be evaluated at	See Appendix F
Parallel operation	yes		
Neutral grounding resistor	no		

Appendix B

Hydrogeological Calculations for Dewatering Activities

Appendix B. Hydrogeological Calculations for Dewatering Activities

1. Introduction

As described in the *Technical Guide to Renewable Energy Approvals (MOE, 2011)*, an important environmental effect to consider in the Construction Plan report is the potential for the Project to interfere with existing uses of a water resource.

Section 3.3.3 (Geology and Groundwater) of the Construction Plan Report determines that the extraction of groundwater for construction dewatering purposes will be less than 50,000 litres per day (L/day) for turbines within the clayey-till unit but has the potential to be greater than 50,000 L/day for turbines within the sand and gravel unit. This is attributable to the following reasons:

- A short duration of dewatering activities (3-4 days per turbine base);
- The number of turbine foundations / collection line trenches installed at one time;
- The amount of precipitation that occurs directly before or during construction; and
- The surficial material being excavated.

2. Calculation of Water Takings

Conservative estimates of 163,000 L/day for a turbine foundation excavation within the glaciolacustrine deposits (foreshore and shoreline) and glaciolacustrine outwash deposits of sand and gravel were calculated based on an assumed excavation of 21 x 21 m and 4 m deep excavation with a required water table drawdown of 3 m. Based on the same excavation dimensions, conservative estimates for groundwater inflow rate to excavations within the silty clayey deposits (St. Joseph Till) or the fine grained glaciolacustrine deposits, were calculated to be 2,300 L/day. The hydraulic conductivity was assumed to be 5.00E-04 m/s for the sand and gravel deposits and 1.00E-07 m/s for the silty clayey deposits.

In addition, the calculated radii of influence for the construction dewatering were calculated to be 213 m and 15 m for the sand and gravel unit and the silty clayey till unit respectively.

The analytical calculations used to determine the predicted groundwater inflow and radii of influence were based upon Powers *et al.* (2007)[1] and Sichart *et al.* (1930)[2].

Table 1 summarizes the predicted groundwater inflow and radii of influence.

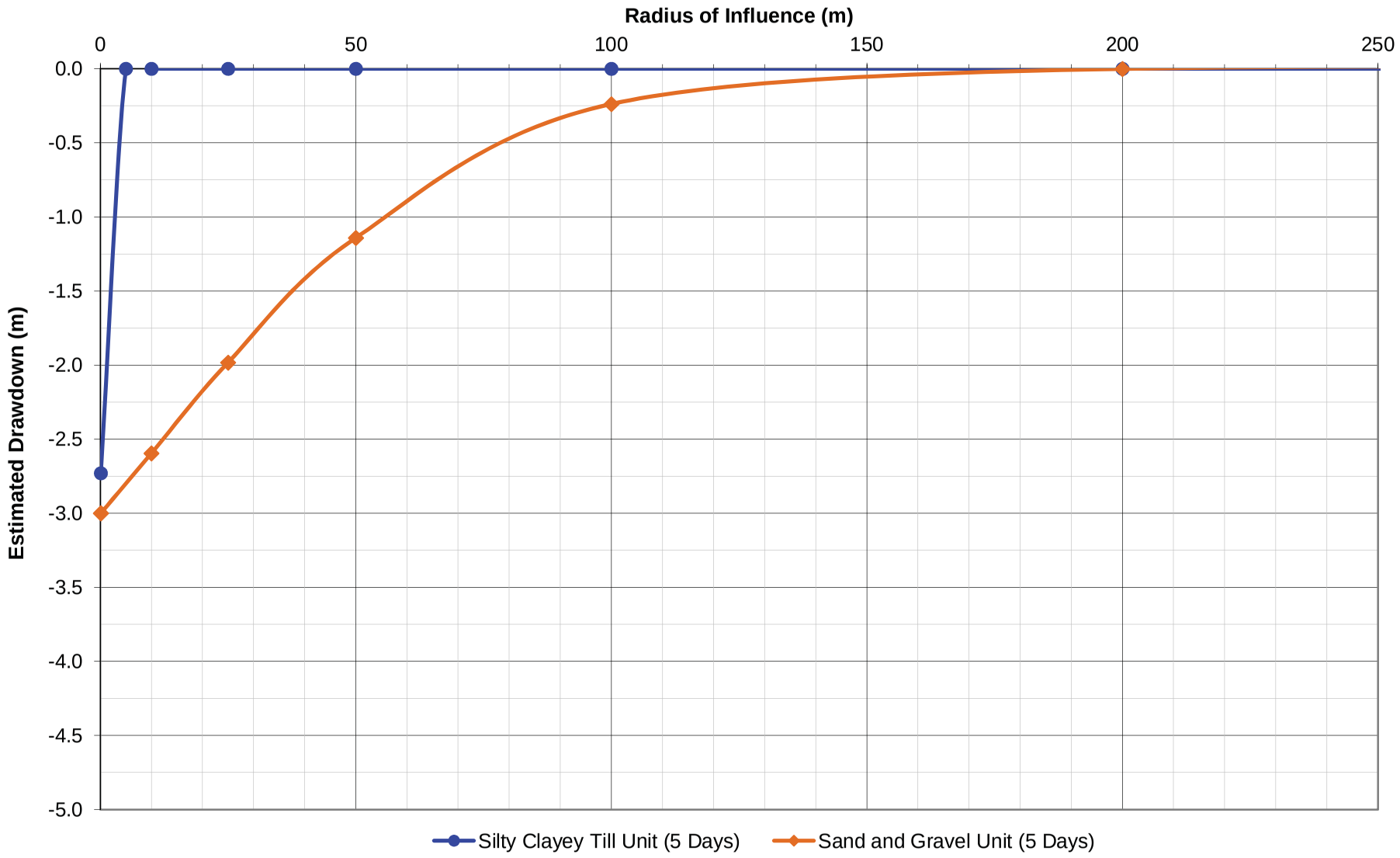
Table 2 shows the calculations used to determine the radius of influence and groundwater inflow for the sand/silt unit.

Table 3 shows the calculations used to determine the radius of influence and groundwater inflow for the silty/clayey till unit.

Figure B1 graphically represents the radii of influence from construction dewatering for an excavation for a turbine foundation for each unit.

1. *Powers, J.P, Corwin, A.B., Schmall, P.C., Kaeck, W.E., and Herridge, C.J., 2007. Construction Dewatering and Groundwater Control: New Methods and Applications, 3rd Ed. John Wiley and Sons Inc.*
2. *Sichart, W. and Kyrieleis, W., 1930. Grundwasser Absekungen bei Fundierungsarbeiten. Berlin, Germany.*

Draft For Discussion



AECOM

Estimated Drawdown Radius of Influence

FIGURE B1

Project 60155032

Table 1. Summary of Predicted Groundwater Inflow and Radii of Influence

Area:	Excavation for base of single turbine
Initial Head:	3 m
Final Head:	0 m
Excavation Length:	21 m
Side Slope Wall Ratio:	Varies, assumed 1H:1V for calculation
Trench Width:	21 m
Number of Sides:	4
Silty/Clayey Till Hydraulic Conductivity:	1.00E-07 m/s
Sand/Gravel Hydraulic Conductivity	5.00E-04 m/s

	Hydraulic Conductivity (m/s)			
	Silty/Clayey Till	***1.00E-07***	***Sand/Gravel***	***5.00E-04***
Q (L/d)	2,295		162,285	
ROI (m)	14.69		213.09	

Notes: *Q – Flow rate (L/day)*
ROI –Radius of Influence (m)
Calculated values are based on an initial water level of 1 mbgs and a turbine base excavation of 21 m x 21 m x 4

Table 2. Radius of Influence and Groundwater Inflow Rate Calculations (Sand and Gravel Deposits)

Radius of Influence and Groundwater Inflow Rate Calculations - Unconfined Aquifer

After: Powers et al, 2007 & Sichart and Kryieleis, 1930.
USE FOR BOX SHAPED EXCAVATIONS, WHERE x/a IS SMALL (I.E. <1.5)

Spreadsheet Instructions
Edit
Results

x/a 1

Radius of Influence
Ro = 3000(H-h)K^1/2
Sichardt's empirical relationship

Radius of Influence	Ro =	201.25	m
Saturated Thickness before Dewatering	H =	3	m
Saturated Thickness after Dewatering	h =	0	m
Hydraulic Conductivity	K =	5.00E-04	m/s
Number of Sides	n =	4	

Equivalent Radius of Influence for Square or rectangular shaped areas
$r_o = (ax/Pi)^{1/2}$

Width of Trench	a =	21	m
Length of Trench	x =	21	m
Pi		3.1415926	
Equiv Radius of Influence	r_o =	11.85	m

Therefore, the Total Radius of Influence equals $R_i = Ro + r_o$

R_i =		213.09	m

Groundwater Seepage Rate
Jacob's modified non-equilibrium equation**
$Q = [(xK(H^2-h^2)/2L]*n$

Radius of Influence	Ro =	201.25	m
Equiv Radius of Influence	r_o =	11.8	m
Saturated Thickness before Dewatering	H =	3	m
Saturated Thickness after Dewatering	h =	0	
Hydraulic Conductivity	K =	5.00E-04	m/s
Length of Trench	x =	21	m
Line Source Distance*	L =	100.623059	m
Pi		3.1415926	
Groundwater Inflow Rate	Q =	1.88E-03	m3/s
	Q =	**162,285**	L/day
Sheet Pile % reduction	%	0	%
Revised Total Groundwater Inflow Rate	**Q' =**	**162,285**	L/day

Notes:
*** Only good for horizontal flow, need to use darcy for vertical flow*
***First Term is for Gravity Flow*
***Second Term is for artesian flow (confined aquifer)*
**Line source distance is the distance where the confined aquifer is drained (i.e., under gravity flow conditions), but the confining unit is still flowing under pressure*

References:
Powers, J.P, Corwin, A.B., Schmall, P.C., Kaeck, W.E., and Herridge, C.J., 2007. Construction Dewatering and Groundwater Control: New Methods and Applications, 3rd Ed. John Wiley and Sons Inc
Sichart, W. and Kyrieleis, W., 1930. Grundwasser Absenkungen bei Fundierungsarbeiten. Berlin, Germany.

Table 3. Radius of Influence and Groundwater Inflow Rate Calculations (Silty Clayey Till)

Radius of Influence and Groundwater Inflow Rate Calculations - Unconfined Aquifer

After: Powers et al, 2007 & Sichart and Kryieleis, 1930.

USE FOR BOX SHAPED EXCAVATIONS, WHERE x/a IS SMALL (i.E. <1.5)

x/a 1

Spreadsheet Instructions

Edit

Results

Radius of Influence

$R_o = 3000(H-h)K^{1/2}$

Sichardt's empirical relationship

Radius of Influence	R_o =	2.85	m
Saturated Thickness before Dewatering	H =	3	m
Saturated Thickness after Dewatering	h =	0	m
Hydraulic Conductivity	K =	1.00E-07	m/s
Number of Sides	n =	4	

Equivalent Radius of Influence for Square or rectangular shaped areas

$r_o = (ax/Pi)^{1/2}$

Width of Trench	a =	21	m
Length of Trench	x =	21	m
Pi		3.1415926	
Equiv Radius of Influence	r_o =	11.85	m

Therefore, the Total Radius of Influence equals: $R_T = Ro + r_o$

	R_T =	14.69	m

Groundwater Seepage Rate

Jacob's modified non-equilibrium equation**

$Q = [(xK(H^2-h^2)/2L]*n$

Radius of Influence	R_o =	2.85	m
Equiv Radius of Influence	r_o =	11.8	m
Saturated Thickness before Dewatering	H =	3	m
Saturated Thickness after Dewatering	h =	0	
Hydraulic Conductivity	K =	1.00E-07	m/s
Length of Trench	x =	21	m
Line Source Distance*	L =	1.813024947	m
Pi		3.1415926	
Groundwater Inflow Rate	Q =	2.66E-05	m3/s
	Q =	2.295	L/day
Sheet Pile % reduction	%	0	%
Revised Total Groundwater Inflow Rate	Q' =	2.295	L/day

Notes:

*** Only good for horizontal flow, need to use darcy for vertical flow*

**First Term is for Gravity Flow*

**Second Term is for artesian flow (confined aquifer)*

**Line source distance is the distance where the confined aquifer is drained (i.e., under gravity flow conditions), but the confining unit is still flowing under pressure*

References:

Powers, J.P, Corwin, A.B., Schmall, P.C., Kaeck, W.E., and Hemidge, C.J., 2007. Construction Dewatering and Groundwater Control: New Methods and Applications. 3rd Ed. John Wiley and Sons Inc

Sichart, W. and Kyrieleis, W., 1930. Grundwasser Absenkungen bei Fundierungsarbeiten. Berlin, Germany.