K2 WIND POWER PROJECT
CONSTRUCTION PLAN REPORT

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1.0 INTRODUCTION

1.1 Project Overview

K2 Wind Ontario Inc., in its capacity as general partner of K2 Wind Ontario Limited Partnership (the Proponent or K2 Wind), is proposing to develop, construct and operate the K2 Wind Power Project (the Project) in the Township of Ashfield-Colborne-Wawanosh (Township of ACW) within the County of Huron, north of Goderich, Ontario (see Figure 1, Appendix A for an overview map of the Project Location). The Proponent is a limited partnership formed under the *Limited Partnerships Act* (Ontario), with K2 Wind Ontario Inc. as general partner and CP K2 Holdings Inc. (an affiliate of Capital Power Corporation), Samsung Renewable Energy Inc., and Pattern K2 LP Holdings LP (an affiliate of Pattern Renewable Holdings Canada ULC), as limited partners. The Project would supply approximately 270 megawatts (MW) of electricity to the Ontario power grid. The development of the Project would help the province of Ontario meet its goal of increasing the proportion of electricity generated from renewable sources. The Project is subject to Ontario Regulation 359/09 – Renewable Energy Approvals under Part V.0.1 of the *Environmental Protection Act* (O. Reg. 359/09).

Key Project components would consist of up to 140 wind turbines, electrical collection and communications systems including a transmission line, a transformer station, a substation, an operation and maintenance building, meteorological towers (met towers), access roads, and temporary construction and laydown areas.

The Proponent has elected to assess and seek approval for some alternative Project configurations. The Renewable Energy Approval (REA) application process will consider two potential transmission line voltages (138 kV vs. 230 kV), two potential transmission line routes, and several alternate access road and collector line alignments. Final selection of the sites to be used would be based on the results of consultation activities, detailed design / engineering work, and the conditions experienced during construction.

The Proponent retained Stantec Consulting Ltd., SENES Consultants Limited, and AMEC Environment & Infrastructure, a division of AMEC Americas Limited (AMEC) to assist in the preparation of the REA application with input from Timmins Martelle Heritage Consultants Inc., Selde Corporation and Zephyr North Canada.

1.2 Report Requirements

The purpose of the *Construction Plan Report* is to provide the public, Aboriginal communities, municipalities, and regulatory agencies with an understanding of the Project construction plan, including any environmental effects that may result from Project construction.

The *Construction Plan Report* has been prepared in accordance with Item 1, Table 1 of O. Reg. 359/09 and in consideration of the Ministry of the Environment's (MOE's) guidance document *Technical Guide to Renewable Energy Approvals*.

The following table provides the requirements of the *Construction Plan Report* as prescribed in the Regulation and the relevant sections where it can be found within this document.

Table 1-1: Construction Plan Report Requirements per Ontario Regulation 359/09

ID	Requirements	Section Number
Set out a description of the following in respect of the renewable energy project:		
1.	Details of any construction or installation activities.	2.0
2.	The location and timing of any construction or installation activities for the duration of the construction or installation.	3.0
3.	Any negative environmental effects that may result from construction or installation activities.	4.0
4.	Mitigation measures in respect of any negative environmental effects mentioned in paragraph 3.	4.0

2.0 DESCRIPTION OF CONSTRUCTION AND INSTALLATION ACTIVITIES

This section provides a description of construction and installation of the Project components. A detailed description of the Project components is provided in the *Project Description Report*. The Construction Contractor will be responsible for the detailed design and construction of the Project. The detailed construction plan will include all commitments for mitigation measures and monitoring programs for the construction phase identified in this report, and other reports submitted as part of the Project's REA application, as applicable. The detailed construction plan would include site practices and procedures based on regulatory requirements and accepted site practices and will include plans related to traffic management, waste management, health and safety, sediment and erosion control, and emergency response and communications.

Project construction would be managed by the Construction Contractor from a main construction staging area located on the substation property. This area would be approximately 21-22 ha, and would be used for Project management trailers, equipment laydown and parking for the duration of the construction work, after which all contractor facilities would be removed.

An overview of the proposed Project activities during construction is summarized in Table 2-1.

Table 2-1: Project Activities

Construction	
Turbine & Met Tower Sites	Staking of site work area and sensitive features, and installation of erosion and runoff controls
	Vegetation clearing, trimming of trees, and site grading
	Delineation of temporary work areas and installation of temporary facilities
	Construction of culverts and temporary access roads and crane paths
	Installation of construction pads or mats
	Installation of turbine and met tower foundations
	Installation of concrete pedestal for the turbine padmount transformer
	Installation of padmount transformers and grounding grid
	Turbine tower and met tower erection
	Installation of underground collector and data lines parallel to access roads
	Installation of underground cabling and data lines for met tower
	Completion of permanent access roads
	Restoration of temporary work areas and landscaping (de-compaction, topsoil replacement, reseeding, etc.)
Collector System/Transmission Line	Staking of site work area and sensitive features, and installation of erosion and runoff controls
	Vegetation clearing, trimming of trees, and site grading
	Installation of cable trenches (underground), cabling, buried splices, junction boxes/disconnecting switch boxes and data lines within the existing road allowance or on private land
	Installation of above ground gathering lines on wooden poles or infrastructure along road allowances for major river and valley crossings and where necessary due to construction constraints
	Grading and restoration of the site

Construction	
Transformer Station	Staking of site work area and sensitive features, and installation of erosion and runoff controls
	Vegetation clearing, trimming of trees, and site grading
	Installation of stormwater management features
	Construction of concrete footings and pads
	Installation of the grounding grid
	Installation of transformers and all other equipment
	Restoration of temporary construction areas
	Installation of site fencing and landscaping or berms
Substation	Assessment and possible decommissioning the existing well and septic system
	Staking of site work area and sensitive features, and installation of erosion and runoff controls
	Vegetation clearing, trimming of trees, and site grading
	Preparation of central laydown area
	Installation of stormwater management features
	Construction of concrete footings and pads
	Installation of the grounding grid
	Installation of substation equipment and connection to the switching station
	Installation or recommissioning of septic system and water well
	Construction of operation and maintenance building and permanent access roads
	Restoration of temporary work areas (de-compaction, topsoil replacement, possible reseeding, etc.)
	Installation of fencing and landscaping of the site
	Connection to Hydro One grid (performed by Hydro One)
	Commissioning of the Project

The following sections provide a detailed description of the construction activities that would occur during the development of the proposed wind farm and are typical for this type of project. Tables 2-2 to 2-4 provide information on the environmental aspects associated with construction activities. These tables provide approximate estimates of the material quantities based on similar projects, however the needs of any specific turbine location can vary with site conditions.

2.1 Pre-Construction Activities

Prior to construction, a registered Ontario Land Surveyor (or equivalent) would survey access roads, collector lines, transmission lines, and turbine locations as appropriate. The buildable area, which includes the footprint of the facility components, plus any temporary work and storage locations, would be staked on private lands. Construction and installation activities would be conducted within this designated area. The underground collector lines (and above ground in some locations) would generally be installed within the boundaries of the municipal road allowance. In some locations the collector system and transmission lines are proposed within private lands based on agreements with the landowners. The buildable area generally consists of the following:

- Substation property (includes the substation, operation and maintenance building, protection and control buildings, stormwater management (SWM) pond, main construction staging area, and Hydro One switching station): approximately 604 m x 680 m.
- Transformer station property (including the grounding grid, protection and control buildings, stormwater management features, and temporary construction area): approximately 200 m x 200 m.
- Access road and underground collector and transmission line locations: approximately 15 m wide corridor at each turbine location; includes 5 to 8 m wide gravel road; underground electrical collector and transmission lines, data cable and junction boxes/disconnecting switch boxes; culverts (where necessary); and temporary staging area.
- Turbine locations: approximately 160 m x 160 m, includes turbine tower, foundation, approximately 3 to 5 m gravelled collar around the turbine base, and temporary staging area.
- Crane paths: temporary 15 m wide corridor between some turbine locations.
- Met tower locations: 150 m x 150 m, includes tower, guy wires (if not self-supporting), temporary staging area, underground power and data cabling, and temporary access route.
- Municipal road allowances: above ground and underground collector lines, data cables and junction/disconnecting switch boxes; transmission line; and buried splices would be installed within the boundaries of the road allowance or on private land.

Where possible, temporary staging areas have been reduced in size on a site-specific basis to exclude natural features and water bodies as part of the proposed mitigation.

Prior to construction, the Proponent or appointed Contractor will develop agreements with Utility companies for the temporary relocation or adjusted location of utilities (i.e., low slung electrical collector lines that impede the flow of large equipment may need to be lifted) within the Project Location, or within the transportation routing. Generally the relocation or adjustment of utilities for this purpose is completed by the Utility Owner and would generally not be undertaken by the Proponent.

Preliminary geotechnical work was completed to obtain general subsurface information within the vicinity of the Project Location. This information was used to aid in evaluating estimates with regards to foundation design and construction for wind turbines.

2.2 Turbine and Met Tower Sites

The construction phase of the complete Project would last approximately 18 to 24 months. Key components that would be constructed or erected on each turbine site include:

- Foundations;
- Concrete pedestal for padmount transformers;
- Towers;
- Turbine generators (nacelles, hubs and rotors);
- Padmount transformers;

- Switchgears;
- Access roads;
- Temporary crane paths (connecting some turbine locations);
- Construction pads; and
- Power (collector) and data lines.

Key components for the met towers would include:

- Footings;
- Towers;
- Guy wires (if not self-supporting);
- Temporary construction area and access; and
- Power supply and data cabling.

Construction will take place generally during regular construction hours with extended hours as necessary. The sequence of construction is described below.

2.2.1 Site Preparation and Construction of Access Roads

Approximately 90 km of new access roads are required to access turbine sites from existing municipal roads during all phases of the Project. Following the delineation of the work areas as described in Section 2.1, erosion and runoff controls would be installed at runoff pathways to protect surface waters during the construction activities, natural features requiring protection will be marked and silt fencing installed as required, and any trees that are to be protected would have temporary fencing placed around them. Silt fencing would be inspected regularly to ensure proper function, particularly during heavy rainfall events. Trees that require removal would be removed to below grade. All tree cutting will be conducted in compliance with the County of Huron tree cutting by-law (By-law No. 10, 2006, Forest Conservation By-law), if applicable.

The turbine working area including laydown would be clearly marked and temporary facilities such as trailers, power, and portable toilets would be installed. Topsoil would be removed and stockpiled separately from subsoil for reuse onsite as needed. Site grading would be completed where necessary and gravel construction pads installed.

Gravel access roads would be installed from the edge of the municipal road to the turbine sites (see Appendix C for typical access road construction). These would initially permit access by construction vehicles but would be required throughout the life of the Project for maintenance purposes. The routes of the access roads were chosen in consultation with the landowners to minimize disruption of farming activity and environmental disturbance, while working within technical constraints. The roads would be constructed by removing and stockpiling topsoil, placing geotextile as appropriate, then building the roadbed using local granular material. The roads would be within a 15 m alignment and have a maximum overall operating width of 5 to 8 m. The design would allow drainage of surface water using lateral drains where appropriate and ditches with culverts. Any new openings across existing fences would be fitted with suitable gates and/or stock grids in consultation with the landowner. Access permits would be required from the municipality for the entry from municipal roads.

All of the Project access roads are designed to prevent significant compaction of the underlying sub soils. The topsoil underlying the area where the road is to be constructed is stripped, with geotextile fabric then being placed on top of the subsoil to prevent weeds from growing but enabling rain water to reach the subsoil for infiltration. A granular road base is placed on top of the geotextile fabric in multiple layers where each layer is compacted to ensure a hard base. This hard base spreads the load of vehicles and concrete trucks, turbine component delivery trucks and the crane during construction in order to minimize subsoil compaction. Any subsoil compaction from the road construction and use by construction vehicles would extend only a short distance into the underlying subsoil, if at all. As a result, there should be limited to no impact on groundwater flows from one side of the road to the other. In areas where surface water drainage issues are anticipated, culverts may be installed below the granular road base to ensure drainage across the roadway.

The cranes for turbine erection would travel along the permanent access roads between turbines; but to reduce demobilization of cranes there would be instances where the crane would travel cross-country between turbines along temporary crane paths (see Figures 2-A to 2-P, Appendix A and Section 2.2.5.2).

2.2.1.1 Temporary Components of Access Roads

Staging Areas

A staging area would occur within the 15 m staked buildable area along access roads for construction of the 5 to 8 m wide access road. Portions of the buildable areas have been reduced on a site-by-site basis to avoid natural features and water bodies, where possible.

The timing of the temporary use of land for the access road staging areas would begin with the construction of the access roads and these areas would be rehabilitated at the end of the construction phase.

Delivery Truck Turnaround Areas

Some access roads require turnaround areas for delivery trucks. These turnaround areas would be the same width as access roads, and would be constructed in the same manner, including the requirement for staging areas.

The timing of the temporary use of land for the delivery truck turnaround areas would begin with the construction of the access roads and these areas would be restored to pre-existing conditions, as nearly as possible, at the end of the construction phase.

Access Road Turning Radii

Access roads would not require resizing for the operation phase, with the exception of the entrances from the municipal or county roads and curves in the access roads, which require wider turning radii for component delivery; these areas would be approximately 15 m wide during the construction phase, and reduced to 5 to 8 m at the end of the construction phase.

Following construction activities, all of the temporary locations would be restored to pre-construction conditions. Restoration work would start following installation of each wind turbine and removal of all construction materials and equipment from each turbine site. This includes removal of the granular and geotextile material from applicable areas. Restoration activities are described in Section 2.2.6.

2.2.2 Water Crossings

Some of the access roads would need to cross watercourses. During Project planning and site layout, the crossing of streams and drainage swales was avoided where feasible. Culverts would be installed at access road water crossings following best management practices for culvert installation and permitting specifications from the Maitland Valley Conservation Authority (MVCA) as required. The culverts would be appropriately sized to meet flow conditions. These would be embedded within the natural channel and backfilled with gravel to match the final grade of the access road. Installation activities would conform to Ontario Provincial Standard Specification 421 (OPSS) – Construction Specification for Pipe Culvert Installation in Open Cut (see Appendix C for typical watercourse crossing plan).

Collector and data cables would be installed below the culverts where associated with an access road crossing, with the design determined by the Construction Contractor in consultation with the MVCA as appropriate.

2.2.2.1 Temporary Water Crossings

Temporary crossings of watercourses may be required for crane paths, and would occur by temporary bridges such as wooden mats (swamp mats), portable bridges or culvert/gravel fill ramps. Temporary crossings would comply with Fisheries and Oceans Canada (DFO) Ontario Operation Statement – Temporary Stream Crossings, where possible, or may require permit approval from the MVCA.

2.2.3 Turbine Foundations

Topsoil would be removed and stockpiled separately from subsoil for reuse on site as needed. Excavations would be completed for each foundation over approximately 2 to 3 days. The foundation for each turbine would be comprised of a reinforced concrete base approximately 19 m across, lying approximately 3 m below ground. The foundation pedestal would be approximately 5.3 m in diameter and sit approximately 0.3 m above grade. An alternate foundation design that may be required at some turbine sites would include a larger approximately 21 m diameter foundation. Based on site-specific geotechnical conditions, alternative foundation designs may be required. Formwork and reinforcing steel would be installed followed by the concrete pour. Concrete would be delivered by truck ready-mixed from local suppliers. The Construction Contractor would be responsible for ensuring that wash water from the cleaning of concrete truck drums is disposed of in a sewage works designed for that purpose and approved under Section 53.(1) of the *Ontario Water Resources Act*, or under Part 8 of the *Building Code Act*. The concrete pour would be continuous over approximately 10 hours.

The concrete foundation would be allowed to cure for approximately 7 to 14 days, after which it would be back filled with stockpiled soil or clean fill and reinstated. All rock and most soil that is excavated would be put back on top of the foundations as fill material provided the material meets fill specifications. If bedrock is encountered close to the surface it would be removed by mechanical digger to the necessary depth required for the foundation. If a significant amount of rock is encountered, the rock removed would be crushed in an on-site crusher and, as appropriate, used for backfill, laydown areas or spread in agreement with the landowner. Any excess soil would be spread in areas agreed with the landowner. Should there be a need to remove soil from site it would be tested for environmental parameters and reused as construction fill or landfill cover, or disposed of at an MOE-approved off site facility. A gravel pad would be installed around the turbine to form a working area and construction pad for turbine erection (see Appendix C for drawings of a typical turbine foundation).

2.2.4 Transformers at Turbines

The wind turbine padmount transformers would be located at the base of each wind turbine tower and foundation. A separate precast or cast in place concrete pedestal would be installed to receive the padmount transformer. Typical sizes of the pedestal are 2.4 m x 2.4 m x 1.5 m. A base consisting of approximately 450 mm granular material may be used to support the pedestal after it is lifted into place.

The padmount transformer would be delivered by flatbed truck and trailer. A small crane would be used to lift the padmount transformer from the truck and place it directly onto the concrete pedestal. No site preparation is required except for excavating the void for the concrete pedestal.

Grounding is required for each padmount transformer and tower. Depending on the system design, this consists of approximately 4 ground rods that are 19 mm in diameter by 3 m long, which are driven vertically into the ground, forming a square pattern around the padmount transformer and tower. The grounding required for the transformer and tower consists of grounding rods and cable, generally made of bare copper, which is connected to both the transformer and tower. There could be a need for an alternative grounding configuration depending on site-specific soil conditions. Mechanical protection for the padmount transformer in the form of bollards may be installed around the entire padmount transformer assembly.

Based on standard industry practices, secondary oil containment should not be necessary for the padmount transformers.

During the construction of the padmount transformer pedestal, surface material will be excavated, stockpiled and reused to the extent possible during site landscaping.

2.2.5 Turbine Installation

The Project consists of up to 140 Siemens SWT - 2.3 wind turbines. The turbine consists of a 99.5 m steel tube tower, three 49 m blades, the nacelle, and rotor hub.

The turbine tower base is approximately 5 m in diameter and would be anchored to the concrete foundation using large diameter anchor bolts.

All major equipment would be moved to site via road transport. As the blades are 49 m in length, these would require coordination of shipments to minimize disruption of traffic and to meet route constraints such as turning radii and temporary road works. The turbine supplier has experience in shipments of components to site and will develop a Traffic Management Plan based on current information. The Traffic Management Plan would be updated as required to adjust for changes such as road construction at the time of delivery.

The wind turbines would be erected using heavy-lift crawler and mobile cranes. The towers arrive in sections and would be bolted together on site. These are connected to the foundation using anchor bolts. After erection of the towers, the nacelle, which contains the generation equipment, would be installed on the top of the tower followed by the addition of the rotor assembly (hub and blades). It is anticipated that approximately 8 turbines would be assembled per week depending on weather conditions (cranes cannot operate in high winds). Following erection of the turbines, these would be connected to the collector lines (see Section 2.3).

Prior to start-up, all systems would be commissioned to ensure correct operation and to adjust the operating parameters to optimize performance. Acceptance testing would be completed on the equipment to ensure that it meets the engineering specifications. Operating staff would be trained on equipment control and operation. This phase would be conducted in the presence of engineers and technical specialists representing the owner, Construction Contractor and major equipment suppliers.

2.2.5.1 Turbine Base

At the base of each turbine an approximately 3 to 5 m gravelled area will be installed for truck turnaround and general care. A staircase will be installed on a gravel or concrete pad to allow access to the turbine.

2.2.5.2 Temporary Components of Turbine Locations

Turbine Staging Areas

A staging area would be used within the 160 m x 160 m staked buildable area delineated around each turbine tower, for temporary storage of the turbine components, parking, and foundation spoil pile.

Portions of the buildable areas have been reduced on a site-by-site basis to avoid natural features and water bodies, where possible.

It is planned that the turbine components would be delivered directly to the turbine sites for temporary storage until assembled.

Temporary staging areas may be excavated or gravelled, and would be restored to pre-existing conditions at the end of the construction phase. Turbine buildable areas would be actively used throughout the construction phase to varying degrees during all construction activities at the turbine siting areas.

Construction Pads or Mats

Temporary construction pads, extending beyond the 3 to 5 m permanent gravelled collar, would be constructed at the same time as the access roads and would be adjacent to each turbine location, within the buildable area at each turbine site. The general construction pad area would be approximately 100 m x 60 m. Generally, the process for construction pad construction would be the same as that for access roads; surface material would be stripped and stockpiled (topsoil separate from subsoil) and a gravel or stone base is applied. The depth of the gravel base may be deeper than that of the access roads at an approximate depth of 0.5 m. Alternatively, if appropriate, the area would be compacted and temporary crane mats made of timber would be used under each of the crane stabilizer arms. Perimeter surface hydrology would be maintained during construction pad construction (see Appendix C for a typical crane pad layout and laydown area plan).

The construction pads would no longer be required once the turbines have been erected; erection of all the turbines would take approximately 20 to 24 weeks. The construction pad or mat area outside of the permanent gravelled collar would be rehabilitated to pre-existing conditions, as possible, once assembly of the turbines is complete.

Crane Paths

Heavy-lift crawler and mobile cranes would be used to assemble the turbines. The movement of the cranes or crawlers between turbine sites, termed ‘crane paths’, would take place along access roads and municipal or county roads where possible. In some places the cranes would be broken down and transported to other turbine locations for re-assembly. However, there are instances where it is most efficient, to minimize potential impact to municipal roads and avoid demobilization of the crane, to move the crane along the most direct path possible between two turbines. All proposed crane paths have been routed on private lands where landowners have agreements with the Proponent.

Crane paths not located on roads would be approximately 15 m wide, and would be relatively level and rolled as required. Timbers, crane mats and/or steel plates would be used where required to facilitate the crane moving through soft or wet areas.

Crane paths not located on roads would be initiated in conjunction with turbine assembly and would be used to move the crane to the next turbine assembly area. These paths would be rehabilitated to pre-construction conditions at the end of the construction phase.

2.2.6 Site Completion and Restoration

The access roads and turbine working area would be completed to specifications including removal of excess gravel placed around the turbines and the access roads except for a gravelled truck turnaround area at the base of each turbine.

The clean-up of the construction site is the final construction activity to be conducted. The clean-up crew would pick up debris and remove surplus materials and equipment. Areas temporarily used to accommodate the construction, such as crane paths and around the turbine, would be restored to a condition determined in consultation with the land owner. Any plantings or re-vegetation for erosion control would be installed in accordance with the detailed design.

2.2.7 Met Tower Sites

The met towers would consist of a lattice or monopole type structure, approximately 100 m high, on a concrete foundation. These towers would either be free standing supported entirely by the foundation or would have guy wires for lateral support. Guy wires would be mounted on steel anchors embedded into concrete pads.

Construction of the met towers would follow the same steps outlined above. Foundations for the met towers are anticipated to be 10 m x 10 m. The site access would be by temporary paths, which would be restored following construction. Sections of the tower would be delivered to site by an appropriately sized pick-up truck or a small rig and the met tower would be assembled and erected by crane.

The power supply and data cabling would be trenched underground from the nearest collector line system within the buildable area delineated for the access route using a trencher or plough. For underground cabling construction, reel trucks dispense the cable, which would be installed at a depth of approximately 1 m. The cables would be bedded in sand or similar sized material, and the trench would be backfilled with the excavated material. Warning tape would be installed along the length of the underground cables approximately 300 mm above the cables. If the installation of underground cables requires directional drilling to cross obstacles, cables would be installed in plastic conduits. Following completion of the met towers, the temporary construction areas would be restored to a condition determined in consultation with the landowner.

2.2.7.1 Temporary Components of Met Tower Sites

The route used by the truck to access the met tower site for installation would be approximately 15 m wide, and would be relatively level and rolled as required. Timbers, crane mats and/or steel plates would be used where required to facilitate the truck moving through soft or wet areas. The truck to be used for delivery of the met tower would be determined based on the tower model selected, but may be an appropriately sized pick-up truck or a small rig.

The met tower access route would be rehabilitated to pre-existing conditions, as possible, at the end of the construction phase.

Table 2-2: Construction Aspects –Turbine Sites

Materials Brought on Site (All quantities are approximate.)	
Quantities and types of materials to be transported to each turbine site	Footings: formwork (1 set), reinforcing steel (~50-75 tonnes), concrete (~370-445 m^3). Road access and construction pads: gravel Culverts for ditch/stream crossings as necessary. Turbines: tower (5 sections); nacelle (1); blades (3); hub (1). Power and data transmission: Cabling, data lines, and utility poles as necessary. Turbine padmount transformer and concrete pedestal.
Total quantity of gravel required for roads	Permanent access roads: 18,000 m^3 of granular A and 126,500 m^3 of granular B. Temporary access roads: 1,300 m^3 of granular A and 8,700 m^3 of granular B. Road turnarounds: 3,700 m^3 of granular A and 25,900 m^3 of granular B. Road entrances: 2,000 m^3 of granular A and 13,600 m^3 of granular B.
Method of transporting to site and numbers of trucks	Transportation to each turbine site would be via truck over approximately 6 months. Peak traffic would occur during the foundation pour (~30-40 trucks/day). Turbines components to each site would arrive in approximately 15 deliveries, scheduled to meet construction needs.
Timeline for and operational plan for transportation to site	Construction of turbine sites would occur sequentially with intermittent traffic patterns depending on activity. Main traffic flow would occur during foundation construction. Traffic would be scheduled to meet construction needs (see Section 3.2 for schedule). The Construction Contractor will provide a Traffic Management Plan in consultation with the Township and County (see Section 4.5.6 for traffic).
Locations where materials will be used	Refer to Project Location (Figure 1, Appendix A).
Temporary materials storage and duration	Civil construction materials would be installed upon delivery. Storage of general supplies would be at the main construction staging area at the substation property (see Figure 2, Appendix A). There could be temporary storage of turbine components to accommodate the logistics of transportation and construction needs. The intent would be to have turbines delivered in time for installation.
Construction Equipment Used	
Type, size of construction equipment	Crawler backhoes would be used for excavation. Four cranes (two main and two assist) would be used for turbine erection. Bulldozers would be used for site preparation. Graders and rollers would be used for road construction.
Potential to emit noise and dust	Exhaust emissions and dust from soil exposure.
Chemicals/fuels used by construction equipment and management	Refuelling of equipment and lubrication would be done by a maintenance service vehicle. There would be no fuel or lubricant storage on turbine sites.
Mobilization and demobilization of construction equipment	Equipment would be brought to site by float truck. Cranes would drive to site.
Timing and Operational Plans	
Sequence of events	The sequence of construction for each turbine site is described in Sections 2.2.1 to 2.2.6 of this report.
Duration	Approximately 18 to 24 months overall.
Timing and seasonality	Work would proceed year round.
Time of day	Construction will take place generally during regular construction hours with extended hours as necessary.

Temporary Uses of Land	
The extent of affected area	Crane paths between turbines would be used to minimize mobilization/demobilization. Increased turning radius at bends of the turbine access roads would be required for crane and equipment delivery. These areas would be restored for agricultural use prior to completion of the work. Major equipment would be delivered as needed. Other general supplies and minor equipment would be stored at the main construction staging area at the substation property.
Description of land use prior to construction	Agricultural
Description of temporary land use during construction	See above.
Timing and duration of the temporary change	Approximately 3 months per turbine.
Materials Generated at or Transported from Project Location	
Quantity and type of material generated	Soil that has been excavated for footings would be temporarily stockpiled at each turbine location and used as backfill (approximately 800 m^3/per turbine). Non-hazardous solid wastes from construction (< 4 m^3/week).
On site storage description	Excavated soils for backfill would be stockpiled around the excavation. Excess soils will be spread on site. Non-hazardous solid wastes would be retained in a dumpster bin.
Use/disposal of materials leaving site	Excavated soils to be reused on site as fill material or spread on-site. (Should there be an instance where this is not possible, it would be removed after environmental testing as fill for other construction sites or landfill cover, or disposed of at an MOE-approved off site facility.) Non-hazardous solid wastes to licensed landfill. Paper and cardboard to recycling.
Mode of transport from site	Truck

2.3 Collector System and Transmission Line

To allow for the collector system to be predominantly buried (as opposed to above ground), as requested by the Township of ACW and local residents, and to reduce the number of circuits entering the main substation, approximately one half of the 34.5 kV lines would be routed to the transformer station where there will be a step-up to 138 or 230 kV. All circuits (138 or 230 kV and 34.5 kV) would then feed into the substation, which is located adjacent to an existing Hydro One 500 kV transmission line.

All cables would be buried according to electrical code requirements. Power and control cabling leaving the wind turbines would generally be buried beneath or adjacent to the turbine access road. Underground cabling would generally be laid in trenches approximately 0.5 m wide x 1.0 m deep according to current practice, and well below cultivation depth. From the junction of each turbine access road and the municipal road allowance, underground cables would be installed in the municipal road allowance in trenches between the property line and the travelled portion of the roadway or directly within the road bed. Trenches would be excavated using backhoes, trenchers, ploughing, or tracked excavators for placement of the cables (see Appendix C for a typical buried cable plan).

Data cabling would generally be laid in the same trenches as collector lines and would follow the routes of the access roads wherever possible. Cables would be bedded in sand, or similar material as necessary, and the trench would be backfilled with the excavated material. Warning tape would be installed along the length of the underground cables, approximately 300 mm above the cables. As appropriate, clay plugs would be placed in the trenches at intervals to prevent water flow through the cable trenches. The top 100 mm of soil would be stripped and laid beside the trench, and used to reinstate to original ground level immediately after installation of the cables. Alternatively, cables could be installed by ploughing or directional drilling where appropriate.

Where necessary, partially buried junction boxes, disconnecting switch boxes, or similar infrastructure will be placed at the junction where the collector line from the turbine meets the collector line in the road allowance. The box would be located either on participating private land or within the road allowance. Boxes will require an excavation approximately 4 m long x 4 m wide x 3 m deep. The boxes are partially buried with a hinged lid sitting above grade to allow for maintenance access. The above ground portion of the box is approximately 2.5 m long x 1.5 m wide x 1.0 m high. At several points along the length of the cable installations, cable splice points would be required to allow cable lines to be spliced together. The splices will either be direct buried or will be housed in boxes. To facilitate the cable splice points, splice box may be installed below ground.

The 138 kV or 230 kV buried cable would be used to connect the transformer station to the substation. The cable will be laid in trenches approximately 1.0 m wide by 1.0 m deep. Trenches would be excavated using backhoes, trenchers or tracked excavators for placement of cables. The cables would be bedded in crushed limestone, or similar bedding material, as necessary and the trench would be backfilled with the excavated material. Warning tape would be installed along the length of the underground cables, approximately 300 mm above the cables. The top 100 mm of soil would be stripped and laid beside the trench and used to reinstate to original ground level immediately after installation of the cables.

Due to the size of the transmission line cables, the cables will require approximately five splices over its length as only a length of approximately 900 m can be put on a single cable reel. The cable splices would be located in either splice vaults or they would be directly buried. An excavation approximately 5 m wide x 3 m long x 3 m deep will be required at the splice locations. If in vaults, the vaults would be pre-cast or poured in place concrete and would be approximately 3 m long x 2 m wide x 2 m deep. If directly buried, they would be buried at the same depth as the cable, placed in beds of crushed limestone, or similar material, and backfilled to grade with native soil. They would potentially also have concrete blocks or concrete slabs forming a wall around them for in-ground protection. The bedding containing the cable splices will also be covered with concrete blocks or slabs for protection. Warning tape would be installed along the length of the splice locations, approximately 300 mm above the top concrete protection. Each splice location would be marked with above ground markers.

Where there are crossings of watercourses, the lines would generally be installed by open cut, on above ground poles, on infrastructure (i.e., bridges), or by directional drilling. The final design will be determined by the Construction Contractor in consultation with the MVCA, as required. If site conditions require directional drilling to cross roads, streams or other obstacles, lines would be installed in plastic conduits.

For above ground construction, existing power line corridors would be used where possible. Existing poles would need to be replaced with taller poles to allow for the addition of new lines. New poles would be installed using linemen trucks with mounted augers. Where trimming of vegetation is required within the road allowance, it would be completed in accordance with Township/County and/or Hydro One requirements. Following installation of poles and hardware the new cabling would be strung to complete the connection to the substation (see Appendix C for a typical above ground collector system plan).

Table 2-3: Construction Aspects – Collector System and Transmission Line

Materials Brought on Site (All quantities are approximate.)	
Quantities and types of materials to be transported to site	Wood utility poles (limited to several sites where underground lines are not feasible) Electrical cables Electrical conduit Junction boxes, disconnecting switch boxes, splice boxes and splice vaults Bedding sand/material
Method of transporting to site and numbers of trucks	All transportation to site would be via truck (approximately 4 linemen trucks and 2 pole trucks).
Timeline for and operational plan for transportation to site	Construction of power lines would occur over approximately 18 to 24 months.
Locations where materials will be used	Refer to Figure 1 for details of the collector system and transmission line routings. Junction boxes and/or disconnecting switch boxes may be placed at the access road entrance either on the participating property or within the municipal road allowance.
Temporary materials storage and duration	Storage of supplies and materials would be at the substation. It is the intent that poles and cabling would be brought to site in time for installation. Temporary laydown of poles and cabling may occur along the road allowance where delivery outpaces construction progress for the power lines.
Construction Equipment Used	
Type, size of construction equipment	Crawler backhoe, or similar equipment, for underground installations of collector lines. Linemen trucks and augers for above ground power lines. Crane and flatbed truck for placement of buried splice boxes or vaults.
Potential to emit noise and dust	Exhaust emissions. Dust from exposed soils.
Chemicals/fuels used by construction equipment and management	Refuelling of trucks would be off site at commercial outlets. Refuelling of construction equipment would be done by a maintenance service vehicle. There would be no fuel or lubricant storage on turbine sites or municipal road allowance.
Mobilization and demobilization of construction equipment	Trucks are driven to site. Excavators are delivered by float truck.
Timing and Operational Plans	
Sequence of events	See Section 2.3 for onsite and off-site collector system.
Duration	Approximately 18 to 24 months overall.
Timing and seasonality	Work would proceed year round, as possible and in accordance with regulatory requirements.

Time of day	Construction will take place generally during regular construction hours with extended hours as necessary.
Temporary Uses of Land	
The extent of affected area	None
Description of land use prior to construction	Existing road allowance.
Description of temporary land use during construction	None
Timing and duration of the temporary change	Not applicable
Materials Generated at or Transported from Project Location	
Quantity and type of material generated	Soil from trench excavation for underground lines would be reused as backfill for the trench. Soil from pole auguring would be used as backfill. Vegetation trimming from the road allowance would be disposed at a licensed landfill.
On site storage description	No storage of wastes would be required for collector line installations. Vegetation would be removed from road allowance site as generated.
Use/disposal of materials leaving site	Auger cuttings would be used as backfill or go to licensed landfill (minor amounts). Vegetation would be disposed of at a licensed landfill.
Mode of transport from site	Truck

2.4 Substation, Operation and Maintenance Building, Temporary Construction Laydown Area and Transformer Station

As part of the construction phase at the substation property, an existing house, associated farm buildings and infrastructure would be demolished and the site graded in accordance with the design.

The construction of facility components at the substation property would last approximately 18 months, although use of the site as the base for construction management and laydown would last for the duration of Project construction. Key components that would be constructed or erected at the substation property would include:

- Site access roads;
- Footings for buildings;
- Operation and maintenance building;
- Water well and septic system for operation and maintenance building;
- Concrete equipment pads and transformer pits;
- Grounding grid;
- Transformers and switchgear;
- Breakers, disconnect switches, PTs and CTs, surge arresters and connecting busbars;
- Electrical building;
- Protection and control buildings;
- Metering, monitoring and control equipment;
- Stormwater management features;

- Grid interconnection (by Hydro One);
- Berming and landscaping as required; and
- Security fencing.

The construction of the transformer station would last approximately 12 months. Key components that would be constructed or erected at the transformer station property would include:

- Site access roads;
- Footings;
- Concrete equipment pads and transformer pit;
- Grounding grid;
- Transformer;
- Switchgear and Control building;
- Breakers (34.5 kV, 138 kV and 230 kV), disconnect switches, PTs and CTs , surge arresters and connecting busbars
- Stormwater management features;
- Berming as required; and
- Security fencing.

The sequence of construction is described below.

2.4.1 Site Preparation, Demolition of Existing Buildings and Civil Works

Prior to commencement of construction, the substation property and the transformer station site would be surveyed and staked to delineate the working area and grading. Erosion and runoff controls would be installed at runoff pathways to protect surface waters during the construction activities and any trees that are to be protected would have temporary fencing placed around them. Trees that require removal would be removed to below grade. Tree cutting will be conducted in compliance with the County of Huron tree cutting by-law (By-law No. 10, 2006, Forest Conservation By-law), if applicable.

At the substation property, the existing house and associated buildings would be demolished/decommissioned as part of the development. If, after assessment, the existing septic system and water well meet the needs of the operation, the systems will be recommissioned and permitted as appropriate. If the onsite systems do not meet the requirements for the operations facility they will be decommissioned. Prior to embarking on the demolition, the Proponent would have a designated substance survey completed to identify any potential hazardous materials and ensure that appropriate work practices are in place for removal and disposal. The Proponent would also have a waste audit of all materials to be handled from the demolition and prepare a waste reduction work plan in accordance with *A Guide to Waste Audits and Waste Reduction Work Plans for Construction & Demolition Projects*, as required under Ontario Regulation 102/94 (O. Reg. 102/94). Following demolition, the land would be restored by removal of footings followed by grading and adding gravel or topsoil as necessary. Demolition wastes would be managed in accordance with Section 2.6.1 of this report. The *Decommissioning Plan Report* provides additional details on mitigation methods to be used during demolition.

Site and access roads would be prepared by excavation of surface soils. Topsoil from site development would be stockpiled for reuse on-site if needed, including construction of berms, if used. Excavations would be completed for the stormwater pond and septic system at the substation property, and for equipment and building foundations and for underground utilities such as electrical conduits and storm sewers. Any excess soil would be used as fill for the Project or spread on site. Gravel fill would be added as necessary to allow construction equipment access, and additional fill used if necessary for berm construction.

Concrete construction would include the installation of the footings for the operations building, equipment pads and supports, and the placement of concrete transformer pits. Excavations would be backfilled using construction fill and excavated materials. Following the major civil works, the site would be underlain by a grounding grid for connection of the electrical equipment and then backfilled with a surface layer of gravel to meet the site plan design.

To support the operation and maintenance building, a septic system expected to consist of a septic tank for treatment, a pump chamber, a distribution box, and weeping bed would be installed. An area of approximately 40 m x 60 m is reserved for the weeping bed. The final design of the septic system would conform to local building code and health unit requirements.

The operation and maintenance building would be erected and a water well would be installed/permitted to service the building for sanitary purposes if it is determined that use of the existing well on site is not feasible. The well would be used for drinking water if water quality meets regulatory requirements for potable water.

A chain link security fence would be installed around the perimeter of both the substation and the transformer station.

2.4.2 Electrical Equipment Installation and Grid Interconnection

Major electrical equipment consisting of transformers and switchgear would be installed on concrete pads and footings. Spill containment would be provided for the primary transformers. Based on standard industry practices, secondary containment should not be necessary for grounding or padmount transformers.

Circuits from the wind turbines and the transformer station would be connected into the substation to step-up the voltage to 500 kV (nominal) to match the operating voltage of the adjacent Hydro-One transmission line. Upon completion of the installation of the electrical equipment the substation would be connected to the provincial grid via the switching station. The design and construction of the switching station would be completed by Hydro One.

Prior to start-up, systems would be commissioned to ensure correct operation and to adjust the operating parameters to optimize performance. Acceptance testing would be completed on the equipment to ensure that it meets the engineering specifications. Operating staff would be trained on equipment control and operation. This phase is conducted in the presence of engineers and technical specialists representing the owner, Construction Contractor and major equipment suppliers.

2.4.3 Site Completion and Restoration

The clean-up crew would pick up debris and remove surplus materials and equipment. Temporary construction areas would be rehabilitated as appropriate. Temporary construction offices and trailers would be removed from the substation property and gravelled surfaces used for parking and laydown would be rehabilitated to meet the final detailed design. Any landscaping plantings would be installed in accordance with the detailed design.

Table 2-4: Construction Aspects – Substation, Operation and Maintenance Building, Construction Laydown and Transformer Station

Materials Brought on Site (All quantities are approximate.)	
Types of materials to be transported to site	Footings: formwork, reinforcing steel, concrete. Gravel: road access, substation, transformer station and laydown Transformers, switchgear.
Quantity of gravel required for laydown area, substation area and Operation and Maintenance area	Laydown area: 36,400 m^3 of granular B. Substation area: 35,600 m^3 of granular B. Operation and Maintenance area: 2,600 m^3 of granular B. Switching station area: 93,700 m^3 of granular B. Transformer Station: approximately 7,000 m^3 of granular B.
Method of transporting to site and numbers of trucks	All transportation to site would be via truck over approximately 18 to 24 months.
Timeline for and operational plan for transportation to site	Construction would occur up to an 18 month period.
Locations where materials will be used	Refer to Project Location (Figures 2 and 3, Appendix A).
Temporary materials storage and duration	All storage of equipment and supplies would be at the laydown area for approximately 18 months.
Construction Equipment Used	
Type, size of construction equipment	Dozers would be used for grading. Crawler backhoes would be used for excavation. Graders and rollers would be used for gravel placement. Front-end loader would be used for materials loading. Cranes would be used for transformer and switchgear placement.
Potential to emit noise and dust	Exhaust emissions and dust from soil exposure.
Chemicals/fuels used by construction equipment and management	Refuelling of equipment and lubrication would be done by a maintenance service vehicle. There would be no fuel or lubricant storage on turbine sites.
Mobilization and demobilization of construction equipment	Equipment would be brought to site by float truck. Trucks and cranes would drive to site.

Timing and Operational Plans	
Sequence of events	See Sections 2.4.1 to 2.4.3 of this report.
Duration	Approximately 12 months for substation and transformer station and 18 months for laydown area.
Timing and seasonality	Work would proceed year round.
Time of day	Construction will take place generally during regular construction hours with extended hours as necessary.
Temporary Uses of Land (main construction staging area only)	
The extent of affected area	Only temporary land use is for site office/yard location approximately 20 ha (Figure 2-J, Appendix A).
Description of land use prior to construction	Land is agricultural.
Description of temporary land use during construction	Used for site office and storage of supplies for construction of entire project.
Timing and duration of the temporary change	Approximately 18 to 24 months.
Materials Generated at or Transported from Project Location	
Quantity and type of material generated	Excavated soils from footings (approximately 800 m). Non-hazardous solid wastes from construction (< 6 m/week). Demolition wastes from buildings (approximately 100 m).
On site storage description	All soils would be stockpiled as excavated for reuse on site. Non-hazardous solid wastes would be retained in a dumpster bin. Demolition wastes will be loaded directly to trucks as generated.
Use/disposal of materials leaving site	Demolition wastes to licensed landfill. Non-hazardous solid wastes to licensed landfill. Paper and cardboard to recycling.
Mode of transport from site	Truck

2.5 Traffic Management Plan

A Traffic Management Plan would be developed in consultation with the construction and turbine contractors, the Proponent, the Township of ACW, County of Huron and Bruce County based on the requirements of the roads leading up to construction. The Construction Contractor would implement a Traffic Management Plan to identify and deal with specific traffic planning issues including the management of traffic and the delivery of materials. The Traffic Management Plan would include details on the size and number of trucks, and the timeline and operational plan for transporting materials to the Project sites (including the sequence of events, duration of activities, and timing with respect to season). The Traffic Management Plan may also include the use of signage, road closures, speed restrictions, truck lighting, load restrictions, and equipment inspections. The plan would be developed during the detailed design phase, once the construction contracts have been awarded.

2.5.1 Turbine Delivery

Siemens (the turbine manufacturer) would be responsible for the transportation of all wind turbine components. The turbine manufacturer would develop a detailed Transportation Plan for delivery of the turbine components to the individual turbine sites. They would also be responsible for securing the necessary transportation and safety permits [e.g. from the Ministry of Transportation (MTO)]. The MTO would be consulted regarding the timing of the deliveries in terms of considering any planned road works on provincial highways when developing the turbine Transportation Plan. The turbines would be delivered directly to the turbine sites for assembly. Approximately 15 truckloads of turbine components would be transported to each turbine site. For public safety, all non-conventional loads would have front and rear escort or "pilot" vehicles to accompany the truck movement on public roads.

Although there are no requirements for formal public notification of wind turbine component load movements, the Proponent will provide notification of non-conventional load movements that may significantly interfere with local traffic, with potential methods of notification including postings on the Project website. This notification would be provided in the interest of public safety, minimization of disruption of other road users, and good community relations.

2.5.2 Delivery of Other Project Materials

Approximately 30 to 40 concrete truck trips would be required per turbine foundation, for a total of approximately 4,500 to 6,000 concrete truck trips to the turbine locations. The crane supplier(s) would be responsible for the transportation of all cranes and related components to the Project Location. The heavy-lift crawler crane would be shipped in individual pieces, requiring individual transport, and then assembled on-site. Smaller cranes would be delivered initially to the laydown area, then to the turbine sites.

The 138 kV or 230 kV and 500 kV electrical transformers would be delivered by low bed trucks directly to the respective sites. Approximately two conventional truck and trailer loads of accessories and supplies would accompany each transformer.

For the remaining Project components on the substation property, including the substation control building and the operation and maintenance building, an estimated 50 conventional truck and trailer loads would be required to transport structural steel, doors / windows, etc. Several flat deck and cargo vans/trucks would be used to transport smaller equipment such as furniture, computer equipment, and spare parts.

An estimated 775 conventional truck and trailer units would transport civil and electrical materials for the construction of roads, building foundations, substation, electrical collection system and supporting infrastructure, and would include such items as 34.5 kV and 138 kV or 230 kV cabling, data cabling, concrete reinforcement steel bar, and foundation anchor bolts.

2.6 Key Process Features and Mitigation Measures

The following sections provide information relating to key process features as identified in O. Reg. 359/09 and MOE's guidance document *Technical Guide to Renewable Energy Approvals*.

2.6.1 Waste Generation

Prior to commencing construction the Construction Contractor would complete a waste assessment in accordance to the principles outlined in *A Guide to Waste Audits and Waste Reduction Work Plans for Construction & Demolition Project*s, under Ontario Regulation 102/94. All wastes will be managed in accordance with *Ontario Regulation 347, General – Waste Management* (O. Reg. 347) and with reference to *Ontario Provincial Standard Specification 180 - General Specification for the Management of Excess Materials* (OPSS 180).

Waste materials that would typically be generated during construction are described in Tables 2-2 to 2-4. These would be temporarily stored on-site and would require reuse, recycling, and/or disposal at an appropriate MOE-approved off-site facility. Improper disposal of waste material generated during construction may result in contamination to soil, groundwater, and/or surface water resources on and off the Project sites. Litter generated during construction may also become a nuisance to nearby residences if allowed to blow off the construction-site due to improper containment.

Hazardous materials are limited to fuels and lubricants that would be on-site for use in equipment. These materials would be stored in appropriate storage containers during the construction phase by the Construction Contractor. Designated storage areas and the type of storage areas would be confirmed by the Construction Contractor prior to construction.

Demolition wastes from removal of the house and associated farm buildings at the substation property could contain hazardous or designated substances, which require appropriate management for safe removal and disposal. The appropriate permits would be sought from the County of Huron to decommission the existing septic system and water well associated with the house and farm buildings, if it is determined that they cannot be used for the planned operations facility.

Waste generated at the construction site would be managed to minimize environmental impacts by:

- Using materials effectively;
- Using, where practical, the principle of reduce, reuse and recycle;
- Informing workers of the risks associated with mismanagement of waste; and
- Selecting appropriate disposal methods where reuse and recycling is not possible.

Soils from excavations would be retained for use on-site as possible. Excess materials generated during the course of construction excavations of soil would be handled in accordance with the MOE's *Protocol for the Management of Excess Materials in Road Construction and Maintenance*. Excess excavated soils may be reused elsewhere on the property with landowner permission.

Solid waste, garbage, trash and debris would only be deposited in the bins designated for pick up. The location of the bins would be selected based on the work in progress. No hazardous waste would be placed into the bins for solid waste, garbage, trash and debris. All hazardous waste would be placed in a secure area to prevent spills. All waste would be removed by a waste contractor that is licensed to accept the wastes. The following waste management activities would be observed:

- Recyclable materials would be stored separately for recycling;
- There would be no burning of waste generated at the site;
- There would be no on-site disposal of wastes at site;
- Domestic waste from site offices including food waste would, as appropriate, be stored in closed steel containers for removal and disposal;
- Non-recyclable non-hazardous construction waste would be removed from site on an as required basis for disposal at an approved waste disposal site;
- Hazardous wastes will be stored in a secure area in labelled containers;
- Liquid wastes such as oils and lubricants would be stored in a labelled tank or drum for disposal or recycle; and
- All wastes will be removed by hauler appropriately licensed to manage the wastes.

2.6.2 Spill Containment and Response

The potential exists for spills during any construction activity. The most probable type of spill would be from refuelling of major construction equipment that cannot readily leave the site, such as cranes or earth movers. This refuelling would be completed from service vehicles. The potential effects of a spill could be the contamination of soils, groundwater or surface water.

By implementing proper handling of fuels and lubricants during construction, the likelihood of accidental events that result in adverse effects to the environment would be prevented or greatly reduced. The following procedures would be implemented to prevent and manage spills:

a) Trucks or other road vehicles would be refuelled and maintained off site, where practicable;
b) Refuelling and lubrication of other construction equipment would not be allowed within 30 m of a waterway, wetland, or drainage systems;
c) Regular inspections of hydraulic and fuel systems on machinery, and leaks would be repaired immediately upon detection or the equipment removed from site;
d) Spill kits containing absorbent materials would be kept on hand; and
e) Implement best management practices and develop an emergency spill response plan.

In terms of accidental spills or releases to the environment, standard containment facilities and emergency response materials would be maintained on-site as required. Refuelling, equipment maintenance, and other potentially contaminating activities would occur in designated areas, and as appropriate spills would be reported immediately to the MOE Spills Action Centre.

As the work would not involve the storage or use of bulk hazardous chemicals or fuels, a potential spill is expected to be of small volume and the effects localized. With implementation of the above mitigation measures the probability of a spill occurring would be low.

2.6.3 Sewage

Sanitary waste generated by the construction crews would be collected via portable toilets and wash stations supplied by a contracted third party. Disposal of these wastes would be the responsibility of the contracted party and would be done in accordance with regulatory requirements.

2.6.4 Water-taking Activities

A *Hydrogeological Assessment in Support of Renewable Energy Approval Application for Short-Term, Non-Recurring Water Taking* was undertaken for the Project to evaluate whether the construction of the wind turbines and their associated infrastructure could encounter shallow groundwater conditions and to determine if groundwater dewatering may be required as part of these construction activities. The *Hydrogeological Assessment in Support of Renewable Energy Approval Application for Short-Term, Non-Recurring Water Taking* is provided in Appendix B.

Preliminary designs for the proposed Siemens SWT-2.3 wind-powered turbines indicate that the footing foundations for the turbines will be constructed to depths up to 3 m with the accompanying building structure foundations (e.g., buildings associated with the Transformer

Station and Substation and Operation and Maintenance building), transformer pads, underground collector lines, data cabling and transmission lines remaining above this specified depth. Previous work completed by Naylor Engineering Associates Ltd. (2007) and WHI (2004) indicate that the highest groundwater level observed throughout the Project Location was in the range of 1.2 m below ground surface (BGS) and, subsequently, any potential dewatering activity is likely to be limited to those excavations where meteorological tower or wind turbine footing foundations will be constructed. Given the above information, dewatering activity is not likely to be required during the installation of the collector lines, data cabling and transmission lines.

Overall, dewatering of the foundation excavations may be required to manage the following events:

- Groundwater seepage into the excavation;
- Precipitation within construction area; and
- Accumulated groundwater within the excavation following a prolonged construction delay.

The type and extent of dewatering system to be used at the construction sites will be the responsibility of the Construction Contractor and may include the use of a vacuum well point system, sump/trash pumps located within the excavation, or a similar type system. Dewatering may occur at any time during construction activities, which are tentatively scheduled to occur from mid-2013 to the winter of 2014.

Dewatering activities are expected to be completed on an as-required basis, with the rate of this dewatering being dictated by the amount of construction activity that is occurring across the Project Location at a given time, the type of overburden material and groundwater elevations encountered at the construction sites, and the elevation at which the groundwater table has to be lowered to construct the foundations of the wind turbines and their associated infrastructure. For further information regarding potential effects and mitigation measures, refer to Section 4.3.1.

3.0 LOCATION AND TIMING OF CONSTRUCTION ACTIVITIES

3.1 Location of Construction

The proposed locations of the construction activities are shown on Figure 1, Appendix A for the turbines, transformer station and substation. The construction activities for the entire Project would be managed from temporary facilities at the substation property (refer to Section 2.4). This would be graded and integrated into the site development plan upon completion of the construction.

3.2 Duration of Construction

The proposed schedule is to commence construction in mid-2013 with completion by the winter of 2014 (see Table 3-1). The construction of turbines would be sequenced with multiple sites in different phases of development at any time so that the various construction trades can progressively move to the next site as their work is completed. Two or more construction crews would be used for the turbine sites to ensure the schedule is maintained.

The substation and transformer station construction would occur over approximately 12 months. A separate construction crew would be used for this work. Once the substation and transformer station became operational, the completed turbines could be commissioned and would be able to provide power to the grid.

Table 3-1: Proposed Construction Schedule

Activity	Schedule	Approximate Duration (Weeks)
Turbine and Met Tower Sites		
Delineation of temporary work areas, installation of mitigation measures, and installation temporary facilities	Q3 2013 – Q1 2014	24
Completion of necessary site grading	Q3 2013 – Q3 2014	24
Construction of temporary access roads and construction pads	Q3 2013 – Q3 2014	24
Installation of tower foundations	Q4 2013 – Q3 2014	24
Tower/turbine erection	Q2 2014 – Q4 2014	15
Site completion and restoration	Q4 2014	6
Collector Lines		
Installation of electrical collector system on participating lands and supporting infrastructure	Q4 2013 – Q3 2014	28
Installation of electrical collector system and supporting infrastructure within the road allowance	Q4 2013 – Q3 2014	28
Substation/Transformer Station		
Delineation of temporary work areas , installation of mitigation measures, and installation of temporary facilities	Q4 2013 – Q1 2014	2
Grading of the site and installation stormwater management	Q4 2013 – Q1 2014	2
Construction of concrete footings and pads	Q1 2014 – Q3-2014	4
Installation of transformers and ancillary facilities	Q1 2014 – Q3 2014	30

Activity	Schedule	Approximate Duration (Weeks)
Connection to Hydro One grid	Q3 2014	4
Removal of temporary facilities, site restoration and completion	Q4 2014	4

4.0 POTENTIAL NEGATIVE ENVIRONMENTAL EFFECTS AND MITIGATION

O. Reg. 359/09 requires that adverse environmental effects that may result from construction activities be described. Generally, an area at least 300 m around the Project Location has been considered in the assessment and is referred to as the study area. The term "environment" in O. Reg. 359/09 has the same meaning as in the *Environmental Protection Act*, and includes the natural, physical, cultural, and socio-economic environment.

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

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

Based upon a screening of the existing environment, experience gained during Project planning, and the requirements of the REA process, the following environmental features have been assessed as part of the REA process, and are described in the following sections:

- Archaeological and Cultural Heritage Resources;
- Natural Heritage Resources;
- Water Bodies and Aquatic Resources;
- Air Quality;
- Environmental Noise;
- Land Use and Socio-Economic Resources;
- Existing Local Infrastructure;
- Public Health and Safety; and
- Contaminated Lands.

For some natural environment and socio-economic features, avoidance during Project siting and planning is anticipated to eliminate all effects. The application of these principles has greatly reduced the potential for adverse environmental effects from the Project as demonstrated in the following subsections.

The key performance objective for each of the features discussed below is avoiding and/or minimizing potential effects (through the use of appropriate mitigation measures) to the features throughout the construction phase of the Project. The proposed mitigation measures would assist in achieving this performance objective. A summary of potential effects and mitigation strategies is provided in Appendix D, with corresponding performance objectives, monitoring plans and contingency measures.

4.1 Cultural Heritage and Archaeological Resources

4.1.1 Protected Properties and Cultural Heritage Resources

A *Built Heritage and Cultural Heritage Landscape Assessment* was undertaken for the Project, to meet the O. Reg. 359/09 requirements for a Cultural Heritage Assessment and a Protected Properties Assessment. The *Built Heritage and Cultural Heritage Landscape Assessment* was completed and submitted to the Ministry of Tourism, Culture and Sport (MTCS), who provided written comments. A subsequent addendum to the report was prepared to address changes to the Project layout and was submitted to the MTCS, who indicated the layout changes did not affect the comments the MTCS had previously provided. The following provides a summary of the potential effects and the associated mitigation measures as described in the *Built Heritage and Cultural Heritage Landscape Assessment* and addendum. Cultural heritage resources are shown in Appendix A, Figure 2. The *Built Heritage and Cultural Landscape Assessment Report* determined that:

- No protected properties as defined by O. Reg. 359/09 are located near the Project Location.
- Built heritage resources are located in the vicinity of the Project Location, and include 3 barns, 1 commercial building, 4 churches, 7 schools, and 43 dwellings.
- 15 cultural heritage landscapes were identified in the vicinity of the Project Location, including 10 cemeteries.

Potential Effects

The *Built Heritage and Cultural Heritage Landscape Assessment* identifies one site with cultural heritage value or interest, Landscape L09, the former site of the Port Albert Air Navigation School. At the time the report was written (February 2012) T224 and T229, and the associated access road and collector lines were in the vicinity of L09. With changes to the proposed Project infrastructure in this area, there is no longer proposed Project infrastructure at this location. The addendum to the *Built Heritage and Cultural Heritage Landscape Assessment* (June 2012) notes the lack of impact on any heritage resources.

Mitigation Measures

Mapping and surface survey of these lands was recommended as part of the Stage 2 Archaeological Assessment. This activity was expected to mitigate impacts to the cultural landscape as artefacts and cultural features may have been encountered during this assessment. The Stage 2 Archaeological surveys completed at the former Port Albert Air Navigation School did not uncover any artefacts at this site. See Section 4.1.2 for proposed mitigation if archaeological materials are uncovered during construction.

Net Effects

No adverse net effects on protected properties and heritage resources are anticipated during construction of the Project.

4.1.2 Archaeological Resources

In accordance with O. Reg. 359/09, a *Stage 1 Archaeological Assessment* and a *Stage 2 Archaeological Assessment* were completed for the Project. The reports were completed and submitted to the MTCS, who provided written comments. Subsequent addenda to the *Stage 2 Archaeological Assessment* were prepared to address changes to the Project layout and MTCS has provided written comments. The following provides a summary of the potential effects and the associated mitigation measures as described in those reports. The locations of archaeological sites are sensitive information, and therefore mapping of these locations has been omitted to ensure the safety of the sites.

The *Stage 2 Archaeological Assessments* and addenda indicate that the potential for the presence of archaeological sites within the proposed construction areas would be low. Where required, Stage 3 and 4 archaeological investigations will be conducted prior to construction of the Project.

Although the Project Location contains multiple hamlets and villages, which have altered the landscape, the majority of the lands are still under agricultural production.

Potential Effects

Although the previous studies indicated that the potential for the presence of archaeological sites within the areas of the proposed turbines and associated power lines would be low, there is potential to discover artefacts during the construction stage.

Mitigation Measures

General mitigation measures and best management practices will be implemented during construction. The buildable area would be well delineated with stakes and flagged so that no construction occurs outside of the assessed area.

The following steps would be taken by the Construction Contractor should archaeological materials be encountered during excavation and construction activities:

a) Construction/excavation activities in the vicinity of the find would be stopped immediately;
b) The Site Engineer and Construction Manager would be advised by the Construction Contractor;
c) A licensed archaeologist would be called in to investigate the find;
d) If the find is significant and warrants further investigation, the MTCS must be notified and activities in that area cannot resume until the site is cleared by the MTCS;
e) If the find is significant, appropriate local Aboriginal communities would be contacted; and
f) If human remains are identified the MTCS and Cemeteries Branch of the Ministry of Small Business and Consumer Services must be notified immediately and all work must stop until the area is cleared by the Cemeteries Registrar.

In the event that human remains are encountered or suspected of being encountered before or during construction, all work in the vicinity of the find would stop immediately. Notification would then be made to the Ontario Provincial Police or local police who would conduct a site investigation and contact the district coroner. The MTCS, local Aboriginal communities, and the Registrar of Cemeteries, Cemeteries Regulation Unit, Ministry of Small Business and Consumer Services would also be notified.

Net Effects

By following the procedures recommended above no adverse residual effects on archaeological resources are anticipated during construction of the Project.

4.2 Natural Heritage Resources

In accordance with O. Reg. 359/09, a *Natural Heritage Assessment and Environmental Impact Study* (*NHA/EIS*) was undertaken for the Project. The report was completed and submitted to the Ministry of Natural Resources (MNR), who confirmed that the methodology, recommendations, and conclusions were to their standards. Four addenda were prepared to address changes to the Project layout and were submitted to the MNR for confirmation. The following provides a summary of the potential effects and the associated mitigation measures as described in those reports. Potential effects and mitigation measures are identified for significant natural features, and other natural features, which are not considered in the *NHA/EIS*. Significant natural heritage features are shown in Appendix A, Figures 3-A through to 3-P.

4.2.1 Significant Natural Heritage Features

The *NHA/EIS* and subsequent addenda identified the following types of significant or provincially significant natural heritage features in or within 120 m of the Project Location (referred to as the zone of investigation):

- Provincially significant wetlands (PSW);
- Areas of Natural and Scientific Interest (ANSI) – earth science;
- Significant woodlands;
- Significant valleylands; and
- Significant wildlife habitat (SWH) – seasonal concentration areas, specialized habitat for wildlife, habitat for species of conservation concern, and animal movement corridors.

Potential Effects

The *NHA/EIS* and subsequent addenda provide a detailed assessment of potential effects to each feature identified in the zone of investigation. A summary of potential effects from construction of the Project to each natural feature type is provided in Table 4-1 below. Direct effects were primarily avoided through siting Project infrastructure outside of significant features.

Mitigation Measures

General mitigation measures and best management practices will be implemented during construction to minimize dust generation, soil erosion and sedimentation, and possible spills (see *NHA/EIS*, Section 5.3). Construction areas would be well delineated with stakes and flagged so that construction does not encroach upon natural features. The boundaries of all significant wetlands, woodlands and valleylands within 30 m of the proposed construction area will be staked and flagged in consultation with a qualified ecologist prior to construction to assist with the demarcation of the construction area, to ensure construction activities avoid significant wetlands, woodlands, valleylands and wildlife habitats and to assist with the proper field installation of erosion and sediment controls measures. Proper storage of fuel and hazardous chemicals will minimize the risk of spills and contamination of the surrounding environment. Although the risk of a hazardous chemical or fuel spill are low, emergency spill plans will be established and implemented immediately if an accidental spill occurs. The MOE will be contacted, as appropriate, in the event a spill occurs. A summary of mitigation measures for each natural feature type during construction is provided in Table 4-1 below. The *NHA/EIS* and subsequent addendum provides a detailed assessment of recommended mitigation measures for each individual significant feature identified in the zone of investigation.

Net Effects

A combination of feature avoidance and implementation of the mitigation measures described above ensure anticipated adverse effects to natural features are minimized or avoided during construction of the Project.

Table 4-1: Summary of Potential Effects and Recommended Mitigation Measures for Significant Natural Heritage Features during Construction of the K2 Wind Power Project

Significant Natural Feature Type	Potential Effects of Construction of the Project	Mitigation Measures
Provincial Parks and Conservation Reserves	• None identified within 120 m of the Project Location.	• Not applicable.
Wetlands	• No direct loss of wetland habitat or function. • Localized dust generation, soil erosion and sedimentation, root zone damage to edge trees (soil compaction), changes to wetland hydrology either by increasing or decreasing surficial runoff and disturbance to wetland wildlife. • During construction, there will be increased traffic and the potential for accidental spills.	• Mitigation measures for spills as detailed in Section 2.6.2 • Mitigation measures for waste as detailed in Section 2.6.1 • Mitigation measures for sediment and erosion control as detailed in Section 4.3.2. • Proposed mitigation for each wetland feature can be found in the *NHA/EIS*, Section 5.4. • Excavation of soils for the purpose of underground collector system installation will occur at the minimum distance of 5 m from a significant wetland boundary, as appropriate. • For construction on private lands, no construction is proposed within 5 m of any significant wetland feature. Should any disturbance occur to vegetation within 5 m of a wetland due to construction, the disturbed area will be seeded with species native to the ecoregion to

Significant Natural Feature Type	Potential Effects of Construction of the Project	Mitigation Measures
		establish the 5 m buffer. • Where possible, and as appropriate, access roads will be constructed at or near existing grade to maintain surface flow contributions.
ANSI – earth science	• Degradation and erosion of soils, loss of landscape form and potential changes to hydrological drainage patterns.	• The limit of the 'buildable areas' for Turbines 335, 339, 340 and 341 and their associated infrastructure (roads, collector lines/data cables, and temporary crane paths and construction pads) will be staked and flagged prior to construction. • Access roads will be constructed at grade for Turbines 340 and 341 and within the offshore sand bar areas. • Excavation of soils for the purpose of turbine and underground collector system installation will be filled as quickly as practicable to grade. Excess soil will be re-used on site as feasible and applicable. Where there is a risk of soil migration into a nearby watercourse, excavated soils will be stockpiled, stabilized and silt-fencing will be installed as appropriate. • Power and data cable trenches within the offshore sand bar trenches will be bedded with sand or similar and backfilled with native soils or appropriate fill material, and if appropriate, clay plugs will be installed every 30 m. • Photographs will be taken prior to construction activities to document the shape of the sand bar areas. Upon competition of construction, the photographs will be used as a guide to assist in re-shaping the areas disturbed by temporary construction. • After turbines have been assembled, the temporary turbine construction area will be restored to pre-existing conditions and the offshore sand bars will be re-shaped to resemble the pre-construction form and function as soon as practical. The pre-existing conditions at each turbine site are agricultural and thus, will be converted back into agricultural production.
Woodlands	• Short-term, localized dust generation, soil erosion and sedimentation, root zone damage to edge trees and disturbance to wildlife. • Soil migration associated with excavation, soil compaction from heavy equipment, potential changes in hydrological low/drainage. • Trenching, which is required to install the underground collector system, has the potential to injure roots that might extend from trees located along the edge of the woodland boundary.	• Mitigation measures for spills as detailed in Section 2.6.2. • Mitigation measures for waste as detailed in Section 2.6.1. • Mitigation measures for sediment and erosion control as detailed in Section 4.3.2. • Mitigation measures for vegetation removal as outlined in Section 5.3.3 in the *NHA/EIS*. • Excavation of soils for the purpose of underground collector system installation will occur at the minimum distance of 5 m from the woodland boundary (drip line).

Significant Natural Feature Type	Potential Effects of Construction of the Project	Mitigation Measures
Valleylands	• Short-term, localized dust generation, soil erosion and sedimentation. • The use of construction equipment creates the potential for negative effects related to chemical and/or fuel spills.	• Mitigation measures for spills as detailed in Section 2.6.2. • Mitigation measures for waste as detailed in Section 2.6.1. • Mitigation measures for sediment and erosion control as detailed in Section 4.3.2.
SWH – seasonal concentration areas	• Short-term disturbance from construction activity, such as increased traffic, noise, or dust. • Potential short term changes to surface water hydrology and drainage to/from the natural feature is a potential risk from construction activities.	• Where the separation distance between significant wildlife areas and the Project site perimeter is 30 m or less, the significant wildlife areas will be well demarcated with fencing such that all construction activities and personnel are excluded from these areas. • To the extent practical, vegetation clearing will be completed prior to or after the breeding season for migratory birds (May 1st to July 31st). Should vegetation clearing be required during the breeding bird season, prior to construction, surveys will be undertaken to identify the presence/absence of nesting birds. If a nest is located, a designated buffer will be marked off to ensure no construction activity will be allowed while the nest is active. The radius of the buffer widths vary and will be determined in consultation with the MNR. • Should construction activities occur within 30 m of the woodland or wetland edge during breeding bird season (May 1st to July 31st), surveys will be undertaken prior to construction to identify the presence/absence of nesting birds up to 50 m within the woodland or wetland. If a nest is located, a designated buffer will be marked off within which no construction activity will be allowed while the nest is active. The radii of the buffer widths vary and will be determined in consultation with the MNR. • After turbines have been assembled, the temporary turbine construction area will be restored to pre-existing conditions as soon as practical. The pre-existing conditions at each turbine site are primarily agricultural and thus will be converted back into agricultural production. • Additional mitigation for colonial nesting sites includes implementing a 1,000 m buffer around the colony during all construction activities conducted during the breeding season. No construction shall be permitted within the buffer for the duration of the heron breeding season (early May to early August). (This mitigation measure is dependent on the outcome of pre-construction confirmation surveys as committed to the *NHA/EIS*. • To avoid impacts to wetland hydrology and maintain existing overland flows and continuous surface water conveyance to wetlands, crossings of water bodies and grassed waterways (drainage swales) will entail the installation of permanent and temporary culverts as to provide continued conveyance function. The culverts
SWH – rare vegetation communities and specialized habitat for wildlife	• Short-term, localized dust generation, soil erosion and sedimentation. • Short-term sensory disturbance to species using these areas, localized dust generation, soil erosion. • Short-term disturbance from construction activity, such as increased traffic and noise may also result in avoidance of habitats. • Sedimentation and chemical or fuel spills. • Amphibians are at an increased risk from vehicle collisions in spring.	
SWH – habitat for species of conservation concern	• Short-term disturbance from construction activity, such as increased traffic, noise, or dust, may result in avoidance of habitats. • Snapping turtles are at an increased risk from vehicle collisions.	
SWH – animal movement corridors	• Short-term disturbance from construction activity, such as increased traffic, noise, or dust, may result in avoidance of habitat. • Amphibians are at an increased risk from vehicle collisions.	

Significant Natural Feature Type	Potential Effects of Construction of the Project	Mitigation Measures
		will be appropriately sized in consultation with the MVCA and/or DFO. All installation activities would conform to Ontario Provincial Standard Specification (OPSS) 421 – Construction Specification for Pipe Culvert Installation in Open Cut. Site specific refinement to the location of individual culverts may occur during detailed design to ensure proper placement and maintain conveyance flows, prevent pooling and maintain hydrology. • To prevent turtles from entering turbine excavation areas during construction and decommissioning activities, the edge of excavation areas will be fenced off where excavations are left overnight. Fencing of excavation sites will occur where turbines are located with 120 m of significant turtle nesting habitat (see Section 5.4 of the *NHA/EIS* for feature-specific mitigation measures). • Any turtles found within the ‘buildable areas’ during construction activities will be safely relocated, as appropriate, in consultation with a qualified biologist to the nearest appropriate habitat. Construction in the specific area will not continue until the species has been relocated or the species has left the area on its own accord. • Turtle nests should not be touched as it can damage eggs; MNR will be contacted if turtle nests are identified in the construction area. Turtles should not be picked up by their tail, as it can fracture their spine. • During construction vehicle traffic shall primarily be restricted to daytime hours. Speed limit signage will be erected and shall be restricted to 30 km/h or less, where appropriate. • Best management practices such as silt fencing, will be employed to minimize negative impacts on wildlife habitats and species that use them. Silt fencing will occur where buildable areas are located within 30 m of significant wildlife habitat (see Section 5.4 of the *NHA/EIS* for feature-specific mitigation measure). • When appropriate, contractors will be required to provide properly working machinery and equipment with adequate noise suppression devices that meet current government requirements.

4.2.2 Other Natural Heritage Features

In addition to natural features identified as significant during the Evaluation of Significance, additional natural features not identified as significant (including woodlands and wildlife habitat) occurred within 120 m of the Project Location. All natural features occurring within 120 m of the Project Location are detailed in the *NHA/EIS*.

Potential Effects

While limited for this Project, clearing activities during construction would result in the removal of vascular plants and portions of plant communities in hedgerows and the municipal road allowance. Alteration or removal of vegetation could have the potential to affect both flora and fauna through loss of species diversity, by reducing or fragmenting available habitat (especially for species with low mobility), from the introduction or spread of invasive species, and from the temporary disruption to movement of wildlife. Due to the currently fragmented nature of the Project Location and the amount of habitat that would remain in the regional landscape, no loss of species diversity is anticipated from the construction of the Project.

If not managed appropriately, impacts on wetland habitat could occur if there are alterations to surface water availability or surface water flow due to construction activities.

Potential negative effects on wildlife and wildlife habitat due to Project construction may occur indirectly from disturbance (affect use of adjacent habitats). Short-term disturbance from construction activity, such as increased traffic, noise, or dust, may result in avoidance of habitats by wildlife if construction disrupts critical life-cycle activities such as mating or nesting (NWCC, 2002). However, a certain level of sensory disturbance to wildlife in the local area already exists from ongoing agricultural activities.

Indirect effects to natural communities from construction of the Project could also occur from accidental spills and/or improper waste disposal.

Mitigation Measures

Indirect impacts resulting from construction activities, such as dust generation, sedimentation and erosion are expected to be short-term, temporary in duration, and mitigable through the use of standard site control measures.

Standard best management practices will be applied, as appropriate, to all construction activities, and are outlined in Section 4.2.1.

An outline of the management plans that will be developed for accidental spills and waste are provided in Sections 2.6.2 and 2.6.1, respectively.

Net Effects

Implementation of the mitigation measures described above ensure anticipated adverse effects to natural features are minimized or avoided during construction of the Project.

4.3 Water Bodies and Aquatic Resources

4.3.1 Groundwater

The Project Location is occupied by two physiographic regions, which Chapman and Putnam (1984) classifies as the Huron Slope and the Horseshoe Moraines. The Huron Slope consists of beveled clay till plain that extends from the shores of Lake Huron to western limits of the

Wyoming Moraine, with a section of this moraine being positioned within the eastern portions of the Project Location. The till plain is occupied by a narrow north-south trending surficial deposit of sand, as well as a ridge of sandy beach deposits that flank the western edge of the moraine, with these soils having been both laid down by the former glacial Lake Warren. The shallow sand deposits are generally characterized by perched groundwater conditions, with wetlands often being present in those sandy areas where topographic depressions exist.

The remainder of the Project Location lies within the Horseshoe Moraines. In general, the section of the Horseshoe Moraines covering the lands within and to the east of the Project Location is comprised of irregular stone knobs and ridges, old spillways with broad sand and gravel terraces, and valley floors containing wetlands. Clayey silt till and spillway deposits of sand and gravel associated with the Wyoming Moraine extend into the eastern portions of the Project Location, terminating at the former shoreline of glacial Lake Warren.

Based on available information, high groundwater levels appear to be to be concentrated along the western flank of the Wyoming Moraine, corresponding with the ridge of sandy beach deposits affiliated with the former glacial Lake Warren shoreline. Areas of high groundwater have been noted and are concentrated along Hawkins Road between Lanesville Line and Cransford Line (in vicinity of Turbine 219), around the intersection of Belgrave Road and Lanesville Line (in the vicinity of the Substation and Turbines 229, 233, 236, 237, 239, 256, 259, 262, 267, 269), and immediately to the north of the settlement of Lothian (in the vicinity of Turbines 344 to 347), with other smaller pockets being present in the vicinity of Turbines 300, 306, 307, 308, 311 and 317 (Figure 11). High groundwater conditions may also be encountered in in the vicinity of Turbines 208, 209, 213, 214, 218, 221, 223, 225, 227, 228, 231, 232, 235, 354 and 355, given that surficial deposits of sand and gravel are mapped as occurring in these areas.

Referring to regional vulnerability mapping presented in the *Maitland Valley Source Protection Area Assessment Report* (Ausable Bayfield Maitland Valley Source Protection Committee, 2011), Highly Vulnerable Aquifers (HVA) and Significant Groundwater Recharge Areas (SGRA) classified as having a low to moderate risk of being impacted by certain prescribed drinking water threats cover approximately 85 ha (0.4%) and 237 ha (1.1%) of the General Project Area (total area of 20,567 ha). An HVA is described as an aquifer where pollutants on the surface could readily enter the subsurface and potentially impact of the quality of the groundwater system, with the intrinsic susceptibility of the aquifer to contamination being largely dictated by the thickness and permeability of the overlying subsurface deposits. An SGRA is deemed to be an area that annually recharges water to the underlying aquifer at a rate that is greater than the average rate of recharge that occurs throughout the Maitland Valley Source Protection Area. Overall, the mapping suggests that the proposed Transformer Station, Substation Operation and Maintenance Building, and wind turbines will not be constructed on any of the HVA or SRGA located within the General Project Area.

Potential Effects

Dewatering

Dewatering activities may be required in proposed construction areas for turbine foundations, building foundations, transformer pads, underground collector lines, data cabling and transmission lines, where groundwater levels are anticipated to occur at depths above 3 m below ground surface. Based on a thorough review of regional surficial geology mapping (OGS, 2003), hydrogeological studies (WHI, 2004) and the completion of a representative geotechnical study (NEA, 2007), site soil conditions are interpreted to consist predominantly of low permeability glaciolacustrine deposits of silt and clay and the St. Joseph's Till (silt to silty clay till).

The maximum pumping rate required to complete dewatering activities across the Project Location (i.e., dewatering up to three excavations at one time) is predicted to range from as low as 13,170 L/day (9.1 L/min) to a conservative based estimate of 1,028,370 L/day (714 L/min), with these rates being highly dependent on the hydraulic conductivity of the deposit encountered at each construction site, the accompanying static groundwater elevation, and the desired elevation to which the groundwater table is to be lowered. Overall, in the event that dewatering is anticipated to exceed the maximum volume of 400,000 L in a given day as allowed under a Category 2 Water Taking, the Construction Contractor will be instructed to manage the dewatering activities in a way that ensures that total water taking across the Project Location will not exceed this daily permitted volume

The *Hydrogeological Assessment in Support of Renewable Energy Approval Application for Short-Term, Non-Recurring Water Taking* indicated potential effects from construction include groundwater interference to local private and/or municipal water well supplies (quantity and quality), function of identified groundwater discharge features (e.g., wetland, watercourses), and the rate, quality of, and location that pumped water is released back into the environment. Further detail is provided in the *Hydrogeological Assessment in Support of Renewable Energy Approval Application for Short-Term, Non-Recurring Water Taking* (see Appendix B).

In the event of an accidental spill, materials such as fuel, lubricating oils and other fluids associated with turbine construction have the potential for discharge to the environment.

As discussed in Section 2.2.1, there should be limited to no impact on groundwater flows from one side of the road to the other as a result of subsoil compaction during road construction.

Groundwater Recharge

The overall groundwater recharge function of the Project Location is not expected to be detrimentally impacted by the proposed construction of the Transformer Station, Substation Operation and Maintenance Building, and wind turbines, given that the impervious surfaces associated with these structures will only represent a very small proportion of the total regional recharge area that provides water to the underlying aquifer systems. In addition, any water captured by the impervious surfaces will be discharged directly back onto the lands where these structures are constructed and, subsequently, this water will continue to have the opportunity to infiltrate to the subsurface.

Mitigation Measures

Dewatering

The key points of concern with the performing of groundwater dewatering activities for the purposes of construction are as follows:

- <u>Groundwater Interference</u>: The potential impact that pumping water from the groundwater system could have on local private and/or municipal water well supplies (quantity and quality) and/or the function of identified groundwater discharge features (e.g., wetlands, watercourses); and
- <u>Management of Pump Water Discharge:</u> The rate, quality of, and location that pumped water is released back into the environment and the impact that this release may have on receiving environmental features (i.e., typically surface water features such as a wetland or watercourse).

Where appropriate, measures that can be employed at the Project Location to mitigate potential impacts arising from groundwater dewatering activities are discussed in the sections below.

<u>Private Well Interference</u>

- Establishment of a private water well monitoring program that will include, as appropriate:
    - Completion of a door-to-door survey of residences located up to 500 m of the point of dewatering to confirm the location, construction details, integrity, and performance (i.e., quantity and quality) of local private water wells; and
    - Selection of suitable wells for the monitoring of water levels and quality prior to and during the scheduled dewatering period, with these data being used to evaluate whether any changes, if reported, in the quantity and/or quality of well water is attributed to groundwater dewatering activities.
- If it is determined that any changes in local well water quantities and/or quality is attributed to dewatering activities, actions will be taken to make available to those affected: (i) a supply of water equivalent in quantity and quality to their normal takings, or (ii) shall reduce the rate and amount of takings to prevent or alleviate the observed negative impact. In the event that dewatering has permanently impacted a given well water supply, actions will be taken to restore that water supply to those who have been permanently affected.

<u>Surface Water Interference</u>

- Through the completion of a desktop-level analysis, evaluate the potential for proposed dewatering activities to detrimentally impact the hydrogeological form and/or function of nearby groundwater sensitive surface water features (e.g., wetlands and/or watercourses);

- In the event that interference is anticipated, a field program will be designed and implemented to monitor groundwater-surface water interactions of the identified surface water feature prior to, during and following the construction dewatering activity; and

- If monitoring results indicate that dewatering activities are causing potentially detrimental impact to the hydrogeological form and/or function of the surface water feature, actions must be taken to improve the situation with the options of reducing the rate of, or shutting down, the dewatering activity as deemed necessary.

Management of Discharge

- During construction dewatering, the main water quality concern is the potential discharging of sediment laden water to surface water receptors. To minimize sediment transport, the following mitigation measures are to be employed as required:

  - If using sump/trash pumps, the inlet pump head for the dewatering system will be wrapped in filter fabric and surrounded with clear stone, or equivalent;

  - Discharged water will be directed through a filter bag or straw bale/filter fabric device or equivalent to reduce suspended solids. The number and size of the sediment control bags or equivalent filter will be dependent on the extent and location of the required dewatering; and

  - An initial settling tank may be used to reduce the suspended solids in the discharge water prior to being released to the surface water receptor, if required.

Spill Response

Mitigation measures may include:

With regard to accidental spills or releases to the environment undesirable materials on-site are limited to fuel, lubricating oils, and other fluids associated with turbine construction. Large quantities of these materials would not be stored at the turbine sites and do not represent a significant potential adverse effect on the groundwater in the event of accidental spills. As per s.13 of the *Environmental Protection Act*, all spills that could potentially have an adverse environmental effect, are outside the normal course of events, or are in excess of the prescribed regulatory levels would be reported to the MOE‘s Spills Action Centre.

A Construction Emergency Response and Communications Plan would be developed by the Construction Contractor and/or the Proponent and would include protocols for the proper handling of material spills and associated procedures to be undertaken in the event of a spill. See Section 7.0 of the *Design and Operations Report* for more information on the Emergency Response and Communications Plan and Section 2.6.2 for information regarding spills response.

Net Effects

Overall, if the recommended mitigation measures are employed as described above, it is reasonable to conclude that no notable impacts will occur to local groundwater and surface water resources as a result of construction activities associated with the Project.

4.3.2 Surface Water Bodies, Fish and Fish Habitat

In accordance with O. Reg. 359/09, a *Water Assessment and Water Bodies Report* was prepared for the Project by AMEC. A subsequent addendum was prepared to address changes to the Project layout. The following provides a summary of the potential effects and the associated mitigation measures as described in those reports. Potential effects and mitigation measures are identified for water bodies (as defined by O.Reg. 359/09). Locations of Water Bodies are presented in the *Addendum to K2 Wind Power Project – Water Assessment Report*, Appendix A.

The Water Assessment Report, Water Bodies Report, and the subsequent addendum identified the following types of water features in or within 120 m of the Project Location (referred to as the zone of investigation):

- Water Bodies consisting of:
  - Permanent and intermittent municipal drains; and
  - Permanent and intermittent natural cold/cool/warmwater streams.
- Water Bodies:
  - Containing fish habitat (including gamefish or sportfish and their habitat); and
  - Contributing indirectly to fish habitat.

Potential Effects

The Project Location is crossed by numerous watercourses with flows from east to west and discharges into Lake Huron. A study of the watercourses and aquatic habitat was completed as part of the inventory of natural features and reported in the *Water Assessment Report*, the *Water Bodies Report* and the subsequent addendum.

Excavations, grading and other construction activity in the vicinity of watercourses could affect fish and fish habitat, including gamefish/sportfish and their habitat. Some access roads to the turbines would either follow beside or cross intermittent or permanent watercourses. Crossings would entail the installation of culverts, sized to meet flow conditions. Power cables and data cables would also be required to cross watercourses both at the turbine sites and along the municipal road allowances. The *Water Assessment Report*, the *Water Bodies Report* and the subsequent addendum provide details of the Project components which are within 120 m of a water body, their potential effects and mitigation measures to minimize effects.

Erosion and sediment concerns could arise both during the construction phase of the Project and following construction. Suitable mitigative measures would therefore be required for temporary site conditions during the construction phase, as well as for the permanent conditions following the completion of the facilities and cleanup of the work sites.

For the substation property and for the transformer station, a *SWM Plan* has been prepared in accordance with MOE guidelines for inclusion with the REA application (the *SWM Plan* is provided in Appendix C of the *Design and Operations Report*). For the substation property, the *SWM Plan* would provide a permanent retention pond for reducing peak runoff from that site and allow sedimentation prior to discharge. Although the pond would be required for management of runoff during operations, early installation pond would reduce effects of runoff from the sites during construction to acceptable levels.

Water bodies sited more than 120 m from the construction activities are not expected to be impacted by construction activities.

Mitigation Measures

The *Water Assessment Report*, the *Water Bodies Report* and the subsequent addendum provide details of the Project components within 120 m of a water body, and the mitigation methods to be used at each water crossing or encroachment during construction. Reference will be made to those documents and any requisite water crossing permits would be obtained prior to proceeding with construction work.

Besides the specific mitigation required at water crossings as noted above, the following general mitigation measures will be applied to the Project as a whole to minimize adverse environmental effects, including effects to gamefish/sportfish. The mitigation measures would be installed prior to commencement of any site clearing, grubbing, excavation, filling or grading works and maintained on a regular basis, prior to and after runoff events as appropriate. Any accumulated materials would be cleaned out during maintenance.

Erosion and sedimentation control measures would contain excavated soils on site and prevent construction related sediment from entering watercourses. Many watercourses exist in the Project Location, which provide or contribute to fish habitat. It would be important to prevent the increase of sediment loadings in the area watercourses.

Disturbed areas would be re-vegetated as soon as conditions allow to prevent erosion and to restore habitat functions. Land based mitigation measures would not be removed until vegetation has been re-established to a sufficient degree (or surface soils stabilized using other measures). This method would provide adequate erosion protection to disturbed work areas.

The grade or slope of the working areas that would be disturbed during the construction phase would determine the amount and complexity of the mitigative measures required to ensure adequate erosion and sediment control. Generally erosion and sediment control measures would include the application of structures such as:

- Runoff Controls – diversion berms, cross trenches, chutes, check dams, interceptor swales;
- Erosion Control – diversion ditch and dispersion aprons, gravel sheeting, mulch, erosion control blankets; and
- Sediment Control – sediment fence, straw bale barriers, filter berms, sediment traps, settling ponds.

The following points and definitions comprise the basic principles of erosion and sediment control. The Construction Contractor would implement these measures, as appropriate, where there is a risk of surficial erosion and loss of soil.

a) Areas where soil or subsoil has been exposed should be stabilized by:

   - Grading exposed areas to a slope which minimizes the potential for erosion;
   - Applying appropriate erosion and sediment control measures; and
   - Seeding, mulching or covering with erosion control matting where deemed appropriate by the Site Engineer.

b) Sediment and erosion control structures would be installed prior to site disturbance and meet the quality as outlined in the construction or manufacturers specifications. These measures should only be removed when the disturbed area is stabilized.
c) Sediment and erosion protection measures would be regularly inspected and also during or immediately following heavy rain events. Sediment fences and buffer ‘zones’ would be maintained in an effective working condition.
d) Discharges from the de-watering of existing groundwater from excavations should be directed to settling sumps, or overland to vegetated areas where appropriate, and should not be released directly into nearby watercourses, or in such a manner that may encourage erosion of surrounding soils.
e) Traffic during construction and follow-up activities would be limited to existing and designated roadways, and must not detour through fields or natural areas.
f) Where possible, the fields surrounding the construction areas would be re-vegetated following the completion of the construction activities.

Specific mitigation measures to be applied would be as follows:

a) Minimize disturbance of existing vegetation outside ditching and grassed slopes where re-grading is required.
b) Minimize time exposure of un-vegetated soils.
c) Steep slopes will be left undisturbed as much as possible.
d) Maximize length of overland flow through to points where stormwater leaves the site.
e) Complete an erosion assessment on all new and existing ditches to determine the need for additional erosion protection.
f) Top of bank barriers (e.g. silt fencing) would be put in place before any construction activity that is in proximity to watercourses. Silt fencing would be inspected regularly to ensure proper function, particularly during heavy rainfall events.

g) As appropriate, use in-line erosion control measures such as erosion blanket, rip rap, straw bale, rock flow checks and vegetated buffers, to mitigate high flow velocities and excessive erosion/sedimentation. Erosion control measures would be inspected regularly to ensure proper function, particularly during heavy rainfall events;
h) Stream banks would be stabilized and restored to their pre-construction condition as soon as possible after construction.
i) Any stockpiled materials would be stored and stabilized away from watercourses.
j) Sediment and erosion control measures would be left in place until all disturbed areas have been stabilized.
k) Work would be suspended if excessive flows of sediment discharges occur, and, any appropriate action will be immediately taken to reduce sediment loading.
l) Sediment laden water and runoff originating from construction areas will be treated using appropriate methods before it is permitted to enter any watercourse.
m) For foundation dewatering, if the amount of discharge exceeds 50,000 litres per day (in most instances, dewatering volumes would be expected to be less than 50,000 L per day):
    a. The inlet pump head shall be surrounded with clear stone and filter fabric;
    b. The discharge must be sampled each day that water is discharged and analyzed for total suspended solids (TSS). In the event that sampling results show that TSS in the discharge water exceeds 25 mg/L, the Proponent shall implement appropriate measures (settling tank or geosock or similar device) to mitigate these impacts; and
    c. The Proponent shall regulate the discharge at such a rate that there is no flooding in the receiving water body or dissipate the discharge so that no soil erosion is caused that impacts the receiving water body.
n) Installation of a second row of silt/sediment control fencing along the edge of the Project Location facing Kerry's Creek (potential salmonid spawning and/or rearing habitat within 120 m zone of investigation).

The sediment controls would be maintained and checked to confirm continued effectiveness. Specific maintenance measures to be applied would be as follows:

a) Barriers would be inspected after each rainfall and regularly during prolonged rainfall.
b) Silt fences installed near watercourses would to be inspected regularly (at least twice per week). Any deterioration or damage would be repaired immediately, or operations ceased until repairs were complete.
c) All barriers or parts of barriers that have been damaged would be repaired immediately.
d) If barriers were removed or opened to allow equipment to pass, the barrier would be replaced immediately.
e) If significant volumes of silt (one half the height of the barrier or a depth of 300 mm immediately upstream of the control device) accumulate against the barrier fence at any location, the silt would be removed from the barrier or a second line of barrier installed.
f) The barriers would be removed to the satisfaction of the Proponent when areas upstream of the measure would have been stabilized or, in the Proponent's opinion, they would no longer be required.

g) The area of the removed fence and any exposed sediment removed from the fence would be dressed, seeded and mulched.

Even with properly installed erosion and siltation control measures, extreme runoff events could result in collapse of silt fencing, slope or trench failures and other problems, which could lead to siltation of water bodies. If siltation to a watercourse occurs, activities will cease immediately until the situation is rectified. The Construction Emergency Response and Communications Plan will contain procedures for spill contingency and response plans, spill response training, notification procedures, and necessary cleanup materials and equipment. As per s.13 of the *Environmental Protection Act*, all spills that could potentially have an adverse environmental effect, are outside the normal course of events, or are in excess of prescribed regulatory levels will be reported to the MOE's Spills Action Centre.

Watercourse crossing requirements under the *Fisheries Act* and O.Reg. 164/06 will be addressed with the Maitland Valley Conservation Authority prior to construction. Any additional mitigation measures to minimize the effects would be in accordance with permit requirements. Where power lines or data cables are to be buried below the water course, these would be installed by means of directional drilling where possible in consultation with the Maitland Valley Conservation Authority. Directional drilling is considered by DFO to be a preferred method of line/cable installation due to the low probability of impacts associated with this method. Specific mitigation measures to prevent effects to fish and fish habitat, including working outside the spawning period of sensitive fish species, are discussed in detail in Section 5.0 of the *Water Bodies Report* and Section 6.0 of the subsequent addendum.

Where applicable, DFO Operational Statements would be followed to protect fish and fish habitat. There are DFO Operational Statements for the following:

- High-pressure directional drilling;
- Isolated or Dry Open-cut Stream Crossings (less than 5 m wide between high water marks);
- Punch and Bore Crossings;
- Overhead Line Construction; and
- Temporary Stream Crossings.

Timing windows for any in-water work would be determined through consultation with the MNR.

As appropriate, the Construction Contractor (or designate) will be on-site during installation of watercourse crossings to ensure compliance with specifications and site plans. In particular, the Construction Contractor will ensure that pre-construction preparation is completed prior to commencement of in-stream work and that bank, bed, and floodplains are restored to pre-existing conditions, as possible, following completion of the construction activities.

Net Effects

The above mitigation measures are in accordance with good construction practice. With implementation of those measures, effects on surface water quality would be minor and of short duration.

4.4 Air Quality and Environmental Noise

4.4.1 Air Emissions

Potential Effects

Construction activities rely on the use of a wide range of mobile equipment, such as bulldozers, dump trucks, and cranes. The engine exhaust from these vehicles, especially from those operating on diesel fuel, represent a source of particulate and other emissions (e.g. sulphur dioxide, nitrogen oxide, volatile organic compounds, polycyclic aromatic hydrocarbons, and carbon dioxide) from the construction site. Traffic delays also result in increased emissions from vehicles traveling slowly through construction zones. The delivery of materials such as concrete to construction-sites can also generate emissions, especially for sites that are relatively far from material manufacturers.

Mitigation Measures

To reduce emissions from equipment and vehicles, several mitigation measures would, as appropriate, be employed:

- Multi-passenger vehicles would be utilized to the extent practical;
- Company and maintenance personnel would avoid idling of vehicles when not necessary for operations activities;
- Equipment and vehicles would be maintained in good working order with functioning mufflers and emission control systems as available; and
- All operations equipment and vehicles would meet the emissions requirements of the MOE and/or Ministry of Transportation (MTO).

Net Effects

The application of the recommended mitigation measures during construction should limit air emissions to the work areas and limit the magnitude of combustion emissions. As a result, any adverse net effects to air quality from air emissions are anticipated to be short-term in duration and highly localized.

4.4.2 Dust and Odour Emissions

Potential Effects

Construction related traffic and activities (e.g. excavation, grading, soil stripping and exposed areas, and placement of gravel on access roads) have the potential to create nuisance dust effects in the immediate vicinity of the Project. High winds during dry weather may erode and disperse loose soil material away from the construction area, which may have a detrimental impact on the local environment, construction safety or integrity, and may be a nuisance to residential properties located in close proximity to the construction sites. Storage piles exposed to wind can also be a source of fugitive dust emissions, as can various road surfaces such as unpaved roads. No odour emissions are anticipated during construction of the Project.

Mitigation Measures

Best management practices which are common to the construction industry would be implemented to ensure the potential impacts from excessive dust are minimized, including:

a) Apply dust suppressants such as water, or calcium chloride dust suppressant on the work sites as required (calcium chloride should not be used on agricultural fields);
b) Maintain adequate control of dust at sites that are in close proximity to residences;
c) Enforce low speed limits for trucks on site as appropriate;
d) Re-vegetate exposed soils as soon as possible;
e) As appropriate, protect stockpiles of friable material with a barrier or windscreen and in the event of dry conditions and excessive dust;
f) Consult with local road authorities prior to application of dust suppressants on public access roads; and
g) Ensure dust generation is monitored and controlled in areas of sensitive land use.

Net Effects

The above mitigation measures are consistent with good construction practice and should limit dust emissions to the work area. The potential for adverse effects would be short term and localized.

4.4.3 Noise

Potential Effects

During construction, excessive noise from construction equipment and trucks hauling materials to site could become a nuisance to nearby residents. The setbacks from the turbine sites to non-participating residences are in excess of 550 m and, hence, the effects of noise from construction equipment at those residences should be minimal.

Mitigation Measures

The following procedures would be implemented to ensure potential impacts from construction are minimized.

a) Equipment and vehicles would be maintained in good working condition to limit engine noise;
b) Company and construction personnel should avoid idling of vehicles when not necessary for construction activities;
c) The Construction Contractor would be required to use noise abatement equipment, in good working order, on all heavy machinery used on the Project; and

d) Construction will take place generally during regular construction hours with extended hours as necessary.

Net Effects

The above mitigation measures are consistent with good construction practice and should limit noise emissions to the vicinity of the work area. The potential for adverse effects would be short term and localized.

4.5 Land-use and Socio-Economic Resources

4.5.1 Existing Land Uses

Several communities are located throughout the Project Location. Current and historical settlement areas include Nile, Sheppardton, Cransford, Crewe, Kingsbridge, Mafeking, Zion, Kintail, Corrie’s Corners, Lothian, Lochalsh, and Amberley. Some industry (e.g., salvage yard, resource extraction, industrial agriculture operations) is within 300 m of the Project Location, and resort/residential areas (e.g. golf course, Point Farms Provincial Park, flea market, Lake Huron Resort) are concentrated along the Lake Huron shoreline, outside of the Project Location.

The general region is dominated by rural and agricultural land use. Within 300 m of the Project Location there are several land use designations, including Natural Environment, Agriculture, and Extractive, as identified in the Township of ACW’s *Official Plan* (October 2003).

All of the turbines locations as well as the associated buildable areas are proposed on lands designated as Agriculture in the Township of ACW’s *Official Plan* (October 2003), with the exception of the buildable areas for T252, T349 and T350 which slightly extend onto lands designated as Natural Environment.

Within 300 m of Project infrastructure, there are two cemeteries and one school.

The Project is not within the Oak Ridges Moraine, Niagara Escarpment, Protected Countryside of the Greenbelt, or the Lake Simcoe watershed.

Potential Effects

During construction there would be a temporary increase in noise and dust levels around the work and haul areas resulting in a potential effects to adjacent land uses.

Mitigation Measures

Landowners would be compensated by the Proponent for land that would be taken out of production during the lifespan of the Project. Mitigation measures have been identified for noise and dust in Sections 4.4.3 and 4.4.2, respectively.

Net Effects

Although some disturbance to adjacent land uses is unavoidable during construction, it is expected to be short-term in duration, temporary, and would be minimized through the implementation of good site practices, transportation planning, and communication with the community.

4.5.2 Recreation Areas and Cultural Features

There are no Provincial Parks within the 300 m study area. Point Farms Provincial Park is west of the Bluewater Highway between Gore Road and Golf Course Road, which is approximately 3 km outside of the Project Location. Within the Project Location, there are a number of festivals and other community events that are held throughout the year. In the winter, recreational opportunities exist in the form of snowmobiling, ice fishing and other winter sports as weather conditions permit. Cycling routes, museum attractions, golf courses, and bed and breakfasts are also located within the Project Location.

Potential Effects

Construction activities would be limited to private land and municipal road allowances and therefore are not expected to directly affect recreation areas. There is, however, the possibility that increased noise, dust and traffic volumes during the construction phase, related to construction vehicles or the operation of construction equipment, may interfere with nearby recreational uses. Refer to Section 4.5.5 for information regarding potential effects to hunting and fishing activities.

Mitigation Measures

Mitigation measures related to noise, dust, and traffic are identified in Sections 4.4.2, 4.4.3, and 4.5.6, respectively.

Net Effects

Noise, dust and traffic effects on the use of recreation areas are anticipated to be short term and intermittent.

4.5.3 Agricultural Lands and Operations

All participating properties for the Project are located on agricultural lands. The lands in the vicinity of the Project Location are dominated by prime agricultural land as defined by the Canada Land Inventory. Crops are currently dominated by corn, wheat and soy.

Potential Effects

There is the potential to affect agricultural lands and operations due to Project construction activities, which may create a temporary inconvenience to site-specific cropping patterns and livestock. The turbine towers, access roads, and ancillary facilities would displace areas of prime agricultural land for the duration of the Project.

During Project construction, additional land in excess of the final facility footprint would be temporarily required to accommodate the construction and assembly of the individual turbines and ancillary facilities. There would be no effects on prime agricultural lands, specialty crops or locally significant agricultural lands on the properties of non-participating landowners.

Soils

Agricultural soils would be disturbed as a result of construction. Activities during wet months or extended periods of heavy rainfall could have adverse impacts on agricultural lands. The movement of heavy machinery on wet soil may cause rutting, compaction, and mixing of topsoil and subsoil. These potential impacts may break down soil structure and affect soil fertility thereby reducing soil productivity. When exposed, soils are more prone to erosion. The degree of erosion is affected by the intensity and duration of rainfall and/or wind events, soil moisture, surface soil cover, slope, soil texture, structure, and organic matter content. Improperly salvaged topsoil can result in topsoil and subsoil mixing, compaction, rutting, and erosion. This can affect re-vegetation of the construction area and potentially decrease crop yields.

Artificial Drainage

Construction could result in adverse effects to artificial drainage, including tiles being crushed or cut by machinery. Temporary or permanent disruption to water flow could result in soil erosion or crop loss on adjacent lands due to flooding.

Livestock

Impacts to livestock during the construction phase of the Project are anticipated to be minimal and limited to noise and dust generated by construction activities. It is advised that the construction team and property/livestock owners maintain regular communication in order to ensure a minimum level of impact on livestock.

Mitigation Measures

To the greatest extent possible, efforts have been made to site the turbines, met towers, access roads, collector lines, and any other ancillary facilities to minimize disturbances to existing agricultural lands and operations. In particular, siting of turbines and access roads are completed in consultation with participating landowners. Construction activities would be restricted to the delineated construction areas.

Soils

Where agriculturally productive lands are impacted by heavy rainfall events and wet soil conditions, the Proponent would implement a wet soil shutdown practice; if conditions deteriorate to a situation where ruts under vehicles become deep enough to cause topsoil/subsoil mixing or create excessive compaction or make topsoil/subsoil separation too difficult, those activities would cease. Construction activities would continue when conditions improve and those soil qualities are protected.

In areas where activity on agricultural land would be for the duration of the construction only, the Construction Contractor would monitor topsoil stripping to ensure that the correct depth of topsoil is removed and stockpiled in a manner that avoids mixing with subsoil material.

Following the completion of construction, as appropriate, temporary workspaces would be graded and de-compacted (if required), the topsoil replaced, and the area left as close to pre-existing condition as possible. The option of de-compacting soil with an agricultural sub-soiler, followed by discing, chisel ploughing or cultivating, to smooth the surface, may be considered on a site-specific basis by an environmental advisor. Soil density and/or penetrometer measurements may be used as a means of assessing the relative degree of soil compaction and to determine if additional compaction relief is required.

Where there is potential for erosion or where erosion has already developed, silt fence and straw bales (or appropriate substitutes) would be installed to reduce soil transport. Silt fencing (or appropriate substitutes) would be inspected regularly to ensure proper function, particularly during heavy rainfall events. The location of such protection measures would be determined by the Construction Contractor. Topsoil salvage and/or replacement should be avoided during heavy precipitation or extremely windy conditions. Silt control fencing would be installed and maintained throughout construction and restoration until lands are stabilized.

Artificial Drainage

The location of artificial tile drainage and associated drains would be confirmed with each landowner on a site-specific basis prior to construction activities. Avoidance of all tile drains may not be possible. Some artificial tile drains may be severed or may require re-alignment due to the installation of the underground collector lines, underground met tower cabling, and/or wind turbine tower and met tower foundation excavations. Should tile drains be severed or crushed during construction activities, locations would be recorded and flagged. If a main drain, header tile, or large diameter tile is severed, a temporary repair should be made to maintain field drainage and prevent flooding of the work area and adjacent lands. Severed tile drains that are not immediately repaired would be capped to prevent the entry of soil, debris, or rodents. After the repair of severed tiles, and prior to backfilling, the landowner would be invited to inspect the repair. If flooding of adjacent agricultural land occurs as a result of a severed tile and subsequent soils are damaged or crops are lost, the impacted area would be rehabilitated as soon as possible.

Where there is potential for damage during construction, the operation of the drains would be monitored during the construction phase, immediately after final clean up, and after the spring thaw the following year.

Where necessary, a qualified drainage tile contractor would be retained to identify reasonable drainage solutions. Any agricultural tile drains damaged during construction, would be repaired by a drainage tile contractor. After repair, the landowner would be invited to inspect the repair. To ensure the success of measures recommended by the drainage tile contractor all persistent drainage problem sites would be monitored quarterly for a one year period after repair.

Disruption to drainage ditches, culverts, field entrances, and fences would be repaired appropriately.

Livestock

As mentioned above, it is advised that the construction team and property/livestock owners maintain regular communication in order to ensure a minimum level of impact on livestock during construction. In areas where agricultural land may be used by livestock, it may be necessary to erect temporary fencing around the workspaces, install gates to accommodate access through pasturelands, and/or move the livestock to different fields for short periods of time. This requirement would be determined in consultation with the landowner prior to the commencement of construction and the Proponent would bear the cost of any such requirements.

Net Effects

Disturbances to agricultural lands and operations are expected to be temporary and spatially limited. However, as appropriate, temporary construction areas would be rehabilitated following construction and restored to agricultural use.

4.5.4 Mineral, Aggregate, and Petroleum Resources

The Township of ACW identifies mineral aggregates as an important resource in its *Official Plan* (October 2003), as does the County of Huron in its *Summary of the Draft Aggregate Resource Strategy Report* (2005). The location of identified primary aggregate deposits was considered during the siting of Project infrastructure in response to consultation with the Township of ACW.

Potential Effects

While lands designated for resource extraction are present, construction of the Project is not anticipated to have any effects on mineral and aggregate resources as the lands required for the Project have been optioned for renewable energy development by the landowner.

Only one turbine, T231, is located within a Primary Aggregate Deposit as shown on Figure 2-J, Appendix A. However, a significant wetland is located in the vicinity of T231 (Figure 3-J, Appendix A) which, in accordance with the policies of the Township of ACW and County of Huron, would preclude this area for resource extraction.

There are oil and gas pipelines and petroleum wells within the Project Location. Petroleum resources have been identified in the Project Location from consultation activities with owners of petroleum infrastructure, information obtained from the Oil, Gas and Salt Resources (OGSR) library and the Township of ACW *Official Plan* mapping.

Mitigation Measures

Landowners would be compensated by the Proponent for land that would be taken out of production during the lifespan of the Project. Additional studies to verify the location of known petroleum resources in proximity to Project components will be undertaken as part of the MNR's

Approval, Permitting and Requirements Document (APRD) process. Companies operating oil and gas pipelines in the area, including Northern Cross and Union Gas, have been consulted regarding the Project regarding locations of infrastructure, and will continue to be consulted throughout the REA process and detailed design, as appropriate. Underground locates in the road allowance will be completed as needed prior to construction.

Net Effects

Primary and Secondary Aggregate Deposits would be removed from future use (until the Project is decommissioned) where Project infrastructure overlays these deposits; however wind turbines are not considered permanent structures on the landscape. No adverse net effects are anticipated to petroleum resources during construction of the Project with the application of the mitigation measures outlined above.

4.5.5 Game and Fishery Resources

Potential Effects

The area is largely cleared for agriculture and there are no game or fishery resources that could be deemed inaccessible, therefore there is no potential for creating access to previously inaccessible areas.

Sensory disturbance to game species may occur during the construction phase due to noise. A certain level of sensory disturbance to wildlife in the Project Location already exists from ongoing agricultural, rural, and domestic activities.

Potential effects to gamefish/sportfish and their habitat may occur during the construction phase including:

- Physical disturbance resulting from in-water works (e.g. culvert installation, collector line installation);
- Silt/sediment release resulting in sedimentation of spawning grounds; and
- Temporary changes in flow patterns/volumes due to in-water work.

Sections 4.2 and 4.2.1.1 of the AMEC Water Bodies Report and Sections 4.2.1 and 5.0 of the addendum present information on the 14 proposed crossings where sensitive coldwater or warmwater fish species are present, and detail the site-specific potential impacts to these features resulting from project activities. Sensitive gamefish species known to reside in Project Location watercourses include Smallmouth Bass, Rainbow Trout, and Coho Salmon as well as other centrarchids (bass and sunfish), and salmonids.

Mitigation Measures

Standard mitigation measures to prevent or reduce impacts to fish and fish habitat are presented in Section 5.0 of the AMEC Water Bodies Report, and in Section 6.0 of the addendum. Implementation of the mitigation measures, including restricting work to within the appropriate MNR timing window will reduce or eliminate the potential for impacts to occur to gamefish/sportfish and their habitat. Typically, MNR timing windows coincide with spawning periods of sensitive fish to preclude impacts to fish and their habitat during those times. Therefore, it is expected that there will be no impacts to gamefish/sportfish and their habitat.

It is anticipated that those who participate in hunting and fishing on Project lands would choose an alternate location for their activities during times when construction would take place. Mitigation measures related to noise are identified in Section 4.4.3.

Net Effects

Construction noise effects on game species are anticipated to be temporary and intermittent. No net effects are anticipated on fisheries resources.

4.5.6 Local Traffic

Potential Effects

There is potential for an increase in traffic during construction on roadways within the Project Location due to commuting workforce, the transport of Project components, construction machinery, equipment and supplies, and to remove excess materials and waste from the Project Location. Transport of Project equipment and supplies would also include carrying excess loads and large turbine components. Truck trips would be noticeably reduced after the access roads and foundations have been installed and the turbine components are on-site. The increase in traffic, including excess load traffic and over-sized loads, may result in short-term, localized disturbance to traffic patterns, increase in traffic volume, and create potential traffic safety hazards.

Mitigation Measures

The Construction Contractor would implement a Traffic Management Plan (see Section 2.5) to identify and deal with specific traffic planning issues including the management of traffic and the delivery of materials.

Net Effects

Truck traffic would increase on some roads during turbine and other component deliveries, but would be restricted to predetermined routes and times to the greatest extent possible. Road safety is not expected to be an issue during the construction phase; however, there is potential for accidents along the haul routes and on-site.

The effect of constructing the various Project components is anticipated to have a limited, short term effect on traffic during construction.

4.5.7 Local Economy

Potential Effects

Construction of the Project is expected to begin in late 2013 with a commercial operation date of 2014. During construction, the actual number employed and the make-up of those employed would vary over time as the Project goes through the various construction phases. On average, it is expected that up to 350 person years (one person year is equivalent to a full-time position for one year) of direct employment would be generated over the construction period.

The construction of the Project would also result in indirect and induced employment, the majority of which is anticipated to be filled by local businesses. Indirect employment is jobs and income in other businesses/industries in the community that supply inputs to the Project and Project employees. Induced employment includes jobs and income changes occurring in other businesses/industries in the community from spending activities of directly and indirectly employed individuals.

To the extent possible, local hiring would be utilised during the construction period providing work for existing qualified tradespersons and labourers. Trades that could be provided locally may include pipefitters, electricians, ironworkers, millwrights and carpenters.

Since it is likely that the labour force would be supplied through local and neighbouring communities no special housing, healthcare or food facilities would be required as part of the Project construction activities.

While the increased number of personnel present in the area during construction would increase the demand for some goods and services from the local area (e.g. lodging, food, and banking), the demand is expected to be nominal and short-term. This demand would also generate local benefits to business and services from Project spending.

Potential disruption to use and enjoyment of businesses may occur in the vicinity of the Project Location during construction. Disruptions in the vicinity of local businesses would be largely due to an increase in traffic, and would be short term and are not expected to affect use of these businesses. Potential disruptions could also be caused by physical effects from traffic noise (Section 4.4.3) and dust (Section 4.4.2).

Mitigation Measures

To the extent possible the Proponent and/or the Construction Contractor would source required goods and services from local qualified suppliers where these items are available in sufficient quantity and at competitive prices.

The Construction Contractor would implement a Traffic Management Plan, as described in Section 2.5, to identify and deal with specific traffic planning issues including the management of traffic and the delivery of materials. The program may include the use of signage, road closures, speed restrictions, truck lighting, load restrictions, and equipment inspections.

Mitigation measures related to noise and dust are identified in Sections 4.4.2 and 4.4.3, respectively.

Net Effects

A positive net effect is anticipated on the local economy during construction of the Project. The Project provides positive income, employment, and fiscal benefits to the local area, including the County of Huron, the Township of ACW and participating landowners. Local government would receive ongoing property tax income from the Project and participating landowners would receive payments through agreements with the Proponent. A nominal increase in municipal services is possible. Existing businesses within local communities could benefit from the demands of the Project workforce during construction.

4.6 Existing Infrastructure

4.6.1 Provincial, Municipal and Other Major Infrastructure

Provincial and other Local infrastructure near the Project Location includes:

- Township and County roads;
- The Bluewater Highway (Provincial Highway 21) runs north-south forming the western boundary of the Project Location;
- Municipal road allowances and municipal drains;
- Northern Cross Energy pipelines;
- Local utilities; and
- A 500 kV Hydro One hydro corridor traverses the Project Location transmitting electricity generated from Bruce Power’s Nuclear Plant.

Potential Effects

No potential effects are anticipated during construction of the Project on provincial, municipal or other major infrastructure other than to roadways. The increase in traffic and transport of excess loads (e.g. turbine and transformer components), as described in Section 4.5.6, may result in abnormal wear on the roads and/or requirements to upgrade some intersections. There may be instances where transport of excess loads would require special traffic planning.

Permits from the MTO may be required to facilitate the transportation of over-sized loads on provincial highways. The additional traffic on the provincial highways is not expected cause any significant traffic congestion.

Potential effects to traffic during the construction of the Project are discussed in Section 4.5.6.

During construction of the Project there is also potential to interfere with local utilities. K2 Wind has and would continue to undertake consultation with local utility providers, to ensure the location of all utilities are known and no potential effects would occur. Municipal road allowances would be used for the siting of the collector lines, junction/disconnecting switch boxes, buried splices, and data cables.

Mitigation Measures

K2 Wind would consult with the owners of any potentially impacted infrastructure. Detailed plans or agreements regarding maintenance, upgrades and/or repairs of the local roads damaged during construction would be developed with the Township and County. Pre and post construction road surveys would be conducted.

The Construction Contractor would implement a Traffic Management Plan as described in Section 2.5.

K2 Wind would undertake consultation with the MTO regarding any necessary agreements related to wear on roads from transportation of Project materials in addition to obtaining the required permits for use of provincial highways. The Proponent will consult with the Township/County regarding excess loads required during construction that have potential to damage roads.

Agreements would be developed with the Township and County for use of the road allowance for routing of the collector and transmission lines and placement of the junction/disconnecting switch boxes and buried splices. The Township and County have agreed to provide input with respect to placement of underground infrastructure. In instances where above ground lines are required, and where appropriate, shared use with existing distribution lines would be negotiated, such that there would not be collector lines on both sides of the road.

Net Effects

The effect of constructing the various Project components is anticipated to have a limited, short term effect on infrastructure.

4.6.2 Navigable Waters

Potential Effects

Project infrastructure and/or construction activities may require the crossing of navigable waters. Confirmation of the presence of these waters would be obtained from Transport Canada. If navigable waters are found and are required to be crossed a permit would be required.

Mitigation Measures

If the presence of navigable waters is determined by Transport Canada, appropriate mitigation measures would also be recommended by Transport Canada. Such measures may include:

- No person shall permit any tools, equipment, vehicles, temporary structures or parts used and maintained for the purpose of construction to remain in the water after completion of construction activities;
- Where work causes debris or other material to accumulate on the bed or on the surface of such water, it shall be removed to the satisfaction of the Minister; and
- All vessels shall be permitted safe passage through the construction-site and assisted as required.

Net Effects

Provided that all mitigation measures are implemented, adverse net effects to navigable waters during construction of the Project are anticipated to be temporary (during the construction phase only).

4.7 Contaminated Lands

Two closed landfills were identified from the Ministry of the Environment's Waste Disposal Site Inventory and are located in proximity to the collector line system (Figures 2-B and 2-L, Appendix A). A site visit was conducted to determine the current status of the closed landfills.

The closed landfill on Figure 2-B, Appendix A is within 120 m of the collector line system and approximately 300 m from T335, the nearest turbine. This closed landfill site was 2 ha in size and has not received non-hazardous waste since 1985. A monitoring program has been in place since 1991 and there have been no off-site migration of leachate and no impacts to ground or surface water have been identified.

The closed landfill illustrated on Figure 2-L is approximately 350 m from the collector line system and approximately 500 m from T218, the nearest turbine. During the site visit, no records could be found that identify this site as a former landfill. Current employees from the Township of ACW did not know that this site was identified as a closed landfill. A visual inspection of the top most north-east section of the site was undertaken, and there are no visual implications that this site was a landfill.

An operating landfill (Figure 2-L, Appendix A) is located approximately 1 km from the nearest turbine, T225. The landfill site is 36 ha with a fill area of 3.4 ha. It accepts both municipal and commercial solid, non-hazardous waste. Groundwater flow is identified as moving east to west, whereas overburden regional flow is west to southwest. There is no evidence of off-site impacts from the current landfill and no landfill gas has ever been detected beyond the fill area.

Potential Effects

The MOE's *Guideline D4: Land Use On or Near Landfills and Dumps* (1994) provides direction on the various factors that should be considered for land use in the vicinity of landfills. In *Guideline D4: Land Use on or Near Landfills and Dumps* (1994), the MOE identifies the most significant contaminant discharges and visual problems generally occur within 500 m of the perimeter of a fill area and uses this distance as a study area for land use proposals. Since the operating landfill falls outside of this 500 m study area, no potential effects are anticipated during the construction phase. The landfill site does not currently affect ground or surface waters, ground settlement, or the visual landscape. There is no identified off-site soil contamination, hazardous waste or landfill gas migration.

For the non-operating site, which are located within 500 m of Project infrastructure, *Guideline D4: Land Use On or Near Landfills and Dumps* (1994) identifies the following factors to be considered for adjacent land use: ground and surface water contamination by leachate, surface runoff, ground settlement, visual impact, soil contamination and hazardous waste and landfill generated gases. No potential effects are anticipated to the Project, or to the closed landfill from the Project, as the closed landfill does not currently affect ground or surface water, ground settlement, or the visual landscape. There is no identified off-site soil contamination, hazardous waste or landfill gas migration.

There is also potential for finding contaminated sites and improperly decommissioned oil and gas wells or pipelines during construction, therefore the possibility of encountering such lands and infrastructure cannot be completely ruled out.

An existing house and associated farm buildings will be demolished in order for the construction of the substation property to proceed. Potential effects are related to any hazardous materials that may be present on the site or within the buildings.

Mitigation Measures

At the substation property, the existing house and associated buildings would be demolished as part of the development. Prior to embarking on the demolition, the Proponent would have a designated substance survey completed to identify any potential hazardous materials and ensure that appropriate work practices are in place for removal and disposal. The Proponent would also have a waste audit of all materials to be handled from the demolition and prepare a waste reduction work plan in accordance with *A Guide to Waste Audits and Waste Reduction Work Plans for Construction & Demolition Projects*, as required under Ontario Regulation 102/94 (O. Reg. 102/94). Following demolition, the land would be restored by removal of footings followed by grading and adding gravel or topsoil as necessary. Demolition wastes would be managed in accordance with Section 2.6.1 of this report. The *Decommissioning Plan Report* provides additional details on mitigation methods to be used during demolition.

In the event that previously unknown contaminated soils, such as buried tanks, drums, oil residue or gaseous odour, are uncovered or suspected of being uncovered, construction would cease in that location until the source of the contamination is further investigated. In such an instance, the Proponent would retain expert advice on assessing and developing a soil sampling, handling and remediation plan. All contaminated material would be managed in accordance with the applicable sections of the *Environmental Protection Act* and Ontario Regulation 347.

The concrete provider would be responsible for ensuring that wash water from the cleaning of concrete truck drums is disposed of in a sewage works designed for that purpose and approved under Section 53.(1) of the *Ontario Water Resources Act*, or under Part 8 of the *Building Code Act.*

Net Effects

The above mitigation measures are in accordance with good construction practice. With implementation of those measures, no net effects are predicted related to contaminated lands.

4.8 Public Health and Safety

Potential Effects

Potential effects to public health and safety during construction are largely in the form of increased construction related traffic (Section 4.5.6), dust emissions (Section 4.4.2), construction noise (Section 4.4.3) and unauthorized access of the public to the work sites.

Mitigation Measures

Implementing transportation planning and safety measures during construction would minimize the potential for traffic related safety concerns. A detailed Traffic Management Plan and a detailed Health and Safety Plan would be prepared and implemented by the Construction Contractor.

An Emergency Response and Communications Plan would be developed in detail for the Project, including the construction phase, and is outlined in greater detail in the *Design and Operations Report*.

Mitigation measures for dust emissions and construction noise are provided in Sections 4.4.2 and 4.4.3, respectively.

Land access to the construction site would be controlled through signage and restricted to authorized personnel only. The Construction Contractor would also employ good site safety practices during the construction phase. The detailed Health and Safety Plan referenced above would consider both public and occupational health and safety issues. This may include protecting the public from equipment and construction areas by posting warning signs, use of personal protective equipment, accident reporting, equipment operation, and confined space entry. Discussions have been undertaken, and would continue, with local emergency services personnel. The Proponent would participate in a training session for these workers.

Net Effects

With proper protection and mitigation measures, and adherence to the Proponent's safety policies and procedures, there is minimal increased or new risk to public health and safety from construction of the Project.

5.0 ENVIRONMENTAL EFFECTS MONITORING PLAN

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

Appendix D summarizes construction-specific potential effects and mitigation measures, as outlined in Section 4.0, and provides the performance objectives, monitoring plans, and contingency measures associated with these mitigation measures.

6.0 CLOSURE

K2 Wind Ontario Limited Partnership, in association with Stantec Consulting Ltd., SENES Consultants Limited, and AMEC Environment and Infrastructure, has completed this report for the exclusive use of the Proponent for specific application to the Project. The work has been completed in accordance with Ontario Regulation 359/09, and in consideration of the guidance document *Technical Guide to Renewable Energy Approvals*.

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