K2 WIND POWER PROJECT
PROJECT DESCRIPTION REPORT

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November 2012

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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 a 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 Project History

Wind power development has been underway in the Township of ACW for approximately a decade. An affiliate of Capital Power Corporation currently operates the Kingsbridge 1 Wind Operation located within the Township of ACW and has worked in and with the local community for many years, helping to create a greater awareness of wind power generation within the province.

In 2011, K2 Wind Ontario Limited Partnership was established and proposed the development of the K2 Wind Power Project using Siemens wind turbine technology. Prior to the establishment of the K2 Wind Ontario Limited Partnership, Capital Power (Ontario) Limited Partnership (Capital Power) was developing the Kingsbridge II Wind Power Project in the Project Study Area. Upon the establishment of the K2 Wind Ontario Limited Partnership (K2 Wind or "the Partnership"), Capital Power transferred Project assets to K2 Wind, as well as all Project materials and previous communications, along with input received while Capital Power was developing the former Kingsbridge II Wind Power Project.

Many of the consultation components under the REA process have strict timelines and requirements. To ensure that this development proposal meets current provincial regulatory requirements regarding the development of wind projects, the Proponent restarted the REA consultation process, taking into consideration recent amendments to the REA Regulation. Recommencing the REA consultation process for the Project allowed the community a further opportunity to learn about and provide comments and feedback regarding the proposed Project.

1.3 Report Requirements

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

This *Project Description Report* has been prepared in accordance with Item 10, Table 1 of O. Reg. 359/09 and in consideration of the Ministry of the Environment's (MOE's) *Technical Guide to Renewable Energy Approvals*. The following table provides the requirements of the *Project Description Report* as prescribed in the Regulation and the relevant sections where it can be found within this document.

Table 1-1: Project Description 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.	Any energy sources to be used to generate electricity at the renewable energy generation facility.	2.5
2.	The facilities, equipment or technology that will be used to convert the renewable energy source or any other energy source to electricity.	3.2
3.	If applicable, the class of the renewable energy generation facility.	2.4
4.	The activities that will be engaged in as part of the renewable energy project.	2.0, 3.0 and 4.0
5.	The name plate capacity of the renewable energy generation facility.	2.3
6.	The ownership of the land on which the project location is to be situated	2.6
7.	If the person proposing to engage in the project does not own the land on which the project location is to be situated, a description of the permissions that are required to access the land and whether they have been obtained.	2.6
8.	Any negative environmental effects that may result from engaging in the Project.	5.0 and Appendix B
9.	If the project is in respect of a Class 2 wind facility and it is determined that the project location is not on a property described in Column 1 of the Table to section 19, a summary of the matters addressed in making the determination	Not applicable

ID	Requirements	Section Number
10.	If the project is in respect of a Class 2 wind facility in respect of which section 20 applies and it is determined that the project location does not meet one of the descriptions set out in subsection 20 (2) or that the project location is not in an area described in subsection 20 (3), a summary of the matters addressed in making the determination.	Not applicable
11.	An unbound, well-marked, legible and reproducible map that is an appropriate size to fit on a 215 mm by 280 mm page, showing the project location and the land within 300 m of the Project Location.	Appendix A

2.0 GENERAL INFORMATION

2.1 Project Proponent and Contact Information

The Proponent, K2 Wind Ontario Limited Partnership, is a limited partnership formed pursuant to 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 Proponent is responsible for the design, construction, operation, and decommissioning of the Project.

The Proponent's contact information for project questions, comments and consultation is as follows:

Local Project Office:

K2 Wind Ontario Inc.
c/o Capital Power
46 Victoria Street North
Goderich, ON N7A 2R6
Project telephone: (519) 524-2760
Project email: K2Wind@capitalpower.com
Project website: www.K2wind.ca

The Proponent's corporate office contact information is as follows:

K2 Wind Ontario Inc.
c/o Pattern Renewable Holdings Canada ULC
Suite 105, 100 Simcoe Street
Toronto, ON M5H 3G2
Facsimile: (416) 979-8428

2.2 Project Location

The Project Location covers an area of approximately 190 km^2 within the County of Huron, and is bounded by Bruce County Road 86 (Amberley Road) to the north; Bluewater Highway (Highway 21) to the west; Golf Course Road to the south, and Hall's Hill Line/Lucknow Line/ Saratoga Line to the east in the Township of ACW (see Figure 1, Appendix A).

The term "Project Location" is defined by O. Reg. 359/09 to include all land and buildings / structures associated with the Project and any air space the Project would occupy. This includes structures such as turbines, access roads and electrical collection lines as well as any temporary work areas to be used during construction of the Project. The boundary of the Project Location is used for defining setback and site investigation distances according to O. Reg. 359/09.

The Project is not located in any areas protected under provincial plans and policies described in O. Reg. 359/09, including the Greenbelt Plan, Oak Ridges Moraine Conservation Plan, Niagara Escarpment Plan, and the Lake Simcoe Protection Plan.

2.3 Nameplate Capacity

The Project consists of up to 140 Siemens SWT-2.3 wind-powered turbines that will operate between 1.824 and 2.300 MW for a combined nameplate capacity of approximately 270 MW. It is anticipated that 20 turbines will operate at 1.824 MW, 95 turbines will operate at 1.903 MW, 14 turbines will operate at 2.030 MW, 5 turbines will operate at 2.126 MW, 2 turbines will operate at 2.221 MW, and 4 turbines at 2.300 MW.

2.4 Renewable Energy Generation Facility Class

Part II of O. Reg. 359/09 identifies criteria for the classification of proposed wind facilities. The Project is considered a Class 4 wind facility based on the following criteria:

1. No part of a wind turbine is located in direct contact with surface water other than a wetland;
2. The name plate capacity of the facility is greater than or equal to 50 kW; and
3. The greatest sound power level is greater than or equal to 102 dBA.

2.5 Energy Sources

Wind turbines capture the kinetic energy in surface winds and convert it into electrical energy in the form of electricity. Wind turbines are comprised of three basic parts: blades, a tower, and a nacelle that houses the generator. As wind moves over the turbine's blades it causes 'lift'; the same effect used by airplane wings. This lift force causes the blade assembly to rotate. The rotational energy resulting from the movement of the blades is directly transferred to the drive shaft. The rotating shaft transfers the energy through a gearbox and into an alternating current generator which then converts the mechanical energy into useable 60 Hz electricity.

No supplementary fuel sources would be used to generate electricity for the Project.

2.6 Land Ownership

All of the land on which the turbines would be located is privately owned with the Proponent having option agreements in place with the landowners for leasing the turbine sites and the transformer site.

The substation site would be owned by the Proponent. In the case of the land designated for the substation, part of the land purchased by the Proponent is expected to later be severed and sold to Hydro One Networks Inc. (Hydro One) for construction and operation of the switching station portion of the site.

The collector system is expected to follow access roads and run within the existing road allowances and on participating private properties from the turbine sites to the transformer station and to the substation. A 138 or 230 kV transmission line, which is proposed to be buried within municipal road allowances and on privately owned lands, will connect the transformer station to the substation. In cases where lines are above ground, some lines may share existing, or new, poles with Hydro One or other rural distribution lines or attached to infrastructure (i.e., bridges).

2.7 Other Required Approvals

At the federal, provincial and municipal levels, multiple permits, licenses and authorizations may be required to facilitate the development of the Project, in addition to the REA. The ultimate applicability of all permits, licenses and authorizations will be determined based on the Project's detailed design and consultation with applicable authorities.

2.7.1 Federal

A Federal Screening report is not expected to be required for the Project, as it is not anticipated that the Project will cause a 'trigger' under the *Canadian Environmental Assessment Act (CEAA)*. However, the consultation program for the Project will include all applicable federal departments and agencies typically interested in wind power projects (e.g. Department of National Defence, Environment Canada, Transport Canada, Fisheries and Oceans Canada, etc.). Potential federal permits, licenses and authorizations that may be required for the Project include those listed in Table 2-1 with the potential for additional approvals if requested by regulatory agencies.

Table 2-1: Federal Permits, Licenses and Authorizations

Permit /License/Authorization	Administering Agency	Rationale
Aeronautical Obstruction Clearance	Transport Canada – Aviation Division	Turbine lighting and marking
Land Use Clearance	NavCanada	Aeronautical safety mapping and designations
Navigational Clearance	Transport Canada – Marine Division	Crossing a navigable watercourse

2.7.2 Provincial

In addition to the REA, all provincial permits, licenses and authorizations required for the Project will be determined, and may include those listed in Table 2-2.

Table 2-2: Provincial Permits, Licenses and Authorizations

Permit/ License/Authorization	Administering Agency	Rationale
Certificate of Inspection	Electrical Safety Authority	A record that electrical work complies with the requirements of the Ontario Electrical Safety Code
Customer Impact Assessment	Hydro One	Integration of project with Hydro One and effects to customers
Connection Cost Recovery Agreement (CCRA)	Hydro One	Recovery of costs to grid operator of changes to allow connection
Approval of Connection	Independent Electricity System	Electrical interconnect with IESO

Permit/ License/Authorization	Administering Agency	Rationale
	Operator (IESO)	regulated network
System Impact Assessment	IESO	Integration of project with IESO-controlled transmission system
Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses Permit	Maitland Valley Conservation Authority (MVCA)	Work within floodplains, water crossings, river or stream valleys, hazardous lands and within or adjacent to wetlands. Projects requiring review, Fisheries Act authorization and/or assessment under the Canadian Environmental Assessment Act are forwarded to the Fisheries and Oceans Canada (DFO).
Notice of Project	Ministry of Labour	Notify the Ministry of Labour before construction begins
Change of Access and Heavy/Oversize Load Transportation Permit	Ministry of Transportation (MTO)	Compliance with provincial highway traffic and road safety regulations. Transportation of large or heavy items on provincial highways
Special vehicle configuration permit	MTO	Use of non-standard vehicles to transport large components
Transportation Plan	MTO	Adherence to road safety and suitability
Generator's License	Ontario Energy Board (OEB)	Generation of electrical power for sale to grid
Endangered Species Act permit	Ministry of Natural Resources (MNR)	If provincially listed species at risk or their habitat are present.
Land Use Permit	MNR	Project components crossing a watercourse subject to the Public Lands Act.

2.7.3 Municipal

All municipal permits, licenses and authorizations required for the Project will be determined in consultation with the Township and/or the County, and may include those listed in Table 2-3.

Table 2-3: Municipal Permits, Licenses and Authorizations

Permit /License/Authorization	Rationale
Building Permits	Compliance with building codes for turbines, transformer station, substation, and operation and maintenance building
Entrance Permits	Entrance from Township or County roads
Civic Address	911 numbers for each turbine site
Township/County Consent – agreement on use of the road allowance	For use of road allowances for collector line siting
Township/County Consent – tree cutting	Agreement with Township/County as necessary for pruning trees or removal within road allowances
Road Condition Survey	Assessment of pre and post construction conditions of Township/County roads to be used for material delivery and construction equipment movement

Permit /License/Authorization	**Rationale**
Shared Use Agreement	Agreement with local utilities as applicable for shared use of poles in road allowances
Traffic Management Plan	Adherence to road safety and suitability, including adherence to load restrictions on Township/County roads
Additional plans related to general engineering (e.g. stormwater)	Required supporting information/plans required by the Township/County
Sewage system permit	Installation and operation of a septic system
Water well permit	Installation and operation of a water well

3.0 PROJECT COMPONENTS

3.1 Project Component Overview

The basic components of the Project include:

- Up to 140 Siemens SWT-2.3 wind-powered turbines, each located on agricultural lands with access roads, and associated culvert installations at watercourse crossings where necessary;
- Padmount transformers located on the ground adjacent to each wind turbine to transform the electricity created in the nacelle to a standard operating power line voltage (i.e. 690 V to 34.5 kV);
- An electrical and data collection system (collector system) consisting of:
  - Predominantly underground 34.5 kV collector lines and data cabling that would generally follow the access roads on turbine sites and municipal road allowances (road allowances). Buried splices, junction boxes, or disconnecting switch boxes would be used as necessary for splicing of the underground collector lines either within road allowances or on participating private land; and
  - Predominantly underground 138 or 230 kV transmission line on road allowances and privately owned lands to connect the transformer station to the substation. Directly buried splices would be used as necessary for splicing of the underground transmission line either within the road allowance or on participating private land.
- A transformer station to allow approximately one half of the 34.5 kV lines from the turbines to step-up to 138 or 230 kV to reduce the number of circuits entering the substation;
- A substation to allow for interconnection of the electrical collection system to the Hydro One switching station;
- Stormwater management systems located at the transformer station and the substation properties;
- Three meteorological (met) tower locations; and
- An operation and maintenance building and protection and control buildings on the substation site, including associated parking area, septic system and water well.

Temporary components during construction include staging areas at the turbine locations; construction pads; staging areas along access roads; delivery truck turnaround areas; a central laydown area; and crane paths and associated culvert installations at watercourse crossings where necessary.

No equipment in the facility design relates to surface water supplies, air discharges and/or waste and biomass management.

3.2 Wind Turbine Generators

The Project includes up to 140 Siemens SWT-2.3 wind turbines. A summary of the basic specifications of the turbine model is provided in Table 3-1 below. Each of the turbine installations would consist of the following key components:

- Concrete foundation;
- Steel support tower comprising 5 sections;
- Nacelle containing the gearbox and electrical generator;
- Hub (rotating structure that holds the turbine blades);
- 3 rotor blades;
- A padmount transformer to convert power from 690 V to 34.5 kV; and
- Electrical controls and connections.

Detailed information about the turbine models are provided in the *Wind Turbine Specifications Report*.

Table 3-1: Basic Wind Turbine Specifications – Siemens SWT-2.3

Manufacturer	Siemens
Model	SWT-2.3-101
Individual turbine nameplate capacity (MW)	1.824 to 2.300 MW
Hub height above grade	99.5 m
Blade length	49 m
Full rotor diameter	101 m
Blade sweep area	8,000 m^2
Nominal revolutions (rotational speed)	6-16 rpm
Frequency spectrum	60 Hz
Sound power (nameplate 1.824 MW)	3 m/s – 91.4 dBA; 4 m/s – 95.3 dBA; 5 m/s – 98.1 dBA; 6 m/s – 100.5 dBA; >7 m/s – 101.0 dBA
Sound power (nameplate 1.903 MW)	3 m/s – 91.4 dBA; 4 m/s – 95.5 dBA; 5 m/s – 99.0 dBA; 6 m/s – 101.5 dBA; >7 m/s – 102.0 dBA
Sound power (nameplate 2.030 MW)	3 m/s – 91.4 dBA; 4 m/s – 95.6 dBA; 5 m/s – 99.8 dBA; 6 m/s – 102.5 dBA; >7 m/s – 103.0 dBA
Sound power (nameplate 2.126 MW)	3 m/s – 91.4 dBA; 4 m/s – 95.7 dBA; 5 m/s – 100.3 dBA; 6 m/s – 103.5 dBA; >7 m/s – 104.0 dBA
Sound power (nameplate 2.221 MW)	3 m/s – 91.4 dBA; 4 m/s – 95.7 dBA; 5 m/s – 100.5 dBA; 6 m/s – 104.5 dBA; >7 m/s – 105.0 dBA
Sound power (nameplate 2.300 MW)	3 m/s – 91.4 dBA; 4 m/s – 95.7 dBA; 5 m/s – 100.6 dBA; 6 m/s – 105.4 dBA; >7 m/s – 106.0 dBA

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 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, the foundation design may require some alteration from site to site.

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.

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.

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. Construction pads will be re-constructed during operation to accommodate crane use during maintenance activities.

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).

Prior to contracted operation, 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.

3.3 Access Roads

Approximately 90 km of new access roads are required to access turbine sites from existing public roads during all phases of the Project. Access roads have been planned in consultation with the landowners. Where possible, access roads have been planned to parallel property boundaries to reduce the interaction with drainage systems, farm operations and agricultural lands. Considerable effort has been made to avoid intrusions by access roads into natural areas such as woodlots, and to minimize the number of water crossings required to access turbine sites. Access roads would be approximately 5 to 8 m wide, and would not require resizing for the operation phase, with the exception of the entrances off the Township or County roads that require wider turning radii during construction.

3.4 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.

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.

3.5 Electrical Infrastructure

3.5.1 Padmount Transformers and Collector System

A padmount transformer, located on the ground adjacent to the tower of each Siemens wind turbine, is required to transform the electricity created in the nacelle to a standard operating power line voltage (i.e. 690 V to 34.5 kV). 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.

From the padmount transformer, underground 34.5 kV collector lines carry the electricity to the municipal road allowances generally following the turbine access roads. Where necessary, a partially buried junction box and/or disconnecting switch box will be placed at the junction of the collector line from the turbine and the collector line in the road allowance. The junction box/disconnecting switch box would be located either on the participating private land or within the road allowance. Junction boxes and disconnecting switch boxes will require an excavation approximately 4 m long x 4 m wide x 3 m deep. with the above ground portion measuring approximately 2.5 m long x 1.5 m wide x 1.0 m high. Both the junction boxes and the disconnecting switch boxes are enclosed in tamper resistant outdoor above-ground enclosures. Underground collector lines have been incorporated into the design of the access roads to reduce the area required for construction and minimize potential construction impacts. The cables would be installed immediately to one side of the access road, just off the gravelled surface.

A predominantly underground 34.5 kV collector system will be located within the municipal road allowance or on participating private land. To allow for the collector system to be predominantly buried (as opposed to above ground on wooden poles) 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.

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.

At each end of a cable run a junction box (see description above), disconnecting switch box, or a buried splice would be required to allow for splicing of cable reels. If buried splices are used, they will be buried at same depth as the cable, potentially with concrete block protection laid around them.

Wherever possible, junction boxes/disconnecting switch boxes at the end of access roads would be used for cable splice locations to reduce the number of junction boxes/disconnecting switch boxes required. Junction boxes/disconnecting switch boxes would primarily be located on participating lands associated with turbine access roads where they connect to the main collector system. Where junction boxes/disconnecting switch boxes are required at splice points within the main collector system, they would be located within the municipal road allowance or on participating private land. Every effort would be made to locate the junction boxes/disconnecting switch boxes away from lands fronting non-participating residences.

Some sections of the collector system may have to be installed above ground on wooden poles or on infrastructure (i.e., bridges) if required to pass sensitive natural features or other obstacles to underground cables.

The data communication system would run with the collector lines throughout the Project, both above and below grade.

3.5.2 Transformer Station and Transmission Line

A 138 or 230 kV transformer station is required to allow for the collector system to be predominantly buried (as opposed to above ground on wooden poles) as requested by the Township of ACW and local residents. The transformer station site would be located on the south west corner of Lanesville Line and Belgrave Road and would be approximately 4.05 ha in size. Several of the 34.5 kV circuits from the turbines in the northern section of the Project Location would be connected into the transformer station to step-up the voltage to 138 or 230 kV to reduce the number of collector lines entering the substation. The site would be largely covered with gravel and underlain by a grounding grid. The transformer station would be surrounded by a chain-link fence for security, equipped with a locked vehicle gate to allow for maintenance access. The transformer station may be surrounded by berms and/or landscaping to mitigate the visual impact of the site. Berms would be set back from the municipal road allowance based on municipal requirements.

An underground 138 or 230 kV transmission line would connect the transformer station to the substation. The transmission line would be buried underground, both within the municipal road allowance and on private lands. Two routings are currently proposed. The preferred routing is following Lanesville Line and Glens Hill Road to connect at the substation. An alternate routing has been proposed in the event that the preferred routing cannot be accommodated. The alternative route is proposed to run eastward from the transformer station along Belgrave Road and then southward along Tower Line Road 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 also potentially 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.

3.5.3 Substation

The substation facility would be located on a property located at the northwest corner of the Tower Line and Glens Hill Road intersection. The substation yard would comprise a portion of the property, which will be used for other Project facilities. The substation yard would house the switching, control, protection, communication and metering system required to support the operation of the substation. The substation yard (including space to allow for development of the Hydro One switching station described below in this section) would be approximately 18.5 ha in size. At the substation, the voltage is stepped up from either 34.5 kV or 138/230 kV to 500 kV via main output transformers.

Prior to commencement of construction, the substation property 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. 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.

As part of the substation development, an existing residence, associated buildings, and existing septic system and water well would likely need to be removed from the site or decommissioned and the area graded according to the site design.

A chain link fence would enclose the substation and would be equipped with a locked vehicle gate to allow for maintenance access. The entire substation yard including both the substation and Hydro One switching station may be surrounded by berms and/or landscaping to mitigate the visual impact of the site. Berms would be set back from the municipal road allowance based on municipal requirements.

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 contracted operation, 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.

3.6 Operation and Maintenance Building

An operation and maintenance building would be would be the on-site operational hub of the completed Project, and would be located on the same property as the substation. This facility is currently envisioned as either a one or two storey building (approximately 32 m x 16 m) and would provide office, control room, workshop, kitchen, restrooms, warehouse facilities and associated parking. The operation and maintenance building would also include areas for storage of Project equipment and spare parts, and would have a secure area for hazardous materials and lubricant storage.

To support the operation and maintenance building, a septic system expected to consist of a septic tank and weeping bed would be installed. If, after assessment, the existing septic system meets the needs of the operation, the systems will be recommissioned and permitted as appropriate. If the existing septic system does not meet the requirements for the operations facility, it will be decommissioned and a new septic system would be installed. The septic tank would be required for primary treatment and the weeping bed for secondary treatment of the wastewater. Conforming to the current guidelines, it is anticipated that each employee would generate 125 L of wastewater per day. Based on a projection of a maximum of 25 employees the septic system would require a capacity of 3,125 L, as a worst case scenario. For non-residential use a septic tank must have a working capacity of 9,375 L. 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.

The wind farm would be operated, monitored and controlled from the operation and maintenance building. The site would also be monitored 24 hours a day from a remote wind operations and monitoring centre. To facilitate this monitoring, data cabling would be installed with the collector system from each wind turbine to the substation and then to the operation and maintenance building.

Building construction and finishes would be chosen to be compatible with the rural setting of the Project Location and other buildings in the locale. A septic system and water well would be installed to service the operation and maintenance building.

3.7 Stormwater Management Systems

Stormwater Management (SWM) Plans were developed for runoff control from the substation and transformer station properties in accordance with the *Stormwater Management Planning and Design Manual* (MOE 2003) and MVCA guidelines (see Appendix C of the *Design and Operations Report*).

The primary component of the *SWM Plan* at the substation property is a stormwater retention pond, located at the southwest corner of the main operations area, which would receive all runoff from the site. The stormwater retention pond would reduce peak stormwater flows and promote sedimentation prior to discharge to the drainage along Glens Hill Road. The retention pond would provide quantity control for stormwater runoff from developed areas of the site. The total storage volume of the SWM pond would be approximately 730 m^3 and would have continuous side slopes of 3:1 (H:V) resulting in an overall top of pond surface area of about 900 m^2. The SWM pond would have a total depth of 1.3 m comprised of active storage (1.0 m) and freeboard (0.3 m). Stormwater runoff from the developed site area would be conveyed to the SWM pond via drainage ditches. The storm sewer system would be sized to convey the 100 year design storm. The SWM pond would discharge to the existing Glens Hill Road roadside ditch.

The outlet structure is designed as a detention control device consisting of one 650 mm diameter culvert with an inlet elevation of approximately 245 m. As appropriate, a shut-off mechanism will be incorporated into the design of the SWM pond outlet chamber to provide the opportunity to close off discharge from the substation property in the event of an emergency during which material other than stormwater enters the SWM system. An oil/grit separator (OGS) for control of stormwater runoff quality from the Site is considered appropriate given the low imperviousness (about 10%) in this area. An OGS traps and retains oil and sediment in a detention chamber. It operates based on the principles of gravity-based sedimentation for the grit and phase separation for the oil.

A 2 m long overflow broad-crested weir with a crest elevation set at 245.7 m will be a component of the outlet configuration. This weir will assist in limiting the maximum depth of the SWM pond. It will also serve the secondary purpose as emergency overflow bypass.

Four diversion ditches will be constructed along the north, west, south and east development perimeter to convey “clean” surface runoff from the upstream undeveloped areas of the substation property around the developed area.

The *SWM Plan* for the transformer station determined that the change in post-development flows versus predevelopment flows was minimal and that a retention pond would not be required to control peak runoff.

Belgrave Road and Lanesville Line represent the upstream boundary for localized drainage at the proposed transformer Site. As such, no perimeter ditches will be necessary to route “clean” runoff from un-developed upstream areas of the site. The site will be developed to ensure that on-site drainage will follow, to the extent possible, the existing drainage pattern.

Vegetated filter strips and grass lined drainage ditches are a low-cost best management practice designed to improve the quality of stormwater runoff by using biological and chemical processes in soils and vegetation to filter out contaminants. They function by slowing runoff velocities and filtering out sediment and other pollutants, and providing some infiltration into underlying soils. Filter strips were originally used as an agricultural treatment practice, and have more recently evolved into an urban practice.

Grassed swales are most effective for quality control when the depth of flow is minimized, bottom width is maximized (≥0.75 m) and channel slope is minimized (e.g. ≤1%). Grassed swales with a slope up to 4% can be used for water quality purposes, but effectiveness diminishes as velocity increases. As appropriate, grass lining will be allowed to grow higher than 75 mm to enhance the filtration of suspended solids.

Vegetated filter strips (minimum 10 m wide) will be integrated into the drainage design for the development.

3.8 Met Towers

Three met tower locations are required for this Project to collect meteorological data during operation of the facility. These towers would be approximately 100 m high and consist of either steel lattice or tubular structures. They would be mounted on a concrete foundation (approximately 10 m x 10 m) and be either free-standing or supported laterally by guy wires. The towers would carry instrumentation for collecting wind data to support operation of the Project.

Access for installation of the met towers is required. No road would be constructed for the met towers; the truck used to deliver the met towers and installation equipment would travel the access route that is delineated to the proposed tower location. The truck to be used for delivery of the met towers would be determined based on the tower model selected, but may be an appropriately sized pick-up truck or a small rig. Power and data cabling for the tower would be trenched in from the nearest collector line system. The area would be restored at the end of the construction phase as necessary.

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.

3.9 Temporary Components

Lands to be temporarily used during the construction of the Project are staging areas for access road construction, delivery truck turnaround areas, staging areas at each turbine location including the construction pads, crane paths, some watercourse crossings and the central laydown area. Any temporary office buildings used during construction would not be serviced, and would be placed within the delineated construction work areas.

The land use prior to construction at all of these areas is agricultural.

Following construction activities, all of the temporary locations would be restored to pre-existing 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.

3.9.1 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

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

A heavy-lift crawler and mobile cranes would be used to assemble the turbines. The movement of the crane between turbine sites, termed ‘crane paths’, would take place along access roads and municipal or county roads where possible. The crane would be, in some places, broken down and transported to other turbine locations for re-assembly. However, there are instances where it is more effective, to minimize potential impact to municipal or county 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 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.

3.9.2 Access Road Locations

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.

Portions of the buildable areas have been reduced on a site-by-site basis to mitigate impacts to natural features and water bodies.

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 construction 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.

3.9.3 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. All temporary crossings would comply with of Fisheries and Oceans Canada (DFO) Ontario Operation Statement – Temporary Stream Crossings, where possible, or may require permit approval from the MVCA.

3.9.4 Central Laydown Area

A gravelled central laydown area, designed to store Project components during the construction phase, would be constructed on the same property as the substation and operation and maintenance building. The central laydown area is not anticipated to be used for mass storage of the wind turbines; it is planned that the turbine components would be delivered directly to the turbine sites. However, some turbine components may be stored at this location if needed. The central laydown area would be primarily used for storage of other Project components such as electrical cabling, padmount transformers, cable bus, buswork, steel structures, and outdoor breakers, as well as resources and general construction materials such as concrete, gravel and steel.

3.9.5 Met Tower Access Routes

The site access would be by temporary paths, which would be restored following construction. The routes used by the truck to access the met tower sites 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.

4.0 PROJECT ACTIVITIES

4.1 Overview of Regulated Activities

A general overview of the activities that would be engaged in during construction, operation, and decommissioning of the Project are provided in Table 4-1.

Table 4-1: Key Project Activities

Project Phase	Activities
Construction	**Turbine Sites & 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 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 (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, underground 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
	Substation Property
	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 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,

Project Phase	Activities
	etc.)
	Installation of fencing and landscaping of the site
	Connection to Hydro One grid (performed by Hydro One)
	Commissioning of the Project
	Transformer Station Property
	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 grounding grid
	Installation of transformers and all other equipment
	Restoration of temporary construction areas
	Installation of site fencing and landscaping or berm
Operation	**Turbine Sites**
	Preventative and routine maintenance
	Unplanned maintenance
	Meter calibrations
	Grounds keeping
	Substation Property/Transformer Station Property
	Preventative and routine maintenance
	Unplanned maintenance
	Remote wind farm condition monitoring
	Operation and maintenance building maintenance
	Additional Activities
	Collector line maintenance
Decommissioning	**Turbine Sites**
	Removal of turbine and met tower infrastructure
	Turbine site grading (dependent upon new proposed use)
	Possible removal of access roads dependent upon agreement with landowner
	Possible excavation and removal of underground collector lines depending upon depth and agreement with property owner
	Substation Property/Transformer Station Property
	Disconnection of substation from the Hydro One switching station
	Removal of substation and transformer station
	Potential removal of operation and maintenance building
	Decommissioning of septic system and water well
	Additional Activities
	Component removal and reuse, recycling, or proper disposal at a landfill
	Removal of above ground and underground collector system in municipal road allowances (remove wires and poles as required, dependent upon agreement with the County of Huron)

4.2 Facility Phases, Timing and Scheduling

The projected start dates for Project construction, operation and decommissioning activities are provided in Table 4-2 below.

Construction is anticipated to commence in mid-2013 and finish in late 2014. Operation and maintenance activities would occur as required throughout the life of the Project. The specific schedule for decommissioning would be determined at the time it is undertaken.

The wind turbines used for the Project can be expected to be in service for the term of the 20 year Ontario Power Authority Power Purchase Agreement. Following the term of the contract, a decision would be made regarding whether to extend the life of the facility or to decommission. Barring routine scheduled maintenance, the turbines are expected to be operational 24 hours a day, 7 days a week, assuming appropriate wind conditions.

Table 4-2: Major Project Phases and Scheduling Milestones

Construction	Operation	Decommissioning/Repowering
Mid-2013 to Late 2014	Late 2014 to Late 2034	Late 2034

4.3 Key Process Activities

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*.

4.3.1 Waste Generation

Construction and Decommissioning

During construction and decommissioning, waste material would be generated at, and transported from, the Project Location. Typical waste material produced by the Project is expected to consist of construction material (e.g. excess fill, soil, brush, scrap lumber and metal, banding, plastic wrap removed from palletized goods, equipment packaging, grease and oil, steel, etc.) and a minor amount of domestic waste (i.e. garbage, recycling and organics).

Operation

During operation, waste will be generated through general maintenance and office activities. Lubricating and hydraulic oils associated with turbine maintenance and operation used for the Project, include oily rags, empty grease/oil containers, and cleaning fluids in low volumes. Oil changes are scheduled in accordance with the annual oil analysis findings. An oil change is not likely to occur until the findings of the annual oil analysis indicate that it is required, which could be after several years of operation. Estimated amounts of oil and grease used for semi-annual maintenance would be approximately 10,650 L of oil and 3,550 kg of grease. Oil changes would be completed in accordance with oil analysis recommendations. A minor amount of domestic waste (i.e. garbage, recycling, and organics) would typically be generated during standard operation and maintenance activities.

Waste materials would be temporarily stored at the operation and maintenance building and would require reuse, recycling, and/or disposal at an appropriate off-site facility. There would be no on-site disposal of waste during the operation of the facility. Used oil would be stored in a secondary containment structure until removal by a certified contractor with the appropriate manifests in place.

During operation, the Proponent and/or the Operation and Maintenance Contractors would implement a site-specific waste collection and disposal management plan.

4.3.2 Air Emissions and Dust Generation

Construction and Decommissioning

Construction and decommissioning activities would 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, represents a source of particulate and other emissions.

Construction related traffic and various construction activities (e.g. excavation, grading, soil stripping, and exposed areas) have the potential to create dust but the effects are expected to be short term and localized.

Operation

During operation minor localized air emissions would occur from the periodic use of maintenance equipment over the life of the Project. Personnel vehicles and waste management haulers would travel to and from the substation site during regular business hours. Operations related traffic has the potential to create dust in the immediate vicinity of the facility however; effects are anticipated to be short-term in duration and highly localized.

In accordance with s.8 of O. Reg. 419/05, air emission rate calculations and dispersion modelling do not have to be performed for emissions from negligible sources or for the emission of negligible contaminants from significant sources.

Based on the preliminary facility design, the following sources of air contaminant emissions have been identified:

- Fuel combustion from on-site vehicles;
- Maintenance use of solvent-based cleaners;
- Maintenance welding activities (no dedicated fume hoods);
- Maintenance building ventilation exhausts;
- Dead tank circuit breakers (SF_6/CFC containing breakers); and
- Batteries.

Based on the guidance given in Table B-3 of Procedure for Preparing an Emission Summary and Dispersion Modelling (ESDM) Report (Version 3, February 2009), the following facility sources are defined as sources that emit contaminants in negligible amounts:

- Small maintenance and janitorial activities;
- Maintenance welding stations;
- Dead tank circuit breakers (SF_6/CFC containing breakers);and
- Batteries.

Therefore, as O. Reg. 419/05 does not apply to discharges of contaminants from motor vehicles and all other facility sources can be considered negligible per the information provided above, no further assessment is required.

4.3.3 Noise Emissions

Construction and Decommissioning

During construction of the Project noise would be generated by the operation of heavy equipment at each of the work areas and associated vehicular traffic on-site and on haul routes.

Operation

Mechanical and aerodynamic noise would be emitted from the wind turbines in addition to environmental noise from the transformers located at the transformer station and at the substation. The broadband source sound power level for the transformers would be a maximum of 79 dBA. A *Noise Assessment Report* will be undertaken for the Project in accordance with the MOE *Noise Guidelines for Wind Farms*, dated October 2008 and O. Reg. 359/09.

4.3.4 Hazardous Materials

Construction and Decommissioning

Hazardous materials are limited to fuels and lubricants that would be on-site for use in equipment. Hazardous 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 / switching station site could contain hazardous or designated substances, which require appropriate management for safe removal and disposal.

Operation

Hazardous materials to be used during the course of Project operation are limited to lubricants and fluids for the operation and maintenance of the turbines, the substation, and other equipment. These materials would be stored at the operation and maintenance building. There are no other known hazardous by-products of the wind energy generation process itself.

4.3.5 Sewage

Construction and Decommissioning

Sanitary waste generated by the construction and decommissioning 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 applicable regulatory requirements.

Operation

The operation and maintenance building would have contain restroom and shower facilities that would be serviced by a septic system. Based on the Ontario Building Code criteria, it is anticipated that each employee will generate 125 L of wastewater per shift with the use of showers and other common daily general usage. A conservative estimate of 25 employees was assumed to calculate total sewage generation at 3,125 L/day. Therefore, the septic system would have a minimum capacity of three times that volume, for a minimum working capacity of 9,375 L for non-residential use. The final design of the septic system would conform to local building code and health unit requirements.

The operation and maintenance building will be equipped with an area in which a vehicle can be driven and allowed to drip dry during the winter. A sump/drainage pit will collect the residues and drain to the septic system.

As appropriate, the contents of the tank will be pumped and hauled for off-site disposal by a licenced waste hauler. It is not anticipated that any chemical inputs will be required for the proper functioning of the septic system.

4.3.6 Stormwater Management

Construction and Decommissioning

During construction and decommissioning, proper grading would be conducted and mitigation measures implemented to reduce potential for runoff at the work areas.

Operation

Stormwater management at the substation and transformer station properties is discussed in Section 3.7. SWM Plans were developed in accordance with the '*Stormwater Management Planning and Design Manual*' (MOE 2003) and MVCA guidelines (see Appendix C of the *Design and Operations Report*). Regular maintenance and inspection of the stormwater management facilities would be required to ensure its continued operation and efficiency.

Substation Property

Maintenance is important for any stormwater management facility in order to ensure its continued operation and efficiency. The following minimal maintenance items have been recommended for the Project:

- Inspect the integrity of the side slopes and vegetation viability of the SWM Pond and the drainage ditches for erosion, on a quarterly basis during the first two years of operation and as a minimum annually thereafter. Inspection should be completed after all significant rainfall events (e.g., 13 mm or greater) and repairs completed as required.
- Inspect the integrity of culverts on a quarterly basis during the first two years of operation and as a minimum annually thereafter. Repair as required.
- Suggested oil and grit separator maintenance recommendations include:

  - Compliance with maintenance information/procedures/schedules obtained from the manufacturer.
  - Units should be inspected post construction, prior to being put into service.
  - Inspect every six months for the first year to determine the oil and sediment accumulation rate.
  - In subsequent years, inspections can be based on first-year observations or local requirements.
  - Cleaning is required once the sediment depth reaches 15% of storage capacity, (generally taking one year or longer). Inspect the unit immediately after an oil, fuel or chemical spill.
  - A licensed waste management company should remove oil and sediment and dispose responsibly.
  - Annual inspections should be conducted during the spring.

Monitoring will consist of the visual inspections of the stormwater management facility as well as testing of water quality pond effluent. The monitoring program will also include regular inspections of the erosion and sediment control features described in the following section.

Transformer Station Property

Proper maintenance is required for maximum filter-strip effectiveness. The maintenance requirements for the grass filter strips within this development will be based on information provided in MOE (2003). The following minimal maintenance items will be implemented:

- Inspect filter strips and grass lined drainage ditches frequently, especially after intense rainfall events and runoff events of long duration. Small breaks in the sod and small erosion channels quickly become large problems.
- Minimize the development of erosion channels within the filter. Even small channels may allow much of the runoff to bypass the filter. These areas would be repaired and reseeded immediately to help ensure proper flow of runoff through filter strips.
- Reseed or inter-seed bare areas of the filter. Since it may be difficult to re-establish vegetation in an established filter strip, the use of mulch or sod can help to reduce some problems.
- Mow and remove vegetation as required to maintain moderate vegetation height.
- Soil test periodically and apply soil amendments according to test results and recommendations.

- Control trees, brush, noxious weeds, and Canada thistle in the filter strip and ditches using either mechanical means or herbicides.

Monitoring will consist of visual inspections of the vegetated areas adjacent to drainage ditches.

The monitoring program will include regular inspections of the erosion and sediment control features described in the following section.

Erosion and Sedimentation

Erosion and sedimentation are naturally occurring processes that involve particle detachment, sediment transport and deposition of soil particles. The erosion and sediment control plan for the Project will be compliant with the following guidelines:

- Erosion and Sediment Control practices study technical report, MOE, 1995;
- Guidelines for Evaluating Construction Activities Impacting on Water Resources, MOE, 1995;
- Stormwater Management Planning and Design Manual, MOE, 2003; and
- Conservation Authority Guidelines on Erosion and Sediment Control for Urban Construction Sites, 2006.

Development of the Transformer Station Property should not contribute to erosion and transport and deposition of suspended sediment downstream into surrounding natural areas, including watercourses (fish habitat), woodlots and wetlands as well as adjacent private lands.

To minimize the potential operation and environmental impacts, the following erosion and sedimentation control practices have been proposed in the *SWM Plan* for the construction of the SWM pond and ditches at the substation property:

- The SWM pond should be excavated in the first stages of pre-grading, and should function as a temporary sediment control pond until grading and servicing are completed;
- The SWM pond embankments not scheduled for construction within 30 days should be stabilized and seeded immediately;
- Storm drain outfalls at the location of the pond and ditch are required to have erosion protection. Riprap stone must be underlain with a geotextile. The minimum diameter of riprap stone should be 300 mm; and
- Rock check dams consisting of granular material should be placed across the ditches to reduce the velocity of runoff to reduce the potential for ditch erosion.

4.3.7 Water-taking Activities

Construction and Decommissioning

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 to the *Design and Operations Report.*

Preliminary designs for the proposed Siemens SWT-2.3 wind-powered turbines indicate that the footing foundations for the turbines will be constructed to a maximum depth of 3 m below the existing grade 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.

Operation

No surface water-taking activities are planned as part of the operation of the facility.

The water well installed at the operation and maintenance building will be used for kitchen and washroom facilities, general landscaping requirements, and washing of equipment and the floor of warehouse and storage spaces. The well would be used as a drinking water source if the water is confirmed to be potable. Water takings would not exceed 50,000 L/day and, therefore, a Ministry of Environment Permit to Take Water (PTTW) will not be required to operate the well. The water well would be maintained, inspected, and sampled in accordance with provincial and local requirements.

5.0 DESCRIPTION OF POTENTIAL ENVIRONMENTAL EFFECTS

O. Reg. 359/09 requires that adverse environmental effects that may result from engaging in the Project be described. The term “environment” in O. Reg. 359/09 has the same meaning as in the *Environmental Assessment Act*, and includes the natural, physical, cultural, and socio-economic environment.

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

- 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.
- Develop measures to avoid, mitigate, and monitor potential adverse effects.

Based on an assessment of the existing environment, experience gained during Project planning phase, as well as the requirements of the REA process, the following environmental features have been assessed as part of the REA application process:

- 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.

Mapping provided in Appendix A illustrates the natural environment and socio-economic features and shows the 300 m study area around the Project Location boundary. The detailed studies in the *Natural Heritage Assessment and Environmental Impact Study* (NHA/EIS) and the *Water Assessment and Water Body Report* (WA/WBR), and subsequent addenda to each report, are completed in the context of a 120 m zone of investigation, also shown on mapping provided in Appendix A.

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

The key performance objective for each of the features noted above is avoiding and/or minimizing potential effects (through the use of appropriate mitigation measures) to the features throughout the construction and operation phases 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 B, with corresponding performance objectives, monitoring plans and contingency 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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