GRAND RENEWABLE ENERGY PARK
PROJECT SUMMARY REPORT

DRAFT

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Prepared for:

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Executive Summary

Samsung C&T (Samsung), Korea Power Electric Corporation (KEPCO) and Pattern Energy (Pattern) are proposing to develop, construct, and operate the Grand Renewable Energy Park (the "Project") in response to the Government of Ontario's initiative to promote the development of renewable electricity in the Province. Together, these companies (referred to herein as "SPK") will be involved in the development of the first phase of the energy cluster development.

The Project is proposed within the County of Haldimand and is generally bounded by Townline Road to the north, Haldimand Road 20 to the west, the Grand River to the east and Lake Erie to the south. It consists of a 148.6 MW (nameplate capacity) wind project, a 100 MW (nameplate capacity) solar project located on privately owned and Ontario Realty Corporation (ORC) managed lands and a transmission line to convey electricity to the existing power grid.

The basic components of the Project include 67 wind turbines, approximately 425,000 photovoltaic (PV) solar panels installed on fixed ground-mounted racking structures organized into 100-1 MW solar modules, a collector sub-station, interconnect station and Operations and Maintenance building, temporary storage and staging areas, approximately 20 km of 230 kV transmission lines along Haldimand Road 20, approximately 82 km of new overhead and/or underground 34.5 kV collector lines along public roads, approximately 48 km of new underground collector lines along turbine access roads, approximately 45 km of turbine access roads, and 40 km of solar panel maintenance roads.

SPK has retained Stantec Consulting Ltd. (Stantec) to prepare a Renewable Energy Approval (REA) application, as required under Ontario Regulation 359/09 - Renewable Energy Approvals under Part V.0.1 of the Act of the Environmental Protection Act (O. Reg. 359/09). According to subsection 6(3) of O. Reg. 359/09, the wind component of the Project is classified as a Class 4 Wind Facility and the solar component of the Project is classified as a Class 3 Solar Facility. This Draft Project Summary Report is one component of the REA application for the Project, and has been prepared in accordance with O. Reg. 359/09, the Ontario Ministry of Natural Resources' (MNR's) *Approval and Permitting Requirements Document for Renewable Energy Projects* (APRD) (September 2009). The preparation of a Project Summary Report is one component of the REA process for the Project and has been prepared in accordance with Section 17.(1)3. of O. Reg. 359/09. This Draft Project Summary Report provides a summary of each draft document that will be made available to the public at least 60 days before the Project's second Public Meeting. This includes a summary of the following draft reports, as presented in Section 3.0:

- Project Description Report;
- Construction Plan Report;

- Design and Operations Report, includes:
  - Stormwater Management (SWM) Plan;
  - Noise Assessment Report
  - Health Impact Assessment; and
  - Property Line Setback Assessment.
- Decommissioning Plan Report;
- Wind Turbine Specifications Report;
- Natural Heritage Assessment and Environmental Impact Study;
- Water Body and Water Assessment Report; and
- Archaeological and Heritage Reports.

A separate summary is also provided of the potential effects, mitigation measures, and monitoring plans that have been identified and developed during the preparation of the draft reports (Section 4.0).

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1.0 Introduction

1.1 PROJECT OVERVIEW

Samsung C&T (Samsung), Korea Power Electric Corporation (KEPCO) and Pattern Energy (Pattern) are proposing to develop, construct, and operate the Grand Renewable Energy Park (the "Project") in response to the Government of Ontario's initiative to promote the development of renewable electricity in the Province. Together, these companies (referred to herein as "SPK") will be involved in the development of the first phase of the energy cluster development.

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The basic components of the Project include 67 wind turbines, approximately 425,000 photovoltaic (PV) solar panels installed on fixed ground-mounted racking structures organized into 100-1 MW solar modules, a collector sub-station, interconnect station and Operations and Maintenance building, temporary storage and staging areas, approximately 20 km of 230 kV transmission lines along Haldimand Road 20, approximately 82 km of new overhead and/or underground 34.5 kV collector lines along public roads, approximately 48 km of new underground collector lines along turbine access roads, approximately 45 km of turbine access roads and 40 km of solar panel maintenance roads. The Project site plan which depicts the Project Location during construction and operation is provided in **Attachment A**.

The Project Location includes all land and buildings/structures associated with the Project and any air space in which the Project will occupy. This includes structures such as turbines, solar panels, access roads and power lines as well as any temporary construction zones surrounding access roads and turbines (constructible areas) which will be required during the construction of the Project. This also includes the corridors surrounding infrastructure such as access roads in which the final infrastructure may be located.

For the purposes of the identification of natural heritage features and the assessment of potential effects, an "Zone of Investigation" has been identified based on the requirements of Ontario Regulation 359/09 (O. Reg. 359/09) and the Ministry of Natural Resources' (MNR's) *Approval and Permitting Requirements Document for Renewable Energy Projects* (APRD) (September 2009). The Zone of Investigation encompasses the Project Location and an additional 120 m surrounding the Project Location. This ensures that adverse environmental effects that may result from construction and operational activities have been assessed.

SPK has retained Stantec Consulting Ltd. (Stantec) to prepare a Renewable Energy Approval (REA) application, as required under O. Reg. 359/09. According to subsection 6.(3) of O. Reg. 359/09, the wind component of the Project is classified as a Class 4 Wind Facility and the solar

component of the Project is classified as a Class 3 Solar Facility. This Draft Project Summary Report is one component of the REA application for the Project, and has been prepared in accordance with O. Reg. 359/09, and the MNR's APRD.

2.0 Project Information

2.1 CONTACT INFORMATION

Applicant

The proponent for the Project is Samsung C&T (Samsung), Korea Power Electric Corporation (KEPCO) and Pattern Energy (Pattern). The contact for the Project is:

Name: Adam Rosso
Title: Manager, Business Development
Company: Samsung Renewable Energy Inc.
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Consultant

The lead consultant for preparation of the Renewable Energy Approval (REA) application is Stantec Consulting Ltd. (Stantec). Stantec provides professional consulting services in planning, engineering, architecture, interior design, landscape architecture, surveying, environmental sciences, project management, and project economics for infrastructure and facilities projects. The consultant's office and Project contact is:

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Title: Senior Project Manager
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Project

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Project Telephone: (877) 536-6050 or (519) 836-6050 (collect)

2.2 PROJECT LOCATION

The Project will be located on privately owned and Ontario Realty Corporation (ORC) managed lands within Haldimand County, Ontario, north of the Lake Erie shoreline and west of the Grand River (see **Attachment A**).

In accordance with O. Reg. 359/09, the Project Location includes all land and buildings/structures associated with the Project and any air space in which the Project will occupy. This includes structures such as turbines, solar panels, access roads and power lines as well as any temporary construction zones surrounding access roads and turbines (constructible areas) which will be required during the construction of the Project. This also

includes the corridors surrounding infrastructure such as access roads in which the final infrastructure may be located.

The boundary of the Project Location is used for defining setback, records review and site investigation distances and notification areas according to O. Reg. 359/09. The Project Location is generally bounded by Townline Road to the north, Haldimand Road 20 to the west, the Grand River to the east and Lake Erie to the south.

2.2.1 Wind Component

The 67 wind turbines will be located at the following coordinates:

Turbine ID Number	Easting	Northing	Turbine ID Number	Easting	Northing
1	607287	4746785	37	602481	4749039
2	605035	4746639	38	602608	4749469
3	606942	4746830	39	603875	4749401
4	604861	4746993	40	604239	4749614
5	602757	4745791	41	590395	4753879
6	606513	4747319	42	600381	4750377
7	608495	4747949	43	588466	4752970
8	607477	4747512	44	599489	4748483
9	600283	4745004	45	590085	4753880
10	593994	4748442	46	590582	4751836
11	603472	4748075	47	604740	4750499
12	601479	4747111	48	594126	4750504
13	594663	4751618	49	608750	4749784
14	603952	4750047	50	609091	4749844
15	608232	4749798	51	601762	4745085
16	594379	4749955	52	599708	4748016
17	598651	4747922	53	600301	4748359
18	587941	4753452	54	607370	4746400
19	606357	4749366	55	600136	4746677
20	592562	4749469	56	598686	4750284
21	602672	4746244	57	606647	4751294
22	601756	4751401	58	589733	4750362
23	591178	4751634	59	614345	4748206
24	592285	4749800	60	614974	4747470
25	599130	4750267	61	614326	4747732
26	607589	4749481	62	614680	4748176
27	598999	4748313	63	614750	4747811
28	591339	4752273	64	614705	4747338
29	599967	4750467	65	611480	4747403
30	606959	4749603	66	611758	4747387

Turbine ID Number	Easting	Northing	Turbine ID Number	Easting	Northing
33	589588	4755581	67	612236	4747633
34	589790	4753921	68	602131	4748909
35	602880	4749652	69	606923	4747368
36	590002	4755767			

2.2.2 Solar Component

The solar power generation component of the Project will include the installation of approximately 425,000 solar photovoltaic (PV) panels on an area bounded by Mt. Olivet Rd on the west, Meadows Rd on the north, Sutor Rd on the east and Haldimand Rd 20 on the south (see **Attachment A**).

The coordinates of the solar component of the Project are as follows:

- Northwest corner – 596145 E, 4750403 N
- Northeast corner – 598018 E, 4750552 N
- Southwest corner – 596760 E, 4747950 N
- Southeast corner – 597571 E, 4748056 N

2.2.3 Electrical Transmission Component

The substation will be located near Haldimand Road 20 and Mt. Olivet Road (see **Attachment A**) within the solar lands of the Project.

The 230 kV transmission line will be located along Haldimand Road 20 within the municipal road right-of-way (see **Attachment A**).

The operations and maintenance building will be constructed on land on the south side of Haldimand Rd 20 opposite the solar farm land area, just east of Mt. Olivet Rd (see **Attachment A**).

2.3 PROJECT COMPONENTS

2.3.1 Wind Component

The Project will include 67 Siemens SWT-2.3 wind turbines (65 with a nameplate capacity of 2.221 MW and 2 with a nameplate capacity of 2.126 MW) with a total nameplate capacity of 148.6 MW. Details of the turbine are provided below in Table 2.1. The nacelle for the turbine

includes the electric generator, as well as blade and turbine control equipment, wind speed and direction sensing equipment, and auxiliary equipment. These components are located at the top of the 100 m supporting tower, and are connected to the blades via a main shaft. Each tower has a concrete foundation which is buried to a depth of up to approximately 2.4 m and is approximately 16.7 m wide depending upon subsurface conditions (land base is approximately 0.02 hectares per turbine foundation).

Table 2.2 - Turbine Description – Siemens SWT-2.3

Operating Data	Specification
General	
Rated capacity (kW)	2221 and 2126
Cut-in wind speed (m/s)	3-5
Cut-out wind speed (m/s)	25
Rotor	
Number of rotor blades	3 (49 m long each)
Rotor diameter (m)	101
Swept area (m^2)	8000
Rotor speed (rpm)	6-16
Tower	
Hub height (m)	100
Tip height (m)	149

2.3.1.1 Turbine Access Roads and Crane Pads

Access roads are required to access each turbine site from existing roads during both the construction and operation phases of the Project. Access roads are approximately 5 m wide (see drawings in **Attachment A**). Access roads will be constructed of native materials or engineered fill and generally consist of approximately 750 mm of granular material. Alternatively, a woven geotextile or cement stabilized soil could also be utilized with a reduced granular material depth. Turbine laydown (prior to turbine erection) will take place adjacent to the access roads and has been incorporated into the Project Location design by designating a 50 m wide “constructible area” for the access roads (see **Attachment A**). A total of approximately 45 km of access roads will be required.

Crane pads will be constructed at the same time as the access roads and will be adjacent to turbine locations (within the constructible area around each turbine as shown in **Attachment A)**. The general crane pad area will be approximately 20 m x 40 m, and will typically consist of the same make up as the access road, whereas the crane platform (where the crane sits) may consist of a heavier granular material depending on site conditions. Once the turbine erection is complete, the crane pads will be removed, the area restored and the prior land use will resume. If necessary the crane pads will be rebuilt if maintenance activities are needed.

2.3.1.2 Step-up Transformers and Collector Circuits (Lines)

A generator step-up transformer (GSU), located immediately adjacent to each turbine, is required to transform the electricity generated in the nacelle of each turbine to a common

collection system line voltage (i.e. 690 V to 34.5 kV). From each GSU, 34.5 kV underground and overhead collector circuits carry the electricity to the Project's substation located near Haldimand Road 20 and Wilson Road. The collector lines will be buried underground from the turbines to the municipal road rights-of-way at which time the lines may be switched to overhead lines or remain buried. The overhead lines will be constructed on single wooden pole structures, similar to existing distribution lines located throughout the area. In most cases, the underground lines will be built within the proposed access roads to minimize the amount of land disturbed during construction of the Project. Typically the collector lines will be buried at a minimum depth of 1.2 m so that agricultural activities can continue on the lands above the collector lines. A total of approximately 130 km of collector lines will be required (48 km underground and 82 km aboveground and/or underground).

2.3.2 Solar Component

2.3.2.1 Solar Panels

The solar power generation part of the Project will include the installation of approximately 425,000 solar photovoltaic (PV) panels on land bounded by Mt. Olivet Rd on the west, Meadows Rd on the north, Sutor Rd on the east and Haldimand Rd 20 on the south (see **Attachment A**). Some additional solar PV panels will be located south of Haldimand Rd 20 on land facing the solar farm to the north. Each solar PV panel is fabricated using multicrystalline manufacturing techniques and is mounted on structural aluminum or galvanized steel racks in rows. Each rack is in a fixed position, facing south and angled 28 - 35 degrees to the horizon. The rows of racks are supported by vertical structural steel posts that are founded in the ground to a depth below the frost line, nominally 1.2 m.

The basic building block of the solar farm is a 1 MW rated solar unit. There are 100 solar units forming the entire solar farm. A 1 MW solar unit consists of rows of 60 solar PV panels mounted on racks in straight rows. Approximately 72 rows of solar PV panels constitute a solar unit of 1 MW. Physical arrangements may vary slightly from unit to unit to accommodate physical, environmental and archaeological constraints within the designated solar farm area and may also vary slightly based on the manufacturer's panel specifications. Each solar PV panel in a row generates Direct Current (DC) power and the power is collected through a low voltage wiring system along a row and interconnected to the adjacent rows within the typical unit.

A 2.4 m high chain link fence will be installed around the entire perimeter of the solar farm to prevent unauthorized access to the solar panel area. In addition, a 6 m wide berm will be constructed to provide a landscaping barrier for landowners of adjacent residences where close proximity occurs to the solar PV panels.

2.3.2.2 Solar Land Stormwater Management System

The solar land stormwater management system will be a passive system comprised of local vegetated ditches/swales alongside the access roads constructed through the area. Because the solar cells are mounted above the ground, infiltration, filtration through vegetation and other natural hydrologic process will continue similar to existing conditions. Drainage will generally be directed to existing receiving systems (drainage paths, roadside ditches, etc.) as under current conditions. Therefore, a general area-wide stormwater treatment and/or detention systems will not be required. The small increase in runoff from the gravel access roads will be attenuated and filtered through local ditches and no formal basins or other management techniques are required.

2.3.2.3 Solar Farm Access Roads

Solar access roads (laneways) are required to access each row of solar PV panels during the construction and maintenance phase of the Project. The minimum road width between solar panel rows will be 3 m; however these access roads will not be graveled. Instead, the roads will be seeded with native grassland species following construction and used sparingly during maintenance activities. Solar panel support structures including racks will be placed adjacent to the access roads at selected areas within the solar farm land area. Snowmobiles and ATV's will be used to access the laneways during operation.

Around the outside of each 1 MW solar unit, a 4 m wide gravel road will be constructed for construction and operational purposes. Approximately 40 km of graveled access road will be required.

2.3.2.4 Step Up Transformers and Collector Circuits

The power from each solar PV panel row is collected by a wiring system and this wiring system is connected to one of two 500 Kilowatt (kW) DC to Alternating Current (AC) power inverter panels located at each of the 100 solar units. Each power inverter panel is mounted on a precast concrete base foundation at a central point of each solar unit. The AC output from the inverter panels is connected to an adjacent solar step up (SSU) pad-mounted transformer rated at 1 MW. Each SSU is mounted on a precast concrete vault to facilitate cable entry/exit. Each SSU is positioned in close proximity to the solar inverter panels to minimize power loss. The output voltage of the SSU is 34,500 Volts. The power output from each of the 1 MW SSUs (100 MW in total) is connected via 5 underground 34.5 kV power cable circuits to the collector substation located within the solar farm land area.

2.3.3 Electrical Transmission Component

2.3.3.1 Collector Substation

A Collector substation will be built to accumulate the power circuits from the wind and solar generation equipment outlined above. The accumulated power of approximately 253 MW at 34.5 kV will arrive via both underground cable collector circuits and overhead pole line

conductor circuits. The power will be transformed from a 34.5 kV collection voltage to a 230 kV transmission voltage. The substation will be located near Haldimand Road 20 and Mt. Olivet Road (see **Attachment A**) within the solar lands of the Project.

The Collector substation will consist of a prepared area of approximately 85 m by 85 m. It will be built on a prepared base of engineered fill and crushed stone to a depth of approximately 600 mm. A grounding grid will be built within the crushed stone and extend to 1 m beyond the 2.4 m high perimeter chain link fence for the substation.

Within the substation will be a prefabricated modular electrical building (EHouse) where all the incoming underground 34.5 kV collector circuits will terminate on interior switchgear. The EHouse will be founded on concrete foundations that are constructed below the frost line. Cable vaults will be installed beneath the EHouse to facilitate cable entry.

Reactive Power Capacitors and control will be located within the Collector Substation. Either one of D-VAR or S-VAR will be installed as approved by local authority(s). The capacitors will be 34.5 kV rated and there will be up to 6 capacitor banks installed in separate concrete containment foundations, founded below grade and below the frost line. The containment will be large enough to hold any insulating fluid that may leak from the capacitors. The dynamic controller will be a Statcom (or similar) controller located adjacent to the capacitors within the substation and on its own concrete foundation below the frost line.

There are two power transformers within the collector substation that will be used to step up the power to 230 kV. The wind power transformer is rated 100/133/166 MVA while the solar power transformer is rated 65/86/108 MVA. Each transformer is mounted on a concrete base foundation within an oil containment facility that would capture all of the oil insulating fluid within each transformer in the event of a leak. A sound attenuation wall will be constructed around the perimeter of the two power transformers to minimize the escape of transformer noise into the surrounding environment. The sound attenuation wall will be constructed with a minimum density of 20 kg/m^2.

Each of the 230 kV outputs of the two transformers are delivered via a 3 phase air bus (aluminum pipe) to a 1,200 Amp 230 kV circuit breaker, isolation disconnect switch and Capacitive Voltage Transformers (CVT). The 230 kV outputs from the final isolation disconnect switches are coupled and connected to a 230 kV termination gantry complete with 230 kV lightning arrestors. The 230 kV termination gantry facilitates the connection of the collector substation to the overhead transmission tower adjacent to the substation. Each of the 230 kV devices located within the collector substation are founded on concrete foundations that extend below finished grade to below the frost line.

2.3.3.2 Collector Substation Stormwater Management System

Area drainage from the collector substation will be accomplished through a series of swales adjacent to the proposed access road that will collect and convey runoff from the substation area and associated access road west and south towards Haldimand Rd 20. The total drainage

area associated with the substation and access road "hard" surfaces is less than 2 ha and therefore a "wet" water quality control pond (i.e. one containing a permanent pool) is inappropriate, as per the MOE *Storm Water Management Planning and Design Guidelines Manual (2003)*. In addition to the conveyance of runoff, the series of grassed swales will also provide water quality control, which is a suitable stormwater management practice for such an area according to the MOE guidelines. Water quantity control will be provided using a dry detention pond for the storage and slow release of runoff to the existing ditch and drainage system along Haldimand Road 20. Drainage from the solar lands will largely be conveyed around the substation facility, access road, and associated stormwater management measures through the use of diversion swales given that it does not require treatment or detention.

Within the substation footprint itself, the two transformers will be equipped with oil containment storage areas to capture oil in the event of a leak. Additionally, an oil/water separator will be incorporated into the design to treat any effluent before it enters the storm drainage swales.

2.3.3.3 Collector Substation Access Road

An access road for the collector substation and main access to the solar lands will be constructed from Haldimand Rd 20 (see **Attachment A**). The gravel surface of the access road is approximately 8 m wide with grassed swale drainage ditches of variable top width on either side, for stormwater runoff conveyance and treatment. The depth of the roadbed will generally consist of 750 mm of granular material. During construction it will be used to transport all the materials for construction of the substation including the two heavy power transformers and for maintenance purposes during operation.

2.3.3.4 Transmission Line

From the substation, a 20 km long overhead 230 kV transmission line, consisting of single, 3 conductor aluminum circuit will be constructed to connect the power generated by the wind and solar generation equipment to the Ontario electricity grid that is accessible at a location south of Hagersville, Ontario. The transmission line will be located along Haldimand Road 20 within the municipal road right-of-way (see **Attachment A**).

The transmission line will be constructed overhead using bare aluminum conductors. They are vertically isolated from the ground via 230 kV insulators and monopole structures measuring 28 m in height. The monopole structures will be erected on concrete foundations located within the existing Haldimand Rd 20 right-of-way. The structures will be spaced approximately 200 m apart except where significant changes in line direction occur along the route. In these cases, the spacing will be closer to reduce the overhead line tension to a practical construction limit. There will also be closer spacing of the structures at the collector substation, the transition stations around Nelles Corners and the interconnect station near the transmission corridor east of Hagersville.

At a location just east of Nelles Corners (intersection of Haldimand Rd 20 and Highway 3), the overhead transmission line will make a transition to an underground cable housed within a concrete encased ductbank. The underground cable is required as the overhead transmission

line would violate safety clearances over the built infrastructure of Nelles Corners. The 230 kV ductbank would be constructed a minimum of 1.2 m below grade and be backfilled with thermal fill to dissipate heat of cable power losses throughout the ground.

The ductbank will be 700 m long and will be constructed entirely within the Haldimand Rd 20 right-of-way beneath the village of Nelles Corners. To facilitate the transitioning of the overhead transmission line to underground cable east of Nelles Corners and to the overhead line from the underground cable west of Nelles Corners, two transitioning stations will be required to be constructed.

The transitioning stations will contain an A-frame galvanized steel lattice type structure complete with 230 kV lightning arrestors. The structure will be anchored to a concrete foundation that is below the frost line. Each transitioning station will consist of a prepared area of 20 m by 20 m. It will be built on a prepared base of engineered fill and crushed stone to a depth of approximately 600 mm. A grounding grid will be built within the crushed stone and extend to 1 m beyond the 2.4 m high perimeter chain link fence for each station.

2.3.3.5 Transmission Line Interconnect Station

The 230 kV transmission line will terminate at an interconnect station located on the north side of Haldimand Rd 20, just east of the transmission corridor east of Hagersville. The transmission line overhead conductors will terminate on a termination gantry (structure) contained within the station area. The station will be enclosed by a chain link fence measuring 40 m wide x 40 m long x 2.4 m high. The station will contain two termination gantries complete with 230 kV lightning arrestors. One will be used for the termination of the 230 kV transmission line and the other will be used to facilitate Hydro One's connection of the power collection circuit to the existing transmission circuit. Each gantry will be anchored to a concrete foundation that is founded to a depth of ground below the frost line. The station will consist of a prepared area of 40 m by 40 m. It will be built on a prepared base of engineered fill and crushed stone to a depth of approximately 600 mm. A grounding grid will be built within the crushed stone and extend to 1 m beyond the 2.4 m high perimeter chain link fence.

In addition, a 230 kV isolation switch and 230 kV-1200 amp circuit breaker will be installed on a concrete foundations between the two termination gantry structures. The foundation will extend below the frost line. A small EHouse will be installed within the fenced enclosure for the station. The EHouse will be founded on concrete foundations that are constructed below the frost line. Cable vaults will be installed beneath the EHouse to facilitate control cable entry.

2.3.3.6 Interconnect Station Stormwater Management System

The interconnect station has a small footprint (less than 0.3 ha of disturbed area) and therefore requires minimal stormwater management infrastructure and no water quantity controls. Water quality control will be provided through the use of grassed swales alongside the proposed access roads that convey drainage from the site to the existing ditches alongside Haldimand Road 20.

2.3.3.7 Operations and Maintenance Building

A building will be constructed on land on the south side of Haldimand Rd 20 opposite the solar farm land area, just east of Mt. Olivet Rd (see **Attachment A**). The building will be a prefabricated engineered structure likely measuring 24 m wide by 85 m long by 7 m high. It will be founded on concrete foundations that are below the frost line. The building will be used as an operations and maintenance facility and it will likely contain several offices, employee welfare facilities, control facilities, solar farm and wind farm spare parts storage space, a public greeting centre, common areas, maintenance work area and vehicle storage facilities.

The employee welfare facilities will be supported by an aboveground potable water tank, filled by tanker trucks, as well as septic system for approximately 20 workers.

An access road to the operations and maintenance building will intersect with Haldimand Rd 20 and proceed south to the building parking area located directly south of the woodlot on the north end of the property. The outdoor vehicle and parts storage areas surrounding the operations and maintenance building will be graveled and fenced in by a 2.4 m high chain link fence.

Electrical power for the operations and maintenance facility will be provided from Haldimand County Hydro power circuits located on Haldimand Rd 20. The power will be delivered by overhead wires on overhead poles installed adjacent to the access road from Haldimand Rd 20. The overhead line will terminate on a transformer pole adjacent to the operations and maintenance building. The transformer will step down the power supply to a voltage that can be utilized within the building. The final connection of the power will be made through underground cable from the transformer pole to the building electrical service located within the building.

2.3.3.8 Operations and Maintenance Building Stormwater Management System

The operations and maintenance facility has a total area of about 3.2 ha including building storage and parking areas as well as the access road, plus a septic system and stormwater management facility. Total impervious coverage of the facility and access road footprints is expected to be about 90%. Drainage from this area is generally southerly towards the existing channel at the south property limit. Stormwater management (conveyance, treatment, and detention) will be achieved through a combination of grassed swale drainage ditches and an end-of-pipe constructed wetland stormwater management facility. While the developed drainage area is slightly less than that recommended by the MOE *Design Manual* for application of a ‘wet’ end-of-pipe facility, the relatively high degree of impervious coverage and ‘tight’ nature of on-site soils mean that the drainage area ought to generate sufficient flows to maintain a permanent pool. Drainage from the access road and operations and maintenance building/parking areas will be conveyed to the end-of-pipe facility through grassed swale drainage ditches which themselves provide water quality treatment benefits, in addition to moderate peak flow reduction. Swale runoff to the stormwater management facility will discharge into a small inlet micropool / forebay for energy dissipation and sediment retention prior to passing through the constructed wetland cell, which contains a permanent pool depth of approximately 0.3 m. The basin will provide both water quality treatment (sediment removal)

and water quantity control (discharge rate restricted to existing conditions) and will be planted with vegetation species tolerant to a variety of moisture conditions. The basin will discharge in a non-erosive fashion to the existing channel at the southern site boundary.

2.3.3.9 Water Crossings

Typical culvert requirements for any water crossings are summarized within **Section 4.5** and are described within the **Draft Water Body and Water Assessment Report**. Permits for the water crossings will be obtained from the Grand River Conservation Authority (GRCA) and Long Point Region Conservation Authority (LPRCA) prior to Project construction.

2.4 TEMPORARY COMPONENTS

Lands to be temporarily used during the construction of the Project include the temporary laydown areas paralleling the access roads and turbine locations, the turbine crane pads, the transmission construction staging and laydown area at the interconnect station, the operations and maintenance building construction staging area, and the solar land staging area. The requirements for these temporary areas including upgrades and restoration are described below and within the **Draft Construction Plan Report**. The current land use at all of these locations is agricultural.

2.4.1 Temporary Turbine Laydown Areas

Turbine laydown (prior to turbine erection) will take place adjacent to the access roads to each turbine location and has been incorporated into the Project Location design by designating a 50 m wide “constructible area” for the access roads (see **Attachment A**). Turbine components will be temporarily placed in these locations prior to erection. No site preparation is required within these laydown areas, however in locations where turbine components are temporarily stored; these areas will be restored following turbine erection to pre-existing conditions.

2.4.2 Operations and Maintenance Building and Solar Panel Construction Staging Areas

A temporary construction staging area for the construction of the Project will be located on the land south of Haldimand Rd 20 at Mt Olivet Rd where the operations and maintenance building will be located. The staging area will be located adjacent to the operations and maintenance building completely within the outer boundary of the proposed solar unit that is to be adjacent to the operations and maintenance building. The staging area will be graveled with compacted surface material suitable for vehicular truck traffic. Prior to installation of the solar unit at this staging area location, the gravel material will be removed and the site will be prepared in the same manner as the other solar unit sites (e.g. gravel road around the solar unit and grassed laneways between each row). The staging area will be approximately five acres in size and will support the following construction operations and project components:

- Portable construction and Owner’s offices and lunch rooms;

- Parking areas for Contractor, Subcontractors and Other Contractors;
- Portable generators;
- Maintenance and tool sheds;
- Water and rinsing facilities (water to be brought in by tanker);
- Equipment storage and maintenance area;
- Approved temporary fuel tanks, in properly contained spill containment structures;
- Disposal facilities for various solid wastes;
- Temporary toilet facilities – self-contained with no on-site disposal;
- Waste disposal containers;
- Laydown areas for small scale solar and wind farm materials, equipment; and,
- Laydown areas for electrical power collection materials.

During the construction of the graveled surface areas forming the construction staging area, surface material will be stripped and stockpiled for reuse (note that only the land to be used by the graveled areas will be stripped). The depth of the graveled areas will vary and will be dependent upon site conditions/requirements at the time of construction. Once the majority of Project construction is complete and the staging area is required for solar unit installation, all equipments will be removed and the area will be used for the installation of a solar unit. The stockpiled soil stripped at the beginning of construction will be replaces where the gravel pad was located.

An additional temporary staging area within the solar farm area will be constructed and removed in the same manner as described. This staging area will also be located in an area to be ultimately used for the installation of a solar unit.

2.4.3 Transmission Construction Staging and Laydown Area

A temporary construction staging area for the construction of the transmission line will be located on land on the north side of Haldimand Rd 20, adjacent to the east side of the transmission corridor, just east of Hagersville. The temporary construction staging and laydown area will be adjacent to the interconnect station. It will be a graveled compacted surface suitable for vehicular truck traffic. The staging laydown area will be approximately 2 acres in size and it will support the following construction operations and components:

- Portable construction staff lunch rooms;
- Parking areas for Contractor, Subcontractors and Other Contractors;

- Portable generators;
- Maintenance and tool storage;
- Water and rinsing facilities (water to be brought in by tanker);
- Equipment storage and maintenance area;
- Approved temporary fuel tanks, in properly contained spill containment structures;
- Disposal facilities for various solid wastes;
- Temporary toilet facilities – self-contained with no on-site disposal;
- Waste disposal containers;
- Laydown areas electrical power collection materials.

During the construction of the graveled areas for the transmission construction staging area, surface material will be stripped and stockpiled for reuse when the Project is completed. The depth of the graveled areas will vary and will depend on site conditions/requirements at the time of construction. Once construction is complete, equipment will be removed including the graveled areas. The stockpiled soil stripped at the beginning of construction operations will be returned to its original location.

2.5 PROJECT ACTIVITIES

A description of the key construction, operation, and repowering/decommissioning phases of the Project are provided in Table 2.3.

Table 2.3: Key Project Activities

Project Phase	Activities
Construction	**Turbine and Solar Sites**
	Delineation of temporary work areas
	Access road construction
	Completion of necessary site grading
	Installation of tower and panel foundations
	Installation of crane pads
	Tower/turbine erection and panel installation
	Installation of step-up transformer and required wiring
	Installation of collector lines, usually parallel to access roads
	Reclamation of temporary work areas
	Site landscaping (final grading, topsoil replacement, etc.)
	Substation Site
	Preparation of laydown area
	Installation of substation and connection with grid

Table 2.3: Key Project Activities

Project Phase	Activities
	Construction of operations and maintenance building
	Reclamation of temporary work areas
	Off-Site Activities
	Installation of collector lines and transmission line in municipal road right of way
Operation	**Turbine and Solar Sites**
	Preventative maintenance
	Unplanned maintenance
	Meter calibrations
	Grounds keeping
	Substation Site
	Preventative maintenance for substation
	Unplanned maintenance for substation
	Remote wind farm condition monitoring
	Operations and maintenance building maintenance
	Off-Site Activities
	Electrical line maintenance
Decommissioning	**Turbine and Solar Sites**
	Removal of turbine and solar panel infrastructure
	Removal of step-up transformer
	Site grading (dependent upon new proposed use)
	Possible removal of access roads dependent upon agreement with property owner
	Possible excavation and removal of collector lines depending upon agreement with property owner
	Off-Site Activities
	Possible removal of collector system and transmission line in municipal right of way (remove wires and poles)
	Disconnection of substation from provincial grid
	Removal of substation
	Removal of operation and maintenance building, dependent upon agreement with property owner

3.0 Summary of REA Documents

In accordance with Section 17.(1)3. of O. Reg. 359/09, the following is a summary of each document that is being provided as part of SPK's REA application (with the exception of the Consultation Report as it is currently ongoing in its preparation). Each document summarized below was prepared in accordance with O. Reg. 359/09. The reports were also prepared in accordance with the MOE's draft Technical Bulletins (March 2010) and the MNR's APRD requirements when available for the specific report.

Section 4.0 of this document provides a summary of the potential environmental effects, mitigation measures, and monitoring/contingency measures that have been identified within each of the following reports summarized below.

3.1 PROJECT DESCRIPTION REPORT

The Draft Project Description Report provides an overall view of the Project along with details regarding the type of energy, facilities, equipment, and technology to be used. This includes detailed descriptions of Project components such as the turbines, solar panels, electrical components, access roads, water crossings, operation and maintenance building, stormwater management systems, and temporary construction areas.

The activities to be engaged in including an overall Project schedule is provided along with the regulatory framework of the Project including the other permits and approvals that apply to the Project outside of the REA process. As described in the Draft Project Description Report, construction is scheduled to commence in March 2012 with commercial operation slated for March 2013. It is anticipated that the wind and solar farm would have a useful operating life of approximately 20-25 years without significant upgrades and/or machinery replacement.

A description of the potential environmental effects is included in the report which summarizes the potential effects during the construction, operation, and decommissioning phases of the Project. Mapping of the Project Location with various natural heritage features is also appended to the report.

3.2 CONSTRUCTION PLAN REPORT

The Draft Construction Plan Report details the construction phase of the Project. This includes detailed descriptions of the construction and installation activities, the location, timing and duration of construction activities, the potential adverse effects as a result of constructing the Project, and the proposed mitigation and monitoring measures.

A description of the Project components along with a detailed description of the materials and construction equipment to be brought on site is provided. The process for constructing/installing facility infrastructure is also provided including any temporary uses of lands and waste

management procedures. Mapping of the Project Location during the construction phase of the Project in relation to natural features is also provided.

The construction of the Project is anticipated to have few net adverse effects on the environment, provided the prescribed protective and mitigation measures are properly applied. Generally, the adverse effects remaining after protective and mitigation measures are applied are localized, short-term in duration, and intermittent. A construction environmental management plan and construction monitoring plans/procedures would be implemented in a manner that is consistent with applicable municipal, provincial, and federal standards and guidelines. The construction environmental management plan would be comprised of a series of procedures covering all critical construction and environmental management tasks including mitigation measures, which would be developed based on the information provided in the REA reports. The monitoring plans would address bedrock excavation, terrestrial habitats, groundwater, aquatic habitats, agricultural lands, public roads, air quality and dust.

3.3 DESIGN AND OPERATIONS REPORT

The Draft Design and Operations Report provides a description of the design of the facility along with the operational/maintenance plans, the potential environmental effects of operating the facility, the environmental effects monitoring plan, and the communications and emergency response plan.

A Site Plan is appended to the report which illustrates Project components and natural features along with applicable setbacks to the features. The facility design plan provides a written description of the project components identified in the Site Plan. This includes a description of the turbines, solar panels, electrical infrastructure, access roads, and the operation and maintenance building. In addition to the site plan, appended to the report are five separate studies related to the operation of the facility:

- Stormwater Management Plan
    - The purpose of this plan is to implement measures that control stormwater runoff from the various Project components.
- Noise Assessment Report
    - The Noise Assessment Report provides an estimation of the noise levels that would be generated by the Project. The report compares the predicted noise levels to the appropriate guidelines to ensure prescribed limits are met.
- Environmental Effects Monitoring Plan
    - The Environmental Effects Monitoring Plan for wildlife and wildlife habitats detail the proposed mitigation, monitoring methods and contingency plans for the Project during operation. Contingency plans that have been proposed in the

event of higher than predicted mortality levels include operational controls such as periodic turbine shutdown.

- Property Line Setback Assessment
  - In accordance with Section 53 of O. Reg. 359/09, all turbines must be located at least 100 m (hub height) from the nearest non-participating property line. When this setback is not achievable, a setback of 59 m (blade length plus 10 m) can be utilized with the completion of a written assessment of the potential effects and preventative measures associated with the turbine location. As such, written assessments have been prepared for turbines that have utilized a minimum setback of 59 m but are closer than 100 m to the nearest non-participating property line.
- Analysis of Potential Health Effects of Wind Turbines
  - Overall, it is the opinion of SPK that the operation of the Project will not lead to adverse human health effects. This statement is based on the analysis provided in the Analysis of Potential Health Effects of Wind Turbines which provides a comprehensive review of information related to the potential effects to human health and safety as a result of wind farm operation.

The facility operations plan describes the various ongoing activities including daily operation of the Project. The potential environmental effects and mitigation measures associated with Project operation is also provided (a summary of the key findings are provided in Section 4.0). The environmental effects monitoring plan identifies the environmental management systems, programs, plans and procedures such as occupational health and safety, and the monitoring requirements and contingency measures. This includes monitoring of features such as terrestrial habitats and significant natural features, birds/bats, surface water features and aquatic habitat, environmental noise and public health and safety, local expenditures, and community relations.

The final component of the Draft Design and Operations Report identifies the emergency response and communications plans including the complaint response protocol to be followed to address any concerns or questions from Project stakeholders. These plans would be implemented during all Project phases.

Provided the prescribed protective and mitigation measures are properly applied to the environmental features discussed, in conjunction with the monitoring plans and contingency measures, the operation phase of the Project is anticipated to have few net adverse effects on the environment. Generally, the net adverse effects remaining after protective and mitigation measures are applied are localized, short-term in duration, and intermittent and are associated with maintenance activities. Further, the Project would positively contribute economic resources to the community, while not contributing green house gases.

3.4 DECOMMISSIONING PLAN REPORT

The Draft Decommissioning Plan Report provides a description of the plans for the decommissioning of the Project including:

- pre-dismantling procedures,
- procedures for equipment dismantling and removal,
- activities related to the restoration of land affected by the Project, procedures for managing excess materials and waste, and
- the removal of all components from the sites.

A description of the decommissioning process is also provided in the event that SPK cannot successfully complete the construction of the Project (e.g. due to financial considerations).

The components used for the Project have a typical operational lifespan of approximately 25 years. At the end of the equipment's useful life, the Project components are expected to be decommissioned. If Project economics and need remain viable at that time, the facility could be "repowered" with new technology. This process may include the replacement and/or upgrading of Project components, however specific details are unknown at this time as technological improvements over the next 20+ years are currently unknown. It should be noted that the Project proponent has a decommissioning bond available at commencement of construction for each of the land owners to remove works from their private property, in the unlikely event that such action is necessary. The costs for removal of Project infrastructure would be the responsibility of the owner of the Project or the purchaser of the reusable materials.

At the time of decommissioning, the restoration plan would be updated as necessary based on the standards and best practices at the time of decommissioning, and in consultation with the landowner and appropriate regulatory and government bodies. The decommissioning plan would involve restoration of agricultural lands, areas not in agricultural production, municipal road allowances and water crossings, contingency measures for potential contamination, and a monitoring period which allows for the Project area to experience seasonal changes and help determine if additional restoration is required.

3.5 WIND TURBINE SPECIFICATIONS REPORT

The Draft Wind Turbine Specifications Report provides specification information on the wind turbine model to be used for the Project, including the make, model, name plate capacity, hub height above grade, rotational speeds and acoustic emissions data, including the sound power level and frequency spectrum, in terms of octave-band power levels.

3.6 NATURAL HERITAGE ASSESSMENT AND ENVIRONMENTAL IMPACT STUDY

The Draft Natural Heritage Assessment and Environmental Impact Study (NHA/EIS) has been prepared in accordance with Sections 24 through 28, 37 and 38 of O. Reg. 359/09. The report identifies the existence and boundaries of all natural features within 120 m of the Project Location based on a review of background records and site investigations. Where the Project Location is within 120 m of natural features, the report provides an evaluation of significance for each identified feature based on either an existing MNR designation of the feature, or by using evaluation criteria or procedures established or accepted by the MNR. An EIS is required for significant natural features that are found within 120 m of the Project Location. The EIS identifies and assesses potential adverse environmental effects and identifies mitigation measures in accordance with Section 38 of O. Reg. 359/09.

Natural heritage information collected from the records review, the site investigations and consultations were analyzed to determine the significance and sensitivity of existing ecological features and functions. Significant natural features identified within 120 m of the Project Location through the records review process and site investigations included wetlands, woodlands, and wildlife habitat.

It was concluded that once the prescribed protective, mitigation and compensation measures are applied to the environmental features discussed in the report, the construction and operation of the Project is expected to have minimal net adverse effects on the significant features and functions identified through the Natural Heritage Assessment process.

3.7 WATER ASSESSMENT AND WATER BODY REPORT

The Draft Water Assessment and Water Body Report provides the results of the records review, site investigations, and impact assessment conducted in accordance with sections 29-31, 39 and 40 of O. Reg. 359/09. For the records review, MNR data indicated there are numerous watercourses and waterbodies within 120 m of the Project Location.

Site investigations were carried out by Stantec to locate and delineate, within 120 m of the Project Location, water bodies as defined in O. Reg. 359/09. Potential water bodies were identified through a review of aerial photographs of the site and MNR data. While on site, the field crew used visual inspections to verify the presence or absence of potential water bodies within 120 m of the Project Location.

Site investigations determined that several water bodies are within 120 m of the Project Location. Fish species were identified at these locations and a general habitat assessment was conducted to identify areas of direct and indirect fish habitat.

It was concluded that with the proposed environmental mitigation measures, in-water work would potentially affect a total of eleven water bodies containing direct fish habitat and an additional seventeen water bodies that contribute indirectly to fish habitat. DFO Authorization

may be required due to access road culvert crossings and underground collector line installation associated with the wind components of the Project. None of the proposed activities associated with the solar and transmission components (including substation and maintenance building) of the Project are expected to result in net impacts to water bodies and fish habitat.

3.8 ARCHAEOLOGICAL AND HERITAGE REPORT

The Archaeological and Heritage Reports (listed below) identify and assess potential impacts to protected properties, built heritage features and cultural heritage landscapes, and archaeological resources near the Project Location:

- Stage I and II Archaeological Assessments;
- Heritage Impact Assessment; and
- Preliminary Protected Properties Assessment

The results of the Stage 1 Archaeological Assessment indicated that most of the proposed Project Location demonstrated the potential for the presence of significant and intact archaeological resources. During the completion of the Stage II Archaeological Assessment, a total of 128 archaeological sites were located within or adjacent to the Project Location.

A total of 609 potential built heritage resources and 36 cultural heritage landscapes were identified within or adjacent to the general Project area (not specifically within the Project Location). Ten (10) designated properties were also found in the general Project area.

4.0 Summary of Potential Environmental Effects

The effects of constructing, operating, and decommissioning a wind farm, solar project and transmission system are well understood and can be mitigated through established and accepted techniques and practices.

Based upon agency guidance and Stantec's understanding of the potential effects of constructing, operating, and decommissioning the proposed Project, the following Project-specific issues and potential effects have been identified and are further analyzed as part of the Renewable Energy Approval (REA) application process. The following is a summary of the potential effects during the construction, operation, and decommissioning of the Project. Detailed descriptions of all potential effects, mitigation measures, and monitoring plans are provided in the above noted reports.

4.1 HERITAGE AND ARCHAEOLOGICAL RESOURCES

A Stage I and II Archaeological Assessment has been completed for the Project and is provided in the **Archaeological and Heritage Report**. In addition, a Built Heritage and Cultural Landscape Inventory Draft Report and a Protected Properties Assessment Draft Report have also been completed for the Project and are provided in the **Archaeological and Heritage Report**.

The results of the Stage 1 Archaeological Assessment indicated that most of the proposed Project Location demonstrated the potential for the presence of significant and intact archaeological resources. During the completion of the Stage II Archaeological Assessment, a total of 128 archaeological sites were located within or adjacent to the Project Location.

A total of 609 potential built heritage resources and 36 cultural heritage landscapes were identified within or adjacent to the general Project area (not specifically within the Project Location). Ten (10) designated properties were also found in the general Project area.

Archaeological resources located during the course of on-site archaeological assessments will be documented and/or removed (as appropriate) from the Project Location prior to construction in accordance with Ministry of Tourism and Culture guidelines. As such, there are no anticipated significant effects to known archaeological resources during the construction of the Project. Project related works such as construction activities will avoid the built heritage and cultural resources and protected properties and resources where possible, thus no there are no anticipated significant effects to these features. Additional information is provided within the **Archaeological and Heritage Report.**

4.2 NATURAL HERITAGE RESOURCES

Natural features which were considered in the assessment of potential effects included species at risk, wildlife, habitat, wetlands, sensitive areas, migratory and breeding birds, and bats. The potential effects along with proposed mitigation measures are described in the **Draft Construction Plan Report**, **Draft Design and Operations Report**, and the **Draft NHA/EIS**. Additional baseline information regarding significant natural features such as significant wildlife habitat and significant woodland based upon records reviews and site investigations are provided within the **Draft NHA/EIS**.

An assessment of how the Project may cause potential effects was conducted and some of the identified potential effects ranged from, but were not limited to, construction activities such as vegetation clearing; installation of turbines, installation of solar panels, access roads, accidental spills; and turbine operation.

The following provides a summary of the key findings within the **Draft Construction Plan Report**, **Draft Design and Operations Report**, and the **Draft NHA/EIS** related to natural features within the Project Location and Zone of Investigation. Where natural features are within the Zone of Investigation, additional analysis is provided in the **Draft NHA/EIS**.

4.3 WILDLIFE AND WILDLIFE HABITATS

4.3.1 Construction and Decommissioning

There is some potential for disturbance to wildlife during construction of the wind, solar and electrical transmission components as a result of the limited amount of vegetation removal, increased human activity and increased traffic, noise and dust.

Overall, the total area of vegetation clearing (1.72 ha) will represent a very small proportion of the habitat in the overall study area , and any wildlife that will be displaced will have adequate habitat alternatives. Disturbance effects are expected to be short-term in duration and spatially limited to the work areas and their immediate vicinity.

Some limited mortality is possible, however potential long-term effects to wildlife populations from this mortality and from barrier effects is anticipated to be minimal because of the temporary nature of the increased traffic activity.

4.3.2 Operation

There is some potential for disturbance to wildlife during construction of the wind, solar and electrical transmission components as a result of the limited amount of vegetation removal, increased human activity, increased traffic, noise, and collisions with turbines.

The installation of the fence around the solar area may disrupt animal movement; however a corridor has been maintained across the site to allow deer to move freely in an east-west direction. Small rodents, amphibians, and mammals will be able to cross the site.

An Environmental Effects Management Plan for Wildlife and Wildlife Habitats (see **Draft Design and Operations Report**) will be implemented which includes post-construction monitoring plan for mortality monitoring and disturbance effects monitoring for birds through point count and transect studies.

The MNR, along with the proponent and other relevant agencies, will collectively review the results of the post-construction disturbance effects monitoring to determine if an ecologically significant disturbance/avoidance effect to birds or amphibians is occurring, and whether such effect is attributed to the Project and not external factors. These discussions will determine whether contingency measures, which may include operational controls, will be undertaken.

Most North American studies have shown that direct bird mortality attributable to wind facilities is low, especially when compared to other anthropogenic structures (Arnett et al., 2007; Kingsley and Whittam, 2007; National Academy of Sciences, 2007), and for birds, is not expected to be significant at a population level (Arnett et al., 2007). Mortality of bats is anticipated to be focused in late summer and to primarily affect migratory species.

Potential effects and mitigation measures associated with endangered and threatened species are being addressed as part of a separate process in conjunction with the MNR. Where potential effects indicate that approvals or permits are required for endangered and threatened species, these will be addressed separately through the applicable statute and corresponding permit and approval process.

4.4 WETLANDS AND WOODLANDS

4.4.1 Construction and Decommissioning

All components of the Project (turbines, access roads, substation etc.) are located outside of all wetland boundaries. While the majority of the Project infrastructure has been sited outside of significant woodlands, there is one new access road and turbine within a plantation, one access road along an existing farm laneway through a deciduous forest and three buried collector lines proposed along existing farm laneways through significant woodlands. Additional Project components (e.g. turbines, access roads and corresponding buried collector lines) are found within 120 m of significant woodlands and as a result, potential impacts and mitigation measures are detailed in the **Draft NHA/EIS**. Proposed clearing will result in the removal of approximately 1.72 ha of plantation in areas identified as significant woodland (please see **Draft NHA/EIS**).

Though the effects are anticipated to be minimal, there is some potential for disturbance of natural features during construction of the wind, solar and electrical transmission components as a result of the limited removal of vegetation and increased human activity, traffic, noise and dust. However, these effects are expected to be short-term in duration and spatially limited to the work areas and their immediate vicinity. The relatively small amount of woodland to be removed represents a very small proportion of the available habitat in the NHA/EIS Study Area

and is not anticipated to have a significant effect on the ecological functions these features support.

Setbacks from wetlands and mitigation measures for infrastructure within 30 m of wetlands will ensure that there is no disruption of wetland function and no net loss of wetland area.

4.4.2 Operation

As stated above, all components of the Project are located outside of all wetland boundaries and the majority of components have been sited outside of significant woodlands. During operation of the Project, some materials such as lubricating oils and other fluids associated with turbine maintenance have the potential for discharge to the on-site environment through accidental spills resulting in a potential impact to natural features. Improper disposal of wastes (fluids, containers, cleaning materials) could also have an adverse impact on the features. With the implementation of good maintenance practices, it is anticipated any potential effects from an accidental spill would be short term in nature and have little to no effect.

Stormwater management systems will also be incorporated into the Project design to ensure that natural flow patterns and hydrological functions of wetlands and woodlands are not adversely impacted during operation of the Project. Where required, contingency measures will be developed on a site-specific basis that may include installation of additional culverts or other stormwater management systems to maintain pre-construction flow patterns.

An Environmental Effects Management Plan for Wildlife and Wildlife Habitats (see **Draft Design and Operations Report**) will be implemented which includes post-construction monitoring plan for visual observations of wetland and woodland hydrology to ensure proposed culverts beneath access roads will convey flows and avoid flooding that may impact such features.

Disturbance effects to the wildlife inhabiting the wetlands and woodlands are addressed in Section 4.3.1. The dust and disturbance to vegetation as a result of maintenance vehicle traffic is expected to be negligible due to the infrequency of traffic.

4.5 WATER BODIES AND AQUATIC RESOURCES

Potential effects to surface and ground water features were assessed for all stages of Project development and all Project components.

There is potential for groundwater to be encountered during the installation of the turbine foundations, turbine access roads, underground collector lines, solar panel foundations, solar panel access roads, transmission line tower foundations, substation, and operations and maintenance building. As such, it is possible that some dewatering activities may be required when installing these Project components. All water pumped during dewatering activities will be directed away from natural features and not directly into wetlands. Due to the dominance of clay soils within the Project Location, seepage is anticipated to be nominal and controllable with standard sump pumps and is anticipated to be below the permitting threshold of 50,000 L/day.

Some materials, such as fuel, lubricating oils and other fluids associated with turbine construction and maintenance have the potential for discharge to the on-site environment through accidental spills. With the implementation of good construction and maintenance practices, it is anticipated any potential effects from an accidental spill would be short term in nature and have little to no effect on surface and/or groundwater quality and adjacent private water wells.

Where culverts are required for watercrossings, culverts will be designed and installed such that there is no restriction of flows through the culvert resulting in upstream pooling, no erosion at the culvert inlets and outlets, and that there is no barrier to fish passage to upstream environments. Mitigation measures, including adherence to timing windows will be implemented for construction activities within and near watercourses to protect fish and fish habitat from potential effects. Culverts will be sized according to hydrologic requirements and will be determined during the permit application stage with the conservation authorities. Stormwater management systems will be incorporated into the Project design to ensure that natural flow patterns and hydrological functions of wetlands and woodlands are not adversely impacted during operation of the Project. Where required, contingency measures will be developed on a site-specific basis, and may include installation of additional culverts or other stormwater management systems to maintain existing flow patterns.

An evaluation of the site's erosion potential is considered to be 'low' (as described in the **Draft Design and Operations Report**), owing primarily to the flat character of the area and the low erodibility of Haldimand / Lincoln clay soils. Instances where the potential for erosion is identified, erosion control measures will be implemented to protect surface water features from experiencing sediment transport and/or siltation.

4.6 AIR, ODOUR, DUST

4.6.1 Construction and Decommissioning

Construction and decommissioning activities will rely on the utilization 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.

Additionally, construction and decommissioning related traffic and various construction activities (e.g. excavation, grading, and exposed areas) have the potential to create short-term nuisance dust effects in the immediate vicinity of the Project.

Traffic delays also result in increased emissions from vehicles traveling slowly through construction zones. The delivery of materials to construction sites can also generate significant emissions, especially for sites that are relatively far from material manufacturers.

The application of recommended mitigation measures during construction and decommissioning (contained within the **Draft Construction Plan Report**) should limit fugitive dust and odour

emissions to the work areas and limit combustion emissions. As a result, any adverse net effects are expected to be short-term in duration and highly localized.

4.6.2 Operation

During operations, minor localized air emissions would occur from the periodic use of maintenance equipment to repair Project infrastructure over the life of the Project and from personnel vehicles and waste management haulers travelling to and from the operations and maintenance building during regular business hours.

The application of recommended mitigation measures during operations (contained within the **Draft Design and Operations Report**) 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 during operation of the Project are anticipated to be short-term in duration and highly localized.

4.7 ENVIRONMENTAL NOISE

4.7.1 Construction and Decommissioning

During construction and decommissioning, noise will be generated by the operation of heavy construction equipment at each of the work areas and associated vehicular traffic on-site. The audible noise at receptors beyond the construction areas is expected to be a minor, short-term disruption consistent with noise generated by any construction project.

The application of recommended mitigation measures during construction and decommissioning (contained within the **Draft Construction Plan Report**) should limit noise emissions to the general vicinity of the work areas. Any net effects are expected to be limited to short-term, intermittent noise increases during daylight hours at the work areas and/or along the haul routes.

4.7.2 Operation

Mechanical and aerodynamic sound would be emitted from the wind turbines and their associated transformers. All turbines proposed as part of the Project are located at a distance of at least 550 m from the nearest non-participating noise receptor. In addition, a Noise Assessment Report has been completed for the Project in accordance with the MOE "*Noise Guidelines for Wind Farms*", dated October 2008 and O.Reg 359/09, and is provided as an appendix in the **Draft Design and Operations Report**.

The solar panels themselves do not generate sound; however the two associated inverter panels will generate sound. Additional sound will be generated by the solar step up (SSU) pad-mounted transformer and the Project's collector substation.

During operation of the Project, sound would be generated by the periodic use of maintenance equipment, personnel vehicles and waste management haulers traveling to and from the operations and maintenance building.

Based upon the Project design, the analysis carried out in the Noise Assessment Report indicates that sound produced by the Project was found to be within the acceptable limits established by the MOE at all noise receptors. The analysis includes the combined impacts of the substation, solar components, wind turbines, and other wind turbines within a three kilometre radius. The Noise Assessment Report has been completed for the Project in accordance with the MOE "*Noise Guidelines for Wind Farms*", dated October 2008 and O.Reg 359/09, and is provided as an appendix in the Design and Operations Report.

4.8 LAND USE, RESOURCES AND INFRASTRUCTURE

4.8.1 Construction and Decommissioning

There are no anticipated net effects related to land use, resources and infrastructure as a result of construction of the wind, solar, and electrical transmission components of the Project. The Project's effect on the rural community during construction, including the temporary suspension of recreational uses, traffic, and some disturbance to adjacent land uses, will be temporary and will be minimized through the implementation of good site practices, transport planning (including the development of a Traffic Management Plan), and good communication with the community. Road safety is not expected to be an issue during the construction phase; however, the potential for accidents along the haul routes and on-site cannot be totally avoided.

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 and participating landowners. The County would receive ongoing property tax income and participating landowners would receive land lease payments. A nominal increase in municipal services is possible. Existing businesses within local communities could benefit from the demands of the Project workforce during construction.

4.8.2 Operation

Disturbances to agricultural lands and operations are expected to be temporary and spatially limited. With the application of recommended mitigation measures during operation (contained within the **Draft Design and Operations Report**) no adverse net effects on telecommunications and radar networks are anticipated during operation of the facility. No net effects are anticipated to provincial and local infrastructure during operation of the Project. Some disturbance to the viewscape is unavoidable due to the height of the turbines, the solar panels, the size of the operations and maintenance building and location of the transmission line. Application of mitigation measures such as a berm and buffer area around the solar are will assist in minimizing the potential visual obtrusiveness of the Project. The changed visual landscape would be present during the life of the facility.

A positive net effect is anticipated on the local economy during operations of the facility. The operation of the Project would provide positive income, employment, and fiscal benefits to the local area, including the County and participating landowners. The County would receive ongoing property tax income from the Project and participating landowners would receive land lease payments.

4.9 TRAFFIC AND ROAD USAGE

4.9.1 Construction and Decommissioning

Abnormal wear (e.g. rutting) on municipal roads may be unavoidable. However, the effect of constructing the various Project components is anticipated to have a limited, short term effect on local roads given SPK's commitment to developing maintenance and/or repair plans or agreements with Haldimand County. Truck traffic would increase on some roads during Project 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 due to the implementation of a Traffic Management Plan (details provided within the **Draft Construction Plan Report**); however, the potential for accidents along the haul routes and on-site cannot be totally avoided.

The effect of constructing the various Project components is anticipated to have a limited, short term effect on traffic during construction and will also be managed through the implementation of the Traffic Management Plan and with agreements made with Haldimand County.

4.9.2 Operation

Road safety is not expected to be an issue during operations; however the potential for accidents along the haul routes and on-site cannot be totally disqualified. Truck traffic would increase on some roads during maintenance activities and from personnel vehicles, and waste management haulers, however this traffic would be short-term in duration and intermittent.

The effect of operating the Project is anticipated to have a limited, short term effect on traffic only during non-conventional load movements.

4.10 PUBLIC HEALTH AND SAFETY

4.10.1 Construction and Decommissioning

During construction/decommissioning, potential effects to public health and safety are largely in the form of increased construction related traffic and unauthorized access of the public to the work sites.

The application of recommended mitigation measures (contained within the **Draft Construction Plan Report**) including implementing transportation planning and safety measures during construction, and controlling land access to the construction sites would minimize the potential for public health and safety concerns. A detailed Traffic Management Plan and Health and

Safety/Emergency Response Plan will be prepared and implemented by the Construction Contractor (details provided within the **Draft Construction Plan Report**).

4.10.2 Operation

4.10.2.1 Wind Component

With the implementation of appropriate operations protocols and routine maintenance there is minimal increased or new risk to public health and safety from the operation of the Project. In addition, under O. Reg. 359/09, minimum setback requirements (which this Project meets) were introduced specifically to ensure the protection of people and the environment from wind farm projects. An extensive review of potential effects to public health and safety as a result of environmental noise, low frequency noise, infrasound, shadow flicker, electric and magnetic fields, and stray voltage is provided within the **Draft Design and Operations Report**. With the implementation of appropriate operations protocols there is minimal increased or new risk to public health and safety from the operation of the Project.

4.10.2.2 Solar Component

The operation of the solar panels does not pose a threat to human and environmental health and safety as no emissions are produced. For public safety reasons, a 2.4 m high chain link fence will be installed around the entire perimeter of the solar farm to prevent unauthorized access to the solar panel area.

With the implementation of appropriate operations protocols and fencing around the solar panels, there is minimal increased or new risk to public health and safety from the operation of the Project.

4.10.2.3 Electrical Transmission Component

A review of potential effects to public health and safety as a result of Electromagnetic Fields is provided within the **Draft Design and Operations Report**. With the understanding that the Project will operate well within the range of voluntary standards in North America, and that the potential health effects from Electromagnetic Fields remain inconclusive, no adverse net effects on human health are expected from operation of the Project. A fence will be installed around the substation and interconnect station in order to limit the proximity to which members of the public may approach these facilities.

4.11 WASTE MATERIAL DISPOSAL

4.11.1 Construction and Decommissioning

During construction, the Construction Contractor would implement a site-specific waste collection and disposal management plan. The plan may include practices for the systematic collection and separation of waste materials within on-site storage areas, labelling and proper

storage of hazardous and liquid wastes, and disposal of non-hazardous waste at a registered waste disposal site(s).

There will be no on-site disposal of waste generated by the Project. It is assumed that licensed waste disposal sites are compliant with Provincial and County regulations.

With the application of recommended mitigation measures (contained within the **Draft Construction Plan Report**) no adverse net effects are anticipated from waste material.

4.11.2 Operation

During operations, SPK and/or the Operation and Maintenance Contractor would implement a site-specific waste collection and disposal management plan, which will include good site practices such as: the systematic collection and separation of waste materials within on-site storage areas, contractors would be required to remove all waste materials from Project sites during maintenance activities, and implementation of an on-going waste management program consisting of reduction, reuse, and recycling of materials.

With the application of the mitigation measures (contained within the **Draft Design and Operations Report**), no adverse net effects from waste material disposal would occur on-site during operation. However, as with all wastes, it is possible that disposal would have a minor incremental effect on soil, groundwater, and surface water at the waste disposal site(s) depending on municipal on-site containment practices and quality of the landfill protection mechanisms (e.g. use of geotextiles to contain leachate). It is assumed that licensed waste disposal sites are legally compliant.

4.12 ACCIDENTS AND MALFUNCTIONS

Though the possibility of injury from full or partial blade detachment from the turbine or collapse of the entire structure exists, the likelihood of this happening with the built in safety features to the structures and ongoing maintenance of the equipment is very low. In accordance with O. Reg. 359/09, the turbines are located at least the minimum regulated setback distance from any receptor and the event of a failure of the structure would likely not fall beyond the setback distance and not affect public health and safety.

There is the potential for exposure to toxic vapours should a fire consume the solar panel. However, given the melting points of the potentially harmful substances within the photovoltaic cells (Fthenakis, 2003) and the lack of burnable materials in a solar panel, the risk of fires and the generation of hazardous fumes are extremely limited.

It is anticipated that the probability of transmission structure failure occurring during operation is low, i.e., one occurrence in 150 years. The transmission and collector lines will be designed and constructed in accordance with applicable regulatory guidelines (e.g. International Electrical Commission standards) minimizing the risk of tower failure.

SPK and the Operation and Maintenance Contractor would aim to minimize accidents and malfunctions with proper training and education of staff operating the control system. County emergency response staff would also be trained to appropriately deal with any potential accidents and malfunctions resulting from the operation of the turbines.

With the implementation of an Emergency Response Plan which would include protocols for the proper handling of material spills and procedures to be undertaken in the event of a spill no adverse net effects are anticipated from spills during the Project.

4.13 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Though the possibility of injury from ice fall from the turbine tower or blades, the likelihood of this happening with the built in safety features of the structures and ongoing maintenance of the equipment if very low. In addition, in accordance with O. Reg. 359/09, the turbines are located at least the minimum regulated setback distance from any receptor and falling ice would likely not travel beyond the setback distance and thus not affect public health and safety.

4.14 AREAS PROTECTED UNDER PROVINCIAL PLANS AND POLICIES

The Project does not fall within any parts of land protected under the following provincial plans: Greenbelt Plan and *Greenbelt Act*, Oak Ridges Moraine Conservation Plan Area, Niagara Escarpment Plan Area, and the Lake Simcoe Watershed Plan Area.

4.15 MONITORING AND CONTINGENCY PLANS

The monitoring program is designed to allow SPK and/or the Operation and Maintenance Contractor to monitor and assess the effectiveness of the proposed management measures/mitigation measures and to verify compliance of the Project with O. Reg. 359/09.

SPK and/or the Operation and Maintenance Contractor would be the primary organization responsible for the implementation of the operational monitoring and contingency planning measures.

4.15.1 Terrestrial Habitats and Significant Natural Features

Operational activities that have the potential to affect terrestrial flora and fauna (other than birds or bats) include equipment operation and accidental spills and/or leaks. Stringent monitoring of these activities is necessary to ensure these features are protected.

As appropriate, records of vehicle maintenance would be retained and made available for periodic review by SPK and/or the Operation and Maintenance Contractor. All vehicles involved in maintenance activities must be maintained in good operating condition; all vehicles identified through the monitoring program that fail to meet the minimum emission standards would be repaired immediately or replaced as soon as practicable.

Monitoring would be required following the unlikely event of contamination from an accidental spill or leak (method for monitoring may be developed in consultation with the Spills Action Centre of the MOE). Contaminated soils would be removed and replaced as appropriate.

The Environmental Effects Monitoring Plan for Wildlife and Wildlife Habitats outlines the post-construction monitoring program and the performance objectives and contingency measures should various objectives not be met. Post-construction monitoring for terrestrial habitats and significant natural features during the first two years of operation will consist of:

- Visual monitoring for changes to hydrological conditions in wetlands and significant woodlands, weekly during construction and seasonally for one year following construction.

Additional monitoring of winter wildlife and vegetated buffer areas is proposed within the **Draft NHA/EIS** to confirm that the proposed mitigation measures are functioning appropriately. The MNR, along with the proponent and other relevant agencies, will collectively review the results of the post-construction disturbance effects monitoring to determine if an ecologically significant disturbance/avoidance effect to amphibians is occurring, and whether such effect is attributed to the Project and not external factors. These discussions will determine whether contingency measures, which may include operational controls, will be undertaken.

4.15.2 Birds and Bats

The Environmental Effects Monitoring Plan for Wildlife and Wildlife Habitats outlines the post-construction monitoring program, the performance objectives and contingency measures should the performance objectives not be met. Post-construction monitoring for birds and bats during the first two years of operation will consist of:

- Mortality monitoring of breeding birds, migratory land birds, migratory raptors and bats in accordance with the MNR bird and bat guidelines;

- A point count-based study to assess disturbance effects to declining forest breeding birds (Feature 42);

- A transect-based study to assess disturbance effects to migratory land birds resulting from wind turbine operation during migration

Bird and bat mortality monitoring will be conducted according to MNR's *Birds and Bird Habitats: Guidelines for Wind Power Projects* (August, 2010) and *Bats and Bat Habitats: Guidelines for Wind Power Projects* (March, 2010). Post-construction monitoring for disturbance effects would occur for one year pre-construction and two years post-construction.

Operational mitigation is required where annual post-construction mortality monitoring exceeds 10 bats per turbine per year (MNR, 2010). Post-construction mitigation, including operational controls, will be considered if annual mortality of birds exceeds 18 birds/ turbine/year at individual turbines or turbine groups; 0.2 raptors or vultures/turbine/year or 0.1 raptors of

provincial conservation concern/turbine/year across the wind power project, or if bird mortality during a single mortality monitoring survey exceeds 10 or more birds at any one turbine or 33 or more birds (including raptors) at multiple turbines.

MNR, along with the proponent and other relevant agencies, will collectively review the results of the post-construction disturbance effects monitoring to determine if an ecologically significant disturbance/avoidance effect to birds or amphibians is occurring, and whether such effect is attributed to the Project and not external factors. These discussions will determine whether contingency measures, which may include operational controls, will be undertaken.

4.15.3 Surface Water Features and Aquatic Habitat

Operational activities that have the potential to affect aquatic habitat includes accidental spills and/or leaks. Proper storage of materials (e.g. maintenance fluids) within proper storage containers at the operations and maintenance building will reduce the potential for accidental spills and/or leaks.

Appropriate remedial measures may be completed as necessary and additional follow-up monitoring conducted as appropriate in the event of an accidental spill and/or leak. The level of monitoring and reporting would be based on the severity of the spill/leak and may be discussed with the MOE Spills Action Centre and the MNR. Additional site specific habitat enhancement measures, and associated fish community and benthic invertebrate monitoring may be required to demonstrate no net effects as a result of an accidental spill or leak.

If *Fisheries Act* approvals are required from DFO, some monitoring may be required that will be stated in the DFO Authorization. Monitoring typically includes photographic records during construction and for two to five years after the completion of construction. If significant habitat enhancement or compensation measures are required, monitoring may also include assessments of the fish community and habitat use.

4.15.4 Public Roads

For a period of one year after construction (first year of operation), local roads may be monitored following a heavy rain event and following spring runoff, to ensure no erosion, bank slumpage, road subsidence or major rutting has occurred as a result of construction activities. As appropriate, affected roadside ditches and drains will be repaired if required and monitored to ensure that they are functioning properly. Additional monitoring and contingency plans may be developed during ongoing discussions with Haldimand County.

4.15.5 Environmental Noise and Public Health and Safety

The *Environmental Protection Act* requires that noise emissions for any new project must not have adverse effects on the natural environment. The REA process is the mechanism through which the controls are administered under the *Environmental Protection Act*. Noise monitoring (if required), would be conducted in accordance with the REA for the Project. In the event of a

malfunctioning turbine and/or transformer which is resulting in noise emissions that are above MOE requirements, the problematic machinery would be shut down until corrective measures are taken. Routine maintenance and monitoring would also help minimize the likelihood of malfunctioning equipment resulting in excessive noise emissions.

Turbines and solar panels would be monitored electronically twenty-four hours a day, seven-days a week, to allow operational changes to be noted and assessed quickly. Turbine shut down would occur automatically upon detection of extreme weather. Inspections of turbines and solar panels would occur after extreme weather events.

5.0 Conclusion and Signatures

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

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