ST. COLUMBAN WIND PROJECT
DESIGN AND OPERATIONS REPORT

File No. 160960649
June 2012

Prepared for:

St. Columban Energy LP
Suite 900
222-3rd Avenue SW
Calgary, AB T2P 0B4

Prepared by:

Stantec Consulting Ltd.
Suite 1 - 70 Southgate Drive
Guelph ON N1G 4P5

Table of Contents

Table of Contents

Table of Contents

List of Tables

List of Appendices

Table of Contents

List of Figures

1.0 Introduction

1.1 PROJECT OVERVIEW

St. Columban Energy LP is proposing to develop, construct, and operate the 33 megawatt (MW) St. Columban Wind Project (the Project) in the Municipality of Huron East (Huron East), Municipality of Morris-Turnberry (Morris-Turnberry), and Township of Howick (Howick), County of Huron (Huron County), in response to the Government of Ontario's initiative to promote the development of renewable electricity in the province.

The overall Project Study Area is comprised of two sections – the Wind Project Study Area and the Interconnection Line Study Area. The Wind Project Study Area is bordered on the north by Winthrop Road, on the south by Huron Road/Highway 8, on the east to the west of Perth Road 180 and on the west by Maple Line. In addition, the Interconnection Line Study Area includes the path along which an approximately 43 kilometre (km) underground electrical interconnection line is proposed to extend from the Wind Project to a transformer substation and one of two connection points to the existing Hydro One Networks Inc. (HONI) electrical distribution system.

The proposed Project Location for this report includes all parts of the land in, on or over which the Project is proposed (the 'construction area' for the Project). The proposed Project Location and Project Study Areas are shown in Appendix A, Figures 1-3.

St. Columban Energy LP retained Stantec Consulting Ltd. (Stantec) to prepare the Renewable Energy Approval (REA) application with input from Zephyr North Ltd., and Archaeological Services Inc. The REA application is a requirement under Ontario Regulation 359/09 - Renewable Energy Approvals under Part V.0.1 of the *Environmental Protection Act* (O. Reg. 359/09). According to subsection 6 (3) of O. Reg. 359/09, the Project is classified as a Class 4 Wind Facility and will follow the requirements identified in O. Reg. 359/09 for such a facility.

This Design and Operations Report has been prepared in accordance with O. Reg. 359/09, and is one component of the REA application for the Project. An Environmental Screening Report (ESR) was prepared, and a Notice of Completion was submitted in the fall of 2009 for the Wind Project Study Area. The current REA application used relevant information collected for the ESR, supplemented with new information when necessary, to maintain compliance with the new Regulation.

1.2 REPORT REQUIREMENTS

The Design and Operations Report is the principal document where the details of a renewable energy project are presented. Aspects of the Project outside of the operation phase such as construction and decommissioning are addressed within separate reports as part of the REA package.

The Design and Operations Report has been prepared in accordance with Item 4, Table 1 of O. Reg. 359/09 and the Ministry of the Environment's (MOE's) *Technical Guide to Renewable Energy Approvals* (MOE 2011). O. Reg. 359/09 sets out specific content requirements for the Design and Operations Report as provided in Table 1.1.

Table 1.1: Design and Operations Report Requirements: O. Reg. 359/09

Requirements	Completed	Section Reference
1. Set out a site plan of the Project Location at which the renewable energy Project will be engaged in, including,		
i. one or more maps or diagrams of:		
A. all buildings, structures, roads, utility corridors, road allowances and easements required in respect of the renewable energy generation facility and situated within 300 m of the facility,	✓	2.0, 3.0, Appendix A
B. any ground water and surface water supplies used at the facility,	N/A	N/A
C. any things from which contaminants are discharged into the air,	N/A	N/A
D. any works for the collection, transmission, treatment and disposal of sewage,	✓	5.2
E. any areas where waste, biomass, source separated organics and farm material are stored, handled, processed or disposed of,	N/A	N/A
F. the Project Location in relation to any of the following within 125 m: properties described in Column 1 of the Table to section 19, heritage resources, archaeological resources, the portion of the Oak Ridges Moraine Conservation Plan Area that is subject to the Oak Ridges Moraine Conservation Plan, the area of the Niagara Escarpment Plan, the Protected Countryside, the Lake Simcoe watershed, and	✓	2.0, Appendix A
G. any noise receptors or odour receptors that may be adversely affected by the use or operation of the facility,	✓	2.0, Appendix A
ii. a description of each item diagrammed under subparagraph i, and	✓	3.0
iii. one or more maps or diagrams of land contours, surface water drainage and any of the following, if they have been identified in complying with this Regulation: properties described in Column 1 of the Table to section 19, heritage resources, archaeological resources, water bodies, significant or provincially significant natural features and any other natural features identified in the Protected Countryside or in the portion of the Oak Ridges Moraine Conservation Plan Area that is subject to the Oak Ridges Moraine Plan.	✓	Appendix A
2. Set out conceptual plans, specifications and descriptions related to the design of the renewable energy generation facility, including a description of:		
i. any works for the collection, transmission, treatment and disposal of sewage, including details of any sediment control features and storm water management facilities,	N/A	N/A
ii. any things from which contaminants are discharged into the air, and	N/A	N/A

Table 1.1: Design and Operations Report Requirements: O. Reg. 359/09

Requirements	Completed	Section Reference
iii. any systems, facilities and equipment for receiving, handling, storing and processing any waste, biomass, source separated organics, farm material and biogas.	N/A	N/A
3. Set out conceptual plans, specifications and descriptions related to the operation of the renewable energy generation facility, including,	✓	3.0, 4.0
i. in respect of any water takings,		
A. a description of the time period and duration of water takings expected to be associated with the operation of the facility,	N/A	N/A
B. a description of the expected water takings, including rates, amounts and an assessment of the availability of water to meet the expected demand, and	N/A	N/A
C. an assessment of and documentation showing the potential for the facility to interfere with existing uses of the water expected to be taken,	N/A	N/A
ii. a description of the expected quantity of sewage produced and the expected quality of that sewage at the Project Location and the manner in which it will be disposed of, including details of any sediment control features and storm water management facilities,	N/A	N/A
iii. a description of any expected concentration of air contaminants discharged from the facility,	N/A	N/A
iv. in respect of any biomass, source separated organics and farm material at the facility,		
A. the maximum daily quantity that will be accepted,	N/A	N/A
B. the estimated annual average quantity that will be accepted,	N/A	N/A
C. the estimated average time that it will remain at the facility, and	N/A	N/A
D. the estimated average rate at which it will be used, and	N/A	N/A
v. in respect of any waste generated as a result of processes at the Project Location, the management and disposal of such waste, including:		
A. the expected types of waste to be generated,	✓	5.6.1
B. the estimated maximum daily quantity of waste to be generated, by type,	✓	5.6.1
C. processes for the storage of waste, and	✓	5.6.1
D. processes for final disposal of waste.	✓	5.6.1
4. Include an environmental effects monitoring plan in respect of any adverse environmental effects that may result from engaging in the renewable energy Project, setting out:		
i. performance objectives in respect of the adverse environmental effects,	✓	5.0, 6.0
ii. mitigation measures to assist in achieving the performance objectives mentioned in subparagraph i,	✓	5.0, 6.0
iii. a program for monitoring adverse environmental effects for the duration of the time that the Project is engaged in, including a contingency plan to be implemented if any mitigation measures	✓	5.0, 6.0

Table 1.1: Design and Operations Report Requirements: O. Reg. 359/09

Requirements	Completed	Section Reference
fail.		
5. Include a response plan setting out a description of the actions to be taken while engaging in the renewable energy Project to inform the public, aboriginal communities and municipalities, local roads boards and Local Services Boards with respect to the Project, including,		
i. measures to provide information regarding the activities occurring at the Project Location, including emergencies,	✓	8.0
ii. means by which persons responsible for engaging in the Project may be contacted, and	✓	8.0
iii. means by which correspondence directed to the persons responsible for engaging in the Project will be recorded and addressed.	✓	8.0
6. If the Project Location is in the Lake Simcoe watershed, a description of whether the Project requires alteration of the shore of Lake Simcoe, the shore of a fresh water estuary of a stream connected to Lake Simcoe or other lakes or any permanent or intermittent stream and,		
i. how the Project may impact any shoreline, including the ecological functions of the shoreline, and	N/A	N/A
ii. how the Project will be engaged in to,		
A. maintain the natural contour of the shoreline through the implementation of natural shoreline treatments, such as planting of natural vegetation and bioengineering, and	N/A	N/A
B. use a vegetative riparian area, unless the Project Location is used for agricultural purposes and will continue to be used for such purposes.	N/A	N/A

The MOE's *Technical Guide to Renewable Energy Approvals* further elaborates on content requirements for the Design and Operations Report, as provided in Table 1.2.

Table 1.2: Design and Operations Report Requirements: MOE Draft Technical Bulletin Two

Requirements	Completed	Section Reference
1. Report Introduction	✓	1.0
2. Site Plan	✓	2.0
3. Facility Design Plan	✓	3.0
4. Facility Operations Plan	✓	4.0
5. Environmental Effects Monitoring Plan	✓	6.0
6. Emergency Response and Communications Plans	✓	8.0

2.0 Site Plan

The Site Plan (Appendix A) provides the following information:

- Facility components, including: turbine locations, underground collector lines/fibre optic cabling, turbine access roads, two unserviced electrical control buildings, the operations and maintenance building, an existing meteorological tower, two connection points to the existing HONI system, underground electrical interconnection line, and transformer station.
- Project Location: the outer limit of all components of the Project, including temporary work areas during construction. The Project Location is used for defining setback and site investigation distances.
- Roads, utility corridors, road allowances, and easements within 300 m of the Project Location.
- Location of property lines.
- Location of heritage resources within 125 m of the Project Location.
- Cultural and natural features including topographic contours, surface water drainage, heritage and archaeological resources, and natural features and water bodies.
- Noise receptors (participating, non-participating and vacant lots).
- Visual representation of setback buffer areas from the Project Location to heritage resources, water bodies and significant or provincially significant natural features.

A detailed description of the Project components and cultural and natural features is provided in Sections 3.0, 4.0 and 5.0.

2.1 SETBACK DISTANCES

O. Reg. 359/09 provides setback distances between the Project Location and:

- Significant and provincially significant natural features;
- Provincial parks and conservation reserves; and
- Water bodies.

O. Reg. 359/09 also provides setback distances between the wind turbine base and:

- Property lines;
- Public road right-of-ways;
- Railway right-of-ways; and
- Noise receptors.

Visual representation of the setback distances are illustrated on the Site Plan (Attachment A) and within the Noise Assessment Report (Attachment B). Where the Project Location is within the setback distances (e.g. to natural features or property lines), additional information is provided within the Natural Heritage Assessment/Environmental Impact Study (NHA/EIS) and the Property Line Setback Assessment (Attachment D to this report).

All turbines are located at a minimum distance of 550 m from the nearest non-participating receptor. In accordance with Section 53 of O. Reg. 359/09, all turbines must be located at least 99.5 m (hub height) from the nearest non-participating property line. When this setback is not achievable, a setback of the 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. Written assessments have been prepared (Attachment D) for turbines that have utilized a minimum setback of blade length plus 10 m (65 m) but are closer than 99.5 m to the nearest non-participating property line. In addition, all turbines have been located at least blade length plus 10 m (65 m) from public roads and railway rights-of-way.

3.0 Facility Design Plan

This section provides a description of the key facility design components identified on the Site Plan (Appendix A).

The key mitigation strategy used to address potential environmental effects from operation of the facility was avoidance of significant natural features and water bodies to the extent possible during siting of the Project.

The basic components of the Project include:

- 15 Siemens SWT 2.3-101/SWT 2.3-113 wind turbine generators with a maximum installed nameplate capacity of 33 MW. To be conservative, two turbine models were assessed as part of the REA process – the SWT 2.3-113 (113m blade span) and the SWT 2.3-101 (101m blade span). For the noise assessment, the SWT 2.3-101 was assessed, due to its higher noise level. For potential impacts to the natural environment, and property line setback assessments, the SWT 2.3-113 was assessed, due to its longer blade length. This conservative approach ensured the 'worst case scenario' was assessed;
- A 34.5 kV underground power line collector system;
- A 27.6 kV underground power line collector system;
- Fibre optic cabling laid with underground power lines;
- Turbine access roads;
- Crane pads;
- Two connection points to the existing electrical system;
- Two unserviced electrical control buildings;
- An existing, currently serviced, operations and maintenance building to be leased from a participating landowner;
- A 34.5kV - approximately 43 km underground electrical interconnection line; and,
- A 44 kV/34.5 kV 15/20 MVA transformer station.

Temporary components during construction include work and storage areas at the turbine locations and along the underground electrical interconnection line. The electrical power line collector system will transport the electricity generated from the Project to two connection points to the HONI local distribution system.

3.1 WIND TURBINE GENERATORS

The Project has two FIT contracts, and two separate connection points to the HONI system. St. Columban 1 (SC1 - 18 MW) and St. Columban 2 (SC2 - 15 MW) in aggregate combine 15 Siemens SWT 2.3-101/SWT 2.3-113 wind turbine generators with a maximum installed nameplate capacity of 33 MW. A summary of the basic specifications of a typical turbine model in this class is provided in Table 3.1, and coordinates for each turbine are provided in Table 3.2. Detailed information about both turbine models is provided in the Wind Turbine Specifications Report, and noise assessments for both models are provided in Appendix C of this report.

As mentioned previously, to be conservative, both the SWT 2.3-113 (113m blade span) and the SWT 2.3-101 (101m blade span) were assessed as part of the REA process. For the noise assessment, the SWT 2.3-101 was assessed, due to its higher noise level. For potential impacts to the natural environment, and property line setback assessments, the SWT 2.3-113 was assessed, due to its longer blade length. This conservative approach ensured the 'worst case scenario' was assessed.

Table 3.1: Basic Wind Turbine Specifications

Manufacturer	**Siemens**	**Siemens**
Model	SWT 2.3-113	SWT 2.3-101
Name plate capacity (MW)	2.3 MW	2.3 MW
Hub height above grade	99.5 m	99.5 m
Blade length	55 m	49 m
Full blade diameter	113 m	101 m
Blade sweep area	10,000 m^2	8,000 m^2
Speed range	6-13 rpm	6-16 rpm
Frequency spectrum	60 Hz	60 Hz

Table 3.2: Turbine Coordinates

Turbine ID	**St. Columban 1 (SC1) or 2 (SC2)**	**Collector System/Connection Voltage**	**Easting (X)**	**Northing (Y)**
1	SC1	34.5/44kV	475688	4819174
2	SC1	34.5/44kV	475982	4819564
3	SC1	34.5/44kV	476068	4820809
4	SC2	27.6/27.6 kV	476439	4821386
5	SC2	27.6/27.6 kV	477290	4822643
6	SC2	27.6/27.6 kV	474695	4824004
7	SC2	27.6/27.6 kV	475642	4823294
8	SC2	27.6/27.6 kV	476421	4822936

Table 3.2: Turbine Coordinates

Turbine ID	St. Columban 1 (SC1) or 2 (SC2)	Collector System/Connection Voltage	Easting (X)	Northing (Y)
9	SC2	27.6/27.6 kV	476794	4824480
10	SC2	27.6/27.6 kV	476414	4824755
11	SC1	34.5/44kV	473668	4819851
12	SC1	34.5/44kV	473905	4820309
13	SC1	34.5/44kV	474447	4820173
14	SC1	34.5/44kV	474574	4819899
15	SC1	34.5/44kV	478016	4820440

3.2 ELECTRICAL INFRASTRUCTURE

A step-up transformer at the base of each turbine is required to transform the electricity created in the nacelle to collector system voltages of either 34.5 kV (SC1) or 27.6 kV (SC2). From each step-up transformer underground 34.5 kV (SC1) or 27.6 kV (SC2) collector lines will be constructed parallel to the turbine access roads, along municipal road allowances, to one of two electrical control buildings located near the turbines for each of St. Columban 1 (T15) and St. Columban 2 (T8).

3.2.1 St. Columban 1

St. Columban 1 includes 8 Siemens SWT 2.3-101/SWT 2.3-113 wind turbine generators with a maximum installed nameplate capacity of 18 MW, turbine access roads, a 34.5 kV underground collector system with fibre optic cabling, and an unserviced electrical control building. Approximately 11.6 km of 34.5 kV underground collection lines will connect the turbines (T1, T2, T3, T11, T12, T13, T14, T15) to the unserviced electrical control building. This structure will measure approximately 6 m X 12 m, and will be located on private property near the entrance from Bridge Road to the turbine access road for T15.

A 34.5 kV - approximately 43 km buried electrical interconnection line will be installed from the electrical control building to a 44 kV/34.5 kV 15/20 MVA transformer station for connection to the existing distribution system originating from HONI's Wingham Transformer Station (TS). The transformer station will occupy an area approximately 20 m X 30 m in size on private lands located south-east of the intersection of Gough Road and McDonald Road in the Township of Howick (43.847°N, -81.154°W). St. Columban Energy LP will construct and operate the electrical interconnection line, which will be buried in municipal road allowances. Potential impacts of construction, operation, and decommissioning of this line are assessed in the current REA application.

3.2.2 St. Columban 2

St. Columban 2 includes 7 Siemens SWT 2.3-101/SWT 2.3-113 wind turbine generators with a maximum installed nameplate capacity of 15 MW, turbine access roads, a 27.6 kV underground

collector system and fibre optic cabling, and an electrical control building. Approximately 9.5 km of 27.6 kV underground collection lines will connect the turbines (T4, T5, T6, T7, T8, T9, and T10) to the unserviced electrical control building for St. Columban 2. This structure will measure approximately 6 m X 12 m, and will be located on private property near the entrance from Beechwood Line to the turbine access road for T8.

The 27.6 kV line from the electrical control building will connect to the HONI grid at the entrance from Beechwood Line to the turbine access road for T8 (43.560°N, -81.297°W). HONI will then construct approximately 2.5 km of 27.6 kV overhead electrical interconnection line, beginning at the unserviced electrical control building at the entrance to Turbine 8 on Beechwood Line (500m north of Bridge Road) and running south to the existing HONI line at the intersection of Beechwood Line and Hydro Line Road (43.541°N, -81.315°W), originating from HONI's Seaforth TS.

The overhead line is not a part of the renewable energy project being assessed as part of the REA application that is submitted to the MOE. The MOE's 2011 Technical Guide for Renewable Energy Approvals states, "For the purposes of the renewable energy approval, the lines built by the local distribution company in their distribution service area will not be considered part of the facility or project and a REA is not required to be obtained in respect of them". This line will be assessed and constructed by HONI, and will be assessed under their separate environmental assessment process. The line will also be installed using their preferred techniques (i.e., overhead).

All underground collector lines will be constructed on leased lands and within municipal road right-of-way (ROW). Wherever possible, underground collector lines on private lands will be aligned with the design of the access roads to reduce the area required for construction and minimize potential construction impacts. The cables will be installed immediately to one side of the access road, just off the graveled surface. In the municipal road ROW the cables are proposed to be installed just off the grass gravel interface at the edge of municipal roads, subject to each municipality's agreement. Typically the collector lines will be buried at a minimum of 1.0 m.

Overhead lines are not anticipated to be required for the Project with the exception of the following:

- 2.5 km overhead 27.6kV line to be constructed and owned by HONI to connect the St. Columban 2 turbines to HONIs existing distribution system at the intersection of Beechwood Line and Hydro Line Road, as described above; and,

- Two 30 m sections of overhead line on private lands to bring the line to the proposed connection point to the HONI system from:

- The buried cable eminating from the unserviced electrical control building at the entrance to Turbine 8 on Beechwood Line (500m north of Bridge Road) (St. Columban 1); and,

- The buried cable eminating from the transformer station near the intersection of Belmore Line and Gough Road in the Township of Howick.

The locations of the electrical lines are shown in Appendix A.

3.3 ELECTRICAL INTERCONNECTION LINE

The 34.5 kV - approximately 43 km electrical interconnection line to the Township of Howick is proposed to be installed just off the grass gravel interface at the edge of municipal roads, subject to each municipality's agreement. The majority of the cable for the line will be plowed to a depth of at least 1.0 m, significantly reducing the need for open trenching.

Directional drilling, by which conduits and cables are installed along a prescribed bore path using a surface launched drilling rig with minimal impact on the surrounding area, would be used at water and road crossings, through other areas not conducive to 'plowed' installation (at the discretion of the contractor), and through the entire settlement of Cranbrook on McNabb Line. Specifications of a typical directional drill are provided in Appendix B.

3.4 ACCESS ROADS AND CRANE PADS

Permanent access laneways will be approximately 6 m wide and would not require resizing for the operation phase. Entrances off municipal roads require wider turning radii during construction (25 - 30 m), but will be returned to a 6 m entrance for operations. Access roads will be used during maintenance activities.

A gravel area (crane pad) adjacent to each turbine will be approximately 30 m x 20 m, to allow for crane redeployment should a major maintenance event occur.

3.5 ELECTRICAL CONTROL BUILDINGS AND OPERATIONS AND MAINTENANCE BUILDING

Two small unserviced electrical control buildings near the entrance to the turbine access roads for T8 and T15 will measure approximately 6 m X 12 m, and are anticipated to be prefabricated engineered structures with a concrete foundation that will extend below the frost line. The buildings will house electrical equipment such as isolation switches and protection and control equipment.

A serviced operations and maintenance facility, located at the access road entrance for T4 at Bridge Road (Figure 2) will be leased from a participating landowner. The building will include office and meeting facilities for maintenance staff, storage for small replacement parts, and Supervisory Control and Data Acquisition (SCADA) and electrical/mechanical monitoring

systems. This building is serviced, and no additional infrastructure is required, with the exception of renovations to create office and storage spaces.

3.6 TRANSFORMER SUBSTATION

A 44 kV/34.5 kV 15/20 MVA transformer substation will be constructed for connection to the existing distribution system originating from HONI's Wingham TS. The transformer substation will occupy an area approximately 20 m X 30 m in size on private lands located south-east of the intersection of Gough Road and McDonald Road in the Township of Howick (43.847°N, -81.154°W).

Area drainage from the substation will be accomplished through swales/ditches adjacent to the proposed access road that will collect and convey stormwater runoff from the substation area and the associated access road. 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 not required, as per the MOE *SWM Planning and Design Guidelines Manual* (2003). In addition to the conveyance of runoff, the swales will also provide water quality control, which is a suitable stormwater management practice for such an area according to the MOE guidelines.

Within the substation footprint itself, the transformer will be equipped with oil containment storage area 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.

3.7 PERMANENT WATER CROSSINGS

Four permanent culvert installations will be required for the access roads and associated underground electrical collector lines and fibre optic cable in the vicinity of Turbines T4, T6, T14, and T15. These culverts will be maintained as required, and inspected regularly. The underground electrical interconnection line in the municipal ROW will be directionally drilled under all watercourses, and will not require permanent water crossings (i.e., culverts).

3.8 MET TOWER

St. Columban Energy LP has a 60 m tubular guyed met tower which was installed in 2005. This met tower has been used to identify the quality of the wind resource for the proposed Project. The wind data collected has been used to determine the suitability of the site. This tower is a prospecting tower and will be removed shortly following commercial operation. For operational purposes, meteorological equipment will be installed within the Project boundary. The meteorological equipment will be installed at or near hub height. The lighting requirements will depend on location and requirements of Navigation Canada and Transport Canada regulations. The permanent meteorological equipment will remain for the duration of the Project's operating life.

4.0 Facility Operations Plan

Operations include daily monitoring of the wind turbines and maintenance activities.

4.1 SITE SUPERVISION AND STAFF TRAINING

St. Columban Energy LP may hire a specialized Operation and Maintenance (O&M) Contractor to carry out various on-going activities, including daily operation and maintenance, associated with the Project. Additional staff will be brought in on an as needed basis to support the maintenance activities required for the Project.

During pre-operational mobilization, St. Columban Energy LP and/or the O&M Contractor will develop an operation and maintenance program to ensure compliance with any applicable municipal, provincial, and/or federal requirements. As appropriate, the program will cover staff training, predictive and preventive maintenance, routine maintenance, unscheduled maintenance (including appropriate environmental mitigation measures), annual overhauling, inspection of equipment and components, procurement of spare parts, and maintenance of optimum inventory levels to reduce inventory carrying costs and working capital costs. No significant inventory will be kept on-site, other than control equipment spares and some consumable materials. It will also include a schedule for regular inspections of the turbines and ancillary facilities.

4.2 PLANNED MAINTENANCE

The maintenance of the turbines would be the responsibility of St. Columban Energy LP. Maintenance and inspection related to the electrical collector system would remain the responsibility of St. Columban Energy LP.

Through use of a SCADA system that is connected to fibre optic cables installed with the collector lines, the maintenance staff would be able to monitor the performance of all turbines on-line in real time. The SCADA system would identify any potential problems so that pro-active inspection and maintenance can be undertaken. Potentially damaged turbines would be shut down until maintenance staff can perform a site inspection. Regular maintenance of the equipment would be a key method of mitigating these potential effects.

Scheduled maintenance will include:

- Visual inspection;
- Inspection of mechanical components;
- Inspection of electrical components; and
- Greasing and general maintenance.

Planned maintenance will occur more frequently at the start of operations, and will slow to once every six months or more as the Project matures. Maintenance of each wind turbine usually takes approximately five days to complete.

Oil changes would be completed in accordance with oil analysis recommendations. The amount of oil and grease stored on site would depend on availability, transportation schedules, and the service cycle. Used oil would be stored in a designated area within the turbine and picked up by a certified contractor with the appropriate manifests in place.

4.3 UNSCHEDULED MAINTENANCE

St. Columban Energy LP and/or the O&M Contractor would also provide unscheduled maintenance for the turbine units when required. Unscheduled maintenance activities could include replacement of major components such as blades or generators.

4.4 MONITORING METEOROLOGICAL DATA

Each turbine would have sensors to measure wind speed and direction. This data would be used to determine when the turbines are operating, as well as to control the pitch of the blades and the orientation of the nacelle.

The meteorological sensors within the nacelle would be used to monitor meteorological data, and the wind farm's SCADA system will use this data to:

- Provide additional parameters such as wind direction, air temperature, air pressure and wind shear to better manage the operational performance of the equipment; and,
- Provide a backup source of wind speed data should a turbine's own sensors prove unreliable.

The Independent Electrical System Operator (IESO) is expected to require St. Columban Energy LP to provide real-time weather data from the meteorological sensors, along with real-time generation data to provide input to their central generation forecasting model.

More information on monitoring activities during operation of the facility can be found in Section 6.0.

4.5 OTHER ACTIVITIES

Potable water for use in the O&M building will be provided by a previously-dug well. No groundwater or surface water-taking activities are planned as part of the operation of the Project, and there is no potential for the Project to interfere with existing uses of water within or near the Study Area. Sanitary waste generated at the O&M building will be managed by a dedicated, previously-installed septic system. Project operations will not discharge contaminants into the air, and no stormwater management activities are required as part of the operation of

the Project. As such, no sediment control features and no storm water management facilities are required. In addition, there are no areas where waste, biomass, source separated organics and farm material are stored, handled, processed or disposed of during the operation of the Project.

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

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

- Fuel combustion from on-site vehicles;
- Maintenance use of solvent-based cleaners;
- Maintenance welding activities;
- One stand-by emergency diesel generator; and,
- Battery chargers.

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

- Small maintenance and janitorial activities;
- Maintenance welding stations;
- Standby power generators firing liquid or gaseous fuels that are used for standby power only with periodic testing as per the Regulation;
- Exhaust of inert gases; and,
- Battery chargers.

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

5.0 Potential Effects and Mitigation Measures

O. Reg. 359/09 requires that any adverse environmental effects that may result from operations activities be described within a 300 m radius of those activities (known as the Zone of Investigation). This section describes the potential effects, mitigation measures (if required) and net effects that may result from operation activities within the Zone of Investigation.

Descriptions of the existing natural heritage, water, archaeological and built heritage environments in the Study Area and/or Project Location can be found within the Natural Heritage Assessment & Environmental Impact Study (NHA/EIS), Water Assessment & Water Body Report (WA/WBR), Stage 1 and 2 Archaeological Assessments, the Protected Properties Assessment, and the Heritage Impact Assessment. These reports were completed for the Wind Project Area, reviewed by the Ministry of Natural Resources (MNR) and the Ministry of Tourism and Culture and Sport (MTCS), and finalized in 2011. Following addition of the underground electrical interconnection line in the fall of 2011, addendum reports were submitted to MNR and MTC in late 2011 and early 2012, and finalized in the spring of 2012. Final reports are provided in the complete REA application.

Description of potential effects and mitigation measures for specific features located within the setbacks specified by O. Reg. 359/09 are provided in the NHA/EIS, WA/WBR, Protected Properties Assessment, and Heritage Impact Assessment.

For most natural environment and socio-economic features, mitigation measures are anticipated to eliminate all effects.

The need, assessment, and selection of protection and mitigation measures discussed in the following sections have been predicated on the hierarchical principles of:

- avoidance – the elimination of adverse environmental effects by siting, scheduling, and design considerations;
- minimization – reduction or control of adverse environmental effects through Project modifications or implementation of protection and mitigation measures; and,
- compensation – enhancement or rehabilitation of affected areas

The application of these principles has greatly reduced the potential for adverse environmental effects from the Project as demonstrated in the following subsections. The key mitigation strategy used to address potential environmental effects from operation of the facility was avoidance of significant natural features and water bodies to the extent possible during siting of the Project.

Where net effects remain, they are characterized as either positive or adverse. Positive net effects were not assessed. Adverse net effects were assessed in consideration of the following nine descriptors, as applicable:

- **Direction**: the degree to which an effect may be positive or adverse;
- **Duration**: the period of time until the element returns to baseline conditions;
- **Ecological/Social Context**: the nature of the area in which the effect may occur;
- **Frequency**: the number of times that an effect may occur;
- **Magnitude**: the degree to which an effect may occur;
- **Permanence**: the degree to which an effect will not return to baseline conditions;
- **Probability**: the likelihood that an effect may occur;
- **Reversibility**: the likelihood that an element will recover from an effect; and
- **Spatial Extent**: the area within which an effect may occur.

The key performance objective for each of the potentially affected features discussed below is avoiding and/or minimizing potential effects (through the use of appropriate mitigation measures) to the features throughout the operations phase of the Project. The proposed mitigation measures would assist in achieving this performance objective. Additional information related to specific performance objectives is provided in Table 7.1, and detailed in the Environmental Effects Monitoring Plan provided in Section 6.0.

5.1 HERITAGE AND ARCHAEOLOGICAL RESOURCES

5.1.1 Protected Properties and Heritage Resources

In accordance with O. Reg. 359/09, a Protected Properties Assessment and Heritage Impact Assessment were undertaken for the Wind Project Study Area, and are included under separate cover as part of the REA application. Both reports were completed and submitted to the MTCS, who confirmed that the methodology, recommendations, and conclusions were to their standards for both the Wind Project Study Area and the Interconnection Line Study Area.

The Protected Properties Assessment determined that there is one property designated by a municipal by-law made under section 29 of the *Ontario Heritage Act* (*OHA*) within the Project Study Area, the Cameron House at 84354 McNabb Line (adjacent to the Project Location for the underground electrical interconnection line). No protected properties were identified within the Project Location for the Wind Study Area.

A total of 47 resources of significant heritage value and two significant cultural heritage landscapes were identified along the Interconnection Line Study Area and within the Wind Project Study Area. Six 19th and 20th century windmills were also noted during the windshield survey. These windmills are considered to be significant in terms of their contribution to the character of the Study Area in general.

For each significant heritage resource and landscape, a Heritage Impact Assessment (HIA) was undertaken in order to identify potential Project-related negative impacts. Impacts evaluated include: destruction; alteration; shadows; isolation; direct or indirect obstruction of significant views; and changes in land use. Potential negative impacts were identified for 18 of the individual significant built heritage resources.

Potential Effects

Operation of the Project, including the underground electrical interconnection line, is not anticipated to have negative impacts on the protected property at 84354 McNabb Line in Cranbrook, or on the identified significant built heritage resources or significant cultural heritage landscapes, as described within the Protected Properties Assessment and Heritage Impact Assessment.

Mitigation Measures

As there would be no potential effects during operation of the Project, no mitigation measures are recommended.

5.1.2 Archaeological Resources

A Stage 1 Archaeological Assessment was completed for the Wind Project Study Area in the Environmental Screening completed in 2009. The Assessment meets the criteria under O. Reg. 359/09, and is included as part of the REA submission under separate cover. The Stage 1 Archaeological Assessment determined that no archaeological sites have been registered within 2 km of the Wind Project Study Area. However, the Wind Project Study Area exhibits archaeological site potential for both Aboriginal and Euro-Canadian archaeological resources. Therefore, archaeological or historical materials or features may be found during construction, and a Stage 2 Archaeological Assessment was recommended.

The Wind Project Study Area for the Stage I Archaeological Assessment included the turbine locations proposed in this REA application, with the exception of T11, T12, T13, T14, and T15. St. Columban Energy LP has taken the conservative approach that the results of the Stage I Archaeological Assessment apply to the lands proposed for the new turbines sites and 2 km from the entire Wind Project Study Area used as part of this REA study, and conducted a Stage 2 Assessment on these lands, as well.

All lands proposed for development within the Wind Project Study Area were assessed as part of a Stage 2 Archaeological Assessment completed by Archaeological Services Inc. (ASI). No cultural material was identified during the Stage 2 Archaeological Assessment. The Stage 2 Archaeological Assessment concluded that the proposed facilities can be cleared of further heritage concerns.

Both reports were completed and submitted to the MTCS, who confirmed that the methodology, recommendations, and conclusions were to their standards.

Following addition of the approximately 43 km underground electrical interconnection line, an addendum report was completed for the Interconnection Line Study Area, and submitted to MTCS for review and comment in the December, 2011, with a confirmation letter from MTCS in the spring of 2012. The addenda looked at the underground electrical interconnection line and three small areas for the proposed electrical control buildings and the transformer station. For the interconnection line, 42 km is in disturbed municipal road right-of-way, and archaeological potential was determined to be non-existent. For the remaining 1.6 km of the line, the ROW was not disturbed, and archaeological potential was present; therefore test pitting was conducted along this length. No artifacts of archaeological value were found in test pits along the interconnection line, or on the three private properties where structures are proposed.

Potential Effects

There are no areas that would be excavated during the operation phase that have not been assessed by the Stage 2 Archaeological Assessment prior to construction, therefore no potential effects are anticipated to archaeological resources during operation of the Project.

Mitigation Measures

No potential effects are anticipated and therefore no mitigation measures are necessary.

5.2 NATURAL HERITAGE RESOURCES

In accordance with O. Reg. 359/09, an NHA/EIS was undertaken for the Project and is included under separate cover as part of the REA application. The reports (one for the Wind Study Area and one for the Interconnection Line Study Area) were completed and submitted to the MNR, who confirmed that the methodology, recommendations, and conclusions were to their standards. The following provides a summary of the potential effects and the associated mitigation measures as described in that report. In addition, potential effects and mitigation measures are identified for regulated features outside the setbacks, and unregulated natural features, which are not considered in the NHA/EIS. Natural heritage resources are shown in Appendix A, Figure 7.

5.2.1 Wetlands

There are no provincially or locally significant wetlands identified in the Project Location (construction area). The records review identified one provincially significant wetland (PSW) and six locally significant wetlands (LSW) within 120 m of the Interconnection Line Project Location. An additional 14 unevaluated wetland units were identified during site visits in the fall of 2011. A total of 17 wetlands required an evaluation of significance.

No wetlands were identified within 120 m of the Wind Project Location during the records review; however, six wetlands were identified during site investigations by AECOM in 2007 (4) and Stantec in 2010 (2). All wetlands were conservatively evaluated as significant using provincial guidance. This allows for greater protection of the wetlands through mitigation. Potential impacts and mitigation measures are detailed in the NHA/EIS.

Potential Effects

As all components of the Project are sited outside wetland boundaries, there would be no direct loss of wetland habitat or function in the Project Study Area as a result of the Project. All Project components (except blade sweep) are greater than 120 m from wetlands. There would be no clearing of trees in or near the features that could result in desiccation or drying.

Potential effects during operations and maintenance include disturbance due to increased traffic, noise, or dust. These impacts are anticipated to be temporary in duration and relatively minor in scale.

During operation of the facility, 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 the wetland through ground or surface water contamination.

Effects to significant woodlands and wildlife habitat supported by the wetland features are discussed in Sections 5.3.4 and 5.3.7, respectively.

Mitigation Measures

Site-specific mitigation measures for wetlands are provided in the NHA/EIS.

Net Effects

The setback of more than 137 m of turbine bases from wetlands would ensure that there is no disruption of wetland function and no net loss of wetland area. Siting the interconnection line within the municipal road ROW would ensure that there is no disruption to wetland function during operations. The separation distance and siting with the municipal ROW would further attenuate disturbance effects due to turbine operations and maintenance.

The mitigation measures described in the NHA/EIS would ensure no adverse effects to wetlands during operation.

5.2.2 Areas of Natural and Scientific Interest

Potential Effects

One regionally significant Life Science Area of Natural and Scientific Interest (ANSI) is located within 120 m of the Interconnection Line Project Location; none were identified within the Wind Project Location. There are no Earth Science ANSIs in the Study Area for either the Wind or Interconnection Line components.

Mitigation Measures

No potential effects on ANSIs are anticipated during operation of the Project.

Net Effects

No adverse net effects on ANSIs are anticipated during operation of the Project.

5.2.3 Valley Lands and Hazard Lands

No valley lands or hazard lands are located within the Project Study Area.

Potential Effects

No potential effects on valley lands or hazard lands are anticipated during operation of the Project.

Mitigation Measures

No potential effects on valley lands or hazard lands would occur and therefore no mitigation measures are necessary.

Net Effects

No adverse net effects on valley lands and hazard lands are anticipated during operation of the Project.

5.2.4 Woodlands

The dominant land use in the Project Study Area is agriculture. The woodlands are small, fragmented, and typically represent deciduous forest and deciduous swamp. Six significant woodland features (including the two swamps discussed in Section 5.2.1) were identified within 120 m of the Wind Project Location, and 19 significant woodland features were identified within 120 m of the Interconnection Line Project Location. No woodland features are located within the Project Location.

Potential Effects

Turbine blade tips are located within 120 m of two significant woodlands; however, no Project components are within these woodlands, and no new edge would be created. Setbacks for all Project components (except blade tip) are greater than 120 m from the natural features. Distance between blade tip and the closest woodland edge ranges from 80.56 m to 93.46 m. Setbacks from the interconnection line range from adjacent to 94 m to the closest edge.

During operation there is the potential for spills and contamination to the woodland. Noise, dust, and general disturbance could also increase when maintenance crews are on site. These impacts are anticipated to be temporary in duration and relatively minor in scale.

Mitigation Measures

Mitigation measures related to dust, noise and accidental spills are outlined in Section 5.4.2, 5.5.3 and Section 5.7.2, respectively.

Net Effects

With the application of the above mitigation measures, any adverse net effects to woodlands during operation of the Project are anticipated to be short-term in duration and spatially limited.

Accidental spills would be spatially limited and of short duration and protocols to minimize their impact would be provided in the Emergency Response Plan. See Section 6.4.5 for more information on the Emergency Response Plan.

5.2.5 Provincial Parks and Conservation Reserves

Potential Effects

No Provincial Parks or Conservation Reserves are located within 120 m of the Project Location.

Mitigation Measures

No potential effects would occur on Provincial Parks or Conservation Reserves and therefore no mitigation measures are necessary.

Net Effects

No adverse net effects on Provincial Parks or Conservation Reserves are anticipated during operation of the Project.

5.2.6 Significant Wildlife and Wildlife Habitat

Two features containing significant wildlife habitat (amphibian breeding ponds) were identified within 120 m of the Wind Project Location.

One feature containing significant wildlife habitat (winter deer yard) was identified within 120 m of the Interconnection Line Project Location.

Generalized candidate significant wildlife habitat within 120 m of the Interconnection Line Project Location is assumed to be present and must be treated as significant.

No species of conservation concern were identified in or within 120 m of the Project Location.

Potential Effects

No potential effects on significant wildlife and wildlife habitat are anticipated during operations and maintenance of the Project.

Siting the Project outside of natural features has largely precluded disturbance to local flora, fauna, habitat, and movement functions supported by the features. Sensory disturbance of wildlife may occur during all phases of the Project as a result of increased on-site human activities. During operations, activity levels would be considerably lower. A certain level of

sensory disturbance to wildlife in the Study Area already exists from ongoing agricultural, rural, and domestic activities.

Studies related to the sensory effects of constructing and operating wind projects on big game resources, carried out in the Western U.S., indicate that species are either unaffected by wind projects, given their small footprint and preservation of the existing land-use, or that they can readily adapt to the presence of the wind project.

During operation there is the potential for spills and contamination to the significant wildlife and wildlife habitat. Noise, dust, and general disturbance could also increase when maintenance crews are on site. These impacts are anticipated to be temporary in duration and relatively minor in scale.

Mitigation Measures

Mitigation measures related to dust, noise and accidental spills are outlined in Section 5.4.2, 5.5.3 and Section 5.7.2, respectively.

Net Effects

No adverse net effects on significant wildlife and wildlife habitat are anticipated during operation of the Project.

Post-construction disturbance and mortality monitoring would be conducted to verify effects predictions and additional operational mitigation would be implemented if unanticipated effects occur. The Environmental Effects Monitoring Plan for Wildlife is provided in Appendix E

5.2.7 Other Wildlife and Wildlife Habitat

The majority of species found within the Project Study Area are ranked S5 (i.e., secure - common widespread and abundant) or S4 (apparently secure - uncommon but not rare) in Ontario.

Potential Effects

Sensory disturbance of wildlife may occur during operations as a result of increased on-site human activities. However, a certain level of sensory disturbance to wildlife in the Study Area already exists from ongoing agricultural activities.

During operation direct mortality to birds and bats may occur from collisions with turbines.

Mitigation Measures

Post-construction monitoring for bird mortality rates involves carcass searches twice-weekly at 10 turbines from May 1- October 31 for three years following the start of operations. Raptor mortality surveys would occur once-weekly from November 1- 30 for three years following start of operations.

Mitigation is specified by current provincial guidance (at the time of writing, thresholds are: 14 birds/ turbine/year, or 10 or more birds at any one turbine, or 33 or more birds at multiple turbines on any one visit, or 2 raptors at the project). Mitigation may include additional scoped mortality and effects monitoring and operational controls, such as periodic shut-down on select turbines or blade feathering at specific times of the year, depending on the species affected. Mitigation scenarios will be developed in consultation with the MNR.

Post-construction monitoring for bat mortality rates involves carcass searches twice-weekly at 10 turbines from May 1 - October 31, for three years following start of operations.

Potential operational controls are specified by current provincial guidance (at the time of writing, threshold is 10 bats/ turbine/year). Operational mitigation will include increasing cut-in speed to 5.5 m/s or feathering wind turbine blades when wind speeds are below 5.5 m/s between sunset and sunrise, from July 15 to September 30. This mitigation should continue for the duration of the project as set out in the MNR's Bat Guidelines (2011b).

A post-construction monitoring plan for direct (mortality) and disturbance effects has been developed, along with a response and contingency plan. Additional details are provided in Section 6.5.2 and the Environmental Effects Monitoring Plan (Appendix E). Mitigation measures for traffic and noise are listed in Sections 5.5.7 and 5.4.3, respectively.

Net Effects

The Project may result in limited mortality to birds and bats. Direct mortality at wind facilities is generally low and is not considered to be significant. Provided that all mitigation and monitoring measures are implemented, any indirect adverse net effects on wildlife from operations are anticipated to be short-term in duration and intermittent.

There is some potential for disturbance to wildlife during operations and maintenance of the Project as a result of increased human activity, particularly increased traffic. Some limited mortality is possible; however potential long-term effects to wildlife populations from this mortality and from barrier effects are anticipated to be minimal because of the temporary nature of the increased human activities.

5.2.8 Significant Flora and Vegetation Communities

Potential Effects

No significant flora or vegetation communities have been identified in or within the Project Location.

Mitigation Measures

No potential effects would occur on significant flora or vegetation communities during operations, and therefore no mitigation measures are necessary.

Net Effects

No adverse net effects on significant flora or vegetation communities are anticipated during operation of the Project.

5.2.9 Other Flora and Vegetation Communities

Potential Effects

Indirect effects to flora species and nearby vegetation communities are related to dust emissions from maintenance traffic.

Mitigation Measures

Mitigation measures related to dust emissions are discussed in Section 5.4.2.

Net Effects

Though the effects are anticipated to be minimal, there is some potential for disturbance to flora and vegetation communities as a result of dust emissions. However, these effects are expected to be short-term in duration and spatially limited.

5.3 WATER BODIES AND AQUATIC RESOURCES

5.3.1 Groundwater

Potential Effects

It is not anticipated that operation of the Project would adversely affect groundwater quality, quantity, or movement.

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

Mitigation Measures

Mitigation measures for accidental spills are outlined in Section 5.7.2.

Net Effects

Accidental spills would be spatially limited and of short duration and protocols to minimize their impact would be provided in the Emergency Response Plan. See Section 6.4.5 for more information on the Emergency Response Plan.

5.3.2 Surface Water, Fish and Fish Habitat

In accordance with O. Reg. 359/09, a WA/WBR was undertaken for the Project (included under separate cover as part of the REA application) to determine the presence of water bodies as defined by O. Reg. 359/09 and associated setbacks. The following provides an assessment of

potential effects and mitigation measures for all surface water features within 300 m of the Project Location (see Appendix A, Figure 7).

Watercourses in the Project Study Area are within the Maitland River watershed. All water features within the Project Study Area drain into the South Maitland River before it converges with Lake Huron to the west.

Potential Effects

The potential for effects on watercourses exists from soil erosion resulting from maintenance activities requiring excavation. Erosion can cause downstream sediment transport and a short-term increase in surface water turbidity, including associated impacts to fish and fish habitat. In addition, some materials, such as fuel, lubricating oils and other fluids associated with turbine maintenance have the potential for release to the environment in the event of accidental spills.

Access roads cross watercourses in the vicinity of T4, T6, T14 and T15. The culverts would be designed and installed in a manner that would not impede fish movement or water passage and where possible, habitat enhancement measures would be incorporated into the design. All work in watercourses will be conducted in consultation with the Maitland Valley Conservation Authority.

Maintenance Activities in Proximity to Watercourses

The potential for effects on watercourses exists from soil erosion resulting from unavoidable removal of stabilizing vegetative cover during maintenance activities. Erosion can cause downstream sediment transport and a short-term increase in surface water turbidity, including associated impacts to fish and fish habitat. Due to the Project Location's rural and agricultural land uses, the watercourses are not highly sensitive to temporary disturbances. However, the magnitude and duration of potential effects to watercourses depend on the specific characteristics of each watercourse (e.g. flow regime, water velocity, bed substrates, bank conditions, local soils and the extent and duration of exposure). In addition, some materials, such as fuel, lubricating oils and other fluids associated with turbine maintenance, have the potential for release to the environment in the event of accidental spills.

Mitigation Measures

Erosion and sediment control measures would be implemented during maintenance activities where excavation is required. The O&M Contractor would obtain adequate quantities of materials in order to control erosion and sediment deposition. Erosion and sediment control measures would be installed at the discretion of the O&M Contractor. Barriers would be inspected regularly to ensure proper functioning and maintenance. Materials removed or stockpiled (e.g. excavated soil, backfill material, etc.) would be deposited and contained in a manner to ensure sediment does not enter a watercourse. Erosion and sediment control measures would remain securely installed until permanent vegetation measures are successful and areas are stabilized, as determined by the O&M Contractor.

If any damage were to occur, as soon as possible following completion of the maintenance activity, stream banks would be restored to their original grade.

If siltation to a watercourse occurs, activities would cease immediately until the situation is rectified. The Emergency Response Plan (**Section 8.0**) would contain procedures for spill contingency and response plans, spill response training, notification procedures, and necessary cleanup materials and equipment. As per S.13 of the *Environmental Protection Act*, all spills that could potentially have an adverse environmental effect, are outside the normal course of events, or are in excess of prescribed regulatory levels would be reported to the MOE's Spills Action Centre by the O&M Contractor.

Mitigation measures related to accidental spills are outlined in **Section 5.7.2**.

No additional mitigation measures are required for correctly installed culverts.

Net Effects

Provided that all mitigation measures are implemented, no adverse net effects on surface water are anticipated during operation of the Project. There remains the potential for adverse net effects to fish and fish habitat due to spills, sedimentation and erosion. With the implementation of the mitigation measures listed above, any associated effects would be infrequent, of low probability, of short duration and of limited spatial extent.

5.4 AIR QUALITY AND ENVIRONMENTAL NOISE

5.4.1 Air Emissions

Potential Effects

During operation minor localized air emissions would occur from the periodic use of maintenance equipment and vehicles over the life of the Project.

Mitigation Measures

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

- Multi-passenger vehicles would be utilized to the extent practical;
- Equipment and vehicles would be turned off when not in use unless required for maintenance activities and/or effective operation;
- Equipment and vehicles would be maintained in good working order with functioning mufflers and emission control systems as available;
- All vehicles would be fitted with catalytic converters as required by applicable regulation;

- All equipment and vehicles would meet the emissions requirements of the MOE and/or Ministry of Transportation (MTO);
- As appropriate, records of vehicle maintenance would be retained and made available for periodic review by the O&M Contractor; and
- 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.

Net Effects

The application of the recommended mitigation measures during operation would 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.

The Project would result in a net reduction of air emissions related to electricity generation, offsetting electricity generated by fossil fuel technologies and therefore, reducing air pollutants and greenhouse gas emissions.

5.4.2 Dust and Odour Emissions

Potential Effects

Operations-related traffic and maintenance activities have the potential to create nuisance dust effects in the immediate vicinity of the Project. Unpaved road surfaces exposed to wind can also be a source of fugitive dust emissions.

No odour emissions are anticipated during operation of the Project. Therefore, no mitigation measures are required.

Mitigation Measures

To protect adjacent receptors from potential off-site dust concerns, St. Columban Energy LP and/or the O&M Contractor would implement good site practices during operation which may include:

- Maintaining equipment in good running condition and in compliance with regulatory requirements;
- Dust suppression (e.g. water) of source areas; and
- Covering loads of friable materials during transport.

Net Effects

The application of the recommended mitigation measures during operation would limit fugitive dust emissions to the work areas. As a result, any adverse effects to air quality from dust

emissions during operation of the Project are anticipated to be short-term in duration and highly localized.

5.4.3 Environmental Noise

Potential Effects

During operations, sound would be generated periodically by maintenance equipment. The audible sound at receptors beyond the turbine siting areas is expected to be a minor, short-term disruption.

Mechanical and aerodynamic sound would be emitted from the wind turbines. 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 (Appendix D) in accordance with the MOE "*Noise Guidelines for Wind Farms*", dated October 2008 and O. Reg. 359/09.

A 44 kV transformer substation will be required at the northern end of the underground interconnection line, to connect the Project to the existing HONI electrical system. According to O. Reg. 359/09, a Noise Assessment Report is required for any transformer that operates at a nominal voltage of 50 kV or greater; therefore, a noise assessment is not required for the St. Columban transformer substation. Nonetheless, a preliminary assessment was conducted in order to provide comfort to the community, and it was determined that, at a distance of 50 m from the transformer substation, the noise level would reach compliance (less than 40 dBA at all noise receptors), and noise levels would continue to decrease with increased distance.

Based upon the Project design, the analysis carried out in the Noise Assessment Report indicates that sound produced by the Project is within the acceptable limits established by the MOE at all non-participating noise receptors.

Mitigation Measures

The Project would operate according to the terms and conditions of the REA. In the event the Project does not operate according to the terms and conditions of the REA, the non-compliant turbine(s) may be shut down until the problem is resolved. A regular maintenance program would largely mitigate potential effects related to noise from damaged turbines.

To minimize inconvenience brought on by noise during the use of maintenance equipment during the operation phase of the Project, all engines associated with maintenance equipment would be equipped with mufflers and/or silencers in accordance with MOE and/or MTO guidelines and regulations. Noise from maintenance equipment would also be compliant with sound levels established by the MOE.

Routine facility maintenance to will be performed as required to ensure infrastructure is operating properly and efficiently.

To the greatest extent possible, operation activities that could create excessive noise would be restricted to regular business hours and adhere to any local noise by-laws and any requirements of the Occupational Health and Safety Act. If maintenance activities that cause excessive noise must be carried out outside of these time frames, adjacent residents would be notified in advance and by-law conformity would occur, as required.

Net Effects

Application of the recommended mitigation measures during operation would limit noise emissions to the general vicinity of the turbine locations. Given that the noise assessment has concluded that the environmental noise effect from the operation of the Project is in compliance with the applicable MOE environmental noise guidelines, no significant net effects are anticipated.

Intermittent noise would increase during regular business hours at the turbine locations. Any adverse net effects due to noise during operation of the Project are anticipated to be short-term in duration and intermittent.

5.5 LAND USE AND SOCIO-ECONOMIC RESOURCES

5.5.1 Areas Protected Under Provincial Plans and Policies

Potential Effects

No areas protected under specified Provincial Plans and Policies are located within the Project Study Area.

Mitigation Measures

No potential effects will occur on areas protected under provincial plans and policies and therefore no mitigation measures are necessary.

Net Effects

No adverse net effects on areas protected under provincial plans and policies are expected during operation of the Project.

5.5.2 Existing Land Uses

Potential Effects

During the operation phase of the Project, the lands which are occupied by facility components would be removed from their present land-use; however, existing surrounding land uses would remain unchanged.

During operation there would be a short-term and intermittent increase in noise and dust around the work and haul areas used by maintenance equipment and personnel vehicles, resulting in a potential effect to adjacent land uses.

There is potential for a minor increase in traffic during operation on roadways within the Project Study Area during maintenance activities. Notification of component delivery dates and a traffic management plan are intended to minimize any potential effects in the local area.

Mitigation Measures

The Project is considered to be compatible with existing land use; therefore no other mitigation measures are required to address effects to the existing land use. Siting of turbines and access roads are completed with the approval of the participating landowner.

Landowners would be compensated by St. Columban Energy LP for agricultural land that would be taken out of production during the lifespan of the Project through the land lease agreements.

Mitigation measures have been identified for noise in Section 5.4.3, dust in Section 5.4.2, and traffic in Section 5.5.7.

Net Effects

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

5.5.3 Recreation Areas and Features

The St. Columban teams of the Western Ontario Soccer League use two soccer fields adjacent to St. Columban Catholic School within the Study Area. The season lasts from the end of May to the end of September, and games are scheduled throughout the week on weekend afternoons and weekday evenings.

St. Columban Catholic Elementary School, part of the Huron-Perth Catholic District School Board, is within the Study Area. There is an enrollment of approximately 153 students from Grades 3 to 8. This school is closely tied with St. Patrick's Church in Dublin and the surrounding community.

At the request of local residents and users of the soccer fields, the distances to the nearest turbines were calculated. Turbine 11 is 735 m from the nearest corner of the closest soccer field, and 948 m from the centre of the school building. The next closest turbine is Turbine 14, which is located 856 m from the closest corner of the nearest soccer field, and 1,097 m from the centre of the school building.

Knox Presbyterian Church, a Knights of Columbus Hall and the Cranbrook Community Hall are located within the Study Area. St. Columban Cemetery and one un-marked cemetery (located on Winthrop Rd) are also located within the Study Area.

Project infrastructure is sited on privately owned lands, which do not include or border local hiking or cycling routes, fishing or conversation areas or parks.

Potential Effects

Due to the presence of the turbines, disturbance to the viewscape may occur. No additional adverse effects are anticipated to recreation areas and features during operation of the Project.

Mitigation Measures

Mitigation measures have been identified for viewscape in Section 5.5.9.

Net Effects

Net effects have been identified for viewscape in Section 5.5.9.

5.5.4 Agricultural Lands and Operations

Potential Effects

The existing land use within the Project Study Area includes primarily agricultural lands, specifically Class 1 and 2 lands. During operations, the Project is estimated to take out of agricultural production approximately 12.5 acres of land, which is equivalent to less than 1% of the total land options for the Project. Most of this land will be used to provide road access to the wind turbines, and these roads have been designed in such a manner as to reduce their overall length, and in consultation with the landowners, to assist with and improve the current and future cultivation of the agricultural lands.

Potential effects to the agricultural land used for the turbines, access roads and collector lines are related to the change in use from agricultural to renewable energy development. However, where lands are being used for Project infrastructure, landowners are being financially compensated for the lease of the private lands and thus offset the effect of removing the land from agricultural production.

Impacts to livestock during the operation of the Project are anticipated to be minimal.

Dust emissions from operation activities are associated with vehicular traffic from maintenance equipment and personnel vehicles. Dust emissions are expected to be short-term in duration and highly localized. No potential physical effects are anticipated on agricultural lands and operation from dust during operation of the Project. Therefore, no mitigation measures are required.

Mitigation Measures

Given that agricultural land would be required during the operation of the turbines, access roads and collector lines, landowners are being financially compensated for the lease of the private lands to offset the effect of removing the land from agricultural production. To the greatest extent possible, efforts have been made to site the turbines, access roads, collector lines, and the interconnection line in such a way as to minimize disturbances to existing agricultural lands and operations. In particular, siting of turbines and access roads are completed with the approval of the participating landowner.

Operational and maintenance activities would be restricted to the delineated Project areas such as access roads and crane pads. Under O. Reg. 359/09, the centre of the turbine base must be at least hub height (99.5 m) from adjacent non-participating landowners, in order to prevent potential effects on land use and businesses. If this distance cannot be achieved, a Property Line Setback Assessment must be completed for those turbines within a minimum of 65 m of adjacent non-participating properties. This assessment is included in Appendix C to this report.

It is recommended that St. Columban Energy LP and/or the O&M Contractor and property/ livestock owners maintain regular communication in order to ensure a minimum level of impact on livestock during operation.

Net Effects

Disturbances to agricultural lands and operations are expected to be temporary and spatially limited.

5.5.5 Mineral, Aggregate, and Petroleum Resources

Based on field studies conducted in November 2011, aggregate resources appear to be actively utilized near or within the Project Study Area, including for example, Handy Aggregates on Hensall Road. There are planned aggregate developments in the vicinity of Centre Line Road and Johnston Line.

Potential Effects

Lands designated as Potential Aggregate Resources according to Huron County's Official Plan are situated in the Wind Project Study Area and along the Interconnection Line. While lands designated for resource extraction are present, operation of the Project is not anticipated to have any effects on mineral and aggregate resources as the lands required for the Project have been granted for renewable energy development instead of mineral and aggregate extraction by each participating landowner. Along the interconnection line, further discussions with the municipalities will identify the locations of deposits, and the details of any known plans to develop these resources.

The Project Study Area lies within a region of southern Ontario with known oil and gas resources, and there are no oil and gas pipelines within 300 m of the Project Location. There is

one abandoned petroleum well within 300 m of the Interconnection Line Project Location – near the intersection of McNabb line and Brandon Road. No adverse effects are anticipated to petroleum resources during operation of the Project.

Mitigation Measures

As no potential effects are anticipated to existing mineral or aggregate resources, no mitigation measures are necessary. St. Columban Energy LP will work with the Municipality of Howick on planned aggregate developments along the interconnection line. Project components are sited more than 75 m from the mapped petroleum well location.

Net Effects

No adverse net effects are anticipated to mineral, aggregate or petroleum resources during operation of the Project.

5.5.6 Game and Fishery Resources

Since the Project has been sited entirely on agricultural lands, most potential indirect effects to wildlife and their habitats will be temporary until the Project becomes part of the environmental "background". The mammals present on the agricultural lands are common in southwestern Ontario and tend to be well-adapted to human-influenced landscapes and disturbance.

Investigations by the German Institute for Wild Animal Research (Institut für Wildtierforschung) show that no permanent adverse effects from wind turbine operation can be determined for game animals (Austrian Wind Power, 2007). A three-year study by the Institut für Wildtierforschung at the Veterinary University of Hanover showed that no adverse effects by wind turbines could be determined on the occurrence and behaviour of animals such as common hare, deer, red foxes, partridges and carrion crows. A survey conducted in parallel of the owners of hunting shoots in Lower-Saxony showed that the majority of hunters did not view the wind turbines as a source of disturbance for smaller game animals (Austrian Wind Power, 2007). Sixty-six percent of hunters stated that the game did not stay away from the immediate vicinity of the wind plants. Almost 60 percent of the interviewees were of the opinion that all species in their corresponding territories became accustomed to the presence and operation of the turbines, whereby the periods required for this varied from one month to five years. This study demonstrates the tolerance of various wildlife populations to the presence of wind turbines (Austrian Wind Power, 2007).

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

From the few studies that are available, mammals were able to adapt to various noises. Noise and its effects on wildlife appear to be habitat and species specific. If species are able to adapt easily to human-modified habitats, generally they do not seem to be adversely affected by noise.

Improperly installed culverts have the potential to affect fish habitat and may impose barriers to fish passage.

Mitigation Measures

Masking of auditory environmental signals, such as mammal warning cries or amphibian calls, may be significant immediately underneath the turbine (Rabin et al., 2006), but the effects rapidly decline with distance from the turbine. A study of low frequency noise and vibration at a modern wind farm determined that vibration is 1/5th to 1/100th of the limit of human perception within 25 m of the turbine base (Legerton et al., 1996). While other mammals and amphibians may be more perceptive of vibration, vibration magnitude drops off significantly as distance increases (K. Smith, Aercoustics, pers. comm.).

Turbines are generally placed on agricultural land, away from woodlands, and far enough away to meet REA requirements and minimize potential effects. Siting the Project on agricultural land has largely precluded disturbance to local flora, small mammals and amphibians, natural habitat, and corridor functions. No further mitigation measures are required.

Culverts will be designed and installed such that there is no restriction of flows resulting in upstream pooling, erosion at the culvert inlets and outlets and barrier to fish passage to upstream environments.

Net Effects

Once the Project is operating human activity around the facilities will decrease, thus allowing local wildlife movement patterns to quickly re-establish.

Considering the periodic nature of maintenance activities, it is likely that resident game species will adapt to the Project quickly. With the proper installation of culverts, no effects on fish habitat are anticipated. Consequently, no net adverse effects are anticipated during the Project to game and fishery resources.

5.5.7 Local Traffic

Provincial and other major infrastructure within the Project Study Area includes Huron Road/Highway 8, Winthrop Road/ Highway 17, Blyth Road/Highway 25, Newry Road/Highway 16, and Amberley Road/Highway 86. Characteristic of low density rural agricultural areas, very low traffic levels are supported by the municipal rural concession roads surrounding the Project. Local traffic and area residents comprise the majority of traffic on these roads which do not typically facilitate through traffic or access to major traffic arteries.

Potential Effects

There is potential for an increase in traffic on municipal roads within the Project Study during operations. A small number of light trucks would be required for typical maintenance activities,

and occasionally larger vehicles would be required to transport turbine components, if required. The contractor responsible for collecting used oil would likely be required on a semi-annual basis.

The increase in traffic may result in short-term, localized disturbance to traffic patterns or increases in traffic volume, and/or create potential traffic safety hazards.

Mitigation Measures

There may be instances during maintenance activities where excess loads (e.g. turbine components) would require special traffic planning. In addition, widening turning radii and road widths and the creation of new ingress/egress nodes from the work areas may be required. As appropriate, permits would be obtained to implement these activities. As appropriate, for public safety all non-conventional loads would have front and rear escort or "pilot" vehicles accompany the truck movement on public roads.

Although there are no requirements for formal public notification of wind turbine component load movements, St. Columban Energy LP may notify the community and the municipalities of non-conventional load movements that may interfere with local traffic. This notification would be provided in the interest of public safety, minimization of disruption of other road users, local businesses, and good community relations. The frequency and type of communications would be determined prior to operation.

Net Effects

Road safety is not expected to be an issue during operation; 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, however this traffic would be short-term in duration and intermittent.

The effect of operating the wind farm is anticipated to have a limited, short term effect on traffic.

5.5.8 Local Economy

As of November 2011, three businesses are located within or near the Interconnection Line Study Area, and 12 businesses are located within the Wind Project Study Area. These businesses include farms, a general store, a hardware store, trucking businesses, a pottery store, a welding and repair shop, wood products, and electrician services.

Potential Effects

Operation of the facility is expected to continue for a minimum of 20 years. St. Columban Energy LP may hire a specialized O&M Contractor for specific maintenance tasks, and to the extent possible, local hiring would be maximized during the operations period to provide work for existing tradespersons and labourers. Trades that could be provided locally may include pipefitters, electricians, ironworkers, millwrights and carpenters. Since it is likely that the majority

of the labour force would be supplied through local and neighbouring communities no special housing, healthcare or food facilities would be required as part of operation activities.

Local economic benefits would also include a minimum of 20 years of land lease payments to participating landowners in addition to municipal taxes to be paid by St. Columban Energy LP.

Mitigation Measures

To the extent possible St. Columban Energy LP and/or the O&M Contractor would source required goods and services from qualified local suppliers where these items are available in sufficient quantity and at competitive prices.

Net Effects

The Project would provide positive benefits to Huron East, Morris-Turnberry, Howick and Huron County, and participating landowners. Huron East and Huron County would receive ongoing property tax income from the Project and participating landowners would receive land lease payments. A nominal increase in municipal services is possible for Huron East, Morris-Turnberry, Howick and Huron County. Existing businesses within local communities could benefit from the demands of the Project workforce during operation.

5.5.9 Viewscape

Potential Effects

Siting of turbines would alter the visual landscape. However, visibility of the turbines would vary from receptor to receptor based on the following factors:

- Surficial patterns: landform – largely determined by physiography and tree cover;
- Topography: slope – the greater the slope the greater the visibility of the turbines from more vantage points;
- Observer position: viewing – distance from the turbines reduces scale and the apparent size of a project is directly related to the angle between the viewer's line-of-sight and the slope upon which the project is to take place;
- Atmospheric conditions: clarity – air pollution, natural haze, fogging, snow affect daytime and nighttime visibility; and,
- Turbine marking: lighting – primarily affecting nighttime visibility.

Mitigation Measures

Landscaping at the electrical control buildings and the transformer station may include tree and shrub planting where appropriate, while still maintaining site visibility and building security.

There are limited opportunities for potential mitigation strategies given the height of the wind turbines and the landscape patterns.

Net Effects

Some disturbance to the viewscape is unavoidable due to the height of the turbines. The changed visual landscape would be present during the life of the Project.

5.6 EXISTING INFRASTRUCTURE

5.6.1 Provincial, Municipal and Other Major Infrastructure

Provincial and other major infrastructure within the Project Study Area includes Huron Road/Highway 8, Winthrop Road/ Highway 17, Blyth Road/Highway 25, Newry Road/Highway 16, and Amberley Road/Highway 86.

Potential Effects

No potential effects are anticipated during operation of the Project on Provincial, Municipal or other major infrastructure other than to roadways. Potential effects on Provincial, Municipal or other major infrastructure from construction of the Project are described in the Construction Plan Report.

There may be instances during maintenance activities where excess loads (e.g. turbine and transformer components) would require special traffic planning.

Potential effects to traffic during the operation of the Project are discussed in Section 5.5.7.

Mitigation Measures

Permits from the MTO may be required to facilitate the transportation of components used for maintenance (e.g. cranes) on provincial highways. As appropriate, for public safety all non-conventional loads would have front and rear escort or “pilot” vehicles accompany the truck movement on public roads.

The additional traffic on the provincial highways is not expected to cause any significant traffic congestion.

Although there are no requirements for formal public notification of wind turbine component load movements, St. Columban Energy LP may notify the community and the municipalities of non-conventional load movements. This notification would be provided in the interest of public safety, minimization of disruption of other road users, local businesses, and good community relations. The frequency and type of communications would be determined prior to operation.

Net Effects

No net effects are anticipated to provincial and local infrastructure during operation of the Project.

Net effects from traffic during the operation of the Project are discussed in Section 5.5.7.

5.6.2 Telecommunications Network

Potential Effects

Wind turbines have the potential to interfere with telecommunication and radar systems, including:

- Cable distribution off-air (over-the-air, OTA) receiver systems (Head-ends);
- Satellite uplinks and receiver systems (including GPS);
- Direct-to-home receiver systems (DTH - Shaw Direct, Bell TV);
- Radar (weather, defence and air traffic);
- Airport communications and guidance systems;
- Broadcasting – radio (AM, FM) and TV;
- Coast Guard communications and vessel traffic radar systems;
- Point-to-point radio-communication systems;
- Point-to-multipoint radio-communication systems, and,
- Cellular and land mobile networks.

Wind turbines can affect radio-communication and radar signals in a number of ways including shadowing, mirror-type reflections, clutter or signal scattering (RABC, 2010).

A cellular telephone system tower belonging to the Bell Mobility Network was identified near the project. Two point-to-point microwave paths to this tower were also identified by Bell Mobility. These paths transect the Project properties (one from the tower toward the northeast, and one toward the southeast).

A consultation zone of 1 km around the communications tower is recommended in RABC/CanWEA (2007). In addition, Bell Mobility recommended that no turbine be within 100 m of the communications path. This is consistent with the point-to-point consultation zone recommended in Table 2 of RABC /CanWEA (2007).

There would be no impact on radar systems employed by the Department of National Defence and NavCanada. In addition, there would be no impact on NavCanada's Air Traffic Control systems. Although there is the potential that some portions of the wind farm may be detected by one of Environment Canada's weather radar systems, mitigation measures are available to alleviate the impacts, if any.

Seismoaccoustic station locations in the vicinity of the project were identified on the Canadian National Seismograph Network website as approximately 170 km to the east-southeast (Effingham, EFO) and 220 km to the northeast (Sadowa, SADO). Given the distances of the seismoacoustic stations from the Project, there are no potential effects.

Mitigation Measures

Although no effects are anticipated, in the unlikely event that signal disruption is experienced, mitigation measures are available to alleviate the impact. This may include replacing the receiving antenna with one that has a better discrimination to the unwanted signals, relocating either the transmitter or receiver, or switching to an alternate means of receiving the information (fibre optic or other means). St. Columban Energy LP would review potential incidents of telecommunications interference on a case by case basis.

In the unlikely case that a cellular provider demonstrates that its coverage has been diminished to the extent that cellular communications are no longer reliable, coverage can be restored by installation of an additional cell tower or possibly installation of one or more additional antennae on the existing cell tower.

For design purposes, exclusion zones of 100 m were designated along the point to point paths and no turbines were placed within the area defined by the exclusion zone for Bell Mobility. In addition, no turbines were placed within 1,000 m of the transmission tower.

Additional information related to potential impacts to telecommunications networks and radar systems are provided in the Consultation Plan Report. This includes comments/clearances provided agencies such as the Ontario Government Mobile Communication Office, Department of National Defence, and the Royal Canadian Mounted Police.

Net Effects

Telecommunication network signals should not be affected by the operation of the Project. However, a complaint resolution system would be in place to record and investigate complaints regarding telecommunications interference. Mitigation would be conducted on a case by case basis pending results of the investigation.

With the application of the above mitigation measures, no significant adverse net effects on telecommunications networks are anticipated during operation of the Project.

5.6.3 Aeronautical Systems

Potential Effects

The presence of wind turbines presents a potential hazard to low flying aircraft. Aviation safety lighting and marking of the turbines is required by Transport Canada's Aerodrome Safety Branch as specified in the Canada Aviation Regulations and Standards. Aviation safety lights, which serve to increase night-time visibility of the turbines to aviators, are required at the top of

turbines as part of the lighting requirements. These safety lights may also brighten the night sky. Turbine lighting is LED, and is powered by the grid power supply in the turbine. If power is lost, the turbines will stop, and the lights will go out. They will automatically restart as soon as power is reinstated to the turbine and as the lights are controlled by satellite, so will resynchronize with each other. The turbine has a sensor to let the operating systems know the light is working – if it burns out, the system will notify the operator, who will arrange to replace the light.

Transport Canada standards state that wind farms require a red obstruction lighting system consisting of fading on and off aviation red beacons. These are used for night marking of wind turbines between the heights of 90 m and 150 m (including blade length) above ground level and spaced approximately 900 m apart. Final aviation lighting requirements would be in accordance with Transport Canada Regulations and Standards, and Transport Canada has approved the lighting plan for this Project.

There are two private registered airstrips, the Brussels (Armstrong) PD4 airstrip and the Ethel (Martin) PD2 airstrip, within 5 km of the proposed interconnection line. As the line will be buried in the municipal road allowance, there are no anticipated effects on operation of the airstrips.

There is one small private unregistered grass airstrip located on the east half of Lot 8, Concession 4 fronting onto Bridge Road (adjacent to access road for T4). The airstrip is owned and used by a participating landowner that holds lease agreements with St. Columban Energy LP. Subject to the erection of wind turbines for the Project, the landowner would evaluate the airstrip's feasibility and take whatever action may be required to meet Transport Canada and NAV CANADA requirements from an aviation safety perspective. The Project has consulted with both NavCanada and Transport Canada regarding potential impacts to navigation, and both have indicated they have no concerns with the Project as designed.

Mitigation Measures

According to Transport Canada's Aerodrome Safety Branch guidelines, a wind turbine more than 900 m from another wind turbine with a light requires its own lighting. Turbine lighting must conform to Transport Canada standards. In order to reduce rural light pollution, lights would be synchronized, with the minimal allowable flash duration, and a narrow beam.

It should be pointed out that turbine marking and lighting are secondary safety measures for aircraft. The turbines, approximately 149 m tall when one blade is upright, are below the minimum flight floor of 500 feet (152.4 m) above ground level. It is illegal for aircraft to fly below 500 feet (152.4 m) unless they have been granted a special clearance for a low level flight. Low-level aircraft such as ultra-lights and crop dusters are to be familiar with the area they are flying over and are prohibited from night-time flights. Nav Canada would be responsible for updating all aeronautical charts with the turbine locations.

Net Effects

With the application of the above mitigation measures, no adverse net effects on aeronautical activities are anticipated during operation of the Project.

5.7 WASTE MANAGEMENT AND CONTAMINATED LANDS

5.7.1 Waste Material Disposal

Potential Effects

Lubricating and hydraulic oils associated with Project maintenance and operation would be used, and waste materials, such as oil, grease, batteries, and air filters and a small amount of domestic waste (i.e. garbage, recycling, and organics), would be generated during standard operation and maintenance activities.

All waste materials will require recycling, and/or disposal at an appropriate off-site facility. Improper disposal of waste material generated during operation may result in contamination to soil, groundwater, and/or surface water resources on and off the Project sites. Litter generated during operation may also become a nuisance to nearby residences if not appropriately contained and allowed to blow off site. There would be no on-site disposal of waste during the operation of the Project. All waste materials would be removed from the Project site and disposed or recycled as required by the municipal and provincial waste management regulations.

Mitigation Measures

During operation, St. Columban Energy LP and/or the O&M Contractor would implement a site-specific waste collection and disposal management plan, which may include good site practices such as:

- Contractors would be required to remove all waste materials from Project sites during maintenance activities;
- All waste materials and recycling would be transported off-site by private waste material collection contractors licensed with a Certificate of Approval – Waste Management System;
- Labelling and proper storage of liquid wastes (e.g. used oil, drained hydraulic fluid, and used solvents) in a secure area that would ensure containment of the material in the event of a spill. As per S.13 of the *Environmental Protection Act*, all spills that could potentially have an adverse environmental effect, are outside the normal course of events, or are in excess of the prescribed regulatory levels would be reported to the MOE's Spills Action Centre by the O&M Contractor;
- As appropriate, spill kits (e.g. containing absorbent cloths and disposal containers) would be provided on-site during maintenance activities and at the operation and maintenance building;
- Dumping or burying wastes within the Project sites would be prohibited;

- Disposal of non-hazardous waste at a registered waste disposal site(s);
- If waste is classified as waste other than solid non-hazardous, a Generator Registration Number is required from the MOE and the generator would have obligations regarding manifesting of waste. Compliance with Schedule 4 of Regulation 347 is mandatory when determining waste category; and
- Implementation of an on-going waste management program consisting of reduction, reuse, and recycling of materials.

Net Effects

With the application of the mitigation measures outlined above, no net effects from waste material disposal would occur on-site during operation of the Project. 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.

5.7.2 Spills

Potential Effects

Some materials, such as fuel, lubricating oils and other fluids associated with turbine maintenance have the potential for discharge to the on-site environment through accidental spills.

Mitigation Measures

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

An Emergency Response Plan would be developed by St. Columban Energy LP and/or the O&M Contractor and would include protocols for the proper handling of material spills and associated procedures to be undertaken in the event of a spill. See Section 6.4.5 for more information on the Emergency Response Plan.

Net Effects

With the application of the mitigation measures outlined above, no net effects from accidental spills or releases to the environment are anticipated during operation of the Project.

5.8 PUBLIC HEALTH AND SAFETY

5.8.1 Turbine Blade and Structural Failure

Potential Effects

While exceptionally rare, the potential exists for full or partial blade detachment from the turbine structure, resulting in damage to the landing area from the impact. Garrad Hassan Canada undertook a review of publicly-available literature on turbine rotor failures resulting in full or partial blade throws (Garrad Hassan Canada, 2007). Such events were found to be very rare; therefore data describing these events are scarce.

Root causes of blade failure have been continuously addressed through developments in best practice in design, testing, manufacture and operation; much of these developments have been captured in the International Electrotechnical Commission (IEC) standards to which all current large wind turbines comply (Garrad Hassan Canada, 2007). There has been widespread introduction of turbine design certification and approval that certifies compliance with standards and requires a dynamic test that simulates the complete life loading on the blade (Garrad Hassan Canada, 2007). The certification body also performs a quality audit of the blade manufacturing facilities and performs strength testing of construction materials. This approach has effectively eliminated blade design as a root cause of failures (Garrad Hassan Canada, 2007).

The reported main causes of blade failure include:

- Human interference with the control system;
- A lightning strike; and
- A manufacturing defect in the blade.

Turbine control systems are subjected to rigorous specification in the design standards for wind turbines (IEC 61400-1) and exhaustive analysis in the certification process. Turbines with industry certification must have a safety system completely independent of the control system. In the event of a failure of one system, the other is designed to control the rotor speed.

Lightning protection systems for wind turbines have developed significantly over the past decade and best practices have been incorporated into the industry standards to which all modern turbines must comply. This has led to a significant reduction in events where lightning causes structural damage. A review of available literature, conducted by the Chatham-Kent Public Health Unit (2008), revealed only four documented turbine failure issues in Ontario due to lightning strikes that required the turbine to be shut down for repair.

The occurrence of structural manufacturing defects in rotor blades has also diminished significantly due to experience and improved quality control in the industry. Design practice has evolved to improve structural margins against any manufacturing deficiencies. Even in the rare event of a blade failure in modern turbines, it is much more likely that the damaged structure

would remain attached to the turbine rather than separating (Garrad Hassan Canada, 2007). Reviews of available information did not find any recorded evidence of injury to the public as a result of turbine blade or structural failure (Garrad Hassan Canada, 2007; Chatham-Kent Public Health Unit, 2008).

Given that accidents or malfunctions of the turbines are considered to be infrequent events, and turbines would be located at least the minimum regulated setback distance from any residence, the event of a failure of the structure would likely not fall beyond the setback distance and not affect public health and safety.

Mitigation Measures

Modern wind turbines must meet strict international engineering standards. Standards include the ability to withstand the forces of a Level 2 tornado (i.e., wind speeds of approximately 55 m/s), and structures must be built to meet earthquake loads as per the Ontario Building Code. The structural integrity of the turbines is designed to withstand wind speeds of approximately 55 m/s. However, during high wind events (i.e., greater than 24 m/s) the turbines are designed to cease operation. Turbine braking is accomplished by aerodynamic (blade pitch) control and friction brakes. The wind turbines would be designed, installed, operated and maintained according to applicable industry standards/certifications.

St. Columban Energy LP and the O&M Contractor would aim to minimize accidents and malfunctions with proper training and education of staff operating the control system. Huron County and Huron East emergency response staff would also be familiarized with the project so that they can deal with any potential accidents and malfunctions resulting from the operation of the turbines. In addition, the turbines would be equipped with lightning protection systems and located at least the minimum regulated setback distance from receptors.

Net Effects

As a result of the structural integrity and design features of the turbines, no adverse net effects from structural failure of the turbines are anticipated during operation of the Project.

5.8.2 Ice Fall and Shed

Potential Effects

Another potential public health and safety issue could result from the accumulation of ice on the turbine blades. This can occur when specific conditions of temperature and humidity exist. This condition is not unique to wind turbines and has the potential to occur on any structure that is exposed to the elements. In Ontario, this condition is most likely to occur in the winter months in extreme weather events. Under these conditions the turbines may be subject to ice coating from freezing rain or interception of low clouds containing super-cooled rain. There are two potential hazards associated with ice accumulation on wind turbines:

- The danger of falling ice that may accumulate on the turbine itself as a result of freeze-thaw of snow and ice; and,
- The throwing of ice from the moving turbine blades.

Falling ice from an immobile turbine does not differ from other tall structures like telecommunication towers, power lines, and antenna masts. The potential ground area affected by falling ice from wind turbines depends to a large extent on the blade position and the prevailing wind speed and direction. Garrad Hassan Canada (2007) estimated that only very high winds may cause ice fragments of any significant mass to be blown beyond 50 m of the base of a modern, stationary 2 MW turbine. Operating staff and landowners are briefed on this situation; therefore the risk is considered minimal (Garrad Hassan Canada, 2007).

Wind turbines typically operate when the wind speed is within the range of 4 m/s to 25 m/s; when turbines are in operation they can accumulate ice on the rotor blades. Ice fragments which detach from the rotor blades can be thrown from the wind turbine; any fragments would land in the plane of the wind turbine rotor or downwind (Garrad Hassan Canada, 2007). Throwing distance varies depending upon the rotor azimuth, rotor speed, local radius, and wind speed. Also, the geometry of the ice fragments and its mass would affect the flight trajectory.

Observations have shown that the ice fragments do not maintain their shape and immediately break into smaller fragments upon detaching from a blade. This would decrease the ice fragment's drag and potentially allow the ice fragment to be thrown greater distances. For human injury to result from wind turbine ice shed from the Project, several conditions would have to exist simultaneously:

- Sustained weather condition conducive to icing;
- Ice dislodging from the turbine blade;
- Ice pieces large enough to remain intact through the air;
- Ice traveling in a particular direction past setback guidelines; and
- A person in the path of the ice as it lands (Garrad Hassan Canada, 2007).

A risk assessment methodology was developed by Garrad Hassan Canada and Partners, in conjunction with the Finnish Meteorological Institute and Deutsches Windenergie-Institut, as part of a research Project on the implementation of Wind Energy in Cold Climates (WECO). Guidelines produced in the WECO Project were based on a combination of numerical modelling and observations. The WECO database of observed ice fragments determined that recorded ice fragments are typically thrown to distances less than 125 m from the base of the turbine (Seifert et al., 2003).

Garrad Hassan Canada developed an Ontario-specific risk assessment methodology for ice shed based on the findings of the WECO Project. Modelling was undertaken to determine the probability of an ice fragment landing within one square metre of ground area, as a function of distance from the turbine. The model result determined that the critical ice shed distance would

be approximately 220 m from a turbine. At distances greater than 220 m, the probability of ice shed reaching ground level at a mass that would cause injury decreases rapidly. The critical distance can effectively be regarded as a “safe” distance, beyond which there is a negligible risk of injury from ice shed (Garrad Hassan Canada, 2007).

Example calculations were presented in the Garrad Hassan Canada (2007) report, using data representative of a typical wind farm Project in rural southern Ontario. These conditions would be considered representative of the Project. Risk to a fixed dwelling, vehicle travelling on a road, and individual person from being struck by an ice fragment thrown from an operating wind turbine were modelled, with the following results:

- Fixed dwelling: equivalent to 1 strike per 500,000 years;
- Vehicle travelling on a road: equivalent to 1 strike per 260,000 years; and
- Individual person: equivalent to 1 strike in 137,500,000 years.

At the request of the Municipality of Huron East, a second model was developed to incorporate the specifics of the proposed turbine model, and also the road use patterns of the study area, particularly in the area of Beechwood Line and Summerhill Road (turbine T9). Based on the known wind speed and direction of the area, and using the same model type as the Garrad Hassan Canada (2007) report, the estimated frequency of a turbine ice fragment impact with a vehicle travelling on Beechwood Line or Summerhill Road within the ice throw range of turbine T9 is approximately 1 in 1,000 years (Zephyr North 2012).

It should be emphasized that these are conservative (high) estimates which will be reduced considerably for lower turbine rotation speeds, especially to zero as in the case of a stationary turbine.

These predictions seem markedly low; however, it is due to the fact that icing events are limited to only a few days per year. For example, Vestas Canada, which maintains turbines across Canada, has experienced no incidents related to falling ice in Canada (Jacques Whitford, 2006).

Mitigation Measures

Unlike telecommunication towers, the wind turbines proposed to be used for this Project would have a solid conical tower. This design reduces the potential for ice buildup on the tower itself since there is no lattice or crevices where ice can accumulate.

In terms of ice shed, several control mitigation strategies are available to wind turbine operators. For example, when the rotor becomes unbalanced due to a change in blade weighting (e.g., caused by ice buildup), the turbine brake is automatically applied to stop the blades from turning (i.e., it shuts itself off). The blades would not restart their movement until the imbalance is removed (e.g., the majority of ice is removed). This design feature greatly reduces the potential ice shed from the turbines on the few days per year when icing is possible. Established protocols and procedures would make operational staff aware and take appropriate action when weather conditions could likely lead to ice accumulation on the blades.

Net Effects

Considering the design features of the turbines which act to reduce or eliminate the potential for ice accumulation, and that the nearest receptors are located at minimum required setbacks from the turbines no adverse net effects are expected due to ice fall and shed from turbines during operation of the facility. Consequently, no additional mitigation measures have been identified.

5.8.3 Extreme Events

Potential Effects

Extreme events that could occur during operation of the Project include fire, flood, temperature extremes, heavy snow, rain, hail, ice storms, tornadoes, earthquakes, and lightning strikes.

The likelihood of a fire occurring during operation of the Project is low. If a fire were to happen, it would likely occur in the fields at the base of the turbine. Fire could damage the turbine tower paint but it is unlikely that a fire would damage the turbine components within the tower. If a fire event were to happen, the O&M Contractor and St. Columban Energy LP will coordinate with local emergency response.

Since there are no major waterways near the Wind Project Study Area, it is unlikely that a flood would occur.

Temperature extremes, to the extent that they are outside the turbine's operating range, are not expected.

No adverse effect is anticipated to the operation of the turbines from heavy snow, except to prevent access to the turbines during an emergency.

In the case of an extreme hail event, the nacelle could suffer cosmetic damage. However, the operation of the turbine would not be effected. It is unlikely that the nacelle cover would suffer structural damage. An extreme hail event may damage the turbine's meterological sensors.

Climatic fluctuations in temperature and/or humidity are unlikely to have a significant effect on the Project. A change in the annual average air temperature or relative humidity could (slightly) affect the energy production of the Project as higher density air (corresponding to lower temperatures and lower humidity) will result in higher production since the wind power density is a linear function of the air density.

Climatic variations in rainfall or snowfall are unlikely to affect the wind Project. Variations in freezing precipitation (but not extreme events) could change the overall project energy production through inefficiencies caused by the modification of the aerodynamic profile of the turbine blade. However, such events occur for such a limited fraction of the time that it is very unlikely that there would be a significant impact on energy production.

A change in the wind climate is the likeliest cause for significant impact on the Project's energy production. This results from the very high sensitivity (the cube) of wind power density to the wind speed (i.e., small change in wind speed can result in relatively large changes in kinetic energy available for conversion to electrical energy. It is not unusual for the average wind speed to fluctuate from year to year by, say, up to +/- 10%. This maximum would, typically, translate into Project energy fluctuations of +/- 20 to 25%. While this would not cause any problems for the Project hardware (turbines, electrical infrastructure, etc.), it would result in the same fluctuations in Project income so it is important that the Project financing be structured so that these fluctuations will not result in any cash flow failures.

Mitigation Measures

Project components have been designed to withstand the effects from extreme weather events as follows:

- Rain – surficial drainage patterns would remain intact and continue to convey rain water;
- Hail – the turbine blades, nacelle, and tower are constructed of materials able to withstand damage from the impact of hail. Should the turbine's meteorological sensors be damaged, the turbine control system would sense there are no wind speed and wind direction data available and would initiate a safe shutdown of its operation;
- Ice storms/freezing rain – as noted above, the turbines are designed to automatically shut down when ice load on the blades exceeds a predetermined threshold;
- Tornadoes –the blades would stop moving at wind speeds greater than 25 m/s, and generally, the structural integrity of turbines is designed to withstand gusts of greater than 59 m/s. The turbine would continue to monitor the wind conditions while it is stopped. A direct hit from a tornado may damage certain components on the wind turbine such as the blades and possibly the tower which would require repair or replacement;
- Earthquakes – as noted above, structures would be designed to meet the earthquake loads as per the Ontario Building Code; and
- Lightning – The turbines are equipped with sophisticated lightning protection. Lightning strikes are safely absorbed by lightning conductors and the lightning current is conducted via a spark gap and cables into the ground surrounding the foundation. If a turbine is damaged sufficiently to affect the operation of the turbine, the control system would force an orderly shutdown.

Net Effects

Considering the design features of the turbine which act to reduce or eliminate the potential for damage from extreme events, no adverse net effects from extreme weather events are anticipated during operation of the Project.

5.8.4 Third Party Damage

Potential Effects

The wind turbines are typically located away from roads and are in largely open areas. Nevertheless, the possibility exists for accidental collision from off-road and maintenance vehicles. Although possible, it is highly unlikely that this equipment would significantly damage the towers given their structural integrity (e.g. the rolled steel in the towers is over an inch thick, supporting foundations, and surrounding gravel pad).

Mitigation Measures

Access to the tower structures would be restricted to avoid potential accidents to unqualified persons.

Net Effects

As a result of restricting access of unqualified persons to the turbines, no adverse net effects from third party damage to the turbines are anticipated during operation of the Project.

6.0 Environmental Effects Monitoring Plan

The environmental effects monitoring plan for the Project has been designed to monitor implementation of the proposed protection and mitigation measures and to verify compliance of the Project with O. Reg. 359/09.

Environmental monitoring would provide data on key functions of natural environment and socio-economic features that may be affected during construction or operation of the Project, and on the effectiveness of mitigation measures implemented as part of the Project. The monitoring procedures noted herein are linked to the potential effects and protection and mitigation measures discussed throughout Section 5.0.

6.1 GOALS AND OBJECTIVES

The goals of the monitoring plan are:

- Minimize environmental effects from the Project during the operation phase;
- Minimize conflicts in the communities affected by the execution of the works according to legal terms and to the proponent's policies;
- Avoid accidents and malfunctions;
- Minimize environmental effects on natural habitats, flora and fauna;
- Avoid levies or sanctions from the relevant government agencies for negligent environmental performance;
- Comply with environmental quality standards set by law; and
- Establish measures that enhance occupational health and safety.

6.2 GUIDING PRINCIPLES

The following guiding principles were considered in preparation of the monitoring plan:

- Focus upon environmental, health, and safety risk prevention;
- Conform to relevant standards, codes, and practices considered in the application of safe technologies;
- Perform all activities in a safe and effective manner, by trained personnel;
- Maintain all equipment in good operating condition for protection of worker health and safety, conservation of the environment, and protection of property;
- Implement all necessary precautions to control, remove, or otherwise correct any health and safety hazards; and

- Meet all relevant municipal, provincial, and federal standards that collectively ensure sufficient technical levels of safety during operation of the facility.

Building upon the above methodology, goals and objectives, and guiding principles, the monitoring plan is composed of three components: environmental management systems; programs, plans, and procedures; and monitoring and contingency requirements. Each component is discussed below.

6.3 ENVIRONMENTAL MANAGEMENT SYSTEMS

As part of the environmental monitoring objectives outlined above, several programs, plans, and procedures would be developed by St. Columban Energy LP, the turbine manufacturer, and/or the O&M Contractor (see Section 6.4). They would guide the operation of the Project to optimize its environmental performance. However, for the programs, plans, and procedures to be effective, appropriate management structures and contract documents must be firmly established.

6.3.1 Management Structures

St. Columban Energy LP, the turbine manufacturer, and/or the O&M Contractor would take steps to ensure that they have appropriately skilled personnel to carry out the environmental responsibilities as defined in this document. All organizations associated with Project development and operation would develop responsive reporting systems that clearly assign responsibility and accountability. As appropriate, St. Columban Energy LP and/or the O&M Contractor would review these reporting documents.

6.3.2 Contract Documents

St. Columban Energy LP is committed to operating the Project in an environmentally responsible manner and in compliance with all applicable environmental laws, regulations, and guidelines. All of St. Columban Energy LP's contractors and subcontractors would be accountable for actions that have an adverse effect on the environment. As such, any contract documents executed by St. Columban Energy LP and/or the O&M Contractor would incorporate appropriate provisions from documents prepared for the REA application.

Additionally, all contractors, subcontractors, and other associates of the Project would follow the guiding principles of the program, plans and procedures (Section 2) and the monitoring and contingency plan (see Section 6.5). These organizations would also comply with all applicable municipal, provincial, and federal legislation

During the operation of the facility, changes to operational plans may be required to address unforeseen or unexpected conditions or situations. St. Columban Energy LP and/or the O&M Contractor would be responsible for ensuring environmental and safety issues are addressed for any such changes. St. Columban Energy LP would undertake any significant changes to the

Project programs, procedures and plans throughout the operation of the facility with the goal of avoiding or minimizing environmental effects.

6.4 PROGRAMS, PLANS, AND PROCEDURES

As appropriate, St. Columban Energy LP, the turbine manufacturer, and/or the O&M Contractor would implement the programs, plans, and procedures discussed below

6.4.1 Operation and Maintenance Program

The operation and maintenance program, including turbine maintenance, is described in Section 4.0.

6.4.2 Environmental Procedures

St. Columban Energy LP and/or the O&M Contractor would be responsible for implementing environmental procedures during the operation phase of the Project. Individual employee responsibilities would be assigned as necessary to support the full and effective implementation of the environmental procedures. As appropriate the procedures would address the following issues to prevent environmental contamination and injury to personnel:

- *Environmental calendar:* to establish the specific dates and times for environmental inspections of turbine facilities, monitoring events, and emergency notifications;
- *Hazardous waste management:* to outline the procedures for proper identification, storage, handling, transport, and disposal of hazardous waste. In addition, the procedures would outline specific requirements for personnel training, emergency response, product review and approval, and record keeping.
- *Non-hazardous waste management:* to establish alternative procedures for the management and disposal of non-hazardous waste such as used lubricants, used drums, and general waste with specific provisions for reuse and recycling of waste materials,

These procedures would ensure internal and external risks are fully evaluated and the information communicated to personnel in advance of any accident or malfunction.

6.4.3 Occupational Health and Safety Procedures

St. Columban Energy LP and/or the O&M Contractor would ensure employee health and safety is maintained throughout their employment term and would also implement the following safety procedures and protocols as appropriate in an effort to ensure employee safety is addressed throughout operation and maintenance activities. Safety measures may include;

- Personal protective equipment, including non-slip footwear, eye protection, clothing, and hardhats, would be worn by operation and maintenance personnel when on duty;

- Elevated platforms, walkways, and ladders would be equipped with handrails, toe boards, and non-slip surfaces; and
- Electrical equipment would be insulated and grounded in compliance with the appropriate electrical code.

Incidents in the work place have the potential to cause personal injury and property damage. As appropriate, St. Columban Energy LP and/or the O&M Contractor would maintain a master Incident Report that documents illnesses and accidents. Incident reporting would follow the requirements of the *Occupational Health and Safety Act*.

6.4.4 Training Program

As appropriate, St. Columban Energy LP and/or the O&M Contractor would develop or have an existing operation training program to ensure personnel receive appropriate training in relation to operation and maintenance programs, environmental, health, and safety procedures, and the Emergency Response Plan. Training may cover the following issues:

Facility Safety

- Accident reporting;
- Chemical and hazardous materials handling;
- Fall and arrest protection;
- Eye, ear, head, hands, feet, and body protective equipment;
- First aid training and equipment;
- Equipment operation and hazards;
- Fire prevention and response;
- Lockout and tag out procedures; and
- Scaffolds and ladders.

Emergency Preparedness

- Fire preparedness and response;
- Natural disasters (i.e. extreme weather events);
- Hazardous materials and spill response;
- Medical emergencies; and
- Rescue procedures.

6.4.5 Emergency Response Plan

St. Columban Energy LP and/or the relevant Contractor would finalize a detailed Emergency Response Plan for each Project phase and coordinate with the applicable municipal agencies.

The Emergency Response Plan would include a plan for the proper handling of material spills and associated procedures to be undertaken during a spill event. The plan would also specify containment and clean-up materials and their storage locations. The plan would include general procedures for personnel training. As appropriate, the plan may cover response to high winds, fire preparedness, evacuation procedures, and medical emergencies. Developing this plan with local emergency services personnel would allow St. Columban Energy LP to determine the extent of emergency response resources and response actions of those involved.

The plan for each Project phase would include key contact information for emergency service providers, a description of the chain of communications and how information would be disseminated between St. Columban Energy LP and/or the relevant Contractor and the relevant responders. The plan would also indicate how St. Columban Energy LP and/or the relevant Contractor would directly contact (via phone or in-person) Project stakeholders who may be directly impacted by an emergency so that the appropriate actions can be taken to protect stakeholders health and safety.

6.4.6 Measurement of Performance

Once performance standards have been established and personnel have been trained (and are functional in procedural operation), the next step is to monitor the performance of the Project and individuals relative to the performance standards and programs.

Specific internal audits (e.g. management team and/or process team), and external audits against the plans, safety and environmental procedures, and other policies and procedures are all part of establishing performance standards necessary to minimize risks on a continuing basis.

As appropriate a formal audit program for the Project, with regard to loss control programs (i.e. health, safety, environment, and security) would be performed regularly.

6.5 MONITORING REQUIREMENTS AND CONTINGENCY PLANS

Building upon the environmental management measures recommended to minimize adverse effects, while enhancing the positive effects associated with the operation of the facility, the following operation monitoring and contingency planning program has been developed. The monitoring program is designed to allow St. Columban Energy LP and/or the O&M Contractor to monitor and assess the effectiveness of the proposed management and mitigation measures and to verify compliance of the Project with O. Reg. 359/09.

St. Columban Energy LP and/or the O&M Contractor would be the primary organization responsible for the implementation of the operational monitoring and contingency planning measures. Implementation of the measures would be undertaken consistent with St. Columban Energy LP's and/or the O&M Contractor standard environmental and engineering practices.

6.5.1 Terrestrial Habitats and Significant Natural Features

A detailed Environmental Effects Monitoring Plan is provided in Appendix C.

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

As appropriate, records of vehicle maintenance would be retained and made available for periodic review by St. Columban Energy LP and/or the O&M 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.

Recommendations for post-construction monitoring during operations include up to two years of monitoring of planted restoration or compensation works in order to recommend supplemental works or replacement plantings, if required.

6.5.2 Wildlife

A post-construction disturbance monitoring program would be developed for amphibians. The performance objective of the monitoring is to determine the presence of calling amphibians in significant wildlife habitat (with consideration for pre-construction species presence) for seasonal concentration areas within 120 m of the Project Location. Monitoring would occur once in each of April, May, and June for two years post-construction at five amphibian breeding habitat locations. Methods would include call count surveys, and baseline count stations to be established pre-construction at stations within 120 m of the Project Location with control stations located more than 120 m from the Project Location. Where post-construction monitoring identifies ecologically significant disturbance effects to amphibians, St. Columban Energy LP, MNR and other relevant agencies would determine if and when additional monitoring and/or mitigation is required and work together to develop a contingency plan. The best available science and information would be considered when determining appropriate mitigation.

A post-construction disturbance monitoring program would also be developed for forest breeding species. The breeding density of forest birds (combined and individual), within the

habitat, would be monitored and compared to pre-construction conditions. In addition to density, the forest species observed would be monitored and compared to pre-construction conditions. Particular attention would be paid to those species identified as being in decline, area-sensitive and those 'main' or dominant species, observed in relatively high numbers or consistently breeding on the site.

The performance objective of the monitoring is to determine if an ecologically significant disturbance/avoidance effect to forest breeding birds is occurring, and whether such effect is attributed to the wind turbines rather than external factors. These discussions with MNR, St. Columban Energy LP and other relevant agencies would determine whether contingency measures would be undertaken. Monitoring would occur twice in June, annually for two years. The method of monitoring would be a point count survey using pre-construction methods. There would be six pre-construction point count stations (three within 120 m of the Project Location, three more than 120 m - "control stations"), and there would be developed an additional paired point count study to confirm that decline is due to turbine disturbance, and determine extent of disturbance effect. Should performance objectives not be met, the following would be undertaken:

- Compare declines to population trends noted through province or continent-wide breeding bird surveys;
- Investigate habitat management means to increase breeding density; and,
- Additional post-construction monitoring and/or mitigation may be required where post-construction monitoring identifies ecologically significant disturbance/avoidance effects associated with forest breeding bird habitat. Mitigation techniques may include (but are not limited to) operational controls, such as periodic shut-down and/or blade feathering. Results would be reviewed collectively by the proponent, MNR and other relevant agencies to determine if and when additional monitoring and/or mitigation is required. The best available science and information would be considered when determining appropriate mitigation.

A post-construction monitoring program has been developed for birds and bats that is consistent with guidelines provided by regulatory agencies at the time of writing (MNR 2011a and b). The plan should give consideration to adaptive management and operational control options. Elements of the post-construction monitoring program will include:

- Bird mortality monitoring at all wind turbines twice-weekly between May 1 and October 31 for a period of three years following start of operations. A weekly mortality survey will be conducted at all turbines in November to assess raptor mortality.

- Bat mortality monitoring at all turbines twice-weekly between May 1 and September 30 for a three-year period following start of operations in accordance with MNR guidelines.

- Searcher efficiency trials seasonally and carcass removal trials monthly between May 1 and September 30. Searcher efficiency and carcass removal rates are known to be more

variable for bats than for birds throughout the year and depending on habitat (in part due to the relative size of the species).

- Regular reporting that includes analysis and submission of results to the MNR and Environment Canada (EC).

Potential operational controls are specified by current provincial guidance (at the time of writing, thresholds are: 10 bats/turbine/year, 14 birds/ turbine/year, or 10 or more birds at any one turbine, or 33 or more birds at multiple turbines on any one visit, or 0.2 raptors/turbine/year [0.1 raptors of provincial conservation concern]). Mitigation may include operational controls, such as periodic shut-down on select turbines or blade feathering at specific times of the year, depending on the species affected.

6.5.3 Surface Water Features and Aquatic Habitat

Operation activities that have the potential to affect aquatic habitat includes accidental spills and/or leaks. Proper storage of materials (e.g. maintenance fluids) at off-site storage containers would greatly 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 MNR.

If *Fisheries Act* approvals are required from DFO, some monitoring may be required, as stated in the DFO authorization. Monitoring typically includes photographic records during construction and for two years after the completion of construction to ensure survival of plantings and overall function of the installation. If significant habitat enhancement or compensation measures are required, monitoring may also include assessments of the fish community and habitat use.

6.5.4 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 which is resulting in noise emissions that are above MOE requirements, the problematic turbine(s) would be shut down until corrective measures are taken. Routine turbine maintenance and monitoring would also help minimize the likelihood of malfunctioning turbines resulting in excessive noise emissions.

Turbines will be monitored electronically twenty-four hours a day, seven-days a week, to allow operational changes to be noted and assessed quickly. Any performance characteristic that falls outside of normal operation (including excessive noise) will be considered and assessed to

determine if further action is required. The MOE requires that if a noise complaint is received, St. Columban Energy LP must act on the complaint to determine if further action is required. The MOE compliance measurement protocol (http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_088931.pdf) will be followed in the case of noise complaints received.

Turbine shut down will occur automatically upon detection of extreme weather. Inspections of turbines will occur after extreme weather events.

6.5.5 Local Expenditures

As was the case during the construction phase, to the extent possible St. Columban Energy LP would continue to encourage the use and procurement of local goods and services where they are available in sufficient quantities and qualities and at competitive pricing

6.5.6 Community Relations

A Complaint Response Protocol (Section 8.2) has been developed to address any stakeholder concerns during operation of the Project.

7.0 Summary of Environmental Effects, Mitigation Strategies, and the Environmental Effects Monitoring Plan

Table 7.1 summarizes the potential adverse effects, performance objectives, mitigation strategies and the monitoring/contingency plan measures of the operational phase of the Project.

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Heritage and Archaeological Resources					
Protected Properties and Heritage Resources	• None	• N/A	• N/A	• N/A.	5.1.1
Archaeological Resources	• None	• N/A	• N/A	• N/A	5.1.2
Natural Heritage Resources					
Wetlands	• Contamination through accidental spills. • Disturbance due to increased traffic, noise or dust during operations and maintenance.	• No spills.	• See 'Accidental Spills, ''Local Traffic', 'Environmental Noise', and 'Dust and Odour Emissions',	• See 'Monitoring Requirements and Contingency Plans'	5.2.1; 5.6.2; 5.4.7; 5.3.5; 5.3.4; 6.0; 6.5
Areas of Natural and Scientific Interest	• None	• N/A	• N/A	• N/A	5.2.2
Valleylands and Hazard Lands	• None	• N/A	• N/A	• N/A	5.2.3
Significant Woodlands	• Contamination through accidental spills. • Dust emissions during operations and maintenance.	• Minimize duration and magnitude of emissions.	• See 'Accidental Spills, ''Local Traffic', 'Environmental Noise', and 'Dust and Odour Emissions',	• See 'Monitoring Requirements and Contingency Plans'	5.2.4; 5.6.2; 5.4.7; 5.3.5; 5.3.4; 6.0; 6.5
Provincial Parks and Conservation Reserves	• None	• N/A	• N/A	• N/A	5.2.5
Significant Wildlife and Wildlife Habitat	• Contamination through accidental spills. • Disturbance due to increased traffic, noise or dust during	• No spills. •	• See 'Accidental Spills, ''Local Traffic', 'Environmental Noise', and 'Dust and Odour Emissions',	• Post-construction disturbance and mortality monitoring would be conducted to verify effects predictions and additional operational mitigation would be	5.2.6; 5.6.2; 5.4.7; 5.3.5; 5.3.4;

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
	operations and maintenance.			implemented if unanticipated effects occur. • See 'Monitoring Requirements and Contingency Plans'	6.0
Other Wildlife and Wildlife Habitat	• Disturbance and direct mortality to forest and grassland breeding species. • Potential for noise, disturbance and limited mortality due to potential bird and bat collisions with turbines.	• Minimize disturbance to wildlife and wildlife habitat.	• See 'Accidental Spills, ''Local Traffic', 'Environmental Noise', and 'Dust and Odour Emissions',	• See 'Local Traffic'. • See 'Environmental Noise'. • Post-construction disturbance and mortality monitoring would be conducted to verify effects predictions and additional operational mitigation would be implemented if unanticipated effects occur. • See 'Monitoring Requirements and Contingency Plans'	5.2.7; 5.6.2; 5.4.7; 5.3.5; 5.3.4; 6.0; 6.5
Significant Flora and Vegetation Communities	• None	• N/A	• N/A	• See 'Monitoring Requirements and Contingency Plans'	5.2.8; 6.5
Other Flora and Vegetation Communities	• Disturbance to other flora and vegetation from dust emissions.	• Minimize disturbance to other flora and vegetation communities.	• See 'Dust and Odour Emissions'.	• See 'Dust and Odour Emissions'. • See 'Monitoring Requirements and Contingency Plans'	5.2.9; 5.3.4 6.5
Birds	• Direct mortality	• Minimize disturbance to birds	• See 'Other Wildlife and Wildlife Habitat'	• See 'Other Wildlife and Wildlife Habitat' • See 'Monitoring Requirements and Contingency Plans'	5.2.7 6.5
Bats	• Direct mortality	• Minimize	• See 'Other Wildlife and Wildlife Habitat'	• See 'Other Wildlife and	5.2.7

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
		disturbance to bats		Wildlife Habitat' • See 'Monitoring Requirements and Contingency Plans'	6.5
Water Bodies and Aquatic Resources					
Groundwater	• Potential contamination from accidental spills.	• No spills.	• See 'Accidental Spills'.	• See 'Accidental Spills'. • See 'Monitoring Requirements and Contingency Plans'	5.3.1; 5.6.2 6.5
Surface Water, Fish, and Fish Habitat	• Potential contamination from accidental spills. • Erosion and, sedimentation	• No spills. • No erosion or sedimentation	• See 'Accidental Spills'. • Following completion of the maintenance activity, stream banks would be restored to original grade and seeding would be completed during favourable climatic conditions. • Seeding completed where possible. • If siltation to a watercourse occurs, activities would cease immediately until the situation is rectified.	• See 'Accidental Spills'. • See 'Monitoring Requirements and Contingency Plans'	5.3.2; 5.6.2 6.5
Air Quality and Environmental Noise					
Air Quality	• Emissions from operation and maintenance activities, including equipment and vehicles.	• Minimize duration and magnitude of emissions.	• Operation staff would operate vehicles in a manner that reduces air emissions to the extent practical, including: o Using multi-passenger vehicles to the extent practical o Avoid idling vehicles • Equipment and vehicles would be maintained in a manner that reduces air emissions, including: o Using mufflers and emission control systems as available; o Using catalytic converters as required o Meet the emissions requirements of	• Adherence to Complaint Response Protocol. • See 'Monitoring Requirements and Contingency Plans'	5.3.3; 6.5; 8.0

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
			the MOE and/or MTO; o As appropriate, records of vehicle maintenance would be retained and made available for periodic review by St. Columban Energy LP and/or the O&M Contractor; and, o 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.		
Dust & Odour Emissions	• Dust emissions from operation and maintenance vehicles.	• Minimize duration and magnitude of emissions. • Minimize disturbance to existing land uses.	• Maintaining equipment in good running condition and in compliance with regulatory requirements. • Dust suppression (e.g. water and/or calcium chloride) of source areas as necessary. • Covering loads of friable materials during transport.	• Adherence to Complaint Response Protocol. • See 'Monitoring Requirements and Contingency Plans'	5.3.4; 6.5; 8.0
Environmental Noise	• Noise emitted from a turbine and/or transformer. • Noise emitted from traffic and/or vehicles.	• Noise at all non-participating to meet MOE Guidelines.	• Adherence to all noise setback requirements. • All engines associated with maintenance equipment would be equipped with mufflers and/or silencers in accordance with MOE and/or MTO guidelines and regulations. • Noise levels arising from maintenance equipment would also be compliant with sound levels established by the MOE. • Routine Project maintenance to ensure infrastructure is operating properly and efficiently. • To the greatest extent possible, operation activities that could create excessive noise would be restricted to	• Noise monitoring (if required), would be conducted in accordance with the REA for the Project. • Turbine shutdown in the event of a malfunctioning turbine or extreme weather event. • Turbine maintenance to ensure turbines are running properly and efficiently. • Adherence to Complaint Response Protocol. • See 'Monitoring Requirements and Contingency Plans'	5.3.5; 6.5.4; 8:0

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
			regular business hours, when residents are less sensitive to noise, and adhere to any local noise by-laws and any requirements of the Occupational Health and Safety Act.		
Areas Protected Under Provincial Plans and Policies	• None	• N/A	• N/A	• N/A	5.4.1
Existing Land Uses	• Lands which are occupied by facility components would be removed from their present land-use. • Temporary increase in noise and dust levels. • Potential for minor increase in traffic during maintenance activities.	• Minimize disturbance to existing land uses, including local businesses.	• Landowners would be compensated by St. Columban Energy LP for agricultural land that would be taken out of production during the lifespan of the Project through the land lease agreements. • See 'Environmental Noise', 'Dust and Odour Emissions', and 'Local Traffic'	• See 'Environmental Noise'. • See 'Dust and Odour Emissions'. • See 'Local Traffic'	5.3.5; 5.3.4; 5.4.7
Recreation Areas and Features	• Temporary increase in noise and dust levels. • disturbance to the viewscape • Potential for minor increase in traffic during maintenance activities.	• Minimize disturbance to recreational areas and features	• See 'Environmental Noise', 'Viewscape', 'Dust and Odour Emissions', and 'Local Traffic'	• See 'Environmental Noise'. • See 'Viewscape' • See 'Dust and Odour Emissions'. • See 'Local Traffic' • Adherence to Complaint Response Protocol. • See 'Monitoring Requirements and Contingency Plans'	5.3.5; 5.4.9; 5.3.4; 5.4.7; 6.5; 8.0
Agricultural Lands and Operations	• Inconvenience to operations from traffic and dust. • Minimal impacts to livestock are	• Minimize disturbance to agricultural lands and operations.	• Activities would be restricted to the delineated Project areas such as access roads and crane pads • Communication with livestock owners. • See 'Dust and Odour Emissions', and	• Adherence to Complaint Response Protocol. • See 'Monitoring Requirements and Contingency Plans'	5.3.4; 5.4.7; 6.5; 8.0

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
	anticipated.		'Local Traffic'		
Mineral, Aggregate, and Petroleum Resources	• None.	• N/A	• N/A	• N/A	5.4.5
Game And Fishery Resources	• Disturbance to game species from noise. • Improperly installed culverts have potential to affect fish habitat and may impose barriers to fish passage.	• Minimize disturbance to game and fishery resources.	• See 'Environmental Noise'. • Turbines would be placed in agricultural lands away from woodlands, and within the REA setback requirements. • Culverts would be designed and installed such that there is no restriction of flows through the culvert.	• See 'Environmental Noise'. • None required.	5.4.6; 5.3.5
Local Traffic	• Short-term, localized disturbance to traffic patterns, increases in traffic volume, and/or creation of potential traffic safety hazards.	• Minimize disturbance to local traffic.	• There may be instances where excess loads (e.g. turbine and transformer components) would require special traffic planning, widening turning radiuses and road widths and the creation of new ingress/egress nodes. • St. Columban Energy LP may provide notification of non-conventional load movements that may interfere with local traffic.	• Adherence to Complaint Response Protocol.	5.4.7; 8.0
Viewscape	• Disruption to viewscape from siting of project infrastructure.	• Minimize potential for visual disturbance.	• Turbines would be painted light grey and spread over the Project Study Area.	• Adherence to Complaint Response Protocol.	5.4.9; 8.0
Local Economy	• Increase in direct, indirect and induced employment over the operations period. • Local economic benefits from land lease payments, municipal taxes, etc.	• Create positive effects on local economy.	• To the extent possible local hiring would be maximized.	• See 'Monitoring Requirements and Contingency Plans'	5.4.8; 6.5
Existing Infrastructure					

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Provincial, municipal, and other major infrastructure	• May be instances during maintenance activities where excess loads would require special traffic planning. Permits from the MTO may be required.	• Minimize disturbance to Provincial, municipal, and other major infrastructure.	• Necessary permits would be obtained. • As appropriate, "pilot" vehicles would accompany non-conventional loads. • Public notification of unconventional load movements may occur. • Consultation with municipalities reading excess loads with potential to damage roads.	• See 'Local Traffic'	5.4.7
Telecommunications Networks	• Potential to interfere with radio, TV, or internet signals. • Potential to interfere with cellular telephone networks. • Potential that some portions of the wind farm may be detected by weather radar systems	• Minimize interference with radio, TV, or internet signals. • Minimize interference with cellular telephone networks.	• St. Columban Energy LP has consulted with relevant agencies and licensed providers to identify any likely effects to telecommunication and radar systems. • Exclusion zones of 100 m were designated along the point-to-point paths and no turbines were placed within the area defined by the exclusion zone. • In the unlikely event that signal disruption is experienced, mitigation measures may include: o Replacing the receiving antenna with one that has a better discrimination to the unwanted signals o Relocating either the transmitter or receiver, or o Switching to an alternate means of receiving the information. • Cellular coverage could be restored by installation of an additional cell tower or of one or more additional antennae on the existing cell tower.	• Adherence to Complaint Response Protocol. • St. Columban Energy LP would review potential incidents of telecommunications interference on a case by case basis.	5.5.2; 8.0
Aeronautical Systems	• Aeronautical obstruction.	• Minimize potential hazard to low flying aircraft.	• Turbine lighting must conform to Transport Canada standards. In order to reduce rural light pollution, lights would be selected with the minimal allowable flash duration, narrow beam, and would be synchronized.	• Routine maintenance of the turbines and replacement of safety lighting in the event of malfunction.	5.5.3; 8.0

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
			• Nav Canada would be responsible for updating all aeronautical charts with the turbine locations promptly after Project approval.		
Waste Management and Contaminated Lands					
Waste Generation	• Improper disposal of waste material may result in contamination to soil, groundwater, and/or surface water resources on and off the Project sites. • Litter generated may become a nuisance to nearby residences if not appropriately contained and allowed to blow off the site.	• Ensure proper disposal of waste.	• Implementation of a site-specific waste collection and disposal management plan, which may include good site practices such as: o Contractors would be required to remove all waste materials from the Project sites during maintenance activities. o All waste materials and recycling would be transported off-site by private waste material collection contractors licensed with a Certificate of Approval – Waste Management System. o Labeling and proper storage of liquid waste. o As appropriate, spill kits would be provided on-site. o Dumping or burying wastes within the Project sites would be prohibited. o Disposal of non-hazardous waste at a registered waste disposal site(s). o If waste is classified as waste other than solid non-hazardous, a Generator Registration Number is required from the MOE and the generator would have obligations regarding manifesting of waste. o Implementation of an on-going waste management program	• See ‘Spills’. • See ‘Emergency Response Plan’	5.6.2; 6.4.5

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
			consisting of reduction, reuse, and recycling of materials. • See 'Accidental Spills'		
Accidental Spills	• Some materials, such as fuel, lubricating oils and other fluids, have the potential for discharge to the on-site environment through accidental spills.	• No spills.	• Standard containment facilities and emergency response materials would be maintained on-site as required. • Refuelling, equipment maintenance, and other potentially contaminating activities would occur in designated areas. • Spills would be reported immediately by the Construction Contractor to the MOE Spills Action Centre, as applicable • Development of Emergency Response Plan.	• 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. • See 'Spills'. • See 'Emergency Response Plan'	5.6.2; 6.4.5
Public Health and Safety					
Turbine Blade and Structural Failure	• Public Health and Safety.	• No structural failure of the turbines or ancillary equipment.	• Adherence to required setbacks. • Design, install, operate, and maintain turbines according to applicable industry standards/certifications. • Use of lightning protection systems. • Training and education of staff operating the control system. • Familiarizing Huron County, Morris-Turnberry and Huron East emergency response staff with Project facilities.	• Inspections of turbines would occur after extreme events and contingency measures such as turbine shutdown would be implemented in the event of structural damage. • Turbine maintenance to ensure turbines are running properly and efficiently. • See 'Emergency Response Plan' • See 'Environmental Noise and Public Health and Safety' • See Emergency Response and Communications Plan'	5.7.1; 6.4.5; 6.5.4; 8.0

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
Ice fall and shed	• Public Health and Safety.	• Limit potential for ice throw/shed to impact pedestrians.	• Adherence to required setbacks. • Design of turbine tower reduces ice accumulation. • Automatic turbine shutdown due to weight imbalances.	• Inspections of turbines would occur after extreme events and contingency measures such as turbine shutdown would be implemented in the event of structural damage and/or icing to a turbine(s). • Turbine maintenance to ensure turbines are running properly and efficiently. • See 'Emergency Response Plan' • See 'Environmental Noise and Public Health and Safety' • See Emergency Response and Communications Plan'	5.7.2; 6.4.5; 6.5.4; 8.0
Extreme Weather Events	• Potential damage to project infrastructure from extreme weather events.	• No structural failure of the turbines or Project equipment.	• Project components have been designed to withstand the effects from extreme events. • Design, install, operate, and maintain turbines according to applicable industry standards/certifications. • Failsafe devices are capable of shutting down the turbine blades in the event of excessive wind conditions, imbalance, or malfunction of other turbine components. • Adherence to setbacks from receptors.	• See 'Extreme Events'. • See 'Emergency Response Plan' • See 'Environmental Noise and Public Health and Safety' • See Emergency Response and Communications Plan'	5.7.3; 6.4.5; 6.5.4; 8.0
Third Party Damage	• Potential damage to towers from accidental collision from off-road and maintenance vehicles.	• No structural failure of the turbines or Project equipment.	• Access to the towers would be restricted to avoid potential accidents to unqualified persons.	• See 'Third Party Damage'. • See 'Emergency Response Plan' • See 'Environmental Noise and Public Health and Safety' • See Emergency Response	5.7.1; 6.4.5; 6.5.4; 8.0

Table 7.1: Summary of the Potential Environmental Effects and the Environmental Effects Monitoring Plan during Operation

Environmental Feature	Potential Adverse Effect	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures	Section Reference
				and Communications Plan'	

8.0 Emergency Response and Communications Plan

The following sets out a description of the actions to be taken during all Project phases to inform the public, aboriginal communities, Huron East, Morris-Turnberry, Howick, Huron County, leaseholders and relevant Ministries of the Ontario Government regarding activities occurring at the Project site (including emergencies), means by which stakeholders can contact St. Columban Energy LP and/or the relevant Contractor, and means by which correspondence sent to St. Columban and/or the Contractor would be recorded and addressed.

As appropriate, St. Columban Energy LP and/or the Contractor would review the Emergency Response and Communications Plan prior to and during each phase of the Project. Notification of any changes to the Emergency Response and Communications Plan would be provided to stakeholders through the Project website (http://www.vereseninc.com/our-businesses/power/wind.html).

8.1 EMERGENCY RESPONSE PLAN

In the event of an emergency, St. Columban Energy LP and/or the relevant Contractor will initiate the Emergency Response Plan. The plan would include key contact information for emergency service providers, a description of the chain of communications and how information would be disseminated between St. Columban Energy LP and/or the relevant Contractor and the relevant responders. The plan would also indicate how St. Columban Energy LP and/or the relevant Contractor would directly contact (via phone or in-person) Project stakeholders who may be directly impacted by an emergency so that the appropriate actions can be taken to protect stakeholders health and safety. The communication plan for emergencies would be developed in collaboration with local emergency responders, and would be prepared following consultations with Huron County, Morris-Turnberry, Howick and Huron East. St. Columban Energy LP also intends to participate with County and Municipal staff in familiarization sessions specific to the Project prior to Project construction.

8.2 COMMUNICATIONS AND COMPLAINT RESPONSE PROTOCOL

8.2.1 Communication Objectives

Veresen Inc./St. Columban Energy LP has committed to undertaking public communication early in the development of the Project and will continue to communicate throughout the construction and operation phases of the Project. The main objectives of the communications protocol are to:

- Involve the local community and keep them informed of the Project;
- work with the local community to address concerns, where possible; and,

- Provide the community and Project personnel with an opportunity for direct communication.

8.2.2 Communication Methods

An email address (Stcolumbanwindproject@vereseninc.com) and telephone number for contacting St. Columban Energy LP and/or the O&M Contractor will be posted on the Project website (http://www.vereseninc.com/our-businesses/power/wind.html) and provided directly to Huron East, Morris-Turnberry, Howick, Huron County and MOE. These will be the direct contact points for St. Columban Energy LP and/or the O&M Contractor during all phases of the Project. The Plan will also will include key contact information for emergency service providers, a description of the chain of communications and how information will be disseminated between St. Columban Energy LP and/or the O&M Contractor and the relevant responders. This information will be obtained during consultations with Huron County, Morris-Turnberry, Howick and Huron East.

The telephone number and email provided for reporting concerns and/or complaints would be equipped with a voice message system. All messages would be recorded in an on-site Complaint Response Document to maintain a record of all complaints. St. Columban Energy LP and/or the O&M Contractor would endeavor to respond to messages within 48 hours. All reasonable commercial efforts would be made to take appropriate action as a result of concerns as soon as practicable. The actions taken to remediate the cause of the complaint and the proposed actions to be taken to prevent reoccurrences of the same complaint in the future would also be recorded within the Complaint Response Document. If appropriate, the MOE Spills Action Centre would be contacted to notify them of the complaint. Correspondence would be shared with other stakeholders, such as the MOE, as required and/or as deemed appropriate.

St. Columban Energy LP and/or the relevant Contractor will engage with Project stakeholders (public, Aboriginal communities, Huron East, Morris-Turnberry, Howick and Huron County) during all phases of the Project including providing updates on the Project website (http://www.vereseninc.com/our-businesses/power/wind.html). As a long-term presence in Huron East and Huron County, St. Columban Energy LP will continue to develop contacts and to develop local relationships and channels of communication. Ongoing stakeholder communication will allow St. Columban Energy LP and/or the O&M Contractor to receive and respond to community issues on an ongoing basis.

Additional updates may be provided to stakeholders via letters/newsletters, newspaper notices, or direct contact. Any updates to the Project, including updates to the communications and complaint protocol, will be placed in local newspapers, mailed to landowners in the Project study area, and provided on the Project website (noted above).

8.3 PUBLIC SAFETY PLAN

In addition to the Public Safety Plan that would be developed by the Construction Contractor for the protection of public safety during the construction and decommissioning phases, St. Columban Energy LP and/or the O&M Contractor would prepare and implement a Public Safety Plan for operation of the Project. As previously noted and as appropriate, St. Columban Energy LP and/or the O&M Contractor would develop or have an existing operation training program to ensure personnel receive appropriate training in relation to operation and maintenance programs, environmental, health and safety procedures, and an Emergency Response and Communications Plan. Proper training would ensure operational safety for Project personnel.

Operational safety to minimize potential risks to the public would include:

- Site access restrictions (with the exception of maintenance and emergency personnel);
- Development of an Emergency Response and Communications Plan; and
- Turbine design and adherence to construction standards.

Signage may include, but would not be limited to signs associated with potential risks at the Project. Signs may be posted in the vicinity of buried cables, high voltage equipment, and warning of the presence of maintenance vehicles along the access roads.

Access restrictions would include “No Trespassing” signs on the turbine access roads and turbine tower site. Access roads would not have restricted access (e.g. gates), thus allowing emergency vehicles to access the substation property and all turbine locations in the event of an emergency.

As previously noted, during pre-operational mobilization St. Columban Energy LP and/or the O&M Contractor would finalize an Emergency Response and Communications Plan for the operational activities in collaboration with Huron County’s Emergency Medical Services and Huron East’s fire department. The development of and proper execution of the Emergency Response and Communications Plan would help ensure public safety is maintained throughout the operation of the facility.

Potential risk to public safety as a result of extreme events such as fire, lightning, and tornadoes were addressed in Section 5.8.3. The turbines have been designed with various protective measures to address extreme events to reduce the potential risk to public safety. The turbines would adhere to marking and lighting requirements of the Aerodrome Safety Branch of Transport Canada. In addition, construction of the turbines would be completed according to stringent national and international codes.

9.0 Closure

The Design and Operations Report for the St. Columban Wind Project has been prepared by Stantec for St. Columban Energy LP in accordance with Item 4, Table 1 of Ontario Regulation 359/09, and the *Technical Guide to Renewable Energy Approvals* (MOE 2011)

This report has been prepared by Stantec for the sole benefit of St. Columban Energy LP, and may not be used by any third party without the express written consent of St. Columban Energy LP. 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.

STANTEC CONSULTING LTD.

Shawna Peddle
Senior Project Manager

Kerrie Skillen
Project Manager

rpt_60649_ppsc_20120611_dor_fnl

10.0 References

Arnett, E. B., D. B. Inkley, D. H. Johnson, R. P. Larkin, S. Manes, A. M. Manville, R. Mason, M. Morrison, M. D. Strickland and R. Thresher. 2007. Impacts of Wind Energy Facilities on Wildlife and Wildlife Habitat. Wildlife Society Technical Review 07-2. The Wildlife Society, Bethesda, Maryland, USA

Austrian Wind Power. (2007). www.windpark.at/en/c_faq/faq_110.htm

American Wind Energy Association (AWEA). 2006. Wind Energy and the Environment.

Chatham-Kent Public Health Unit. 2008. The Health Impact of Wind Turbines: A Review of the Current White, Grey and Published Literature. June 2008.

Fahrig, L. (2007). Effects of Roads and Traffic on Populations of Small Animals: Implications for Transportation Planning. Roads and Ecopassages Forum. Toronto, Ontario, March 20-22, 2007.

Farmer, B. and R. J. Brooks. (2007). Factors Associated with Roadkill in Southern Ontario Parks. Roads and Ecopassages Forum. Toronto, Ontario, March 20-22, 2007.

Garrad Hassan Canada. 2007. Recommendations For Risk Assessments Of Ice Throw And Blade Failure In Ontario. 38079/OR/01.

Habib, E. M. Bayne, and S. Boutin. 2007. Chronic industrial noise affects pairing success and age structure of ovenbirds Seiurus aurocapilla. Journal of Applied Ecology. 44:176-184

Jacques Whitford Limited. 2006. Health, Safety and Nuisance Concerns Associated with Wind Energy Development. Prepared for EPCOR Utilities Inc.

James, Ross D. 2008. Erie Shores Wind Farm Port Burwell, Ontario. Fieldwork Report for 2006 and 2007. Report to Environment Canada, Ontario Ministry of Natural Resources, Erie Shores Wind Farm LP- McQuarrie North America and AIM PowerGen Corporation.

Kingsley, A. and B. Whittam. 2007. Wind Turbines and Birds: A Background Review for Environmental Assessment. Prepared for the Canadian Wildlife Service. Draft April 2, 2007.

Legerton, M. L., D. M. J. P. Manley, J. W. Sargent, D. J. Snow and P. Styles. (1996). Low frequency noise and vibration levels at a modern wind farm. Pp. 459-462 in Proceedings of Internoise 96: 25th Anniversary Congress – Liverpool.

LesBarreres, D. (2007). Highway and Amphibians I: Genetic Impact of Roads. Roads and Ecopassages Forum. Toronto, Ontario, March 20-22, 2007.

Levert, M. and Munro, I. 2006. CBC Technology Review – Effects of Windmills on Television Reception. CBC Technology.

Maxell, B. and G. Hokit. (1999). Amphibians and Reptiles, Effects of Recreation on Rocky Mountain Wildlife: A Review for Montana. Montana Chapter of the Wildlife Society, September 1999. www.montanatws.org/chapters/mt/PDF%20Files/2hp1.pdf.

Ministry of the Environment (MOE), 2010. Technical Bulletin Two – Guidance for Preparing the Design and Operations Report.

MOE. 2003. Stormwater Management Planning and Design Manual, Ministry of the Environment, 2003.

Ministry of Natural Resources. 2010a. *Bats and Bat Habitats. Guidelines for Wind Power Projects*. Draft. 24 pp. March, 2010.

Ministry of Natural Resources. 2010b. *Birds and Bird Habitats. Guidelines for Wind Power Projects*. Draft. 32 pp. November, 2010.

National Academy of Sciences. 2007. Environmental Impacts of Wind-Energy Projects. Committee on Environmental Impacts of Wind-Energy Projects, Board on Environmental Studies and Toxicology, Division on Earth and Life Studies, National Research Council of the National Academies. The National Academies Press, Washington, D.C., USA.

Penna, M., H. Pottstock and N. Velasquez. (2005). Effect of natural and synthetic noise on evoked vocal responses in a frog of the temperate austral forest. Animal Behaviour 70:639-651.

Polisky, L. 2005. White Paper – Identifying and Avoiding Radio Frequency Interference for Wind Turbine Facilities. Comsearch, Andrew Corporation.

RABC. 2010. Technical Information and Coordination Process Between Wind Turbines and Radiocommunication and Radar Systems..

Rabin, L.A., R.G. Coss and D.H. Owings. (2006). The effects of wind turbines on antipredator behavior in California ground squirrels (*Spermophilus beecheyi*). Biological Conservation 131:410-420.

Reijnen, R., R. Foppen, C. Terbraak, and J. Thissen. 1996. The effects of car traffic on breeding bird populations in woodland. III. Reduction of density in relation to the proximity of main roads. Journal of Applied Ecology 32: 187–202.

Seifert, H., Westerhellweg, A. and J. Kroning. 2003. Risk Analysis of Ice Throw From Wind Turbines. Paper Presented at BOREAS 6, 9 to 11 April, Pyha, Finland.

Stantec Consulting Ltd. 2010b. Melancthon EcoPower® Centre Post-Construction Bird and Bat Monitoring Report: 2009. Prepared for TransAlta Corporation. February 2010.

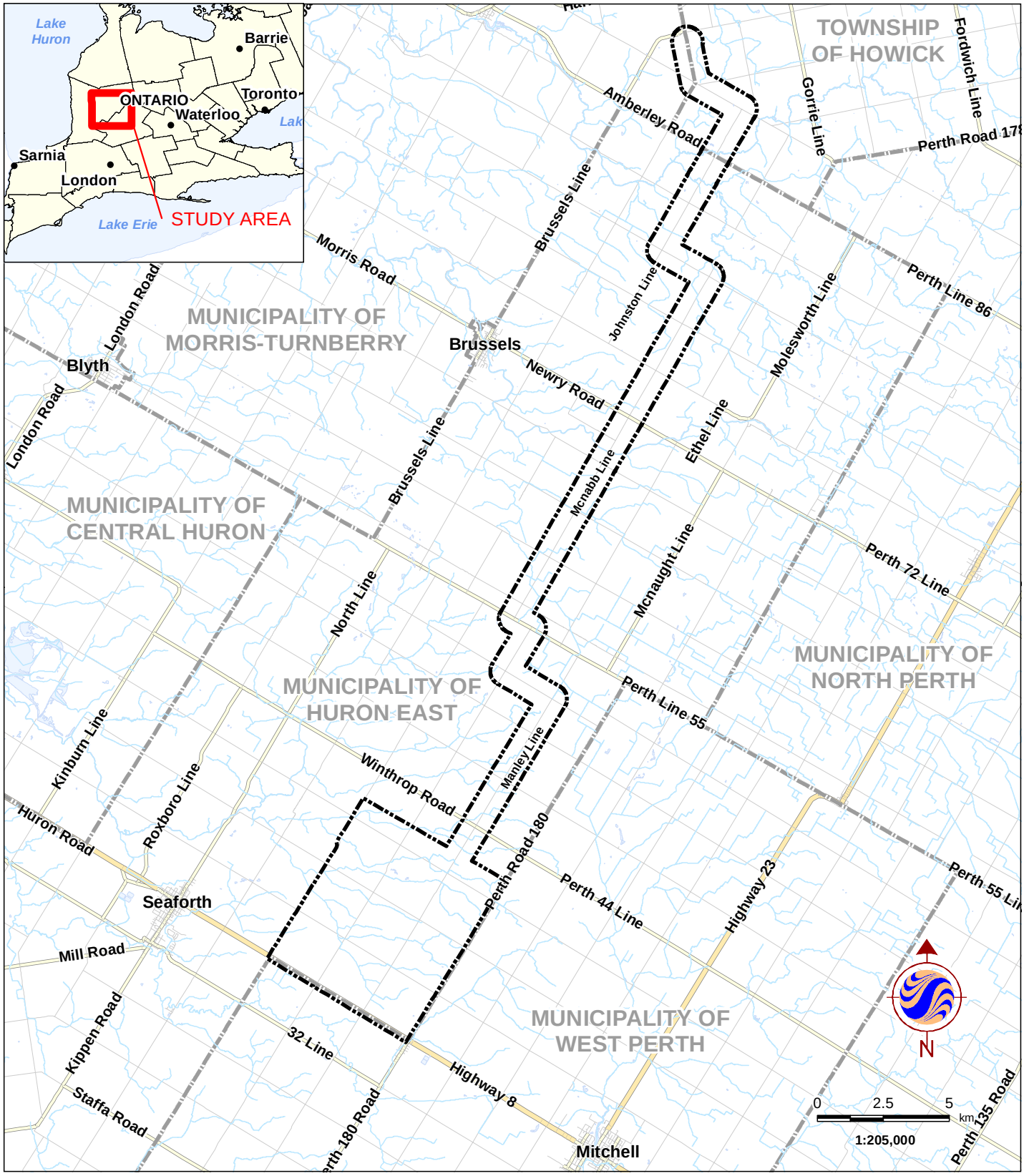
Sun, W.C. and P.M. Narins. (2004). Anthropogenic sounds differentially affect amphibian call rate. Biological Conservation 121:419-427.

Warren, P. S., M. Katti, M. Ermann and A. Brazel. (2006). Urban bioacoustics: it's not just noise. Animal Behavior 71: 491-502.

Zephyr North (2012). St. Columban Wind Energy Project, Turbine T9 Ice Throw Assessment. Prepared for St. Columban Energy LP. May 2012.

Appendix A

Site Plan



W:\active\160960649\drawing\GIS\MXD\CPR\160960649_Fig1_ProjectLocation_20120607.mxd
Revised: 2012-06-07 By: dharvey

June, 2012
160960649

Stantec

Legend

- Study Area
- Highway
- Major Road
- Local Road
- Municipal Boundary
- Watercourse
- Waterbody

Notes

1. Coordinate System: UTM Zone 17 Northern Hemisphere
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

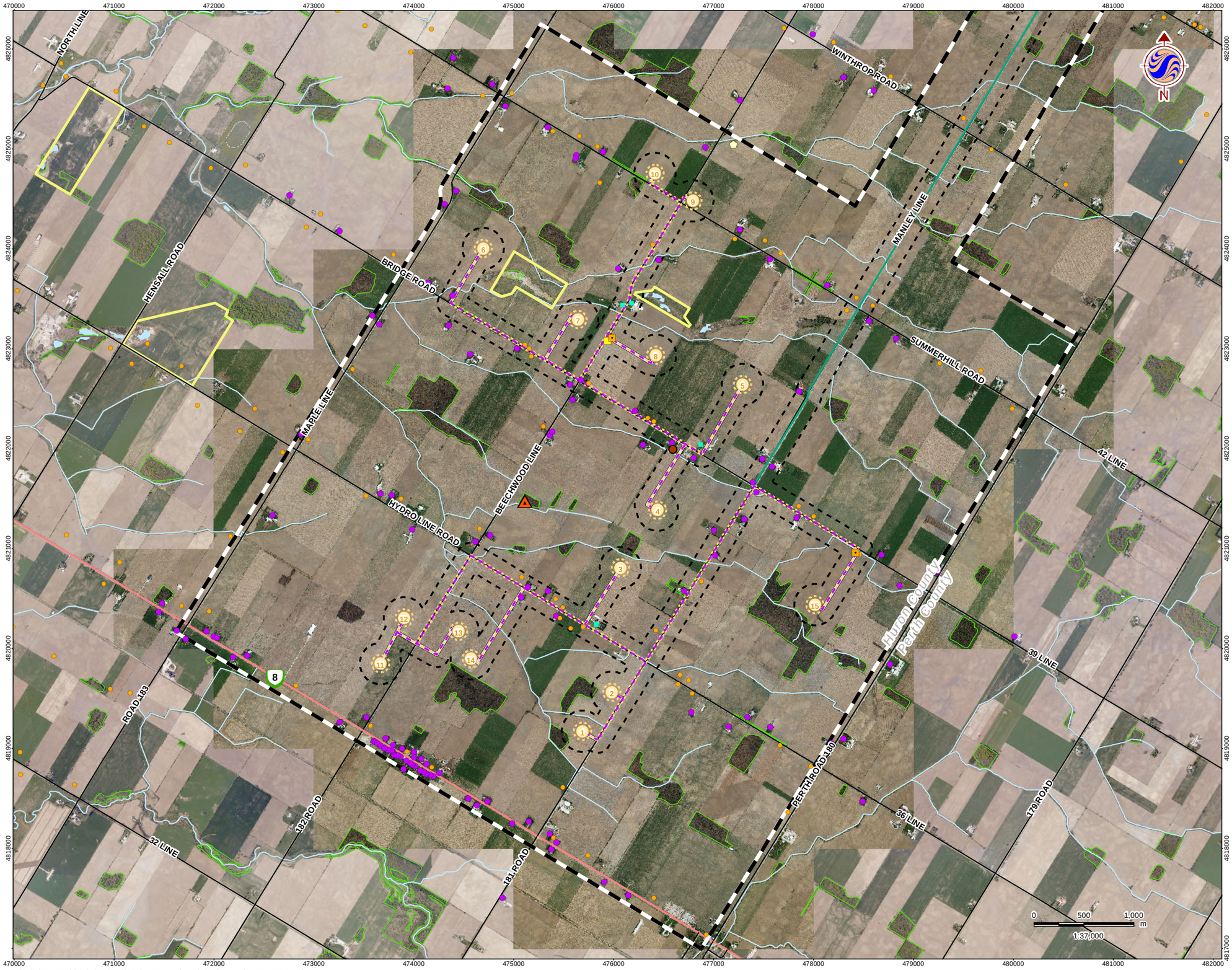
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

1

Title

PROJECT LOCATION



Legend

- Study Area
- 120m Zone of Investigation

Project Components

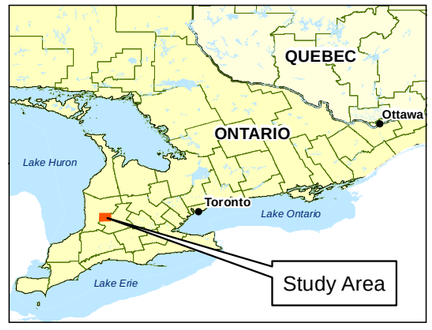
- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Met Tower
- Unserviced Electrical Control Building

Existing Features

- Bell Communication Tower
- Highway
- Road
- Watercourse
- Waterbody
- Aggregate Site
- Wooded Area

Noise Receptors (As defined under 0.Reg 359109)

- Participating
- Non-Participating
- Vacant Lot



Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic Imagery: © First Base Solutions, Huron County
   Imagery Date: 2006, 2010

Stantec

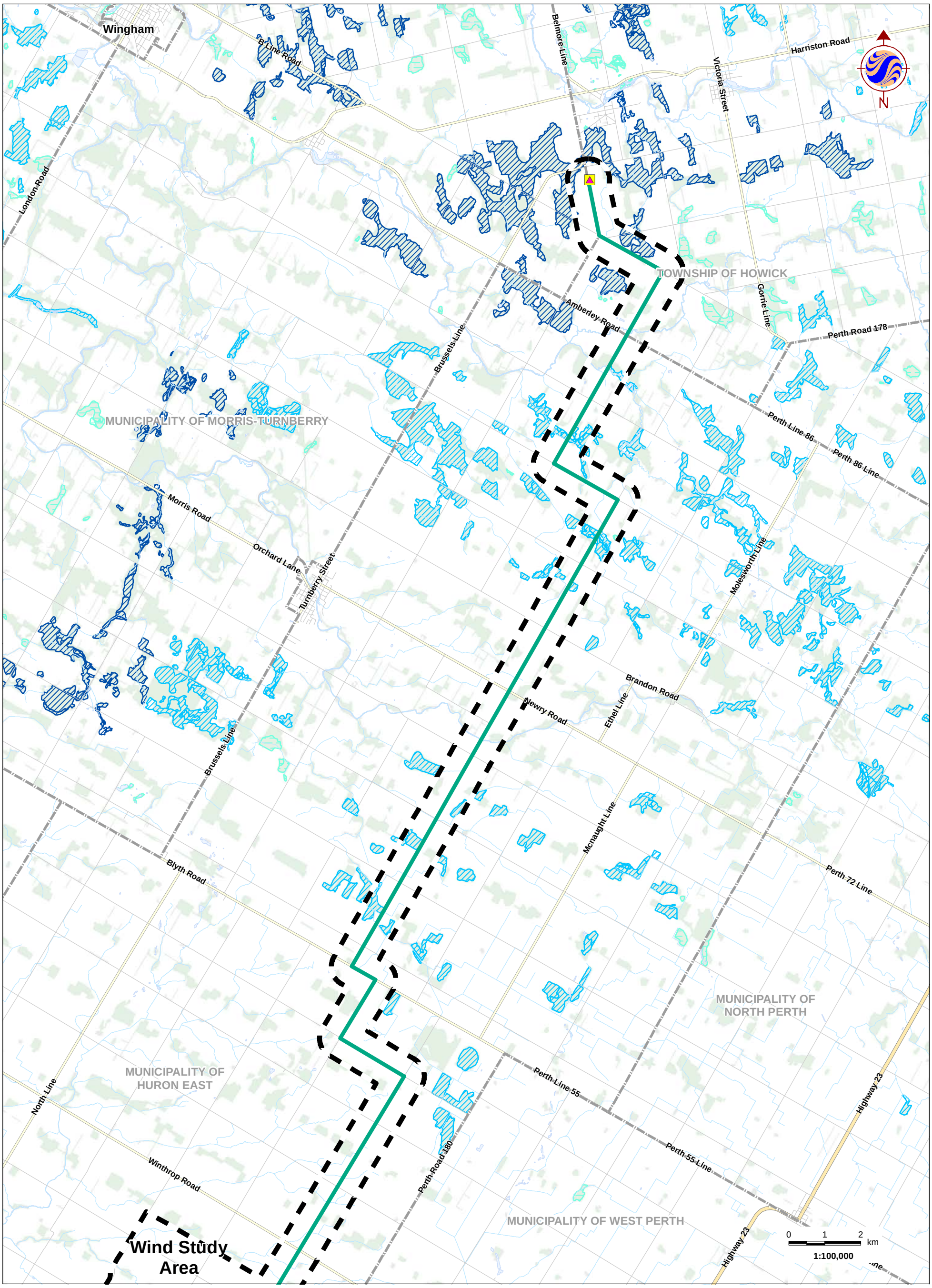
June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
2.0

Title
WIND PROJECT LOCATION

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig2_WindProjectLocation_201200607.mxd
Revised: 2012-06-07 By: dharvey



W:\active\160960649\drawing\GIS\MXD\CPR160960649_Fig3_InterconnectLineLocation_20120607.mxd
Revised: 2012-06-07 By: dharvey

June, 2012
160960649

Stantec

Legend

- Study Area

Project Components

- Proposed Interconnection Line
- Transformer Substation
- Point of Connection to HONI Network

Existing Features

- Highway
- Major Road
- Local Road
- Municipal Boundary
- Wooded Area
- Watercourse
- Waterbody
- Provincially Significant Wetland
- Locally Significant Wetland
- Other Wetland

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

3.0

Title

UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION

Legend

- Study Area

Project Components

- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Met Tower
- Unserviced Electrical Control Building

Existing Features

- Bell Communication Tower
- Highway
- Road
- Abandoned Petroleum Well
- Heritage Resources
- Airstrip
- School
- Soccer Field
- Water Well
- Railway
- Aggregate Site
- Watercourse
- Optioned Property

Setback

- Road Setback (65m)
- Property Line Setback (99.5m)

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic Imagery: © First Base Solutions, Huron County
   Imagery Date: 2006, 2010

Stantec

June 2012
160960649

Client/Project

ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

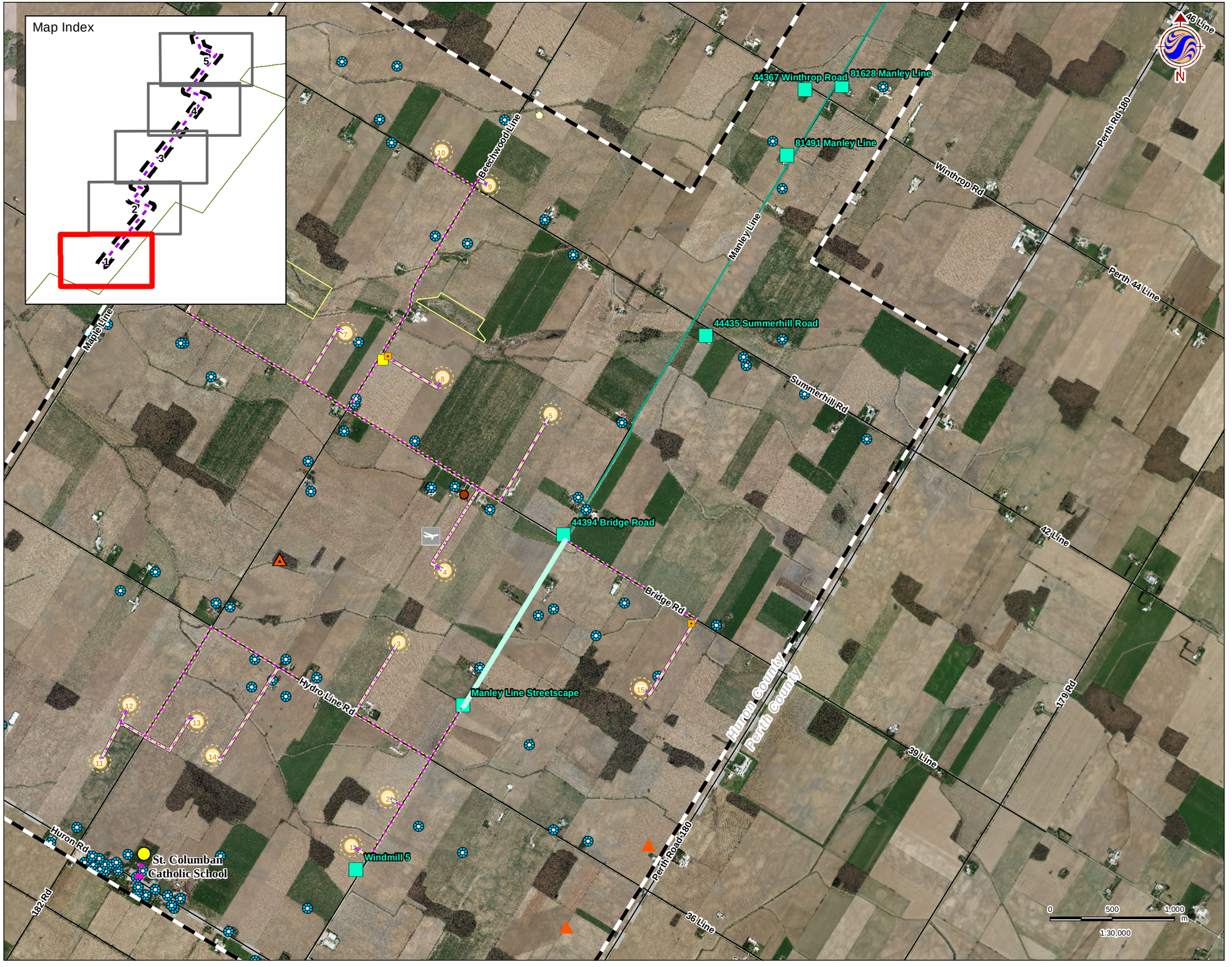
Figure No.

4.0

Title

SOCIO-ECONOMIC FEATURES WIND PROJECT LOCATION

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig4_0_SocioEc_Windproject_20120607.mxd
Revised: 2012-06-07 By: dharvey



Legend

- Study Area

Project Components

- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower

Existing Features

- Bell Communication Tower
- Road
- Railway
- Aggregate Site
- Heritage Resources
- Cultural Heritage Landscape
- Abandoned Petroleum Well
- Water well (Identified by member of public not in MOE Water Well Records)
- Airstrip
- School
- Soccer Field
- Water Well (MOE)

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic Imagery: © Huron County, First Base Solutions
   Imagery Date: 2010 & 2006.

Stantec

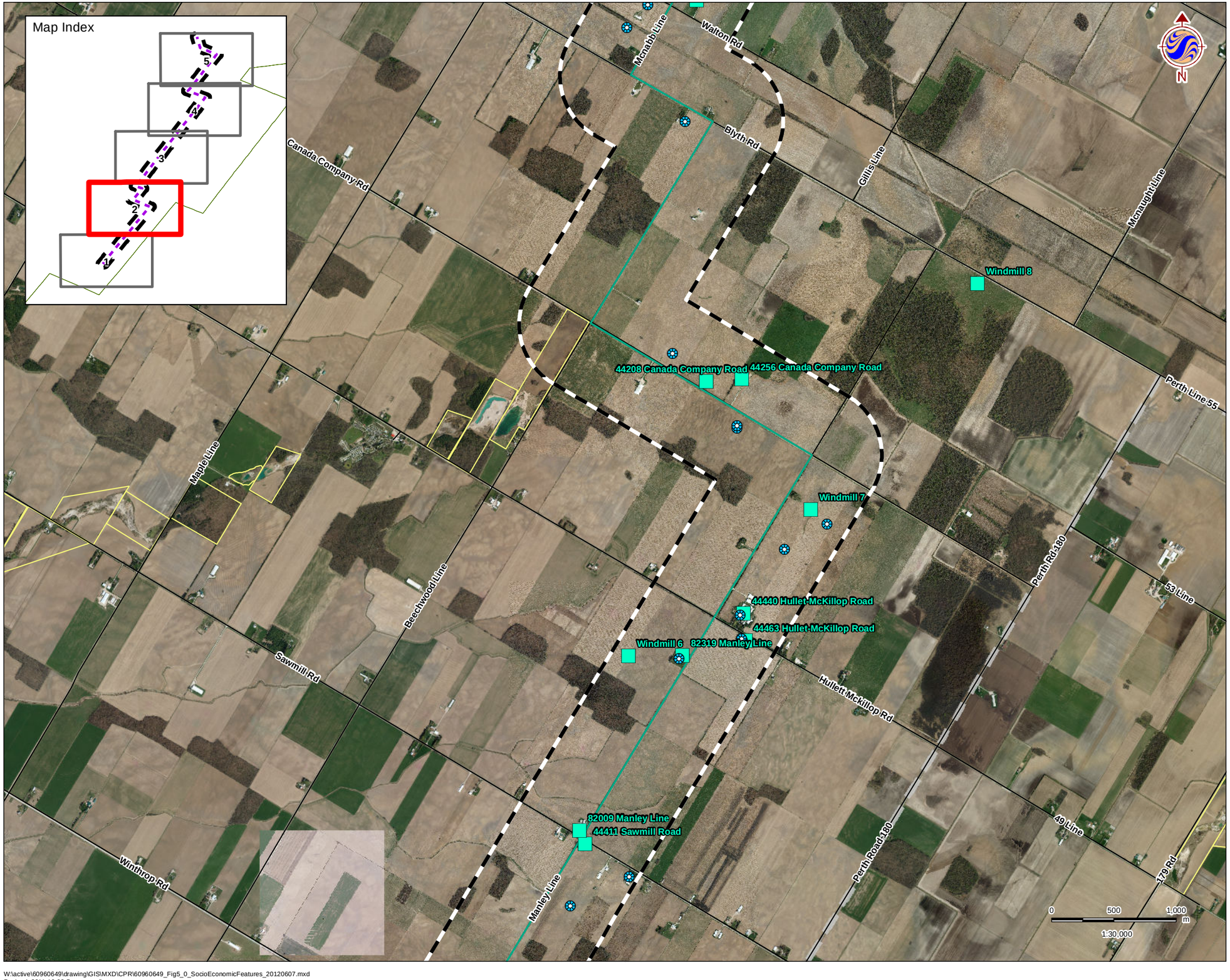
June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
5.0

Title
SOCIO- ECONOMIC FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 1 of 5)

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig5_0_SocioEconomicFeatures_20120607.mxd
Revised: 2011-10-02 By: pworsell



Legend

- Study Area

Project Components

- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower

Existing Features

- Bell Communication Tower
- Road
- Railway
- Aggregate Site
- Heritage Resources
- Cultural Heritage Landscape
- Abandoned Petroleum Well
- Water well (Identified by member of public not in MOE Water Well Records)
- Airstrip
- School
- Soccer Field
- Water Well (MOE)

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic Imagery: © Huron County, First Base Solutions
   Imagery Date: 2010 & 2006.

Stantec

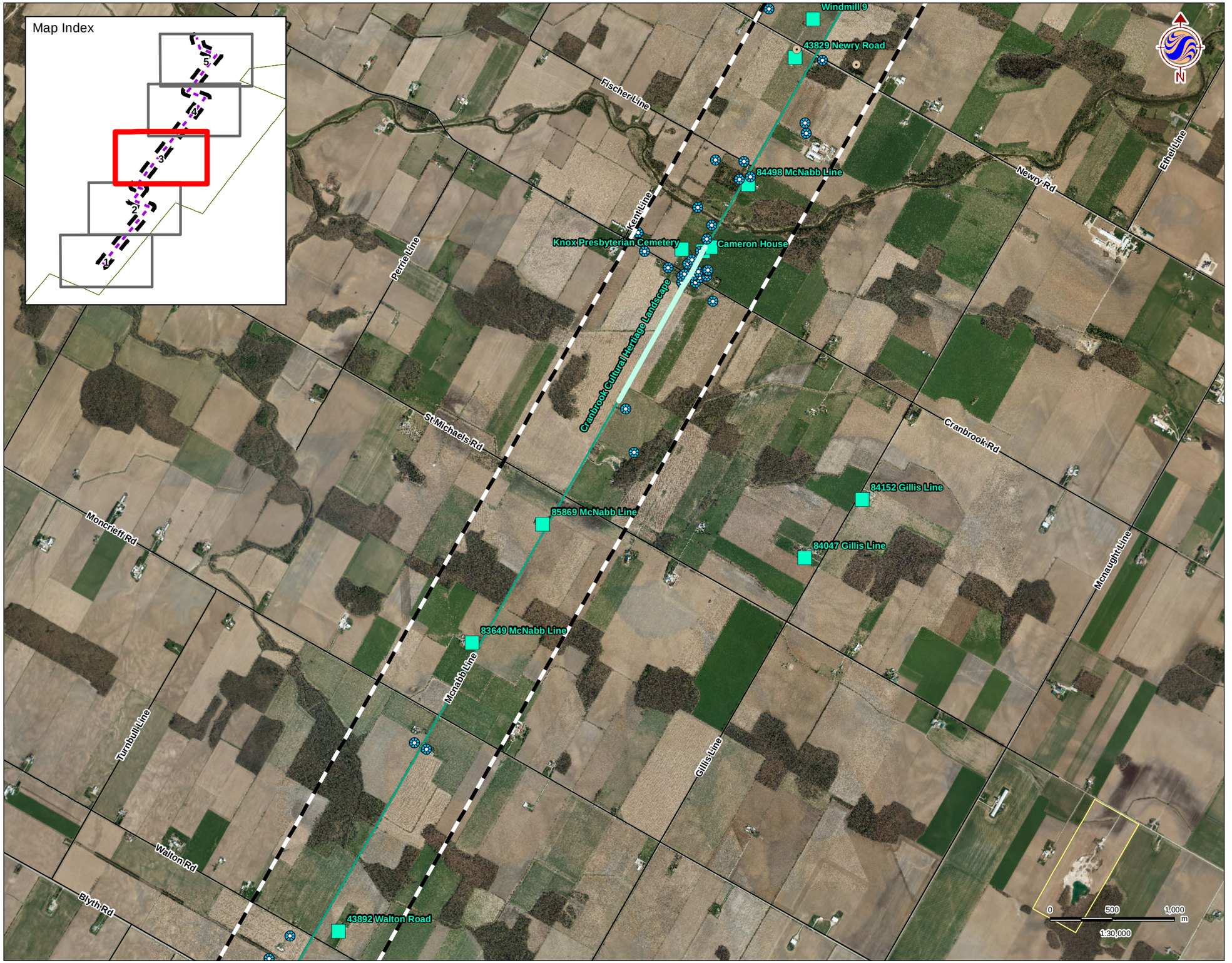
June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
5.0

Title
SOCIO- ECONOMIC FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 2 of 5)

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig5_0_SocioEconomicFeatures_20120607.mxd
Revised: 2011-10-02 By: pworsell



Legend

- Study Area

Project Components

- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower

Existing Features

- Bell Communication Tower
- Road
- Railway
- Aggregate Site
- Heritage Resources
- Cultural Heritage Landscape
- Abandoned Petroleum Well
- Water well (Identified by member of public not in MOE Water Well Records)
- Airstrip
- School
- Soccer Field
- Water Well (MOE)

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic Imagery: © Huron County, First Base Solutions
   Imagery Date: 2010 & 2006.

Stantec

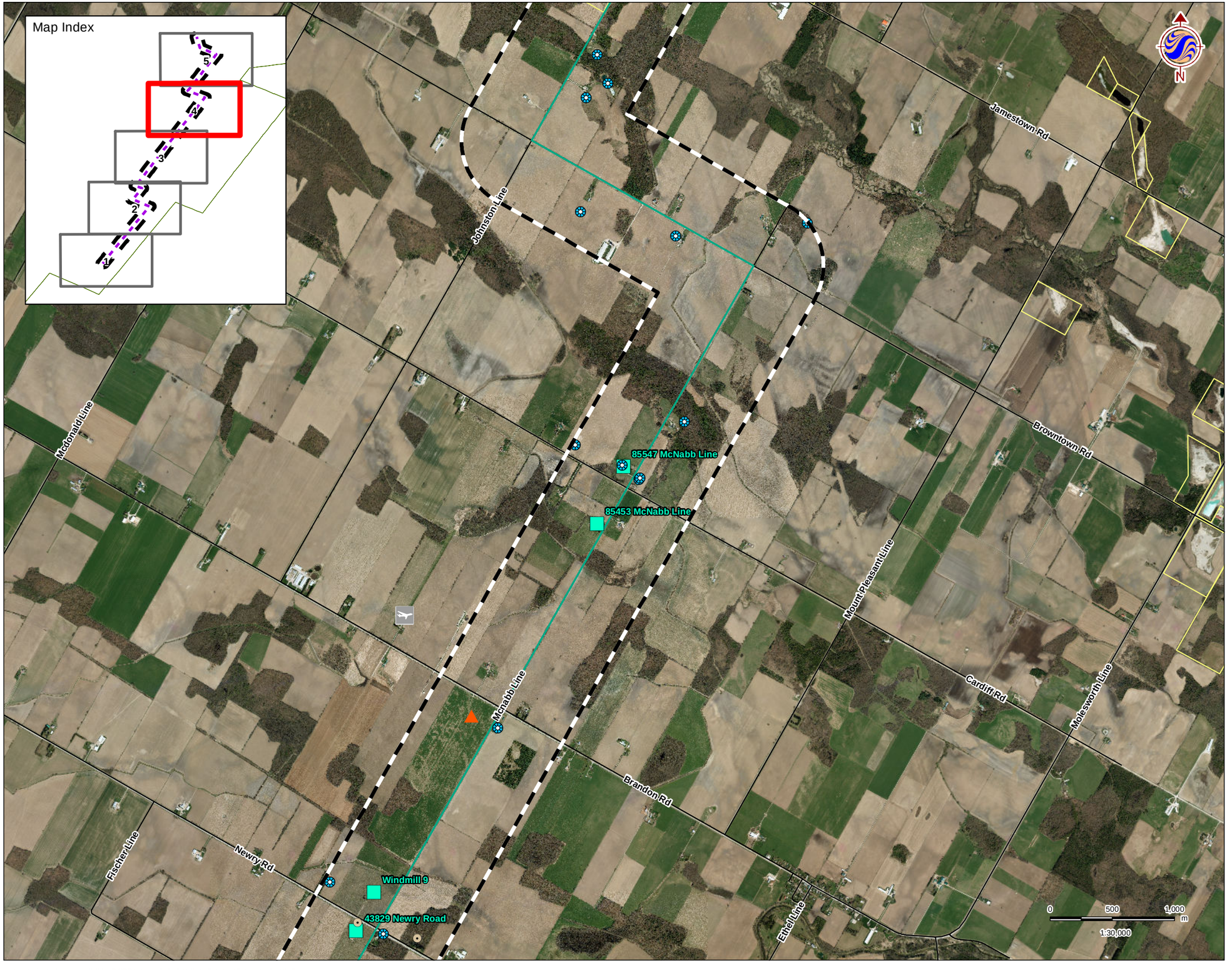
June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
5.0

Title
SOCIO- ECONOMIC FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 3 of 5)

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig5_0_SocioEconomicFeatures_20120607.mxd
Revised: 2011-10-02 By: pworsell



Legend

- Study Area

Project Components

- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower

Existing Features

- Bell Communication Tower
- Road
- Railway
- Aggregate Site
- Heritage Resources
- Cultural Heritage Landscape
- Abandoned Petroleum Well
- Water well (Identified by member of public not in MOE Water Well Records)
- Airstrip
- School
- Soccer Field
- Water Well (MOE)

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic Imagery: © Huron County, First Base Solutions
   Imagery Date: 2010 & 2006.

Stantec

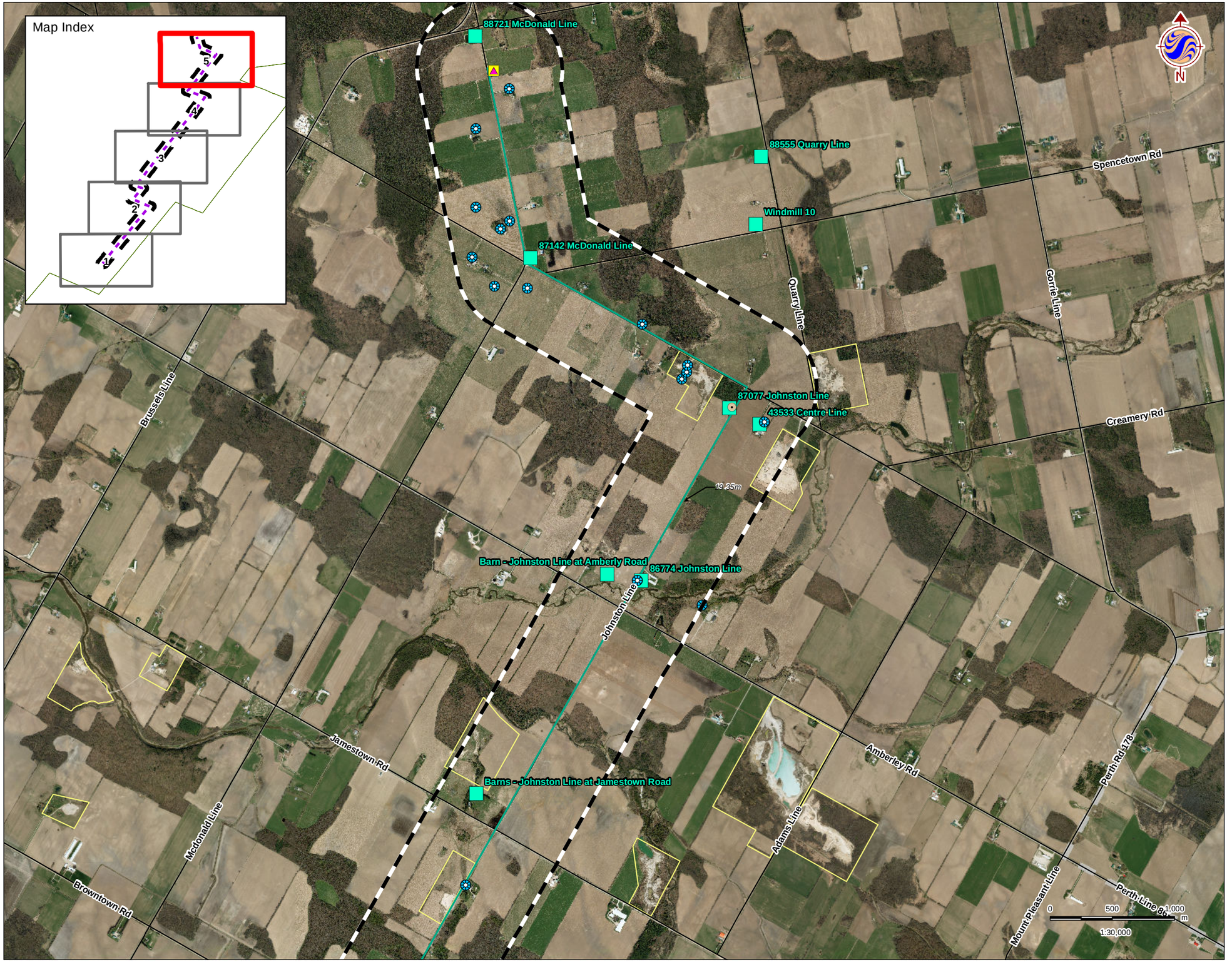
June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
5.0

Title
SOCIO- ECONOMIC FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 4 of 5)

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig5_0_SocioEconomicFeatures_20120607.mxd
Revised: 2011-10-02 By: pworsell



Legend

- Study Area

Project Components

- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower

Existing Features

- Bell Communication Tower
- Road
- Railway
- Aggregate Site
- Heritage Resources
- Cultural Heritage Landscape
- Abandoned Petroleum Well
- Water well (Identified by member of public not in MOE Water Well Records)
- Airstrip
- School
- Soccer Field
- Water Well (MOE)

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic Imagery: © Huron County, First Base Solutions
   Imagery Date: 2010 & 2006.

Stantec

June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
5.0

Title
SOCIO- ECONOMIC FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 5 of 5)

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig5_0_SocioEconomicFeatures_20120607.mxd
Revised: 2011-10-02 By: pworsell

Legend

- Study Area

Project Components

- Turbine Location
- Construction Area
- Access Road
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Met Tower
- Unserviced Electrical Control Building

Existing Features

- Highway
- Road
- Railway
- Optioned Property

Noise Receptors (As defined under 0.Reg 359109)

- Participating
- Non-Participating
- Vacant Lot

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic Imagery: © Huron County, First Base Solutions
   Imagery Date: 2010 & 2006.

Stantec

June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
6.0

Title
NOISE RECEPTORS
WIND PROJECT LOCATION

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig6_0_NoiseReceptor_20120607.mxd
Revised: 2012-05-28 By: dharvey

Legend

- Study Area
- 120m Zone of Investigation

Project Components

- Turbine Location
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower
- Construction Area
- Proposed Underground Electrical Interconnection Line Route
- Underground Collector
- Access Road

Existing Features

- Highway
- Road
- Railway
- Regionally Significant Earth Science ANSI
- Aggregate Site
- Watercourse
- REA Waterbody (as defined in O.Reg 359/09)
- Waterbody
- Wooded Area
- Significant Natural Features
- Contour Line (Metres)

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic Imagery: © First Base Solutions, Huron County
   Imagery Date: 2006, 2010

Stantec

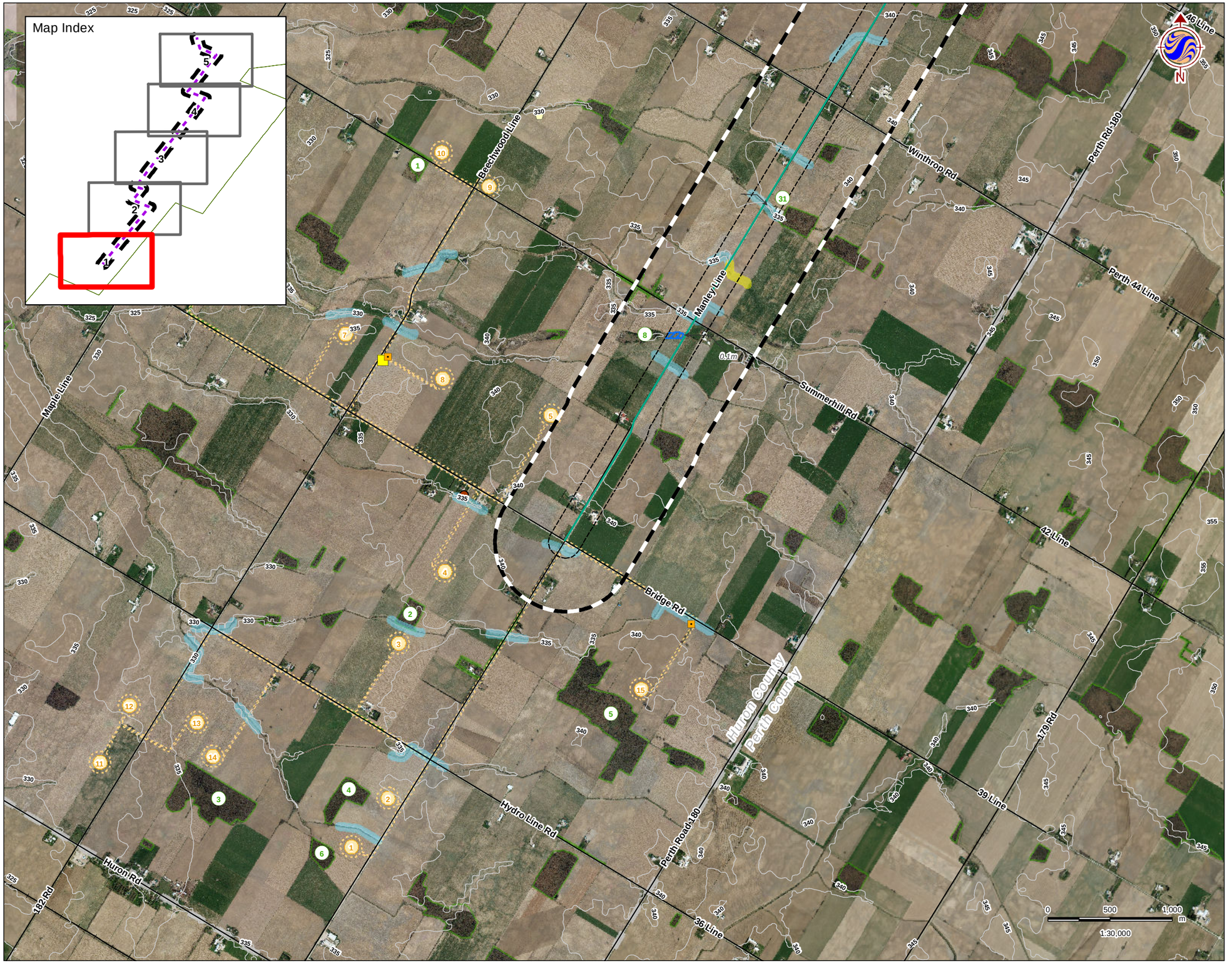
June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
7.0

Title
NATURAL HERITAGE FEATURES
WIND PROJECT LOCATION

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig7_NaturalFeaturesWindProjectLocation_20120607.mxd
Revised: 2012-06-07 By: dharvey



Legend

- Study Area
- 120m Zone of Investigation

Project Components

- Turbine Location
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower
- Proposed Underground Electrical Interconnection Line Route
- Wind Construction Area

Existing Features

- Road
- Railway
- Contour Line (Metres)
- Regionally Significant Life Science ANSI (MNR, 2011)
- Provincially Significant Wetland (MNR, 2011)
- Locally Significant Wetland (MNR, 2011)
- Other Wetland (MNR, 2011)
- Winter Deer Yard (MNR, 2011)
- Wooded Area (MNR, 2011)
- Water Body (as defined in O.Reg 359/09)
- Not Water Body (as defined in O.Reg 359/09)

Significant Natural Features

- Significant Woodlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Significant Wetlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Winter Deer Yards and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- 29 Natural Feature Number

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic Imagery: © Huron County, First Base Solutions
   Imagery Date: 2010 & 2006.

Stantec

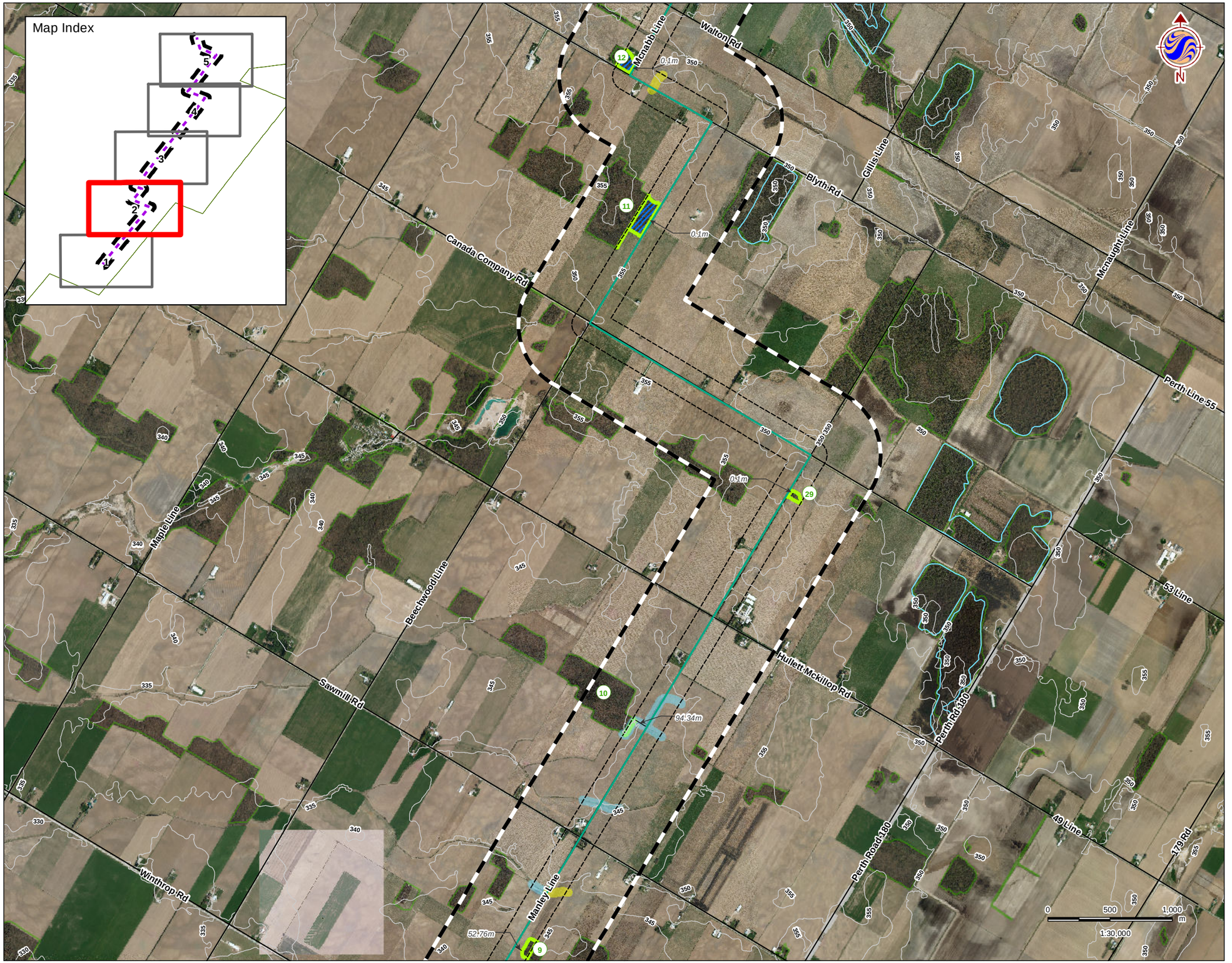
June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
8.0

Title
NATURAL HERITAGE FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 1 of 5)

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig8_0_NaturalFeaturesTline_20120607.mxd
Revised: 2012-06-07 By: dharvey



Legend

- Study Area
- 120m Zone of Investigation

Project Components

- Turbine Location
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower
- Proposed Underground Electrical Interconnection Line Route
- Wind Construction Area

Existing Features

- Road
- Railway
- Contour Line (Metres)
- Regionally Significant Life Science ANSI (MNR, 2011)
- Provincially Significant Wetland (MNR, 2011)
- Locally Significant Wetland (MNR, 2011)
- Other Wetland (MNR, 2011)
- Winter Deer Yard (MNR, 2011)
- Wooded Area (MNR, 2011)
- Water Body (as defined in O.Reg 359/09)
- Not Water Body (as defined in O.Reg 359/09)

Significant Natural Features

- Significant Woodlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Significant Wetlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Winter Deer Yards and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- 29 Natural Feature Number

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic Imagery: © Huron County, First Base Solutions
   Imagery Date: 2010 & 2006.

Stantec

June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
8.0

Title
NATURAL HERITAGE FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 2 of 5)

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig8_0_NaturalFeaturesTline_20120607.mxd
Revised: 2012-06-07 By: dharvey

Legend

- Study Area
- 120m Zone of Investigation

Project Components

- Turbine Location
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower
- Proposed Underground Electrical Interconnection Line Route
- Wind Construction Area

Existing Features

- Road
- Railway
- Contour Line (Metres)
- Regionally Significant Life Science ANSI (MNR, 2011)
- Provincially Significant Wetland (MNR, 2011)
- Locally Significant Wetland (MNR, 2011)
- Other Wetland (MNR, 2011)
- Winter Deer Yard (MNR, 2011)
- Wooded Area (MNR, 2011)
- Water Body (as defined in O.Reg 359/09)
- Not Water Body (as defined in O.Reg 359/09)

Significant Natural Features

- Significant Woodlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Significant Wetlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Winter Deer Yards and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- 29 Natural Feature Number

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic Imagery: © Huron County, First Base Solutions
   Imagery Date: 2010 & 2006.

Stantec

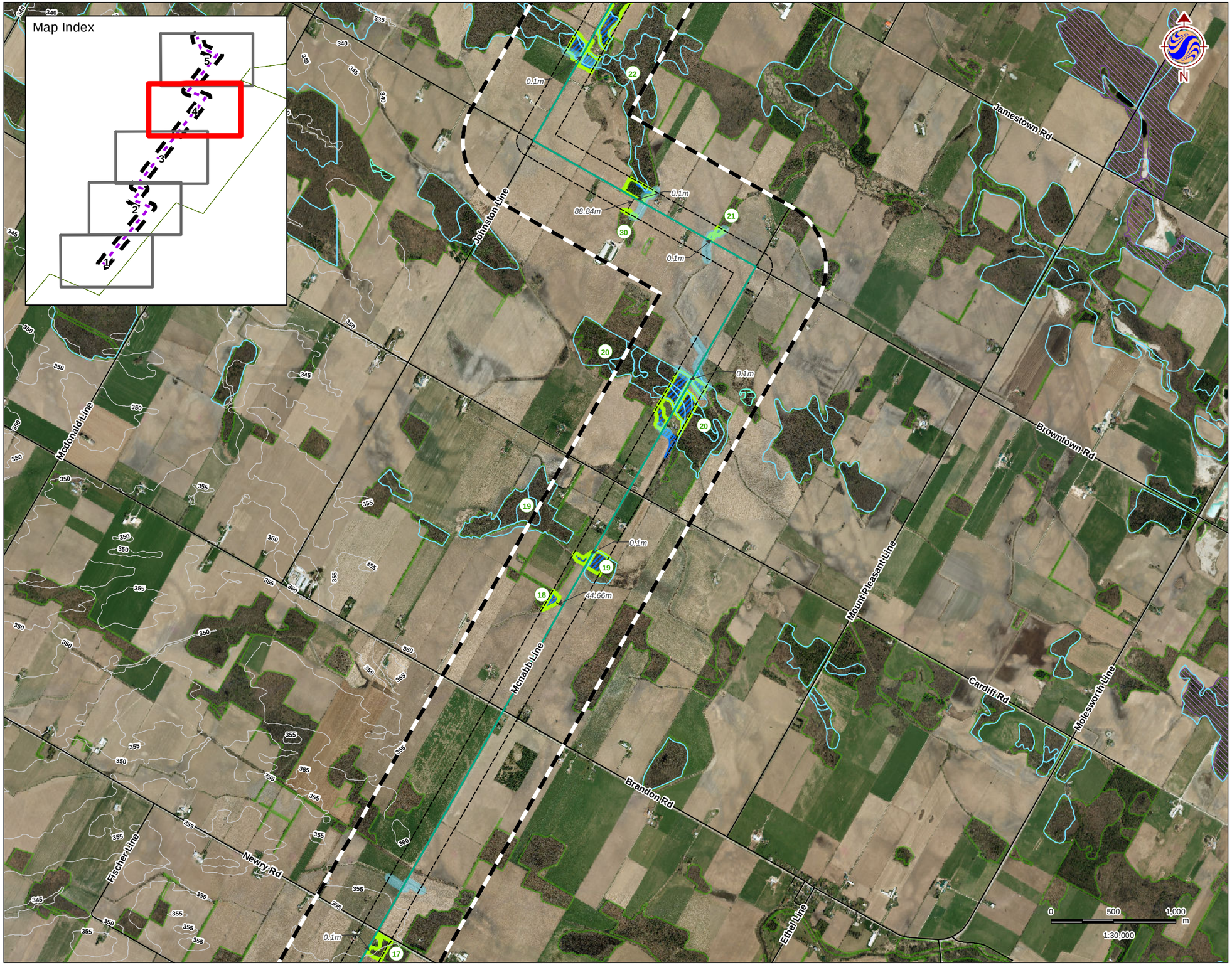
June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
8.0

Title
NATURAL HERITAGE FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 3 of 5)

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig8_0_NaturalFeaturesTline_20120607.mxd
Revised: 2012-06-07 By: dharvey



Legend

- Study Area
- 120m Zone of Investigation

Project Components

- Turbine Location
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower
- Proposed Underground Electrical Interconnection Line Route
- Wind Construction Area

Existing Features

- Road
- Railway
- Contour Line (Metres)
- Regionally Significant Life Science ANSI (MNR, 2011)
- Provincially Significant Wetland (MNR, 2011)
- Locally Significant Wetland (MNR, 2011)
- Other Wetland (MNR, 2011)
- Winter Deer Yard (MNR, 2011)
- Wooded Area (MNR, 2011)
- Water Body (as defined in O.Reg 359/09)
- Not Water Body (as defined in O.Reg 359/09)

Significant Natural Features

- Significant Woodlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Significant Wetlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Winter Deer Yards and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- 29 Natural Feature Number

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic Imagery: © Huron County, First Base Solutions
   Imagery Date: 2010 & 2006.

Stantec

June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.
8.0

Title
NATURAL HERITAGE FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 4 of 5)

W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig8_0_NaturalFeaturesTline_20120607.mxd
Revised: 2012-06-07 By: dharvey

Legend

- Study Area
- 120m Zone of Investigation

Project Components

- Turbine Location
- Transformer Substation
- Operations and Maintenance Building
- Point of Connection to HONI Network
- Unserviced Electrical Control Building
- Met Tower
- Proposed Underground Electrical Interconnection Line Route
- Wind Construction Area

Existing Features

- Road
- Railway
- Contour Line (Metres)
- Regionally Significant Life Science ANSI (MNR, 2011)
- Provincially Significant Wetland (MNR, 2011)
- Locally Significant Wetland (MNR, 2011)
- Other Wetland (MNR, 2011)
- Winter Deer Yard (MNR, 2011)
- Wooded Area (MNR, 2011)
- Water Body (as defined in O.Reg 359/09)
- Not Water Body (as defined in O.Reg 359/09)

Significant Natural Features

- Significant Woodlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Significant Wetlands and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- Winter Deer Yards and Generalized Candidate Significant Wildlife Habitat (Stantec, 2011)
- 29 Natural Feature Number

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.
3. Orthographic Imagery: © Huron County, First Base Solutions
   Imagery Date: 2010 & 2006.

Stantec

June 2012
160960649

Client/Project
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

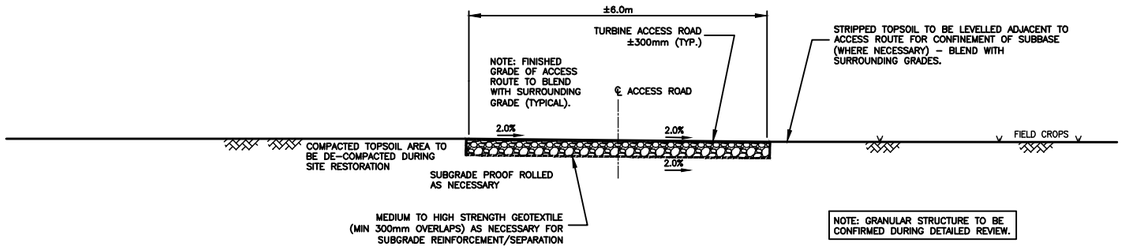
Figure No.
8.0

Title
NATURAL HERITAGE FEATURES UNDERGROUND ELECTRICAL INTERCONNECTION LINE PROJECT LOCATION (Tile 5 of 5)

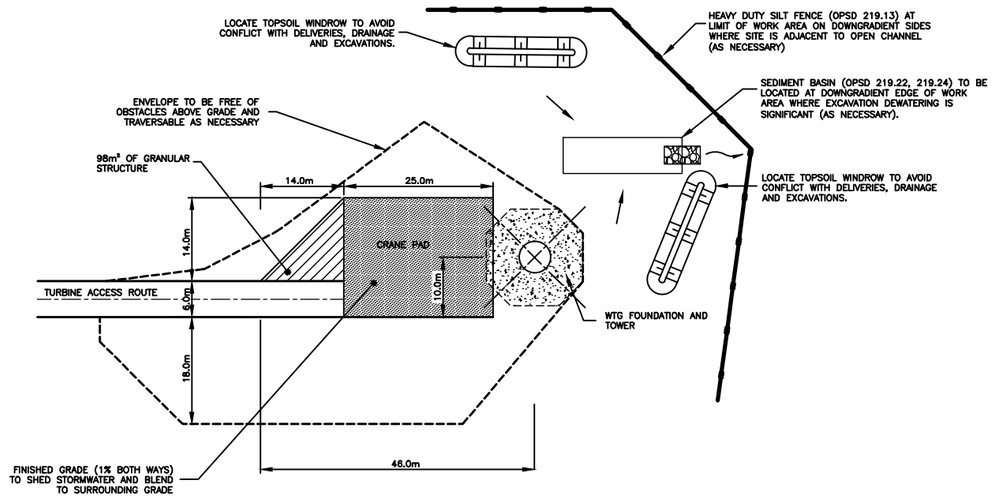
W:\active\60960649\drawing\GIS\MXD\CPR\60960649_Fig8_0_NaturalFeaturesTline_20120607.mxd
Revised: 2012-06-07 By: dharvey

Appendix B

Conceptual Plans and Specifications



TYPICAL ACCESS ROAD CROSS SECTION
NTS



TURBINE ERECTION ZONE
DEAD END LAYOUT (TYPICAL)
NTS

SILT CONTROLS SHALL BE IMPLEMENTED AT CROSSING SITES PER DETAIL DRAWINGS.

ALL REASONABLE EFFORTS SHALL BE TAKEN TO PREVENT DISCHARGE OF DELETERIOUS SUBSTANCES TO THE CHANNEL AND TO MINIMIZE IMPACTS TO FISH HABITAT.

NOTE: IN WATER WORKS TO BE UNDERTAKEN DURING NO TO LOW FLOW CONDITIONS. CONTRACTOR SHALL CONTROL WATER IN WORK ZONE PER OPSD 221.020 OR APPROVED EQUAL.

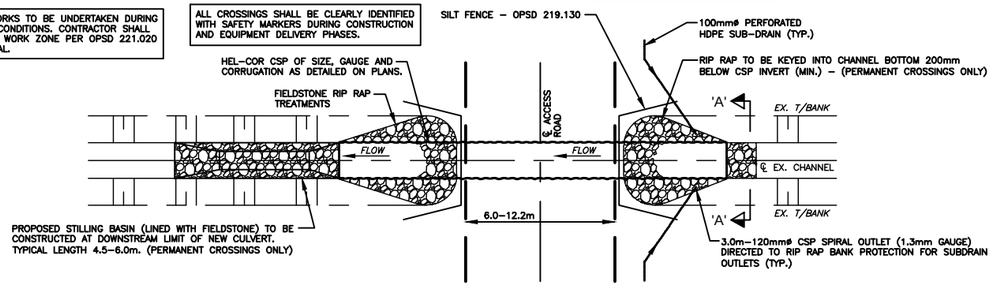
NOTE: FUELING OPERATIONS SHALL NOT BE CONDUCTED WITHIN 15.0m OF A DITCH OR FIELD TILE INLET.

NOTE: ALL DISTURBED BANKS TO BE SEEDED IMMEDIATELY AFTER CONSTRUCTION. STABILIZE WITH EROSION CONTROL MATTING (S150 BY NORTH AMERICAN GREEN, OR EQUIVALENT)

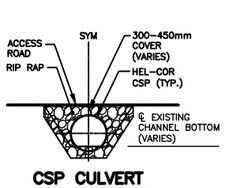
ALL CROSSINGS SHALL BE CLEARLY IDENTIFIED WITH SAFETY MARKERS DURING CONSTRUCTION AND EQUIPMENT DELIVERY PHASES.

NOTE: WINDROWS OF TOPSOIL SHALL NOT BE LOCATED WITHIN 10.0m OF ANY OPEN CHANNEL. DISPOSAL OF EXCESS FILL MATERIAL WITHIN 15m OF A RIPARIAN ZONE MAY BE SUBJECT TO CONSERVATION AUTHORITY APPROVAL.

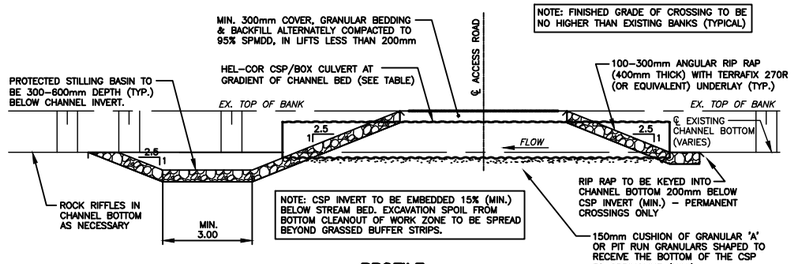
NOTE: EXISTING CHANNEL VEGETATION TO BE PROTECTED WHERE POSSIBLE.



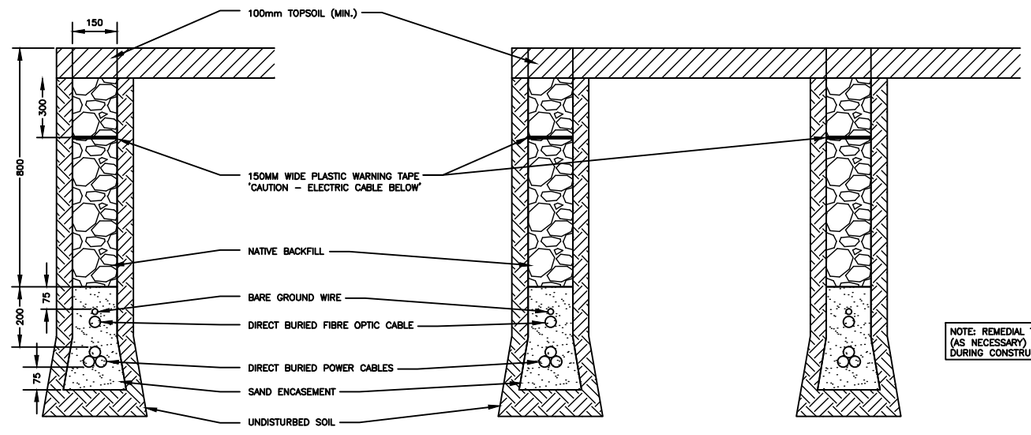
TYPICAL CULVERT CROSSING DETAIL
NTS



CSP CULVERT SECTION 'A'–'A'



PROFILE



PLOW DETAIL FOR 1 CIRCUIT

PLOW DETAIL FOR 2 CIRCUITS

UNDERGROUND POWER CABLES
TYPICAL PLOW DETAIL
NTS

PRELIMINARY
NOT APPROVED FOR CONSTRUCTION

DETAILS	No.	REVISIONS	DATE	CONSULTANT
DESIGN	1	FOR REVIEW	MAY 11/11	DE(L)L
DRAWN BY JS				
CHECKED RAH				
APPROVED				
DATE MAY 2011				
F.B#.				
LDD FILENAME:				
FILENAME:				

CONSULTANT OR DIVISION
Consulting Civil Engineers
41 Adelaide St. N., Unit 71
London, Ontario N6B 3P4
Phone (519) 672-8310
Fax (519) 672-4182
e-mail: deveng@deveng.net
development engineering (London) Limited

ENGINEER'S STAMP

VERESEN INC.

SCALE: AS NOTED

TITLE: ST. COLUMBAN WIND FARM

TYPICAL DETAILS

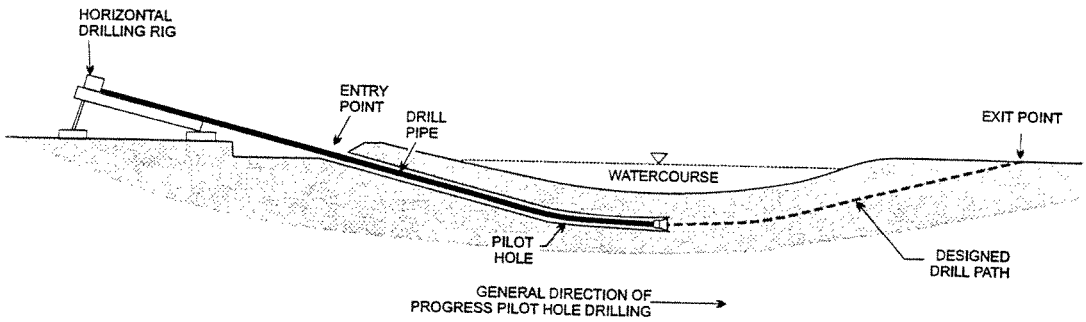
PROJECT No. DEL11-054

SHEET No. 1

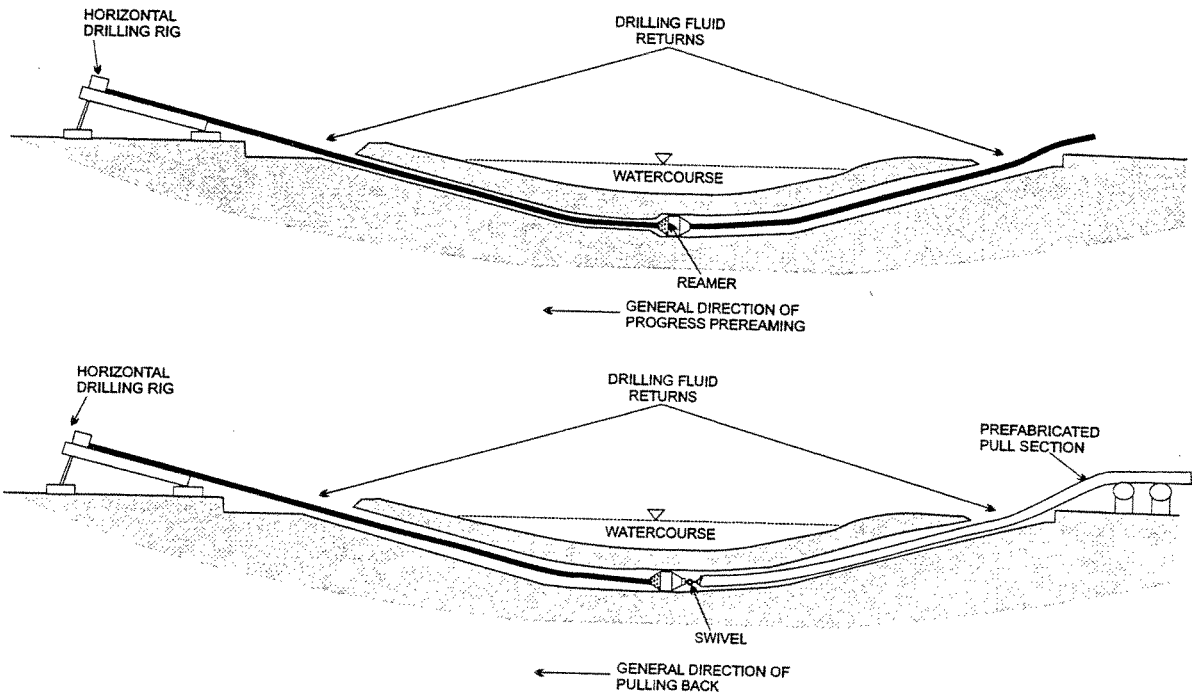
PLAN FILE No.

jsmith May/11/11–1:19pm DEL11-054-typical details.dwg

STAGE 1: PILOT HOLE DIRECTIONAL DRILLING



STAGE 2: REAMING AND PULLING BACK



PROFILE
(Not to Scale)

Notes:

1. Obtain geotechnical data prior to initiating drilling. Drilling may not be feasible in some materials such as unconsolidated gravels.
2. Prepare a drilling mud release contingency plan.
3. Set up drilling equipment a minimum of 10 m from the edge of the watercourse; do not clear or grade within 10 m zone.
4. Employ full time inspectors to observe for an inadvertent mud release into the watercourse.
5. Ensure that only bentonite based drilling mud is used. Do not allow the use of any additives to the drilling mud without the approval of appropriate regulatory authorities.
6. Install suitable drilling mud tanks or sumps to prevent contamination of watercourse.
7. Install berms downslope from the drill entry and anticipated exit points to contain any release of drilling mud.
8. Dispose of drilling mud in accordance with the appropriate regulatory authority requirements.

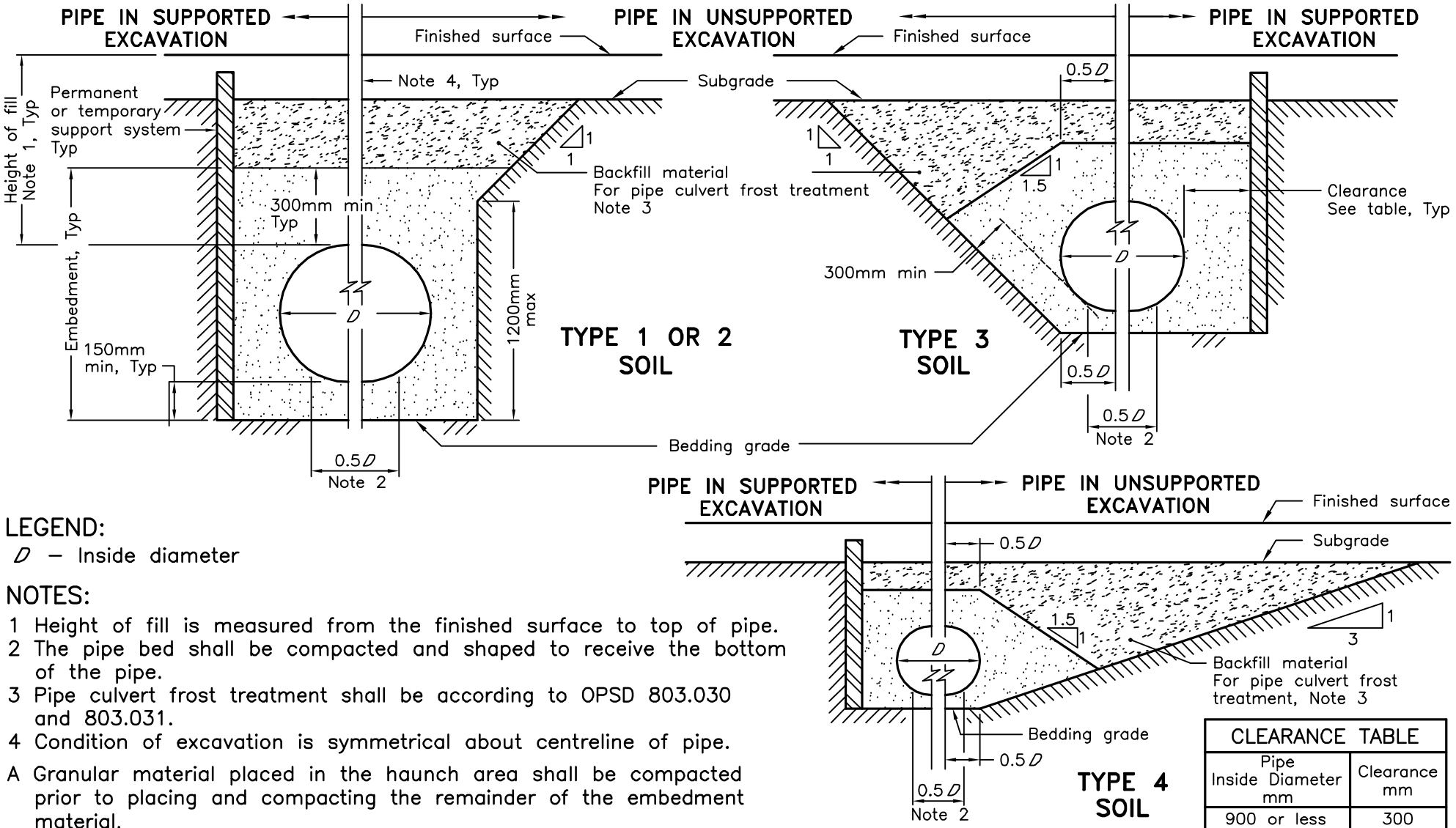
Source: Adapted from ASCE 1996, TERA 1998

CPWCC WATERCOURSE CROSSINGS

CONSTRUCTION TECHNIQUE – TYPICAL HORIZONTAL DIRECTIONAL DRILL

Second Edition

DWG. NO. 11(a)



LEGEND:

D – Inside diameter

NOTES:

1 Height of fill is measured from the finished surface to top of pipe.
2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
4 Condition of excavation is symmetrical about centreline of pipe.

A Granular material placed in the haunch area shall be compacted prior to placing and compacting the remainder of the embedment material.

B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

C All dimensions are in metres unless otherwise shown.

CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 | Rev 2

FLEXIBLE PIPE EMBEDMENT AND BACKFILL EARTH EXCAVATION

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 802.010

Appendix C

Noise Assessment Report

Appendix D

Property Line Setback Assessment

ST. COLUMBAN WIND PROJECT

PROPERTY LINE SETBACK
ASSESSMENT REPORT

File No. 160960649
June 2012

Prepared for:

St. Columban Energy LP
Suite 900
Livingston Place, South Tower
222-3rd Avenue SW
Calgary, AB T2P 0B4

Prepared by:

Stantec Consulting Ltd.
Suite 1 - 70 Southgate Drive
Guelph ON N1G 4P5

Table of Contents

List of Attachments

1.0 Introduction

1.1 PROJECT OVERVIEW

St. Columban Energy LP is proposing to develop, construct, and operate the 33 megawatt (MW) St. Columban Wind Project (the Project) in the Municipality of Huron East (Huron East), Municipality of Morris-Turnberry (Morris-Turnberry), and Township of Howick (Howick), County of Huron (Huron County), in response to the Government of Ontario's initiative to promote the development of renewable electricity in the province.

The overall Project Study Area is comprised of two sections – the Wind Project Study Area and the Interconnection Line Study Area. The Wind Project Study Area is bordered on the north by Winthrop Road, on the south by Huron Road/Highway 8, on the east to the west of Perth Road 180 and on the west by Maple Line. In addition, the Interconnection Line Study Area includes the path along which an approximately 43 kilometre (km) underground electrical interconnection line is proposed to extend from the Wind Project to a transformer substation and one of two connection points to the existing Hydro One Networks Inc. (HONI) electrical distribution system.

The proposed Project Location for this report includes all parts of the land in, on or over which the Project is proposed (the 'construction area' for the Project). The proposed Project Location and Project Study Areas are shown in Appendix A, Figures 1-3.

The basic components of the Project include:

- 15 Siemens SWT 2.3-101/SWT 2.3-113 wind turbine generators with a maximum installed nameplate capacity of 33 MW. To be conservative, two turbine models were assessed as part of the Renewable Energy Approval (REA) process – the SWT 2.3-113 (113m blade span) and the SWT 2.3-101 (101m blade span). For the noise assessment, the SWT 2.3-101 was assessed, due to its higher noise level. For potential impacts to the natural environment, and property line setback assessments, the SWT 2.3-113 was assessed, due to its longer blade length. This conservative approach ensured the 'worst case scenario' was assessed;
- A 34.5 kV underground power line collector system;
- A 27.6 kV underground power line collector system;
- Fibre optic cabling laid with underground power lines;
- Turbine access roads;
- Crane pads;
- Two connection points to the existing electrical system;
- Two unserviced electrical control buildings;

- An existing, currently serviced, operations and maintenance building to be leased from a participating landowner;
- A 34.5kV - approximately 43 km underground electrical interconnection line; and,
- A 44 kV/34.5 kV 15/20 MVA transformer station.

Temporary components during construction include work and storage areas at the turbine locations and along the underground electrical interconnection line. The electrical power line collector system will transport the electricity generated from the Project to two connection points to the HONI local distribution system.

St. Columban Energy LP retained Stantec Consulting Ltd. (Stantec) to prepare the REA application with input from Zephyr North Ltd., and Archaeological Services Inc. The REA application is a requirement 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 Project is classified as a Class 4 Wind Facility and will follow the requirements identified in O. Reg. 359/09 for such a facility.

This Property Line Setback Assessment Report has been prepared in accordance with O. Reg. 359/09, and is one component of the REA application for the Project.

1.2 REPORT REQUIREMENTS

Of the 15 potential turbine sites being assessed for the Project, 6 are located closer to a property line than the height of the turbine (99.5 metres). None of the potential turbine sites are located less than the length of the turbine blades plus 10 metres (i.e., 65 metres) from a property line or the boundary of a municipal road right-of-way. All of the potential turbine sites meet the minimum setback requirement of at least 550 metres from the nearest non-participating noise receptor.

The purpose of the Property Line Setback Assessment Report is to provide a review of potential adverse impacts and preventative measures for wind turbines located within the prescribed setback from non-participating parcels of land (i.e. where there is no agreement with the land owner specifically permitting a closer setback).

The Property Line Setback Assessment Report has been prepared in accordance with s.53 of O.Reg.359/09, which sets out specific content requirements:

- Demonstrate that the proposed location of the wind turbine would not result in adverse impacts on nearby business, infrastructure, properties or land use activities, and
- Describe any preventative measures that are required to be implemented to address the possibility of any adverse impacts.

2.0 Summary of Property Line Setback Analysis

This section summarizes the features over which Project turbine locations overlap the 99.5 metre setback, potential adverse impacts on those features, and preventative measures to address potential adverse impacts. Mapping of each potential turbine location analyzed is provided in Appendix A.

The detailed analysis for each turbine, including the distance of each potential turbine site from the non-participating property line, and the distance of overlap, is provided in Appendix B.

2.1 INFRASTRUCTURE

Description of Features within Overlap

No structures on non-participating properties, such as barns, storage units, or receptors are present. One turbine (T9) has a setback overlap with municipal roads (Beechwood Line and Summerhill Road). Details regarding the distance of overlap are provided in Appendix B.

Potential Adverse Impacts

Adverse impacts to municipal road allowances may occur in the unlikely event of turbine collapse.

Adverse impacts to road users from ice throw from the turbine.

Preventative Measures

All turbines meet the setback distance from public road right-of-ways, 65 m (blade length + 10 m), as prescribed in s. 53 of O. Reg. 359/09. In addition, the turbines would be constructed and designed by professional engineers, undergo regular maintenance and monitoring by operational staff, and contain automatic shutdown mechanisms in instances such as extreme weather. All of these measures are standard best practices detailed in the REA reports, and no additional preventative measures are required for the changes in setback.

All equipment (including the wind turbines) and associated infrastructure is designed and would be constructed to industry standards. Through use of a Supervisory Control and Data Acquisition (SCADA) system that is connected to fibre optic cables installed with the collector lines, the maintenance staff would be able to monitor the performance of all turbines on-line in real time. The SCADA system would identify any potential problems so that pro-active inspection and maintenance can be undertaken.

The turbine model selected for this Project is equipped with a very sophisticated torque reading sensor. If there is any additional drag on the blades (such as ice or damage) the turbine will immediately shut down. The turbine will then need to be manually restarted by a technician following a visual inspection at the site. If ice builds up on a turbine, even millimeters, the power output to wind speed ratio changes, forcing a shutdown of the turbine mechanically. Even a

small buildup will trigger a shutdown if the ratio changes. This happens automatically, and all turbines can shut down before technicians arrive on the site to assess the potential for ice throw from the turbines.

In addition to the above preventative measure, the turbines are fitted with vibration monitoring equipment. If ice forms on the blades, the turbine will experience higher than normal vibration due to an unbalanced rotor and the turbine will shut down. In an icing event, the towers are left idling (very slow pinwheeling) and when the sun comes out (regardless of air temperature) the ice will melt due to the metallic paint used on the towers and fall directly to the ground. Visual checks are performed and then with a spotter in-place the towers are started up. This allows for a controlled discharge of the ice from the slower turning blades during re-start. These safety and preventative measures are in place to be protective of livestock, people, and buildings in the vicinity of the turbines.

In response to an inquiry from the Municipality of Huron East, a modeling exercise was completed to incorporate the specifics of the proposed turbine model and the road use patterns of the study area, particularly in the area of Beechwood Line and Summerhill Road (turbine T9). Based on the known wind speed and direction of the area, and using the same model type as the Garrad Hassan Canada (2007) report, the estimated frequency of a turbine ice fragment impact with a vehicle travelling on Beechwood Line or Summerhill Road within the ice throw range of turbine T9 is approximately 1 in 1,000 years. This, of course, is assuming that all of the other mitigation measures in place noted above (e.g. turbine control and monitoring system) were not in operation during this period.

It should also be emphasized that these are conservative (high) estimates which would be reduced considerably for lower turbine rotational speeds, especially to zero as in the case of a stationary turbine.

2.2 AGRICULTURAL LAND

Description of Features within Overlap

Six turbines (T7, 8, 9, 13, 14 and 15) have setback overlaps with agricultural cash crop land. Details regarding the specific turbines, and the overlap distance, are provided in Appendix B.

Potential Adverse Impacts

Adverse impacts to agricultural land, including crop damage and soil compaction, may occur in the unlikely event of turbine collapse.

Preventative Measures

The turbines would be constructed and designed by professional engineers, undergo regular maintenance and monitoring by operational staff, and contain automatic shutdown mechanisms in instances such as extreme weather. All of these measures are standard best practices detailed in the REA reports. In the unlikely event of damage to agricultural land due to turbine collapse, landowners would be compensated by St. Columban Energy LP for any crop damage, and measures are outlined in the REA reports to mitigate soil compaction. Given the above measures, no additional preventative measures are required for the changes in setback.

2.3 HEDGEROWS

Description of Features within Overlap

One turbine (T15) has a setback overlap with a hedgerow. Details regarding the specific turbines, and the overlap distance, are provided in Appendix B.

Potential Adverse Impacts

Adverse impacts to hedgerows, including vegetation damage and disturbance to related wildlife, may occur in the unlikely event of turbine collapse.

Preventative Measures

The turbines would be constructed and designed by professional engineers, undergo regular maintenance and monitoring by operational staff, and contain automatic shutdown mechanisms in instances such as extreme weather. All of these measures are standard best practices detailed in the REA reports. Additional mitigation measures for vegetation, including damage and disturbance to related wildlife habitat, are outlined in the REA reports. Given the above measures, no additional preventative measures are required for the changes in setback.

3.0 Closure

This Property Line Setback Assessment Report for the St. Columban Wind Project has been prepared by Stantec for St. Columban Energy LP in accordance with Ontario Regulation 359/09.

This report has been prepared by Stantec for the sole benefit of St. Columban Energy LP, and may not be used by any third party without the express written consent of St. Columban Energy LP. 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.

STANTEC CONSULTING LTD.

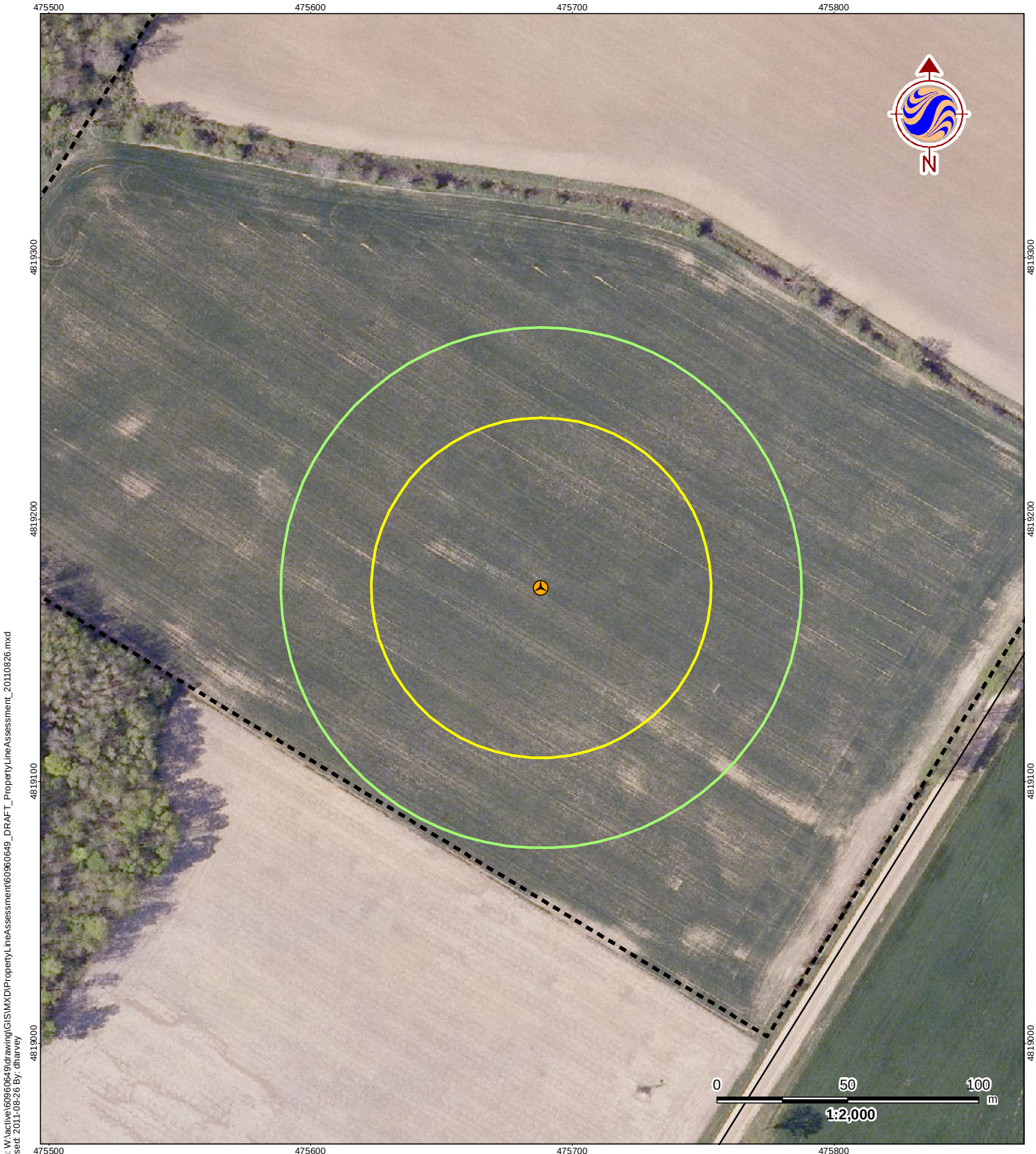
Shawna Peddle
Senior Project Manager

Kerrie Skillen
Project Manager

rpt_60649_property_line_setback_asst_20120607

Attachment A

Figures: Individual Turbine Locations and Property Line Setbacks



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\160960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

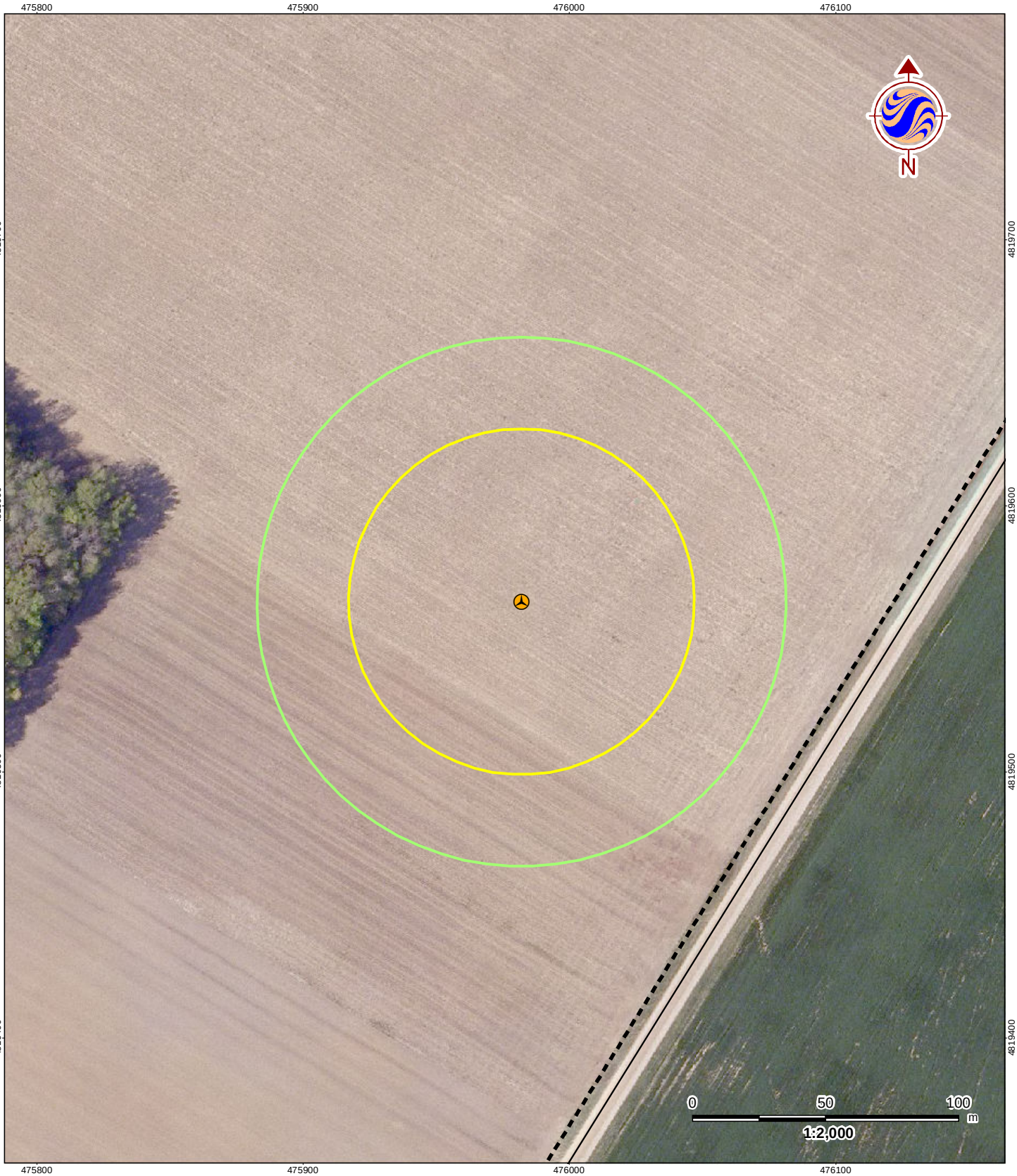
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 1

Title

PROPERTY LINE ASSESSMENT



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\160960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

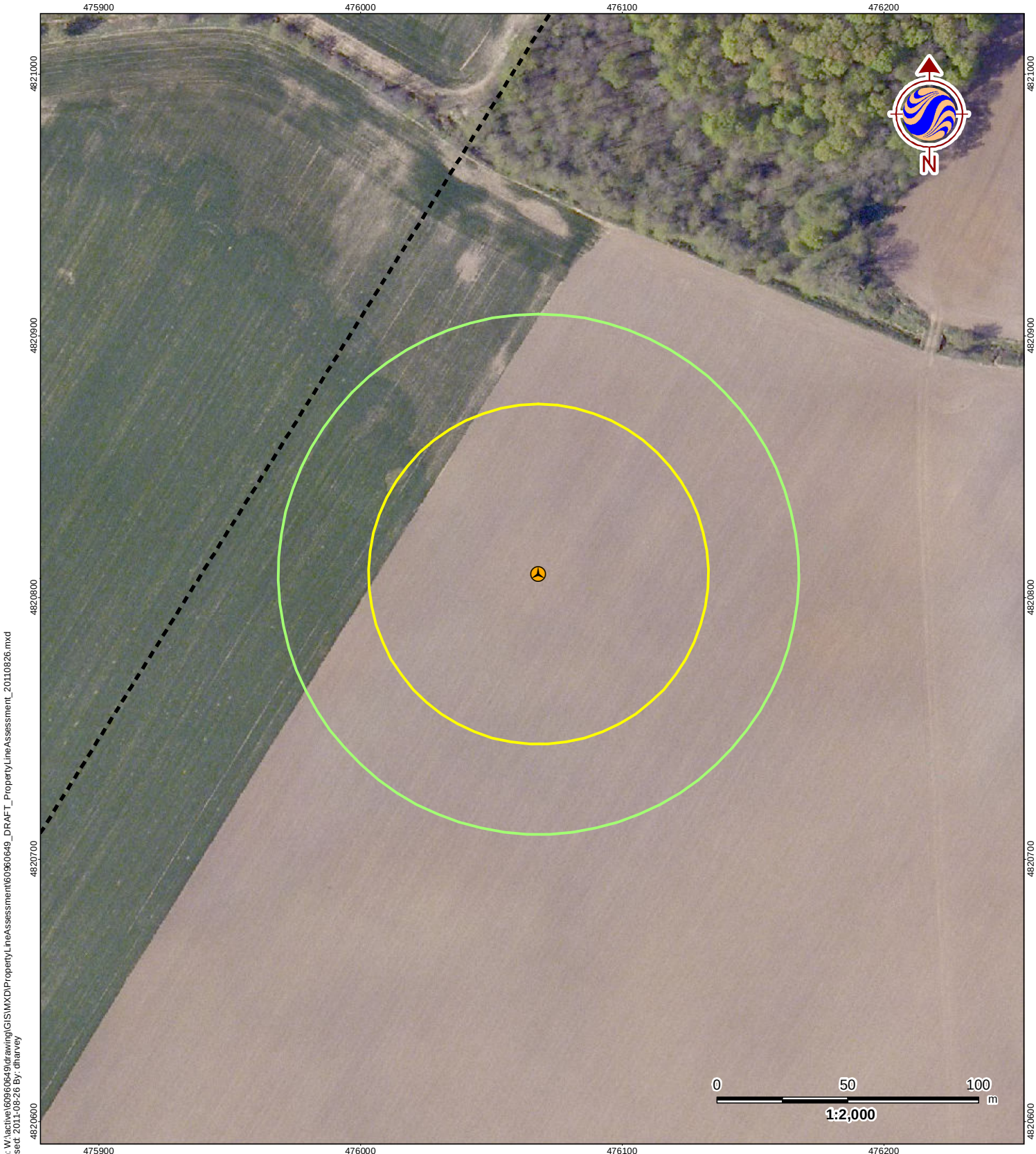
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 2

Title

PROPERTY LINE ASSESSMENT



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\60960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

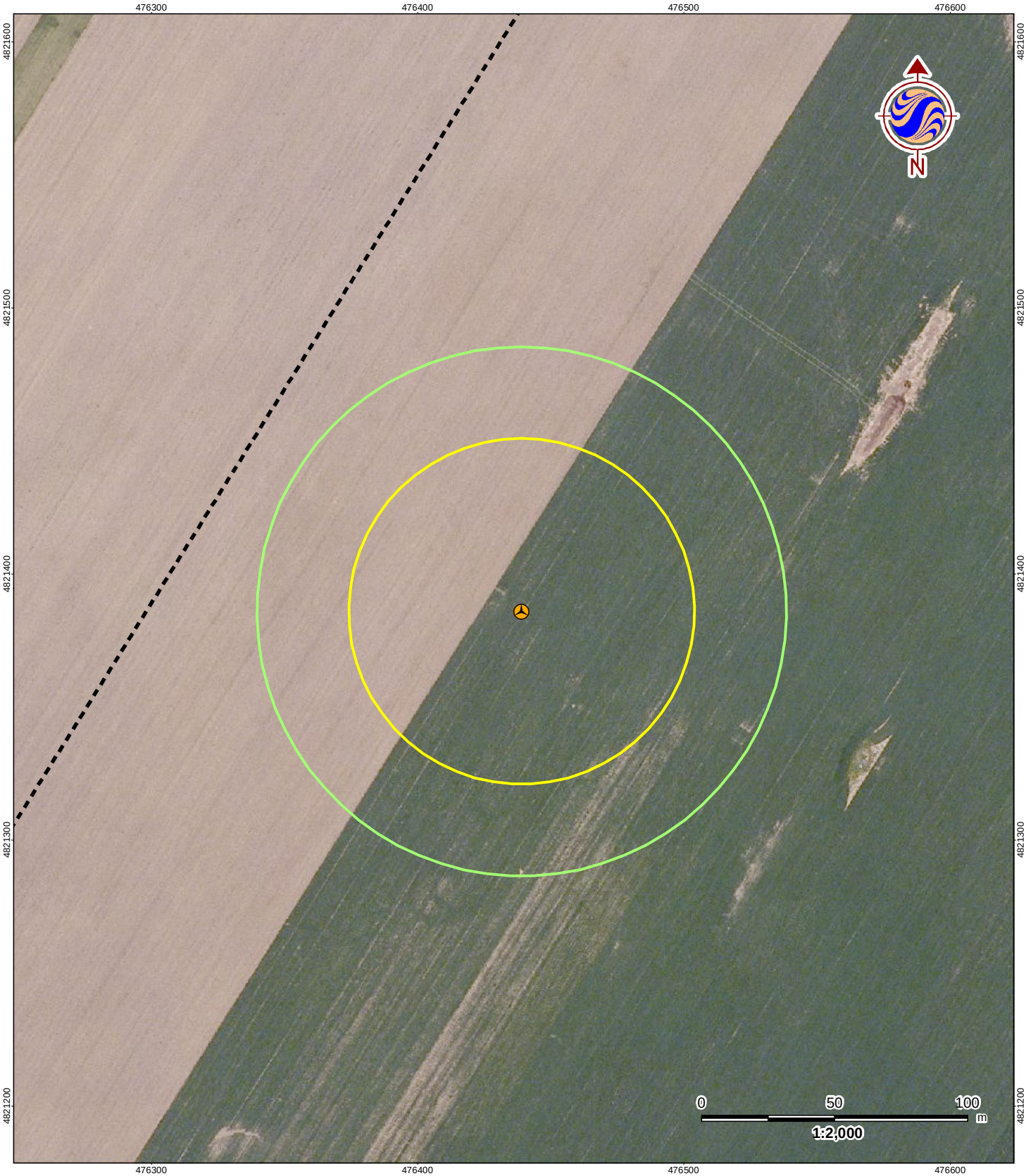
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 3

Title

PROPERTY LINE ASSESSMENT



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\160960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

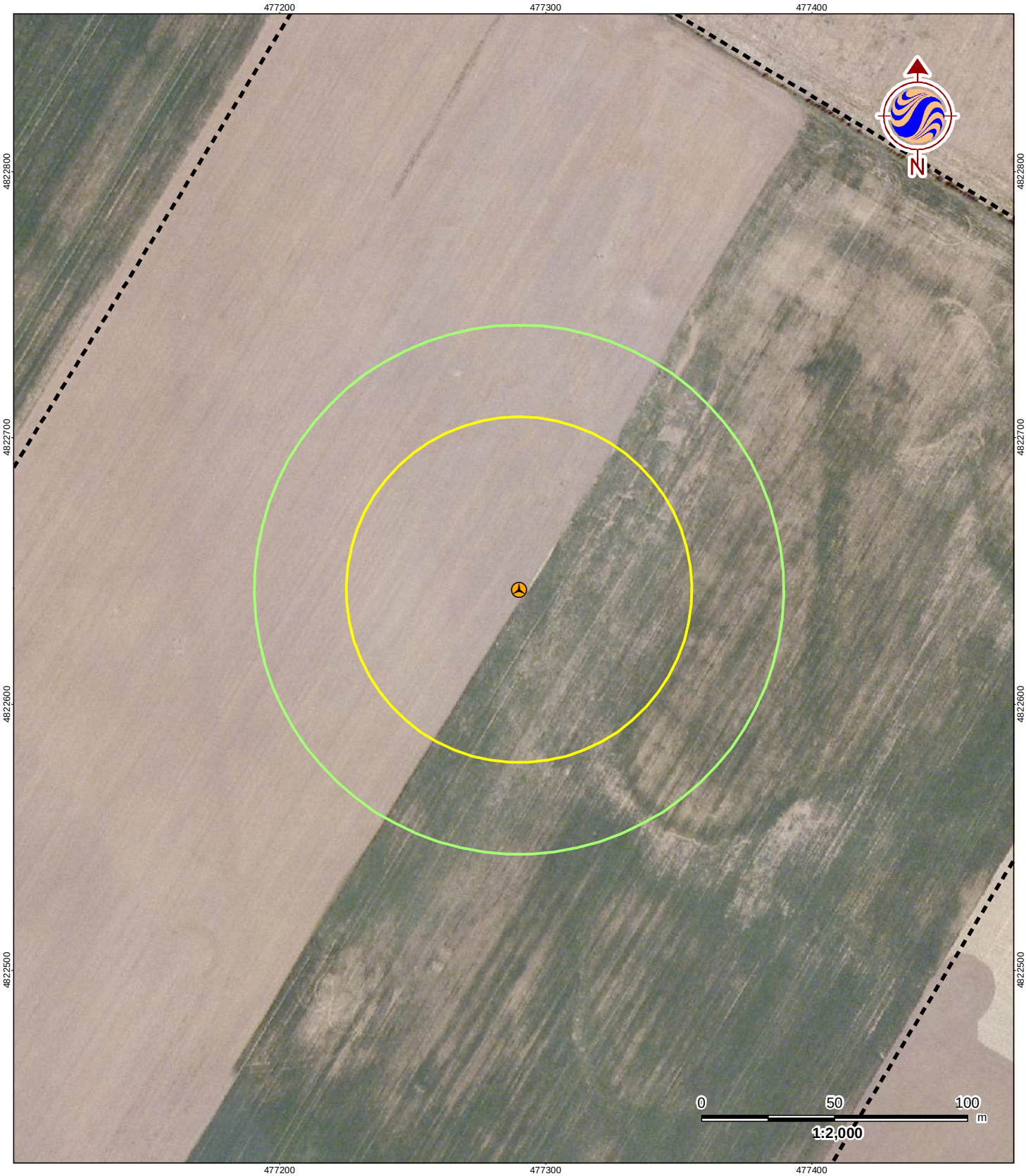
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 4

Title

PROPERTY LINE ASSESSMENT



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\60960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

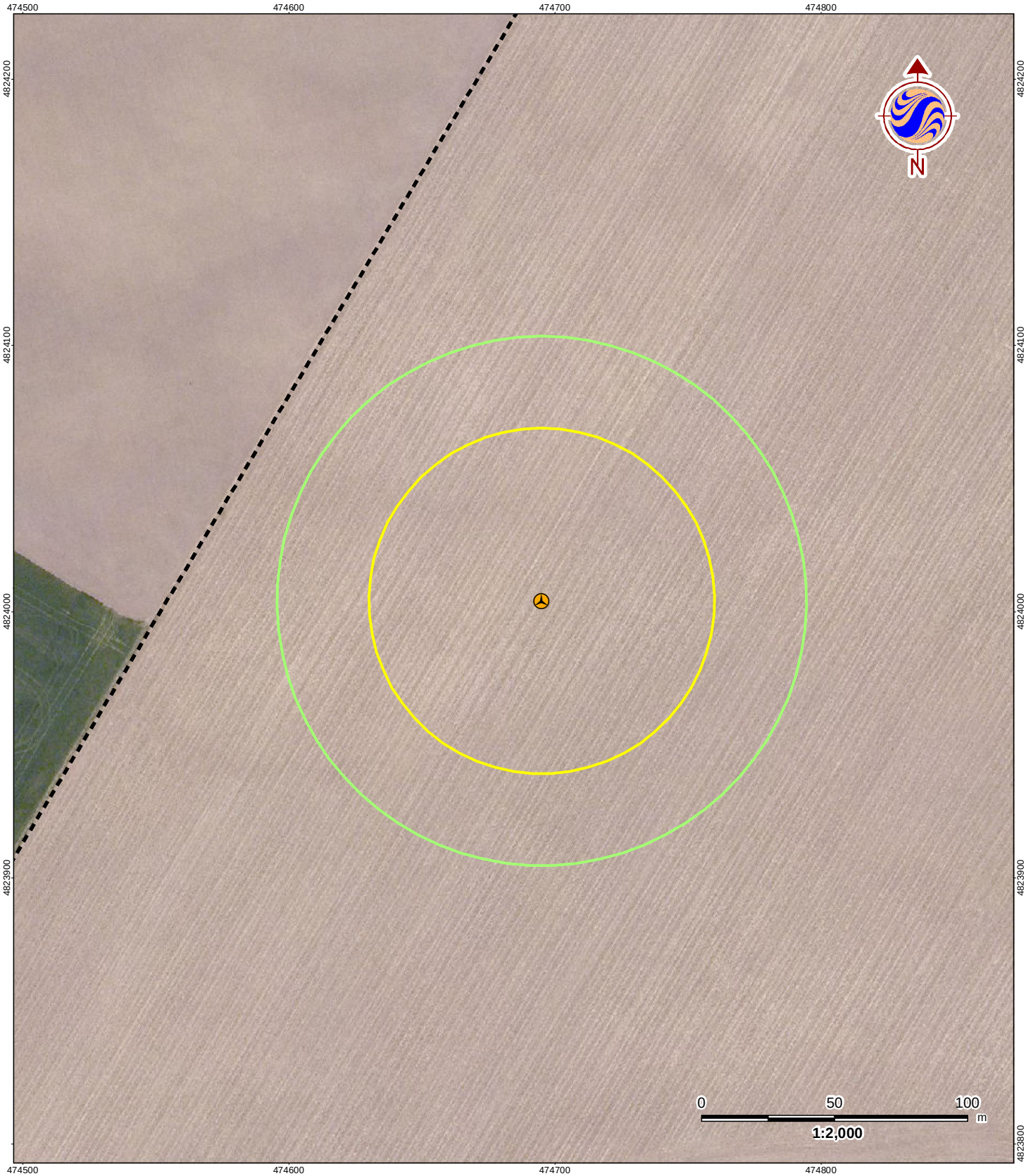
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 5

Title

PROPERTY LINE ASSESSMENT



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\60960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

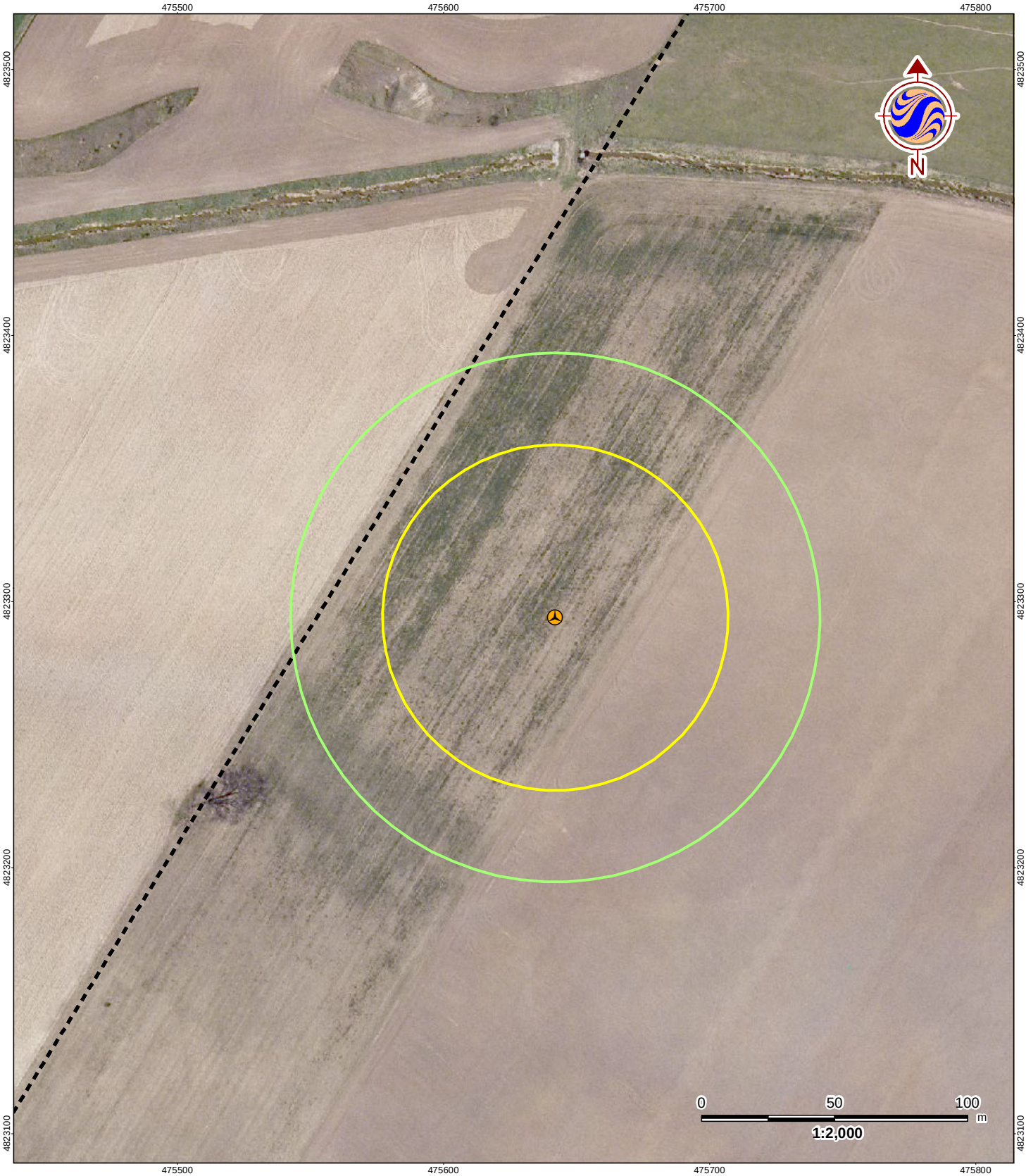
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 6

Title

PROPERTY LINE ASSESSMENT



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\160960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

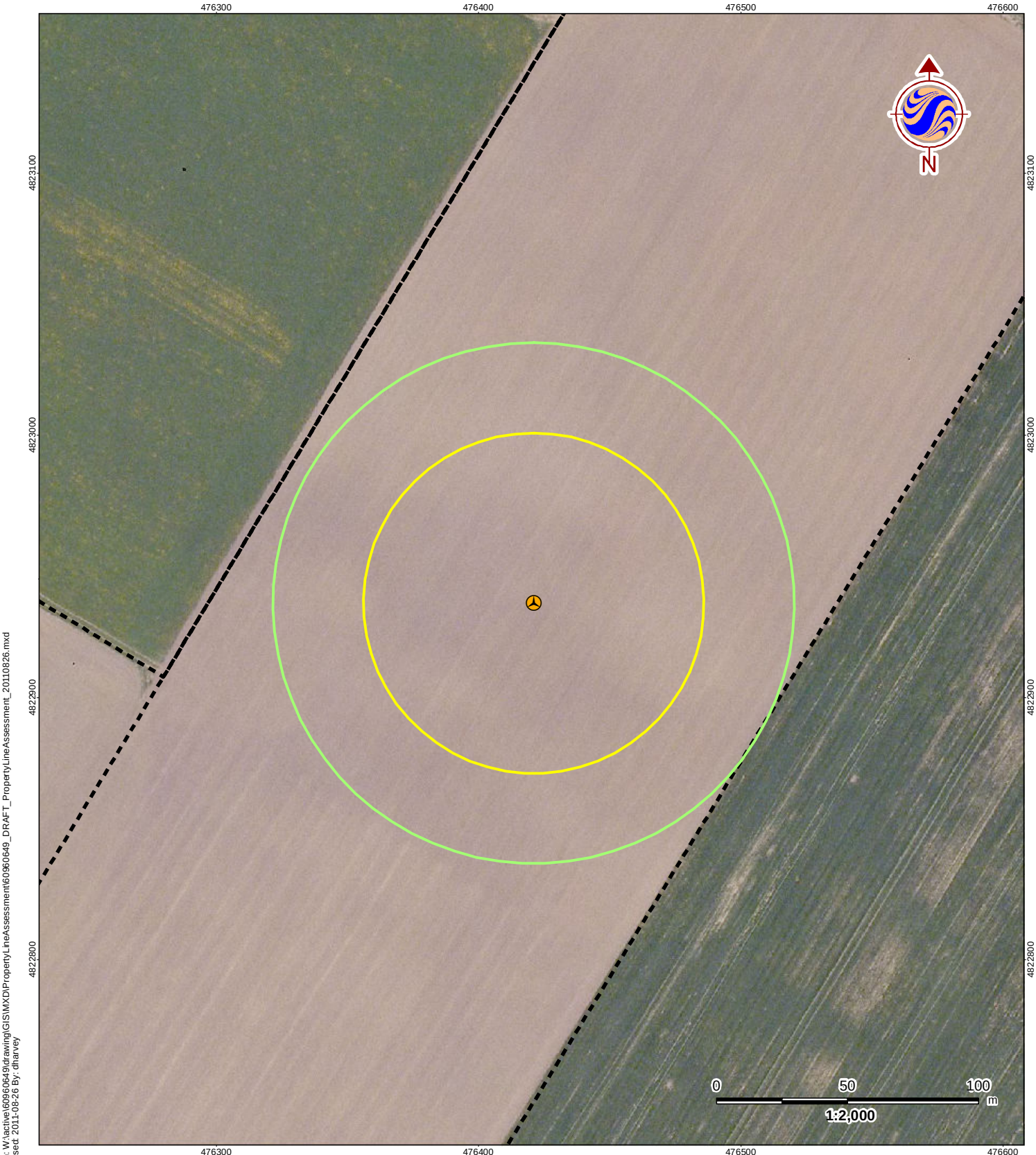
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 7

Title

PROPERTY LINE ASSESSMENT



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\60960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

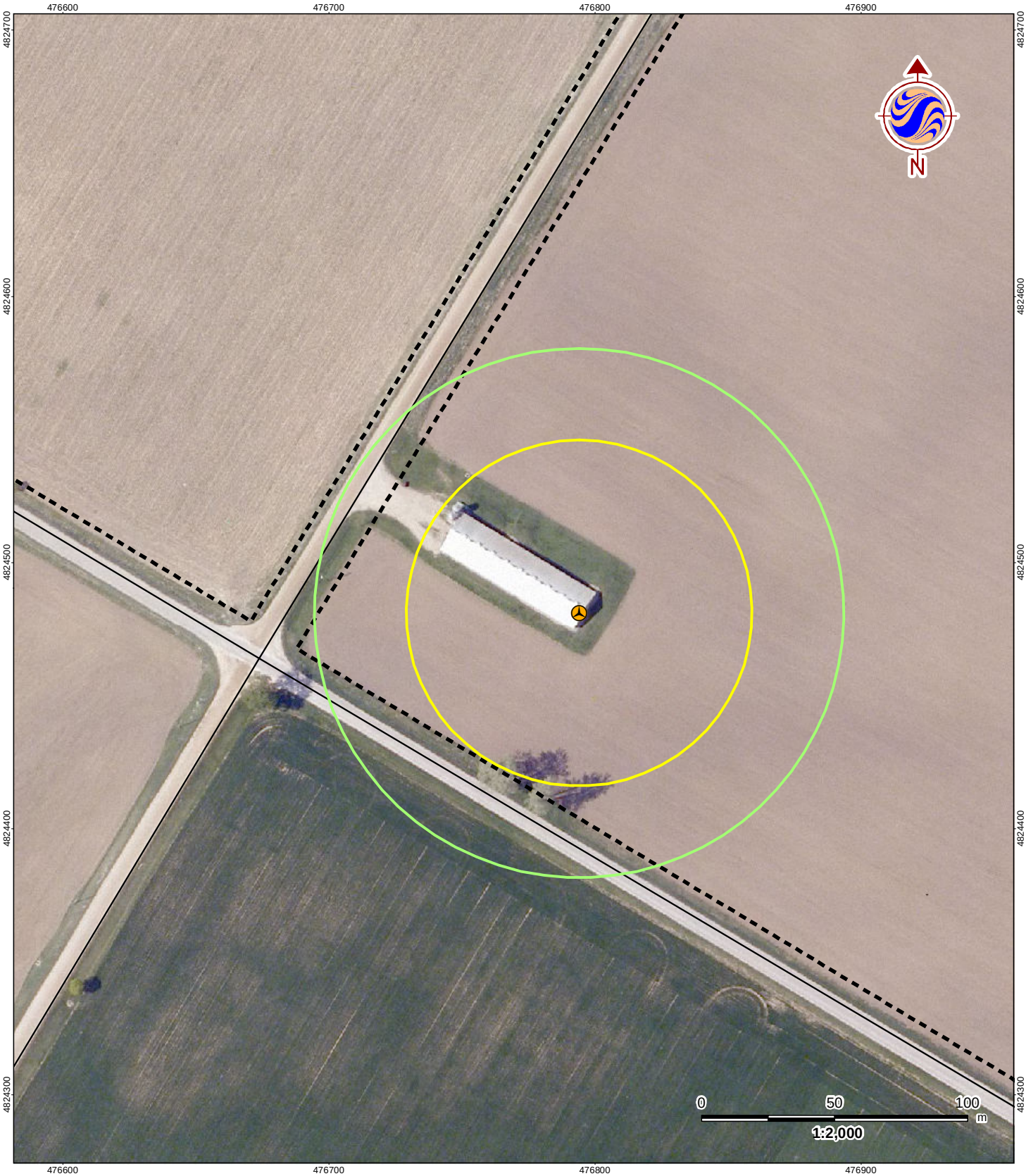
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 8

Title

PROPERTY LINE ASSESSMENT



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\160960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

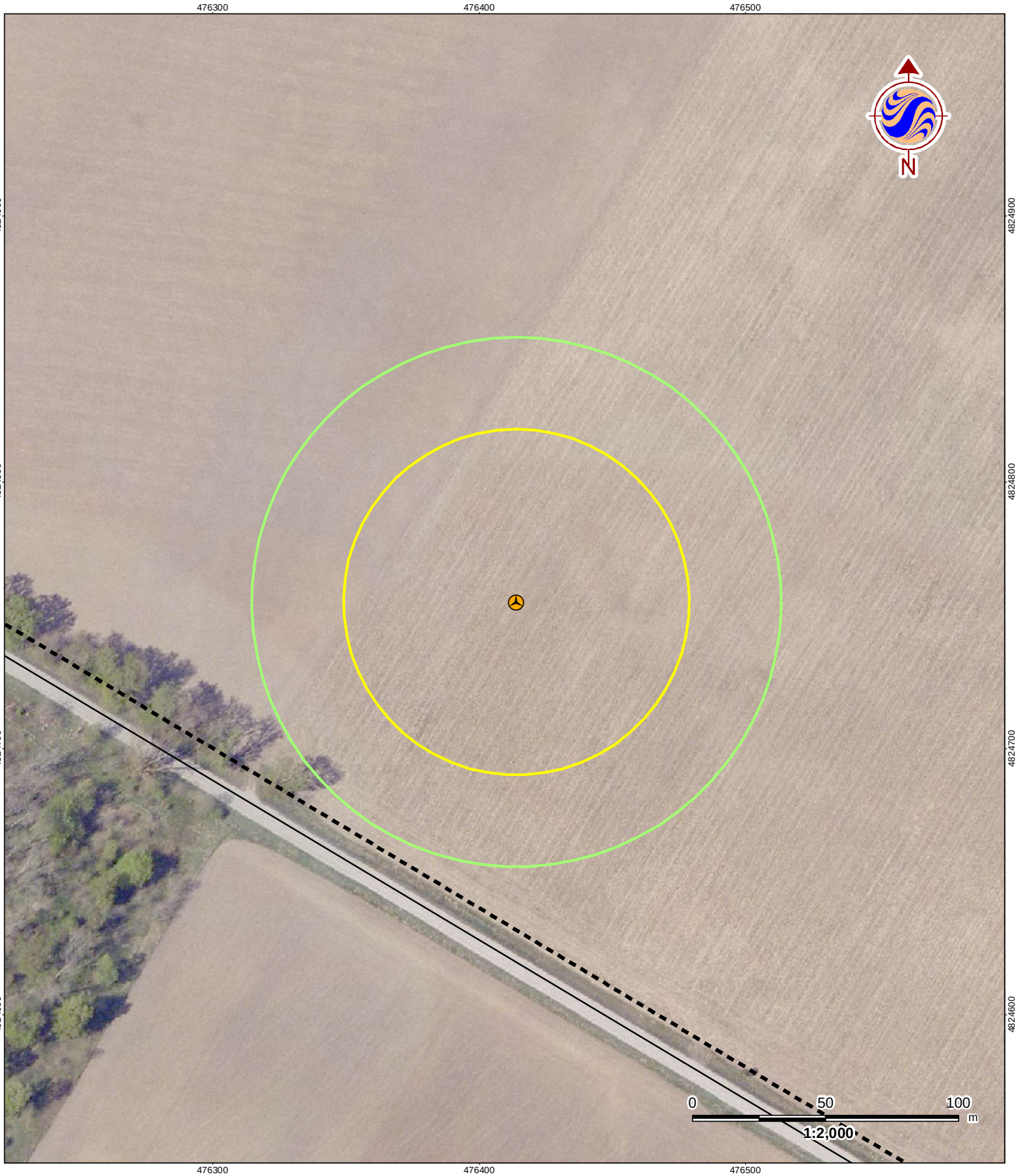
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 9

Title

PROPERTY LINE ASSESSMENT



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\160960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

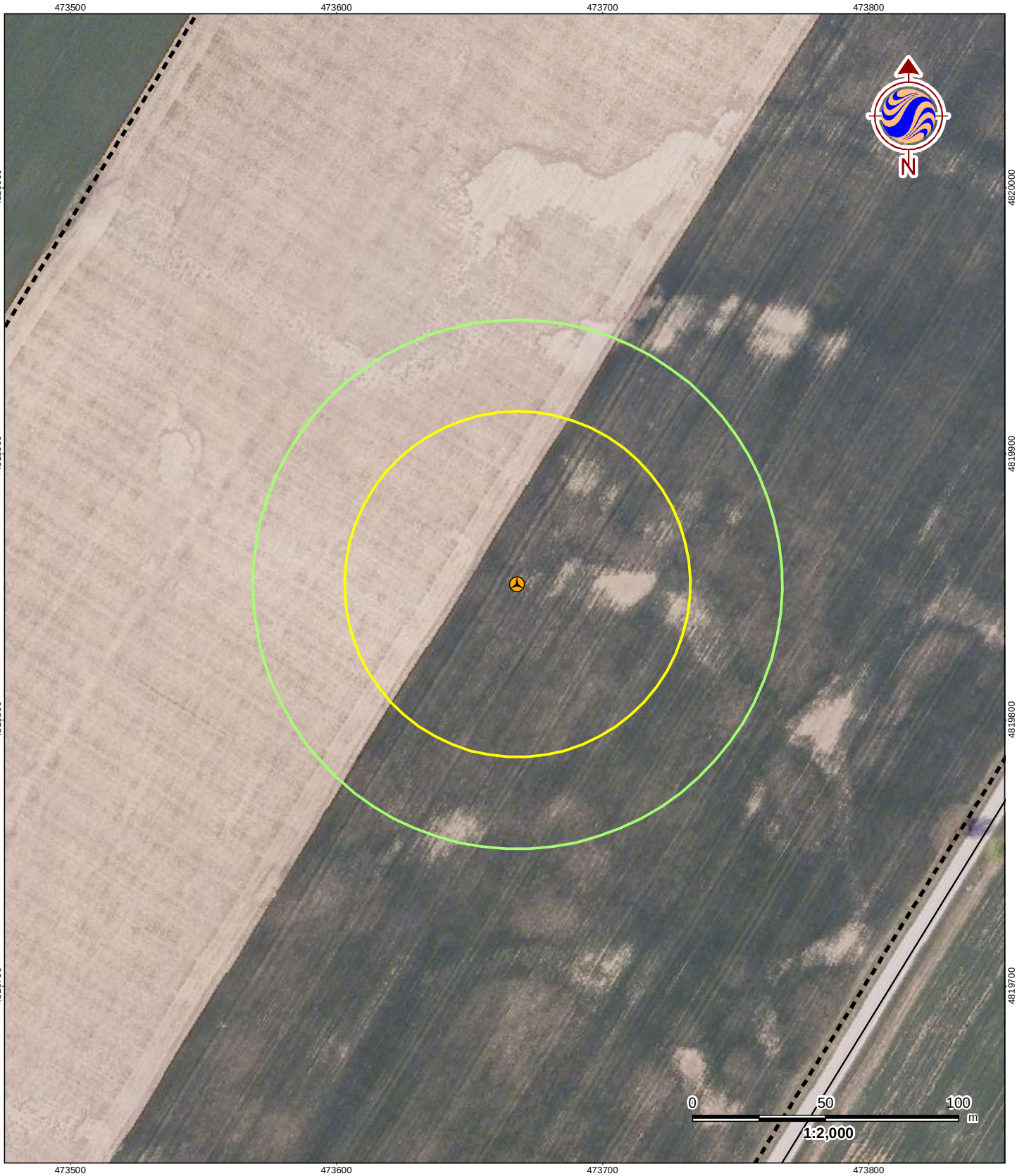
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 10

Title

PROPERTY LINE ASSESSMENT



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\60960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

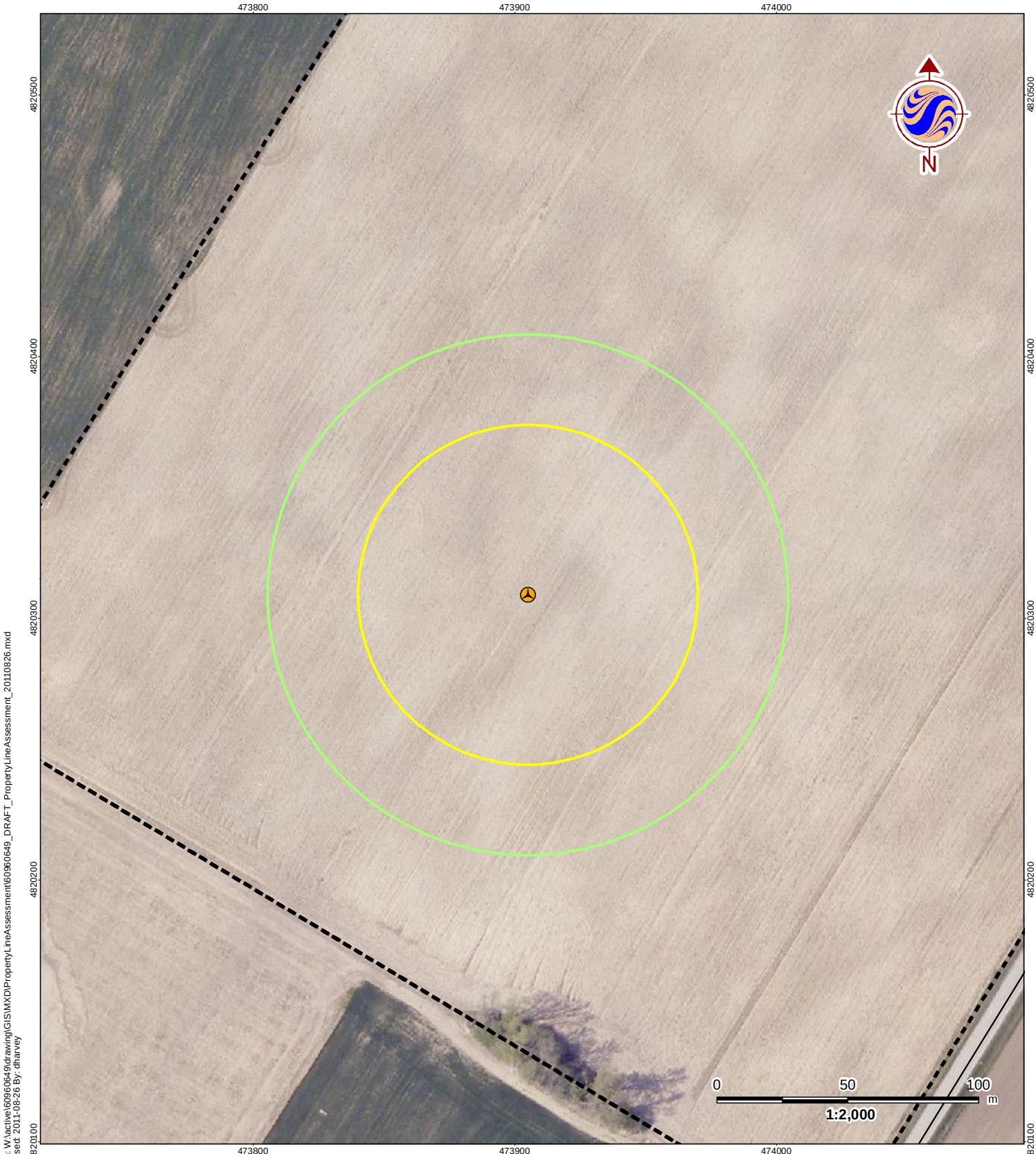
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 11

Title

PROPERTY LINE ASSESSMENT



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\160960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

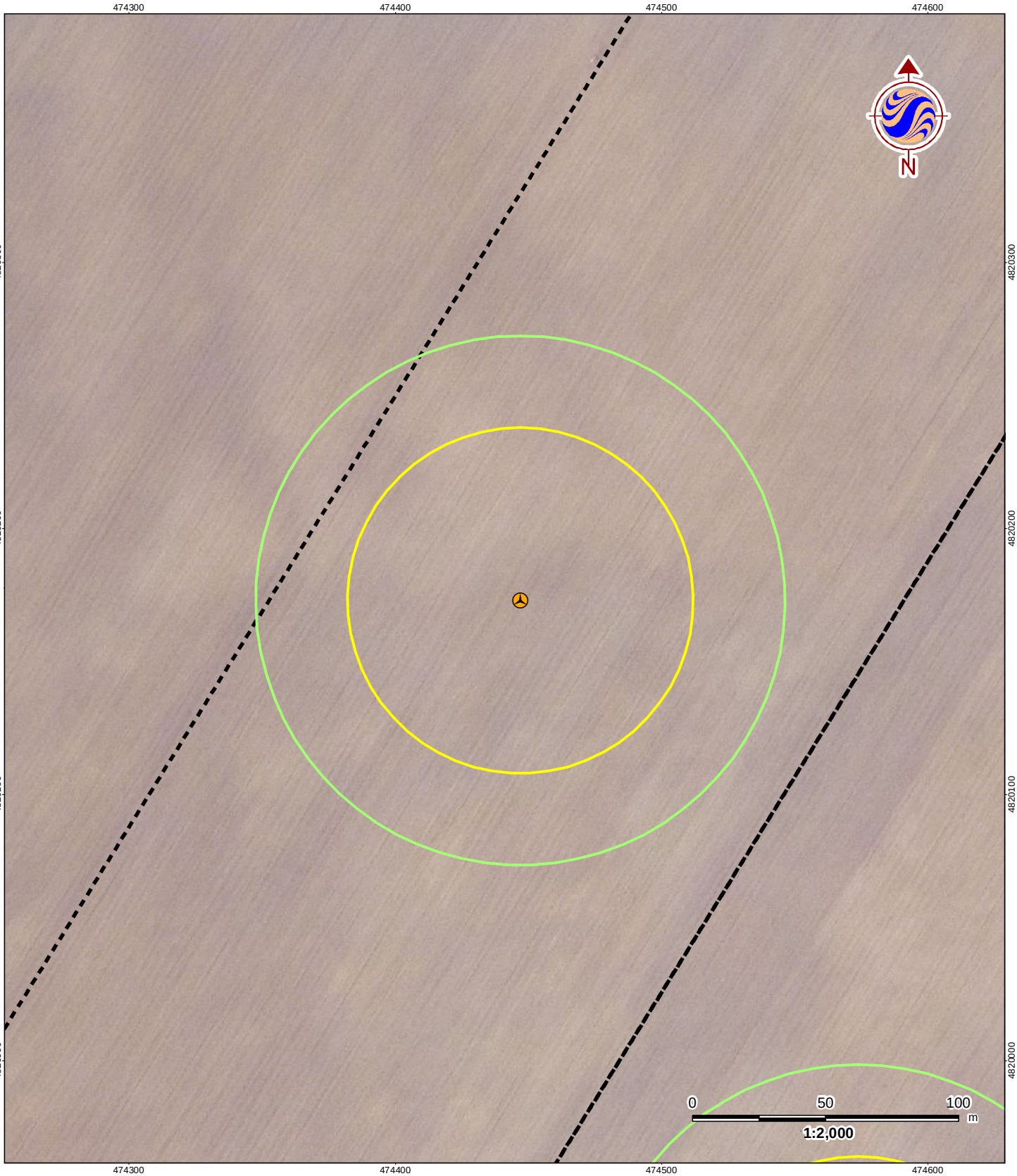
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 12

Title

PROPERTY LINE ASSESSMENT



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\160960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

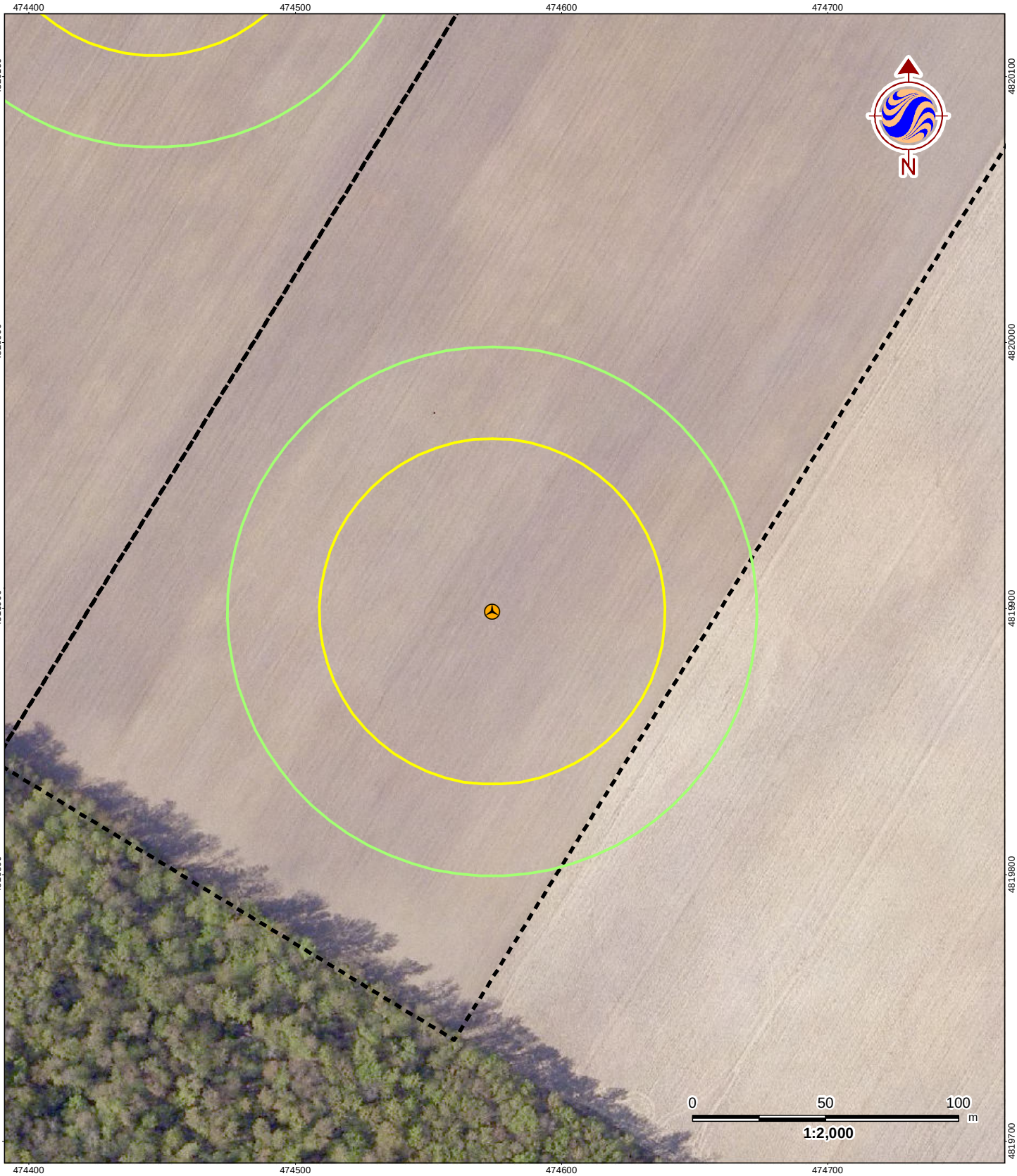
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 13

Title

PROPERTY LINE ASSESSMENT



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\160960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

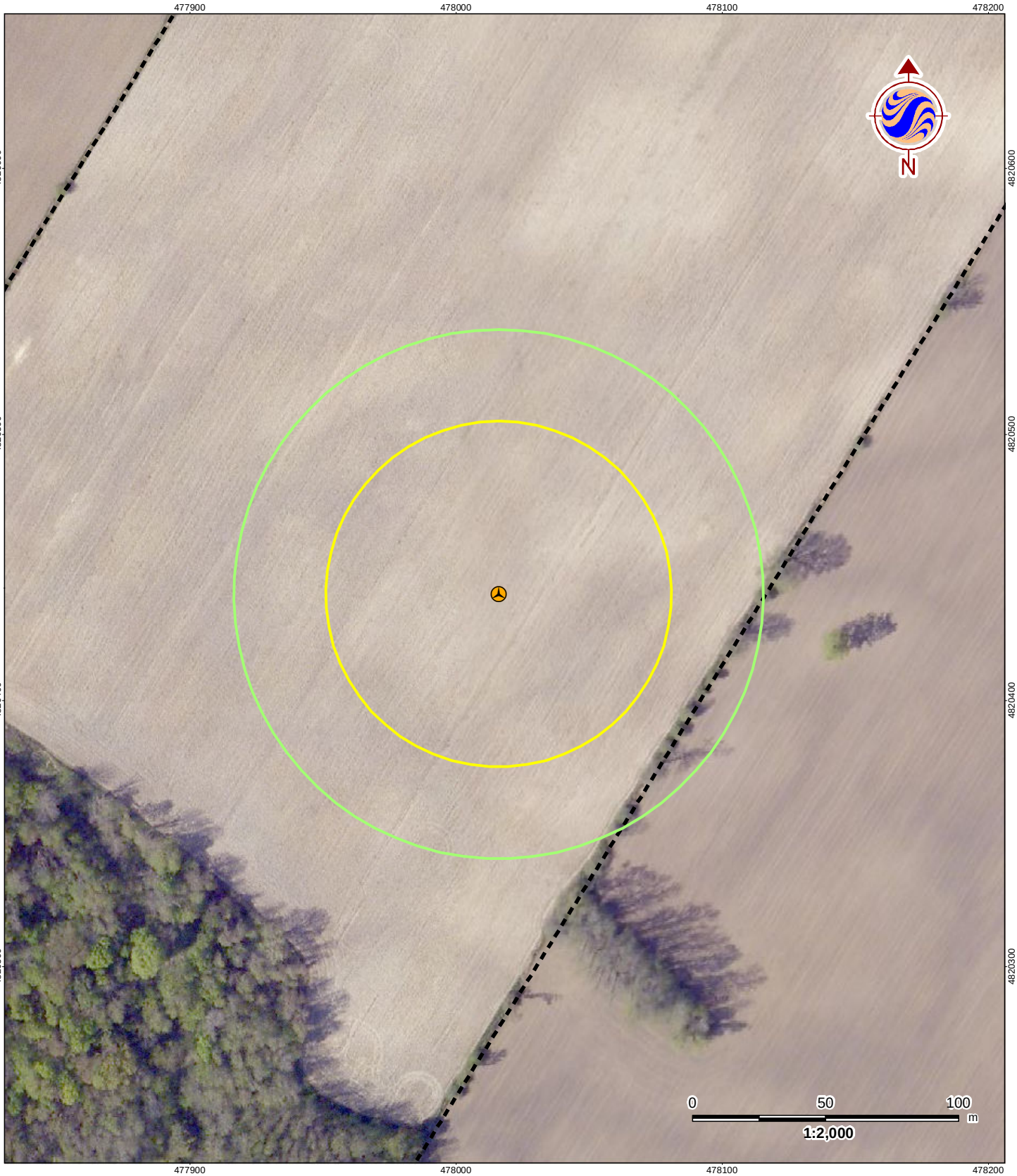
ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 14

Title

PROPERTY LINE ASSESSMENT



Path: W:\active\160960649\drawing\GIS\MXD\PropertyLineAssessment\160960649_DRAFT_PropertyLineAssessment_20110826.mxd
Revised: 2011-08-26 By: dharvey

August 2011
160960649

Stantec

Legend

- Turbine
- Turbine 99.5m Buffer
- Turbine 65m Buffer
- Property Boundary

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2011.

Client/Project

ST. COLUMBAN ENERGY LP
ST. COLUMBAN WIND PROJECT

Figure No.

Turbine 15

Title

PROPERTY LINE ASSESSMENT

Attachment B

Individual Property Line Setback Assessments

Appendix B: Property Line Assessment Summary

Turbine ID	Distance to Property Line (m)	Distance of Overlap (m)	Greater than Blade + 10m (65.0m)?	Features Within Overlap	Potential Adverse Impacts	Preventative Measures
7	76.50m	23.00	Yes	Infrastructure: ☐ Agricultural Land: ☒ Hedgerows: ☐ Woodlots: ☐ Watercourses: ☐	• Adverse impacts to agricultural land, including crop damage and soil compaction, may occur in the unlikely event of turbine collapse.	• The turbines would be constructed and designed by professional engineers, undergo regular maintenance and monitoring by operational staff, and contain shutdown mechanisms in instances such as extreme weather. • In the unlikely event of damage to agricultural land due to turbine collapse, landowners would be compensated by St. Columban Energy LP for any crop damage, and measures are outlined in the Renewable Energy Approval (REA) reports to mitigate soil compaction.
8	99.50m	0.00m	Yes	Infrastructure: ☐ Agricultural Land: ☒ Hedgerows: ☐ Woodlots: ☐ Watercourses: ☐	• Adverse impacts to agricultural land, including crop damage and soil compaction, may occur in the unlikely event of turbine collapse.	• The turbines would be constructed and designed by professional engineers, undergo regular maintenance and monitoring by operational staff, and contain shutdown mechanisms in instances such as extreme weather. • In the unlikely event of damage to agricultural land due to turbine collapse, landowners would be compensated by St. Columban Energy LP for any crop damage, and measures are outlined in the REA reports to mitigate soil compaction.
9	66.00m	33.50m	Yes	Infrastructure: ☒ Agricultural Land: ☒ Hedgerows: ☐ Woodlots: ☐ Watercourses: ☐	• Adverse impacts to municipal road allowance may occur in the unlikely event of turbine collapse. • Adverse impacts due to ice throw from the turbine • Adverse impacts to agricultural land, including crop damage and soil compaction, may occur in the unlikely event of turbine collapse.	• The turbine meets the setback distance from public road rights of way, 65 metres, as prescribed in s.53 of O. Reg. 359/09. • The turbines would be constructed and designed by professional engineers, undergo regular maintenance and monitoring by operational staff, and contain shutdown mechanisms in instances such as extreme weather. • In the unlikely event of damage to agricultural land due to turbine collapse, landowners would be compensated by St. Columban Energy LP for any crop damage, and measures are outlined in the REA reports to mitigate soil compaction.
13	80.40m	19.10m	Yes	Infrastructure: ☐ Agricultural Land: ☒ Hedgerows: ☐ Woodlots: ☐ Watercourses: ☐	• Adverse impacts to agricultural land, including crop damage and soil compaction, may occur in the unlikely event of turbine collapse.	• The turbines would be constructed and designed by professional engineers, undergo regular maintenance and monitoring by operational staff, and contain shutdown mechanisms in instances such as extreme weather. • In the unlikely event of damage to agricultural land due to turbine collapse, landowners would be compensated by St. Columban Energy LP for any crop damage, and measures are outlined in the REA reports to mitigate soil compaction.
14	72.70m	26.80m	Yes	Infrastructure: ☐ Agricultural Land: ☒ Hedgerows: ☐ Woodlots: ☐ Watercourses: ☐	• Adverse impacts to agricultural land, including crop damage and soil compaction, may occur in the unlikely event of turbine collapse.	• The turbines would be constructed and designed by professional engineers, undergo regular maintenance and monitoring by operational staff, and contain shutdown mechanisms in instances such as extreme weather. • In the unlikely event of damage to agricultural land due to turbine collapse, landowners would be compensated by St. Columban Energy LP for any crop damage, and measures are outlined in the REA reports to mitigate soil compaction.
15	85.60m	13.90m	Yes	Infrastructure: ☐ Agricultural Land: ☒ Hedgerows: ☒ Woodlots: ☐ Watercourses: ☐	• Adverse impacts to agricultural land, including crop damage and soil compaction, may occur in the unlikely event of turbine collapse. • Adverse impacts to hedgerows, including vegetation damage and disturbance to related wildlife habitat, may occur in the unlikely event of turbine collapse.	• The turbines would be constructed and designed by professional engineers, undergo regular maintenance and monitoring by operational staff, and contain shutdown mechanisms in instances such as extreme weather. • In the unlikely event of damage to agricultural land due to turbine collapse, landowners would be compensated by St. Columban Energy LP for any crop damage, and measures are outlined in the REA reports to mitigate soil compaction. • Mitigation measures for vegetation, including damage and disturbance to related wildlife habitat, are outlined in the REA reports.

Appendix E

Environmental Effects Monitoring Plan for Wildlife

ST. COLUMBAN WIND PROJECT
ENVIRONMENTAL EFFECTS MONITORING PLAN FOR WILDLIFE

File No. 160960649
May 2012

Prepared for:

St. Columban Energy LP
Suite 900
Livingston Place, South Tower
222-3rd Avenue SW
Calgary, AB T2P 0B4

Prepared by:

Stantec Consulting Ltd.
Suite 1 - 70 Southgate Drive
Guelph, ON N1G 4P5

Table of Contents

1.0 Introduction

St. Columban Energy LP is proposing to develop, construct, and operate the 33 megawatt (MW) St. Columban Wind Project (the Project) in the Municipality of Huron East (Huron East), Municipality of Morris-Turnberry (Morris-Turnberry), and Township of Howick (Howick), County of Huron (Huron County), in response to the Government of Ontario's initiative to promote the development of renewable electricity in the province.

The overall Project Study Area is comprised of two sections – the Wind Project Study Area and the Interconnection Line Study Area. The Wind Project Study Area is bordered on the north by Winthrop Road, on the south by Huron Road/Highway 8, on the east to the west of Perth Road 180 and on the west by Maple Line. In addition, the Interconnection Line Study Area includes the path along which an approximately 43 kilometre (km) underground electrical interconnection line is proposed to extend from the Wind Project to a transformer station and one of two connection points to the existing Hydro One Networks Inc. (HONI) electrical distribution system.

The basic components of the Project include:

- 15 Siemens SWT 2.3-101/SWT 2.3-113 wind turbine generators with a maximum installed nameplate capacity of 33 MW. To be conservative, two turbine models were assessed as part of the Renewable Energy Approval (REA) process – the SWT 2.3-113 (113m blade span) and the SWT 2.3-101 (101m blade span). For the noise assessment, the SWT 2.3-101 was assessed, due to its higher noise level. For potential impacts to the natural environment, and property line setback assessments, the SWT 2.3-113 was assessed, due to its longer blade length. This conservative approach ensured the 'worst case scenario' was assessed;
- A 34.5 kV underground power line collector system;
- A 27.6 kV underground power line collector system;
- Fibre optic cabling laid with the underground collector lines;
- Turbine access roads;
- Crane pads;
- Two connection points to the existing electrical system;
- Two un-serviced electrical control buildings;
- A 34.5kV - approximately 43 km underground electrical interconnection line; and,

- A 44 kV/34.5 kV 15/20 MVA transformer station.

Temporary components during construction include work and storage areas at the turbine locations and along the underground electrical interconnection line. The electrical power line collector system will transport the electricity generated from the Project to two connection points to the HONI local distribution system.

This Post-Construction Monitoring Program is one component of the Mitigation and Environmental Effects Monitoring Plan (EEMP) 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* (September 2009), the Ministry of the Environment's (MOE's) draft *Technical Bulletin Two: Guidance for preparing the Design and Operations Report* (March 2010), MNR's *Bats and Bat Habitats: Guidelines for Wind Power Projects* (July 2011) and MNR's *Birds and Bird Habitats: Guidelines for Wind Power Projects* (December 2011).

As discussed in the Project's Natural Heritage Assessment (NHA), primary data was collected in the Project Study Area pre-construction. This data was augmented with secondary data from published and unpublished sources to generate a dataset from which to assess the potential effects of the Project. No bird or bat significant wildlife habitat was identified in the Project Location (NHA, Section 4.0); however, post-construction mortality surveys are required for all Class 3 and 4 wind power projects (MNR 2011a and b).

The purpose of this EEMP is to verify compliance of the Project with applicable provincial and federal legislation and guidelines. This monitoring plan provides details on the post-construction wildlife monitoring program for mortality monitoring birds and bats.

2.0 Post-Construction Monitoring Program

2.1 PURPOSE AND TIMING

The purpose of the wildlife post-construction monitoring program is to identify performance objectives, assess the effectiveness of the proposed mitigation measures and to identify contingency measures that will be implemented if performance objectives cannot be met. Furthermore, any unanticipated potentially significant adverse environmental effects discovered during the post-construction monitoring program will be mitigated as described in Section 3.0. No bird or bat significant wildlife habitat was identified in the Project Location (NHA, Section 4.0); however, post-construction mortality surveys are required for all Class 3 and 4 wind power projects (MNR 2011a and b).

The Environmental Effects Monitoring Plan for wildlife at the St. Columban Wind Project includes the following:

- *mortality monitoring for birds and bats:* twice weekly (3-4 day intervals) mortality monitoring at ten turbines from May 1 to October 31, and weekly monitoring for raptors during November, for a period of three years. Searcher efficiency and scavenger trials will be conducted each year according to current guidance documents.

2.2 PRIMARY DATA COLLECTION

Detailed monitoring methods, including duration and frequency are discussed below.

2.2.1 Bird Mortality Monitoring

Background

The Project Location does not contain any factors (i.e. colonies, staging areas, migration corridors) that elevate its risk to birds. It is considered a low sensitivity site, representing the lowest level of potential risk to birds.

Monitoring

Bird mortality monitoring will be conducted according to MNR's *Birds and Bird Habitats: Guidelines for Wind Power Projects* (2011a).

Mortality monitoring within minimally-vegetated portions (i.e., Visibility Classes 1 and 2 [MNR, 2011a and b]) of a 50 m search area radius from the base of ten wind turbines will be conducted twice-weekly (3-4 day intervals) between May 1 and October 31 for a period of three years. A weekly mortality survey will be conducted at all turbines in November to assess raptor mortality.

Although all reasonable efforts will be made to conduct surveys as scheduled, surveys will not be conducted if weather (e.g. lightning, severe fog) presents safety concerns. Weather

conditions will be noted when surveys were not conducted as scheduled, and every attempt will be made to complete the missed survey(s) as soon as possible.

Searcher efficiency and scavenger trials will be conducted in accordance with Environment Canada (EC) and MNR guidelines. Searcher efficiency trials will typically be conducted once in each of spring, summer and fall, but will be repeated if searchers change during the year. Searcher efficiency trials are designed to correct for carcasses that may be overlooked by surveyors during the survey periods. Searcher efficiency trials involve a "tester" that places bird and bat carcasses under turbines prior to the standard carcass searches to test the searcher's detection rate. These trials are considered 'blind' trials; the testers are unaware when or where they are being tested. Each trial will consist of a minimum of 10 carcasses per searcher per visibility class. No more than three trial carcasses would be placed at any one time.

Searcher efficiency (Se) is calculated for each searcher as follows:

$$Se = \frac{\text{number of test carcasses found}}{\text{number of test carcasses placed} - \text{number of test carcasses scavenged}}$$

Should multiple searchers be involved in searches, overall searcher efficiency (S_{e0}) will be calculated as follows:

$S_{e0} = S_{e1}(n_1/T) + S_{e2}(n_2/T) + S_{e3}(n_3/T)\ldots$ where:

- $\mathbf{S_{e0}}$ is the overall searcher efficiency;
- $\mathbf{S_{e1}}$and $\mathbf{S_{e2}}$and $\mathbf{S_{e3}}$…are individual searcher efficiency ratings (calculated as outlined above);
- $\mathbf{n_1}$and $\mathbf{n_2}$ and $\mathbf{n_3}$…are number of turbines searched by each searcher; and
- **T** is the total number of turbines searched by all searchers.

Scavenger trials will be conducted once a month (May-Oct) and will involve 10 carcasses of bird and bat turbine fatalities, if available, or dark-coloured poultry chicks. If available, at least one raptor carcass will be used for some trials. A maximum of five trial carcasses will be placed at any one time. Carcasses should be monitored every 3 – 4 days as part of the regular carcass searches. The carcasses will be left until decomposed, or for two weeks. Carcasses should be fresh or thawed if frozen. Scavenger trials are designed to correct for carcasses that are removed by predators before the search period. These trials involve the distribution of carcasses in habitat types being searched, at known locations at each wind turbine generator, followed by periodic checking to determine the rate of removal. Proportions of carcasses remaining after each search interval are pooled to calculate the overall scavenger correction factors:

$Sc = \frac{n_{visit1} + n_{visit2} + n_{visit3} + n_{visit4}}{n_{visit0} + n_{visit1} + n_{visit2} + n_{visit3}}$ where

Sc is the proportion of carcasses not removed by scavengers over the search period

$\mathbf{n_{visit0}}$ is the total number of carcasses placed

$\mathbf{n_{visit1} - n_{visit4}}$ are the numbers of carcasses remaining on visits 1 through 4

There are numerous published and unpublished approaches to incorporating these corrective factors into an overall assessment of total bird and bat mortality. The estimated mortality will be calculated as follows:

C = c / (Seo x Sc x Ps), where:

- **C** is the corrected number of bird or bat fatalities;
- **c** is the number of carcasses found;
- **Seo** is the weighted proportion of carcasses expected to be found by searchers (overall searcher efficiency);
- **Sc** is the proportion of carcasses not removed by scavengers over the search period; and
- **Ps** is the percent of the area searched.

Most birds and bats will fall within 50 m of the turbine base (MNR 2011a). This value will be used to determine the percent of area searched (Ps). When the entire 50 m radius search area is searched, Ps will equal 100%. If portions of the 50 m radius search area are impossible due to site conditions (such as agricultural crops) Ps will be adjusted accordingly based on the searchers' ongoing estimates of the proportion of the search area that was physically searched. If feasible, a GPS will be used to delineate the search area and calculate the Ps.

The area searched will be determined for each turbine by mapping searchable areas on a grid (by visibility class – see Table 1 below) and counting the number of searched grid cells within 50 m. Where feasible, the search area will be searched using a grid system created with a GPS.

Table 1. Visibility Classes based on MNR (2011a)

% Vegetation Cover	Vegetation Height	Visibility Class
≥ 90% bare ground	≤ 15cm tall	Class 1 (easy)
≥ 25% bare ground	≤ 15cm tall	Class 2 (moderate)
≤ 25% bare ground	≤ 25% > 30cm tall	Class 3 (difficult)

Little or no bare ground	≥ 25% > 30cm tall	Class 4 (very difficult)

Maps of the varying search areas will be made available to review agencies. The summed area of those cells will be divided by the total area within a 50 m radius circle to determine the percent area searched for that turbine (Ps_x, where x is the turbine number).

$$Ps_x = \frac{\text{area searched within 50 m radius circle}}{7854\ m^2}$$

The overall Ps for the facility will be calculated as the average of Ps_1 through Ps_{10}.

Observed fatalities will be photographed, and the species, GPS coordinates, substrate, carcass conditions, possible injuries, sex (if possible) and distance and direction to the nearest turbine will be recorded along with the date, time, weather conditions and searcher. This approach to mortality monitoring will facilitate any potential correlation between mortality occurrences, turbine location, habitat/land use features, and season.

Bird carcasses in good condition may be collected and stored in a freezer for future use in searcher efficiency and/or scavenger removal trials. Persons handling bird carcasses will take reasonable precautions (e.g. gloves, tools etc.) to protect their personal health. Bird carcasses will be placed in heavy-duty plastic bags and transported that day to a freezer, where they will be stored until required for the trials. Carcasses of any species covered under the *Endangered Species Act, 2007* ("ESA") or the federal *Species at Risk Act* ("SARA") will be collected in a manner consistent with the conditions of applicable permits (see below).

As of 30 June 2008, species that are extirpated, endangered, or threatened are protected under the *ESA*. Consequently, unless otherwise authorized, possession and transport of species at risk is prohibited under the ESA. Therefore, in order to carry out the various activities contemplated in this Plan, a permit under clause 17(2)b of the ESA is necessary to allow St. Columban Energy LP and its agents to collect, possess, and transport species at risk as obtained from the Project Study Area. Any conditions attached to the permit relating to handling of injured birds, including raptors and species at risk, will be adhered to.

Additionally, in support of the activities contemplated in this Plan, St. Columban Energy LP or its agents will apply for a scientific collector's permit under the *Fish and Wildlife Conservation Act* ("FWCA") from the MNR that would allow St. Columban Energy LP and its agents to possess and transport a species protected by this legislation.

Finally, St. Columban Energy LP or its agents will apply to EC (Canadian Wildlife Service) for a scientific collector's permit under the *Migratory Bird Convention Act, 1994* (MBCA) that would allow St. Columban Energy LP and its agents to collect, possess, and to utilize for scientific research purposes, deceased specimens of migratory birds obtained from the study area.

Other permits, approvals, authorizations, etc., are not likely to be required from the MNR or EC to permit the monitoring activities contemplated in this Plan.

If an injured bird is found, the local MNR District will be contacted, and the injured bird will be brought to a near-by wildlife rehabilitation facility.

2.2.2 Bat Mortality Monitoring

Background

Bat mortality has been documented at wind power facilities in a variety of habitats across North America. Nearly every monitored wind power facility in the United States and Canada has reported bat mortality with minimum annual mortality varying from < 1 to 50 bat fatalities/ turbine/year (MNR 2006). The majority of bat fatalities at wind power facilities occur in the late summer and fall, and the long-distance migratory bats (i.e., hoary bat, eastern red bat, silver-haired bat) appear to be most vulnerable to collisions with moving turbine blades. Specific factors causing bat mortality and affecting species vulnerability to wind turbine mortality remain unclear, although recent evidence from Alberta suggests that air pressure differences in the blade vortices may contribute to bat mortality. Ontario specific data is relatively sparse at this time. Current evidence from operating facilities in Ontario suggests that bat mortality is lowest in open farmland away from forests and major waterbodies (MNR 2011b).

Monitoring

Bat mortality monitoring will be conducted according to MNR's *Bats and Bat Habitats: Guidelines for Wind Power Projects* (2011b). In general, the mortality monitoring requirements for bats will be captured in conjunction with bird mortality monitoring (described above).

- Bat mortality monitoring will be conducted twice-weekly (3-4 day intervals) within minimally-vegetated portions (i.e., Visibility Classes 1 and 2 [MNR, 2011b]) of a 50 m search area radius from the base of ten turbines between May 1 and October 31 for a three-year period in accordance with MNR guidelines. This time period includes the core season when resident and migratory bats are active. Bat mortality monitoring will be conducted in conjunction with other monitoring activities (birds) for efficiency.

- Searcher efficiency trials will be conducted seasonally and carcass removal trials will be conducted monthly between May 1 and October 31. Searcher efficiency and carcass removal rates are known to be more variable for bats than for birds throughout the year and depending on habitat (in part due to the relative size of the species).

Each trial will consist of a minimum of 10 carcasses per searcher per visibility class (for searcher efficiency trials) or per trial (for scavenger removal trials). At least one-third of the trial carcasses should be bats.

Bat carcasses in good condition may be collected and stored in a freezer for future use in searcher efficiency and/or scavenger removal trials. Persons handling bat carcasses will take reasonable precautions (e.g., gloves, tools etc.) to protect their personal health. All searchers will ensure they have updated rabies pre-exposure vaccinations. Biological material will be disposed of in a way to ensure that it does not pose a public or environmental health risk and in accordance with any applicable federal, provincial, and municipal laws.

If an injured bat is found, the local MNR District will be contacted, and the injured bat will be brought to a near-by wildlife rehabilitation facility.

2.3 REPORTING AND REVIEW OF RESULTS

Annual post-construction monitoring reports will summarize and analyze the results of mortality surveys. Reports will be submitted to the MOE within three months of the conclusion of the November mortality monitoring.

The monitoring program will be reassessed by MNR and St. Columban Energy LP at the end of each monitoring year. Pending the reassessment results, the program methods, frequencies, and duration may be reasonably modified to better reflect the findings.

3.0 Adaptive Management Program

The adaptive management program described in this section outlines performance objectives, and contingency measures, that will be implemented should the performance objectives not be met.

Contingency measures may include an adaptive management approach. An adaptive management program allows mitigation measures to be implemented in the event that unanticipated potentially significant adverse environmental effects are observed. Potentially significant adverse effects will be assessed through review of the annual report.

The following sections describe the procedures for notifications, reporting and adaptive management for mortality and disturbance effects monitoring. An additional section describes a contingency plan for both birds and bats if mass mortality occurs/continues after implementation of the mitigation measures discussed below.

3.1 MORTALITY MONITORING

All bird and bat mortality will be reported in the annual report submission. Mortality rate is expressed as the number of fatalities per turbine per year (e.g. from May 1 to November 30). Mortality of priority species in Bird Conservation Region ("BCR") 13 and mortality of all species of conservation concern, such as raptors and declining woodland breeding bird species, will be highlighted in the annual post-construction monitoring reports. A threshold approach will be used to identify and mitigate potential negative effects resulting from the operation of wind turbines.

3.1.1 Birds

Post-construction mitigation, including operational controls, will be considered if annual mortality (e.g. from May 1 to November 30) of birds exceed the following thresholds defined by the MNR:

- 14 birds/ turbine/year at individual turbines or turbine groups; and
- 2 raptors/wind power project (<10 turbines).

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.

Any and all mortality of species at risk (i.e., a species listed as Endangered, Threatened or Special Concern under Schedule 1 of the federal Species at Risk Act or a species listed on the Species at Risk in Ontario list as Extirpated, Endangered, Threatened, or Special Concern

under the provincial Endangered Species Act, 2007) that occurs will be reported immediately to EC and/or the MNR.

If, with due consideration of seasonal abundance and species composition, annual mortality levels at turbines located outside 120 m of bird SWH exceed the thresholds noted above, 2 years of subsequent scoped mortality and cause and effect monitoring will be conducted. Following scoped monitoring, post-construction mitigation (e.g. operation mitigation) and effectiveness monitoring may be required at individual turbines where a mortality effect has been identified or significant annual mortality persists (MNR 2011a).

If significant annual mortality persists, MNR will be engaged to initiate an appropriate response plan as set out in the MNR's Bird Guidelines (2010), which may include some or all of the following mitigation measures (or alternate plan reasonably agreed to between St. Columban Energy LP and the MNR[1]):

- Periodic shut-down of select turbines at specific times of year (MNR, 2011a); and
- Blade feathering at specific times of year (MNR, 2011a).

In the unlikely event of a mass mortality occurrence, a contingency plan is discussed below in **Section 3.3.1**.

3.1.2 Bats

Operational mitigation is required where annual post-construction mortality monitoring exceeds 10 bats per turbine per year (MNR 2011b).

Operation mitigation to be implemented includes increasing cut-in speed to 5.5 m/s or feathering wind turbine blades when wind speeds are below 5.5 m/s between sunset and sunrise, from July 15 to September 30. This mitigation should continue for the duration of the project as set out in the MNR's Bat Guidelines (2011b).

In the event of continued significant bat mortality occurrence, a contingency plan is discussed below in **Section 3.3.2**.

Where post-construction mitigation is applied for either birds or bats, an additional 3 years of effectiveness monitoring is required (MNR 2011b).

[1] An alternate plan maintains flexibility within the Plan to consider alternative response ideas that may arise over the course of the Plan (e.g., new technologies that may reduce bird or bat fatalities).

3.2 CONTINGENCY PLAN

3.2.1 Contingency Plan for Mass Mortality of Birds

To date, there have been no recorded events of mass mortality of birds at wind farms in Ontario. The various post-construction monitoring projects in Ontario typically record between 0 to 2 bird fatalities at individual turbines during any one survey, with only a single record of 3 birds fatalities observed at one turbine during a single visit (Friesen, 2011). As such, the risk of a mass mortality event for birds is anticipated to be very low.

In the event of a mass mortality event, defined as 10 or more bird fatalities at any one turbine, or 33 or more bird fatalities at multiple turbines on a single survey, the following steps will be implemented:

1. MNR will be notified of the event immediately and will be provided with any available details (e.g. species, number and distribution of turbines involved).

2. An emergency search of all turbines in the project will be conducted as soon as feasibly possible to determine the extent and the distribution of the mortality event.

3. An analysis of the results of the emergency search will be completed to identify potential risk factors (e.g., weather conditions, proximity to natural heritage features) leading to the mortality event.

4. Based on the risk factors identified, additional mitigation and scoped monitoring recommendations will be developed in conjunction with MNR with the goal of avoiding future mortality events.

3.2.2 Contingency Plan for Continued Significant Bat Mortality

Additional mitigation measures may be implemented in the event of continued significant bat mortality (i.e., more than 10 bats/turbine/year) after the mitigation measures outlined in **Section 3. 2** have been implemented. Should the cut-in speed mitigation be implemented and the bat mortality threshold continues to be exceeded, St. Columban Energy LP will work with the MNR to determine additional mitigation and scoped monitoring requirements.

4.0 Best Management Practices

St. Columban Energy LP will include the following best management practices as part of the post-construction monitoring program (as outlined in MNR 2011b).

4.1 DATA MANAGEMENT

All post-construction data, collected in accordance with MNR guidance and reported to MOE, will be made available for entry into the joint Canadian Wildlife Service – Canadian Wind Energy Association – Bird Studies Canada – Ontario Ministry of Natural Resources Wind Power and Birds Monitoring Database.

4.2 WHITE-NOSE SYNDROME

Carcasses of the following species found during bat mortality searches may be sent to the Canadian Cooperative Wildlife Health Centre for analysis of White-nose Syndrome and should not be used in carcass removal or searcher efficiency trials.

- *Myotis septentrionalis*
- *Myotis lucifugus*
- *Myotis leibii*
- *Perimyotis subflavus*
- *Eptesicus fuscus*

4.3 BAT TISSUE SAMPLES

Tissue samples from bat carcasses may be used in a number of DNA analyses to provide insight into population size and structure, as well as the geographic origin migrants. St. Columban Energy LP will contact the local MNR office prior to disposing bat carcasses, to determine if this type of research is occurring in the area.

5.0 Closure

This report has been prepared by Stantec for the sole benefit of St. Columban Energy LP, and may not be used by any third party without the express written consent of St Columban Energy LP. 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.

STANTEC CONSULTING LTD.

Shannon Catton, M.Sc.
Natural Heritage Co-ordinator
Ph: (519) 836-6050 Ext. 277
Fx: (519) 836-2493
Cell: (519) 831-5925
shannon.catton@stantec.com

rpt_160960649_eemp_20120509_fnl

6.0 References

Friesen, L. 2011. No evidence of large-scale fatality events at Ontario wind projects in *Ontario Birds*, Volume 29, No. 3, December 2011: pages 149- 155.

Ontario Ministry of Natural Resources. 2006. Wind Turbines and Bats: Bat Ecology Background Information and Literature Review of Impacts. December 2006.

Ontario Ministry of Natural Resources. 2007. Guideline to Assist in the Review of Wind Power Proposals: Potential Impacts to Bats and Bat Habitats (Working Draft). 28 pp.

Ontario Ministry of Natural Resources. 2009. Approval and Permitting Requirements Document for Renewable Energy Projects. 64 pp.

Ontario Ministry of Natural Resources. 2010. Technical Bulletin Two: Guidance for preparing the Design and Operations Report (draft). 41 pp.

Ontario Ministry of Natural Resources. 2011a. Birds And Bird Habitats: Guidelines For Wind Power Projects. 32 pp.

Ontario Ministry of Natural Resources. 2011b. Bats And Bat Habitats: Guidelines For Wind Power Projects. 24 pp.